ANL/DIS-10-8

Enabling ARG-US Radio Frequency Identification Technology in Los Alamos National Laboratory's "Big Bird," The Off-Site Source Recovery Project Truck

Conducted for

The DOE Packaging Certification Program of U.S. Department of Energy Environmental Management, Office of Packaging and Transportation

The mission of the DOE Packaging Certification Program (PCP) is to ensure the safety and security of packagings for radioactive and fissile materials and support vital DOE missions across the DOE Complex, as well as EM's risk reduction, clean up and site closure activities.

NNSA National Nuclear Security Administration

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August 30, 2010

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Notation

Acronyms

ARG-US	Integrated hardware and software sets from Argonne
ASCII	American Standard Code for Information Interchange
CCITT	Consultative Committee for International Telegraphy and Telephony (now ITU-T)
CRC	Cylindrical Redundancy Check
DEMO	Demonstration
DIS	Decision and Information Science Division
DOE	U.S. Department of Energy
TRANSCOM	DOE tracking system for high-visibility shipments
EM	Environmental Management
EM-45	Office of Packaging and Transportation
FFT	Free Form Text
GeoLogic	A commercial tracking system
GIS	Geographic information system
GMT	Greenwich Mean Time
HEX	Hexadecimal
IMCT	Integrated Mobile Communication Terminal
ITU-T	International Telecommunication Union (formerly CCITT)
LANL	Los Alamos National Laboratory
MHz	Megahertz
MIP	Mobile interface protocol
NMF	Network Management Facility
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
OmniTRACS	Satellite tracking equipment from Qualcomm
OSRP	Off-Site Source Recovery Project
PCP	Packaging Certification Program
RFID	Radio frequency identification
SQL	Structured Query Language

URL	Uniform resource locator
VP	Vehicle position
VPN	Virtual Private Network
VTS	Vehicle and item tracking system developed by Argonne
XML	Extensible Markup Language

Units of Measure

h	hour(s)
mi	mile(s)
min	minute(s)
s	second(s)

Acknowledgments

The authors wish to acknowledge Dr. James Shuler, Manager of the DOE Packaging Certification Program (PCP), Office of Packaging and Transportation (EM-45), for his continuing support and guidance of the project on applying the radio frequency identification (RFID) technology to the management of nuclear materials. The authors also wish to thank Jim Matzke and Justin Griffin of the Los Alamos National Laboratory and Bob Eddy of Qualcomm — without their assistance, the tasks described in the report would not have been possible.

Enabling ARG-US Radio Frequency Identification Technology in Los Alamos National Laboratory's "Big Bird," The Off-Site Source Recovery Project Truck

Executive Summary

The Packaging Certification Program (PCP) of the U.S. Department of Energy (DOE) Environmental Management (EM), Office of Packaging and Transportation (EM-45), has developed and tested a radio frequency identification (RFID) tracking and monitoring system, called ARG-US, for the management of nuclear materials during storage and transportation. The system, developed by the PCP team at Argonne National Laboratory, consists of hardware (MK-series sensor tags, fixed and handheld readers, form factor for multiple drum types, sensor suite for seal integrity and environmental parameters, and enhanced battery management), software (application programming interface, ARG-US software for local and remote/web applications, secure server, and database management), and cellular/satellite communication interfaces for vehicle tracking and item monitoring during transport. The ability of the above system to provide accurate, near-real-time tracking and monitoring of the "state of health" of multiple, certified containers of nuclear materials was demonstrated successfully in a MiniDemo in August 2009.

Los Alamos National Laboratory (LANL) recently acquired a Peterbilt truck, nicknamed "Big Bird," for the Off-Site Source Recovery Project (OSRP) for the National Nuclear Security Administration's (NNSA's) Office of Global Threat Reduction, in support of its Global Threat Reduction Initiative (GTRI). The mission of the OSRP is to remove excess, unwanted, abandoned, or orphan radioactive sealed sources that pose a potential risk to health, safety, and national security. In addition to the removal of transuranic sources, the OSRP mission includes the recovery of beta/gamma emitting sources, which are of concern to both the U.S. government and the International Atomic Energy Agency (IAEA). Because of the positive experience with the PCP's ARG-US RFID system in tracking items in shipment and storage and reporting alarms in case of incidents, LANL decided to install the ARG-US RFID system in the "Big Bird" to augment existing capabilities and to better serve OSRP missions. Global Positioning System (GPS) and satellite communication gear, as part of Qualcomm's OmniTRACS package, are already implemented in the "Big Bird."

Installation of an RFID tracking system and its integration with OmniTRACS in the "Big Bird" truck were completed in approximately half a day during the week of March 15, 2010, at Argonne National Laboratory. The installation, which consisted of mounting an RFID reader in the trailer, tapping into the vehicle's 12-V power supply, routing an Ethernet cable from the trailer to the tracker, and connecting the cable to a control computer and the Qualcomm gear, was straightforward. After several successful stationary communication tests, on March 24, 2010, a 300-mi road test was conducted to verify the overall performance of the system. The progression of the road test was broadcast in real time via secure Internet for a restricted audience, which included representatives from Argonne, LANL, Oak Ridge National Laboratory, and DOE. All aspects of the RFID installation and OmniTRACS integration, including alert reporting from staged incidents, were verified in this road test and found to be satisfactory.

The success of this exercise reinforces the expectation that the ARG-US RFID system installed in the Big Bird truck will perform its intended functions during actual OSRP shipments. In addition, the experience may help to enable the implementation of ARG-US RFID tracking and monitoring capabilities for nuclear/radioactive/hazardous materials containers in other government and commercial vehicles.

1 Introduction

In April 2008, the DOE Packaging Certification Program (PCP), at the direction of Dr. Ines Triay, the then Deputy Assistant Secretary of the Office of Environment Management, conducted a demonstration (DEMO) of the application of radio frequency identification (RFID) technology for the tracking and monitoring of nuclear materials containers during storage and transportation. The DEMO, conducted by the PCP team at Argonne National Laboratory, used a rental semi-trailer and 14 certified Type B transportation containers (i.e., drums) for nuclear materials, each fitted with an active RFID tag equipped with a suite of sensors for temperature, humidity, shock, seal integrity, and battery status. The drums (Model 9975, 9977, and ES-3100) were empty, but otherwise the DEMO represented the operating conditions in the real-world environment, including the loading and unloading of pallets of drums from the trailer and incidents and alarm notifications along the route and at the stopover facilities. Four vehicle-tracking systems — DIS, VTS, DOE TRANSCOM, and GeoLogic — were deployed during the 4.5-day DEMO. Two of the systems, DIS and VTS, developed by Argonne, also monitored the status of the tagged drums in the trailer. RFID tag monitoring was not possible for DOE TRANSCOM and GeoLogic during the DEMO because of a lack of an interface with the RFID reader in the truck. These two government/commercial systems nonetheless provided a valuable side-by-side comparison with Argonne's developmental systems during the DEMO (Tsai et al. 2008).

In the post-DEMO evaluation, it was concluded that the robust hardware and infrastructure features of the DOE TRANSCOM system are well suited to enhance the efficacy of the ARG-US RFID tracking and monitoring system. Because DOE TRANSCOM uses on-board GPS and satellite communication equipment provided by Qualcomm, Inc., one such system was acquired and integrated with the ARG-US RFID system for a feasibility study. The integration effort culminated in a successful 300-mile road test called the "MiniDemo" in August 2009 (Tsai et al. 2009).

Employing ARG-US RFID tracking of sensitive nuclear materials during transport offers a number of advantages over tracking only the transport vehicle — package integrity and environmental parameters are monitored continuously; content- and event-specific Geographic Information System (GIS) buffer zone reports can be issued promptly to aid first responders in case of an incident; administrative work at the receiving end may be reduced because of the complete, end-to-end transport surveillance records; and situation awareness for key personnel with a need to know can be enabled on a near-real-time basis. These attributes were verified in the DEMO and MiniDemo and are deemed beneficial to the various DOE shipments of nuclear/radioactive/hazardous materials. This report describes the effort to enable the ARG-US RFID tracking capability in the OSRP's "Big Bird" truck, the results of the stationary and road tests, and future use of the installed ARG-US RFID system in the truck and DOE TRANSCOM — the well-established DOE satellite tracking and communication system used to monitor radioactive materials shipments from DOE and Nuclear Regulatory Commission (NRC) licensee facilities — in actual OSRP shipments.

2 Equipment and Tracking Methodology

2.1 Platform

The in-vehicle components of OmniTRACS include a keyboard/display unit (tablet) and an externally mounted multidirectional satellite antenna communication unit (Qualcomm 2004). Together, they are called "Integrated Mobile Communication Terminal" (IMCT). These features were already installed in the LANL OSRP's "Big Bird" truck before it arrived at Argonne in March 2010. In operation, the in-vehicle system communicates with U.S. GPS satellites for position information and the data satellite for data and message exchanges (Figure 1). In the implementation of the ARG-US RFID interface, the added tag information would be transmitted as part of the message to the data satellite and be received at Qualcomm for processing. In the "Big Bird" ARG-US RFID enabling project, the command center was the one located at Argonne with its secure server.

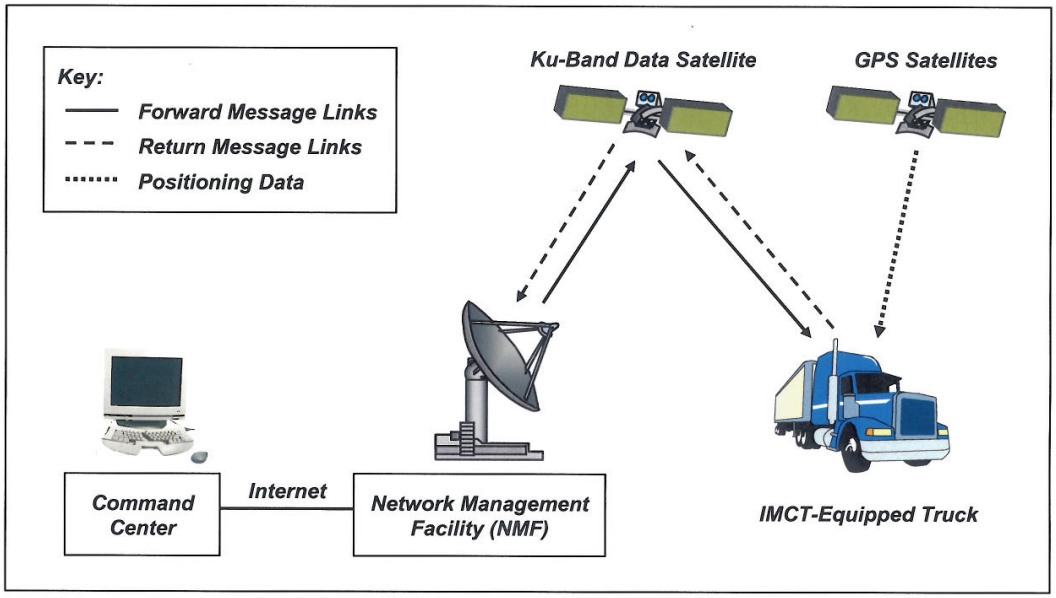


FIGURE 1 Schematic of Qualcomm's OmniTRACS System (Courtesy of Qualcomm, Inc.)

After the RFID equipment was installed in "Big Bird," the ARG-US RFID system was integrated with Qualcomm's OmniTRACS system. Together, they form the communication platform, as depicted in Figure 2.

The ARG-US MK-II RFID tags (Chen et al. 2009) are equipped with sensors for seal integrity, temperature, humidity, shock, and battery status. They are also equipped with non-volatile memories for storing the content manifest and the sensor event data. The alarm thresholds for the sensors are adjustable to suit the specific mode of operation (e.g., transport or storage). Figure 3 shows the front and interior views of an MK-II tag and mounting of tags on multiple drum types (Model 9975, 9977/9978, ES-3100, and DOT 7A).

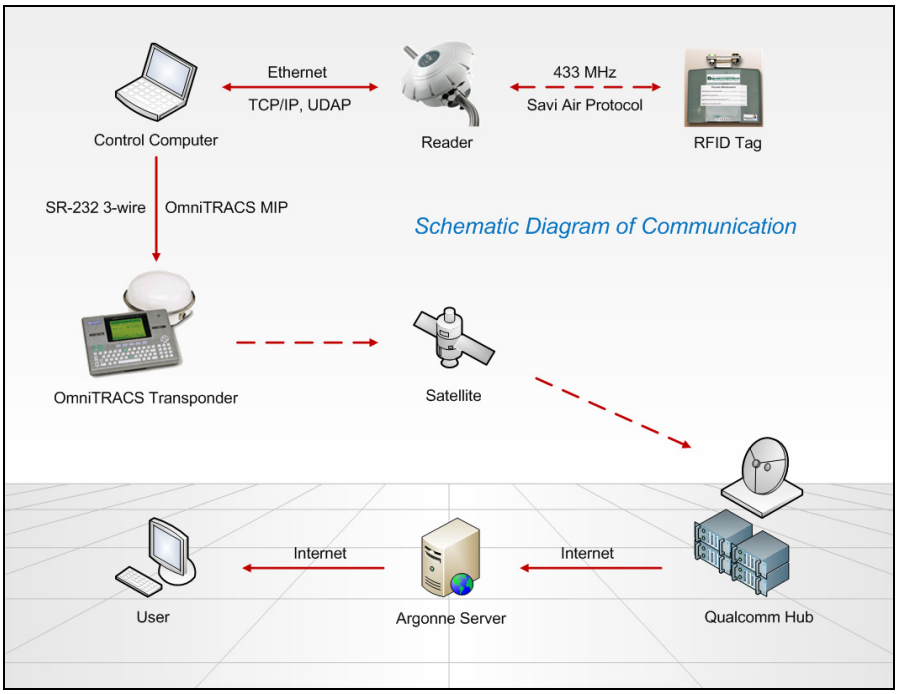


FIGURE 2 Schematic Diagram of Communication Platform in ARG-US RFID-enabled "Big Bird"

FIGURE 3 ARG-US MK-II RFID Tag (top) and Mounting on Different Drum Types (bottom, from left to right**:** 9975, 9977/9978, ES-3100, DOT 7A)

2.2 "Big Bird" Truck and ARG-US RFID Equipment Installation

"Big Bird" arrived at Argonne on March 8, 2010, from Oak Ridge. Figure 4 shows the truck and the OmniTRACS equipment already in the vehicle.

FIGURE 4 "Big Bird" with the Externally Mounted Transponder and the Tablet Communication Terminal in the Cab

A work plan was prepared that delineated the steps required for the installation of the ARG-US RFID equipment in the truck. The steps included mounting an RFID fixed reader in the trailer, tapping the 12-V power line in the trailer to power the reader, installing an Ethernet cable from the reader to the cab, and connecting the Ethernet cable and the tablet communication terminal to the control computer. The work plan also called for an on-the-road test to verify the performance of the integrated system.

Reader installation in the trailer involved using the existing brackets from the original mounting of the Qualcomm transponder. Figure 5 shows the RFID fixed reader mounted on the forward wall of the trailer. The high elevation prevented interference with cargo in the trailer. The reader was mounted by using bolts and could be removed easily, if necessary. The two cables connected to the reader were for 12-V power (tapped from the power line for the trailer interior lighting) and data connection (Ethernet). Both cables could be disconnected to disable the reader.

From the undercarriage of the trailer, the Ethernet cable was routed into the cab by using an existing hole on the cab floor (Figure 6).

In the sleeper section of the cab, the Ethernet cable and the leads from the Qualcomm communication tablet terminal were connected to the control computer, as shown in Figure 7.

Once the work plan was approved and the processes established, the physical installation took less than half a day, and no problems were encountered during installation. Only ordinary shop tools were necessary, and the overall cost of installation was minimal.

After the RFID equipment was installed, several stationary communication tests and one Road Test were conducted to verify the success of the installation and Qualcomm OmniTRACS integration. These results are discussed in subsequent sections of the report.

FIGURE 5 Mounted RFID Fixed Reader on the Forward Wall of the Trailer

FIGURE 6 Routing of the Reader Ethernet Cable in the Truck Undercarriage

FIGURE 7 Control Computer in the Cab of "Big Bird"

2.3 Data Handling

Inside the "Big Bird," the RFID fixed reader continually polled the MK-II tags by radio frequency and relayed the collected data through the Ethernet cable to a control PC. The purposes of the control computer were to (1) format the data collected from the tag into packets suitable for transmission to the satellite via the Qualcomm transponder (Figure 2) and (2) allow the LANL operator to update inventory information during the pick-up of the OSRP sources. The polling and sending intervals, which are adjustable, were set at 5 min for the Road Test. Between polling, the tags were in a half-asleep state, and the RF transceiver was turned off to conserve the battery. Even in the half-sleep state, all sensors were active and monitoring. When any of the alarm thresholds were exceeded, the tag instantly woke up and broadcast the alarm message to the reader. Sending the alarm message via satellite took precedence over all other actions that the reader and the communication system were undertaking at that time. After the alarm message was dispatched, the system resumed sending of the regular data packet, if the process had been interrupted

For each message sent, the current time was added to the sensor information. The time stamp and tag information were formatted in a Free Form Text (FFT) message per the Qualcomm mobile interface protocol (MIP). The format is user-defined and shown in Table 1. The FFT message was then converted to a byte array that can be sent out via a three-wire serial port in the tablet display unit and the OmniTRACS antenna. The format of the array was defined by Qualcomm and shown in Table 2. All message formation and conversion were done by the data processor. Sample FFT messages and byte arrays are given in Appendix A.

TABLE 1 Free Form Text Message Format

Position	Content
1	Format Flat (0 plain text, 1 compressed)
2–15	Date/Time (MMDDYYYYHHmmSS)
16–26	Tag ID (text padded on right with spaces)
27–28	Event Code (HEX)
29	Seal Code (HEX)
30–31	Seal Value (HEX)
32	Temperature Code (HEX)
33–34	Temperature Value (HEX)
35	Humidity Code (HEX)
36–37	Humidity Value (HEX)
38	Shock Code (HEX)
39–40	Shock Value (HEX)
41	Radiation Code (HEX)
42–43	Radiation Value (HEX)
44	Battery Code (HEX)
	Repeat the above for the next tag until all tags are processed

Note: The Free Form Text (FFT) message format is user-defined. The maximum length of the message is 1,900 bytes. The FFT supports only 6-bits ASCII.

When the FFT message was sent from the vehicle, a Vehicle Position (VP) message was also generated and sent. The latest position — as well as the nearest cities/towns and a date/time stamp — was contained in the VP message. From the data satellite, the message was relayed to the Qualcomm Network Management Facility (NMF) or Qualcomm Hub, as depicted in Figures 1 and 2. The VP messages were important because they allowed the Argonne RFID server to obtain the current latitude and longitude of the vehicle.

At the Pilot RFID Command Center (Building 221 at Argonne), the ARG-US RFID software continually polled the Qualcomm Hub at 10-s intervals to check if any new transmissions have been received. When a transmission was returned, the software converted the message from the transmission encoding of Base 64 into an Extensible Markup Language (XML) collection of transmissions (see an example in Appendix B). After the message was converted, the software parsed the XML to find the formatted text that represents the transmitted RFID tag data (see Appendix C). Once the text was located, the software parsed the formatted text and inserted the latest sensor values into the RFID database. At this point, the newly obtained data were shown on the RFID website.

TABLE 2 Format of Byte Array Sent Over-the-Air

Message	Length	Note
END	1 byte	C0
SPARE 1	1 byte	00
PACKET TYPE	1 byte	07 = text message
SEQUENCE #	1 byte	00
CONTROL	1 byte	00 = no error
ERROR	1 byte	00 = no error
RESERVED	1 byte	00
DATA 0	1 byte	00 = Normal message
FFT MESSAGE	0 – 1900 bytes	ASCII 6 bits only
CRC high byte	1 byte	High byte of CRC-16-CCITT
CRC low byte	1 byte	Low byte of CRC-16-CCITT
END	1 byte	C0

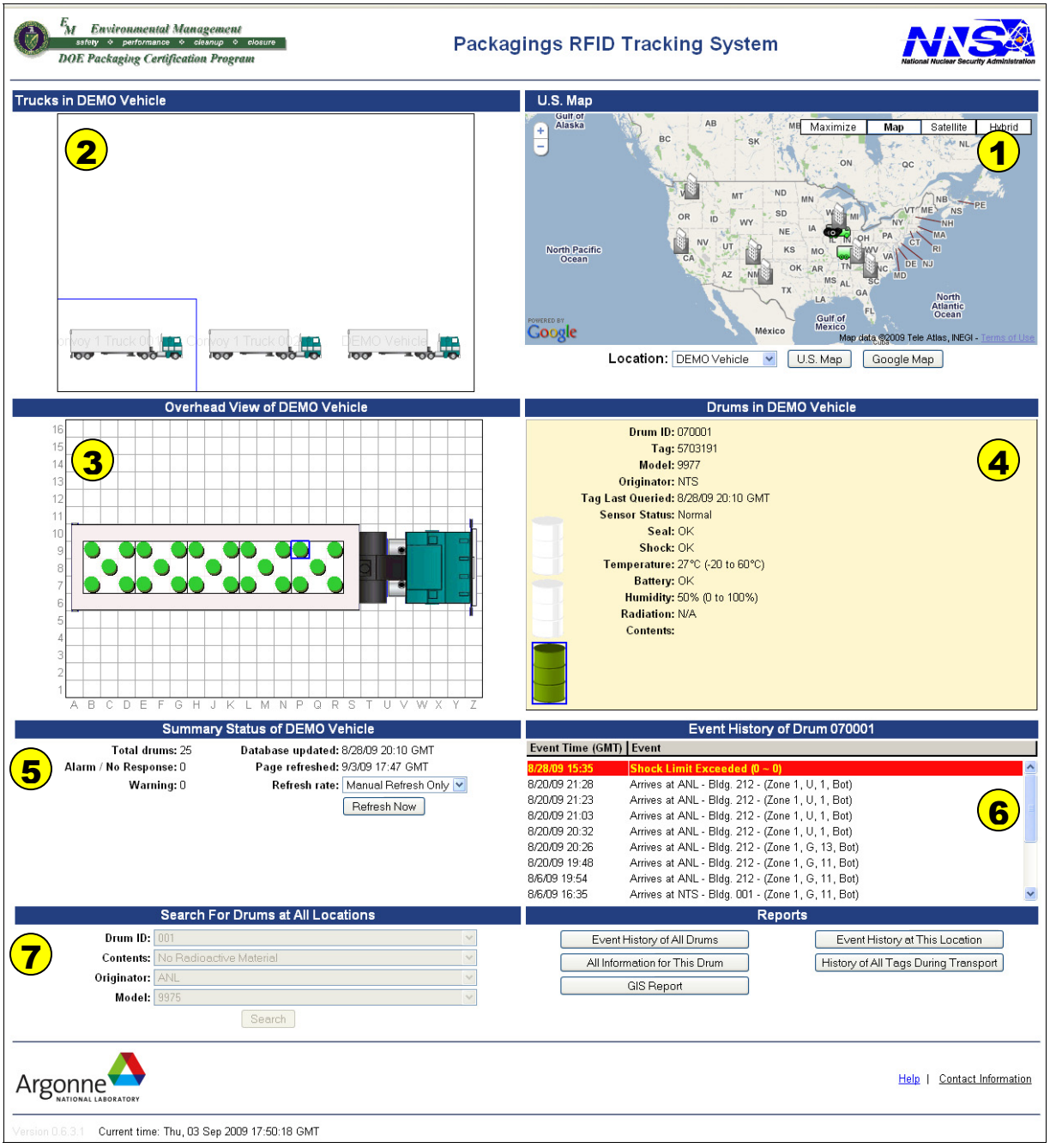
Note: A Cylindrical Redundancy Check (CRC) is used to ensure data integrity. The generating polynomial is the standard CCITT (now ITU-T) polynomial used in the X.25 protocol. The seed value of the CRC is 0xFFFF. The byte array that is used for calculating the final value of CRC starts from "SPARE1" and ends at the end of the FFT message.

2.4 Web Functions

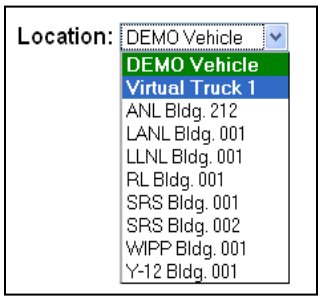
Significant improvements in web functions have been made since the April 2008 DEMO, particularly in the development of mapping capabilities using the Google Maps engine. Planned route, route tracking (bread-crumbing), zooming, and spot information are some of the new features added. The ability to view detailed information on tags/drums in tabulated form for the current and past time steps is now possible directly on the webpage, without having to navigate through the server database. Another important improvement is in the geographic information system (GIS) reporting — pre-formatted GIS reports, when warranted, can now be issued with a single click from the Pilot RFID Command Center. GIS reports, with

a concise summary of local assets and vulnerabilities, are important for first responders and emergency management in case of a transportation incident. The illustrations shown in this section are those obtained from the 2009 MiniDemo.

The current ARG-US RFID web site's URL is https://rfid.dis.anl.gov/pcp-test/webform1.aspx. After the page is opened, the first transportation vehicle, if any exist, will become the selected location. The web page always displays information about the currently selected location. There are seven major sections on the secure web page, as delineated below.



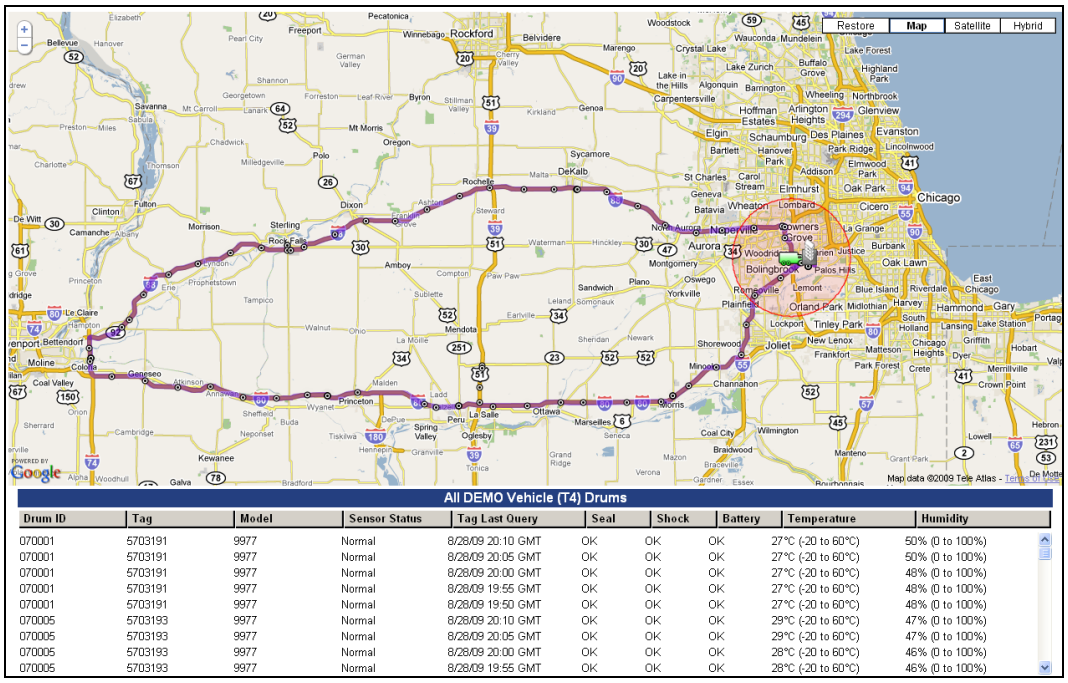
By default, the first section of the main web page contains a Google map of the United States, showing the potential ARG-US RFID implementation locations, whether they are storage sites or transportation vehicles. Users can pan the map by dragging the "hand" cursor back and forth. Various details about this selected location are shown throughout the page. One way to change the location is by clicking on its icon or using the drop-down menu:



The color of each location's icon represents the current status of sensors in the RFID MK-II tags, indicating the "state of health" of the monitored drums:

	Alert	Warning	Normal	Other
Storage Location:				
Transportation Vehicle				

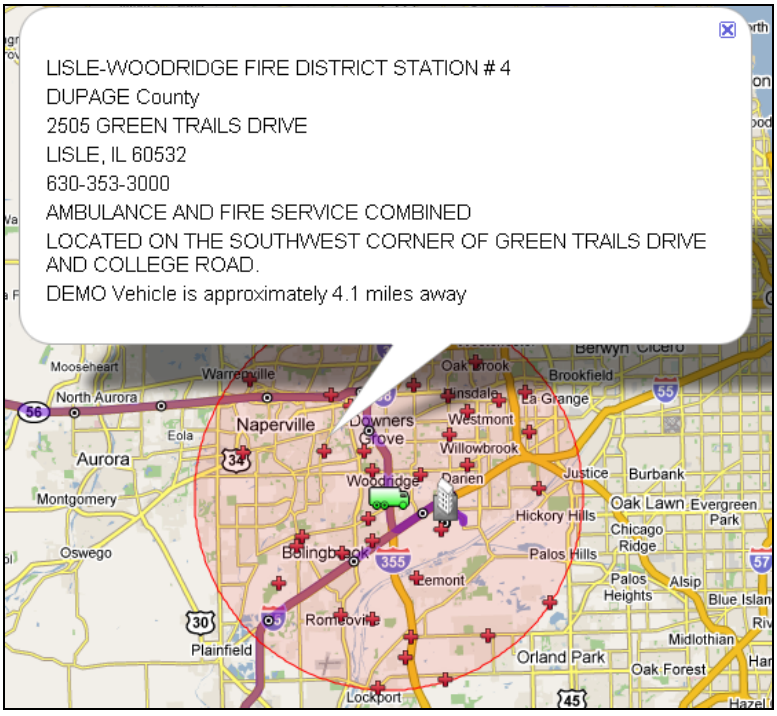
If the ***Maximize*** button on the Google map is clicked when a transportation vehicle is selected, the web page will change. A larger map will be displayed, along with a table at the bottom detailing the chronological status of all drums in that vehicle:



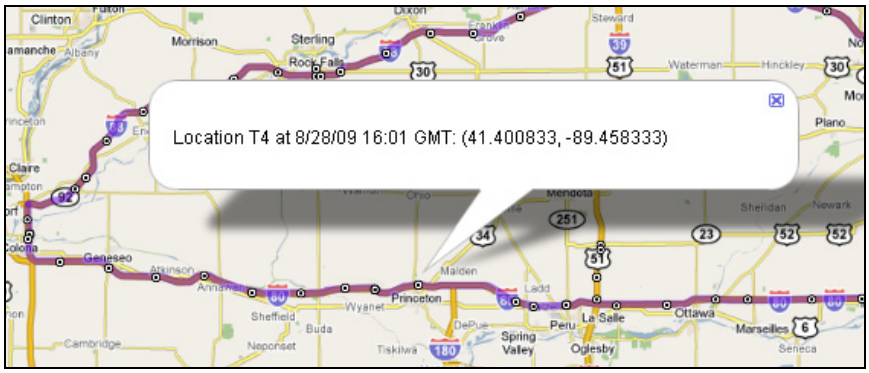
All DEMO Vehicle (T4) Drums

Drum ID	Tag	Model	Sensor Status	Tag Last Query	Seal	Shock	Battery	Temperature	Humidity
070001	5703191	9977	Normal	8/28/09 20:10 GMT	OK	OK	OK	27°C (-20 to 60°C)	50% (0 to 100%)
070001	5703191	9977	Normal	8/28/09 20:05 GMT	OK	OK	OK	27°C (-20 to 60°C)	50% (0 to 100%)
070001	5703191	9977	Normal	8/28/09 20:00 GMT	OK	OK	OK	27°C (-20 to 60°C)	48% (0 to 100%)
070001	5703191	9977	Normal	8/28/09 19:55 GMT	OK	OK	OK	27°C (-20 to 60°C)	48% (0 to 100%)
070001	5703191	9977	Normal	8/28/09 19:50 GMT	OK	OK	OK	27°C (-20 to 60°C)	48% (0 to 100%)
070005	5703193	9977	Normal	8/28/09 20:10 GMT	OK	OK	OK	29°C (-20 to 60°C)	47% (0 to 100%)
070005	5703193	9977	Normal	8/28/09 20:05 GMT	OK	OK	OK	29°C (-20 to 60°C)	47% (0 to 100%)
070005	5703193	9977	Normal	8/28/09 20:00 GMT	OK	OK	OK	28°C (-20 to 60°C)	46% (0 to 100%)
070005	5703193	9977	Normal	8/28/09 19:55 GMT	OK	OK	OK	28°C (-20 to 60°C)	46% (0 to 100%)

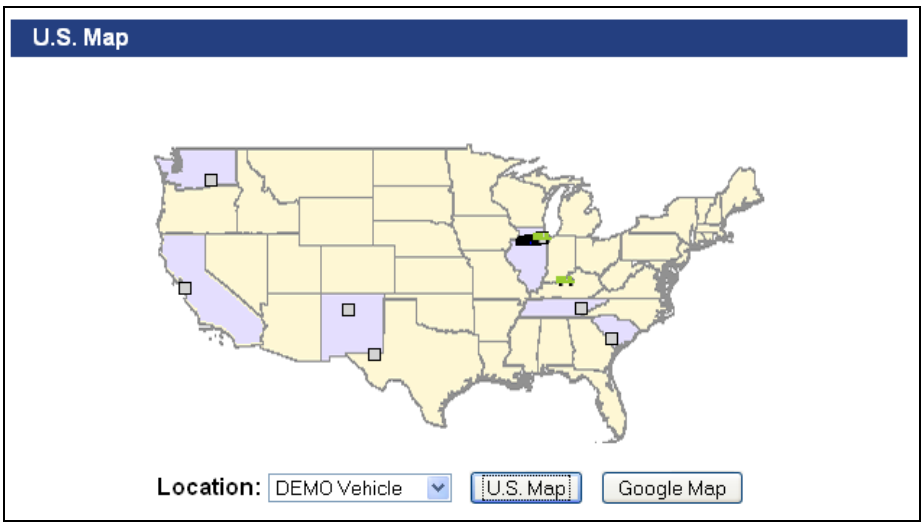
Clicking on the ***Restore*** button on the enlarged Google map will reset the map to its original size. Positioning the mouse over the Google map and using the scroll wheel, or clicking on the + or – buttons, will zoom the image in or out. Emergency and other facilities within a 5-mi radius of the selected vehicle are displayed (as red crosses in the following diagram) if the zoom level is close enough. Users can click on a facility's icon for more information, including its distance from the current location of the selected vehicle, as shown below:



A predetermined transportation route, if defined for the currently selected transportation vehicle, is displayed on the Google map. Along this route are "breadcrumbs" that track the vehicle's actual position. If a breadcrumb (indicated by the symbol ⊙) is clicked, the latitude and longitude of the vehicle at that point in time during the transport will be displayed, as shown below:

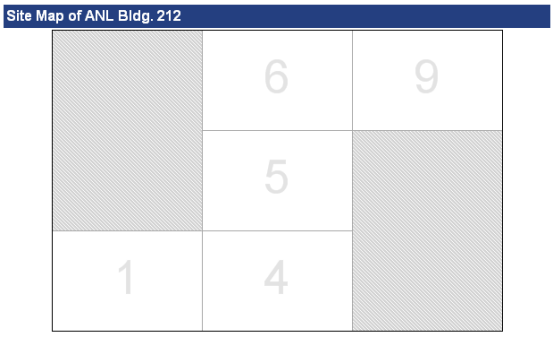


1 When the ***U.S. Map*** button the Google map is clicked, the image changes to a more generic U.S. map:

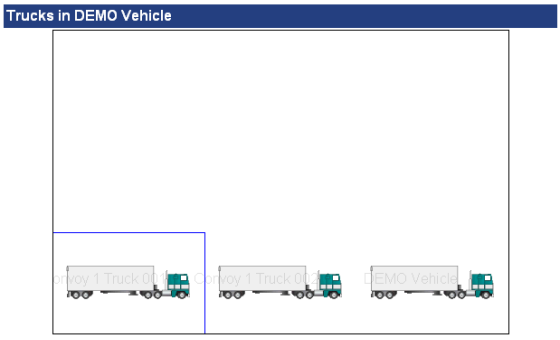


Users can revert to the Google map by clicking the ***Google Map*** button.

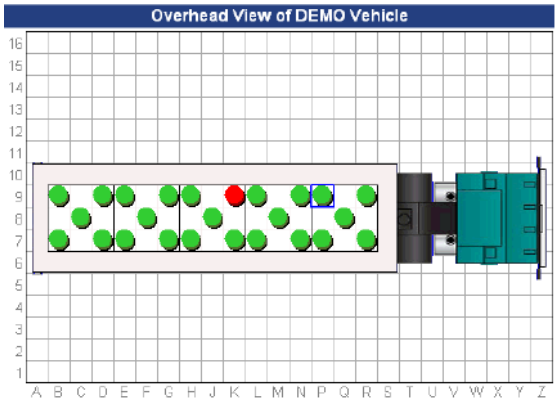
2 The second section of the main web page contains either a site map of a storage location (shown at left, below, for Argonne Building 212) or a diagram of a convoy of vehicles (shown at right, below, for Trucks in DEMO Vehicle). If there is more than one truck in the convoy, users can use the mouse to select a specific vehicle. When the highlighted vehicle changes, other parts of the web page also change accordingly.



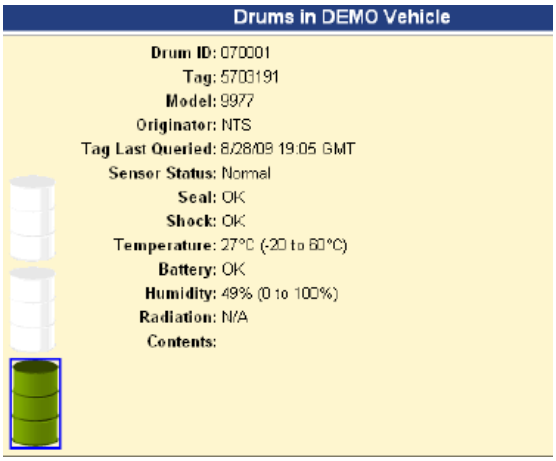
or



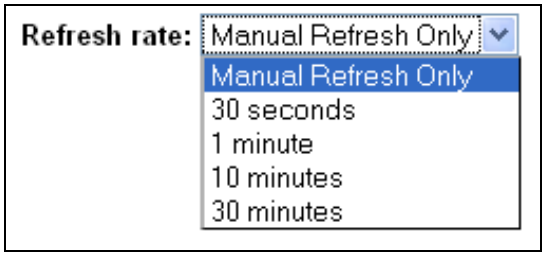
3 The third section of the main web page contains an overhead view of the selected transportation vehicle shown below or storage zone (not shown). Drums in storage can be stacked up to three high; however, drums in transport are generally not stacked but are placed on pallets that are tied down securely to the trailer floor. The color of drums indicates normal (green), alert/alarm (red), and warning (yellow), which is not shown. Clicking on a drum (or stack) in this overhead view will select the drum (or stack), as shown by the square enclosing the drum (or stack).



4 The fourth section of the main web page contains the current status of the drum selected in section 3, above. A stack image is preserved for storage application such that any drum shown in the stack image can be selected by clicking on the drum by using the mouse.



5 The fifth section of the main web page is a summary status of all drums at either the currently selected storage location or the selected transportation vehicle. By default, this information (and all other information on the web page) is updated only when the ***Refresh Now*** button is clicked. The refresh rate of the display (and the entire web page) can be set by selecting a specific time interval from the **Refresh Rate** drop-down menu:



Refreshing the display reads the information present in the ARG-US RFID database at that point in time. The current time in GMT (Greenwich Mean Time) is shown at the bottom of the web page.

6 The sixth section of the main web page displays the event history of a specific drum. This section changes when a specific drum is selected from the "Overhead View of DEMO Vehicle (3)" or from the "Drums in DEMO Vehicle (4)" section of the web page.

7 The seventh section of the main web page contains two sets of buttons. The first set is reserved for future implementation of search tools. The second set of buttons is used to create five types of reports, which are displayed as HTML on separate web pages. The reports are described below.

Report 1: Event History of All Drums — This report contains the description and time of all events associated with all drums at all storage locations and in all transportation vehicles. Events are sorted by location, drum, and time. A portion of a sample report is shown below:

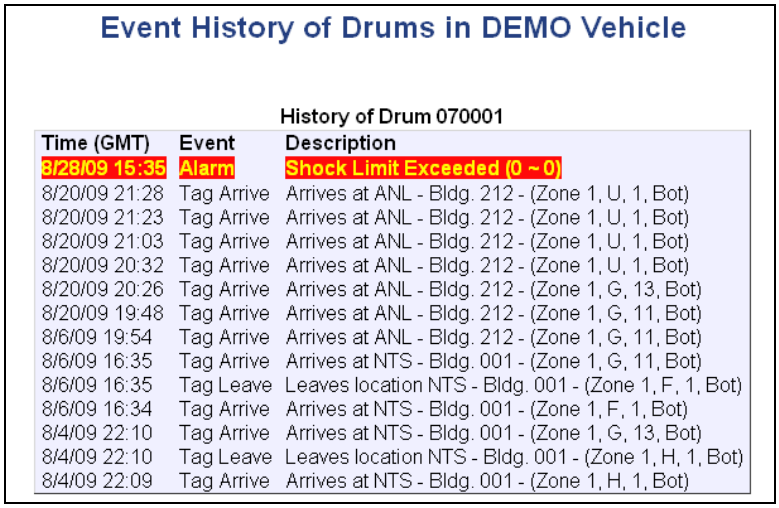
Event History of Drums in DEMO Vehicle

Drum	Time (GMT)	Event	Description
070001	8/28/09 15:35	Alarm	Shock Limit Exceeded (0 ~ 0)
070001	8/20/09 21:28	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
070001	8/20/09 21:23	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
070001	8/20/09 21:03	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
070001	8/20/09 20:32	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
070001	8/20/09 20:26	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 13, Bot)
070001	8/20/09 19:48	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 11, Bot)
070001	8/6/09 19:54	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 11, Bot)
070001	8/6/09 16:35	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, G, 11, Bot)
070001	8/6/09 16:35	Tag Leave	Leaves location NTS - Bldg. 001 - (Zone 1, F, 1, Bot)
070001	8/6/09 16:34	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, F, 1, Bot)
070001	8/4/09 22:10	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, G, 13, Bot)
070001	8/4/09 22:10	Tag Leave	Leaves location NTS - Bldg. 001 - (Zone 1, H, 1, Bot)
070001	8/4/09 22:09	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, H, 1, Bot)
⋮			
5714449	5/27/09 21:52	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, A, 1, Mid)
5714449	5/26/09 19:19	Tag Leave	Leaves location ANL - Bldg. 212 - (Zone 1, K, 12, Bot)
5714449	5/26/09 19:15	Alarm	Seal is Open.
5714449	5/26/09 19:15	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, K, 12, Bot)
5714449	5/8/09 19:27	Alarm	Seal is Open.
5714449	5/8/09 19:27	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, K, 12, Bot)

Event History of Drums in Virtual Truck 1

Drum	Time (GMT)	Event	Description
V00	5/29/09 16:05	Automatic	Current Drum Status (Temp=4°c , Humidity=56%)
V00	5/29/09 16:00	Automatic	Current Drum Status (Temp=6°c , Humidity=55%)
V00	5/29/09 15:38	Automatic	Current Drum Status (Temp=5°c , Humidity=62%)
V00	5/29/09 15:10	Automatic	Current Drum Status (Temp=4°c , Humidity=57%)
V00	5/29/09 15:00	Automatic	Current Drum Status (Temp=4°c , Humidity=64%)
V00	5/29/09 14:55	Automatic	Current Drum Status (Temp=4°c , Humidity=66%)
⋮			

Report 2: Event History at This Location — This report shows the event history of all drums on the currently selected transportation vehicle.

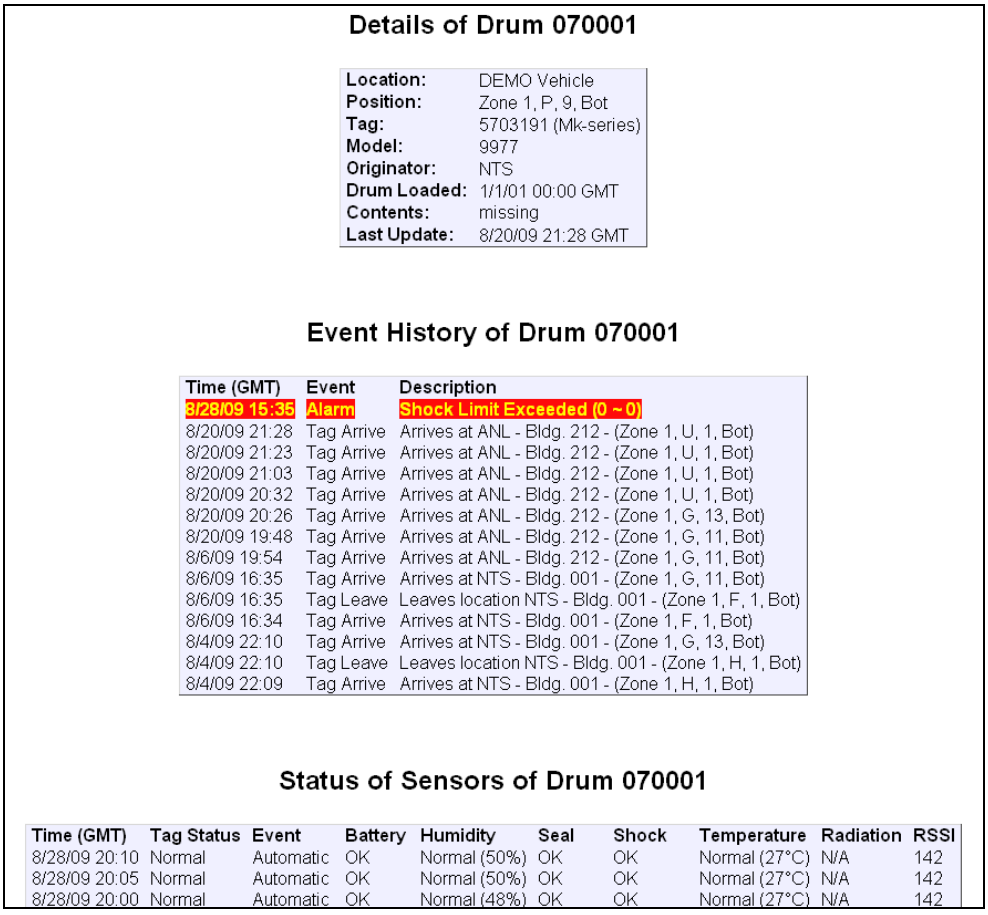


Event History of Drums in DEMO Vehicle

History of Drum 070001

Time (GMT)	Event	Description
8/28/09 15:35	Alarm	Shock Limit Exceeded (0 ~ 0)
8/20/09 21:28	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 21:23	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 21:03	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 20:32	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 20:26	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 13, Bot)
8/20/09 19:48	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 11, Bot)
8/6/09 19:54	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 11, Bot)
8/6/09 16:35	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, G, 11, Bot)
8/6/09 16:35	Tag Leave	Leaves location NTS - Bldg. 001 - (Zone 1, F, 1, Bot)
8/6/09 16:34	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, F, 1, Bot)
8/4/09 22:10	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, G, 13, Bot)
8/4/09 22:10	Tag Leave	Leaves location NTS - Bldg. 001 - (Zone 1, H, 1, Bot)
8/4/09 22:09	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, H, 1, Bot)

Report 3: All Information for This Drum — This report shows the sensor and event history for the currently selected drum. A portion of the report is shown below:



Details of Drum 070001

Location:	DEMO Vehicle
Position:	Zone 1, P, 9, Bot
Tag:	5703191 (Mk-series)
Model:	9977
Originator:	NTS
Drum Loaded:	1/1/01 00:00 GMT
Contents:	missing
Last Update:	8/20/09 21:28 GMT

Event History of Drum 070001

Time (GMT)	Event	Description
8/28/09 15:35	Alarm	Shock Limit Exceeded (0 ~ 0)
8/20/09 21:28	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 21:23	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 21:03	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 20:32	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, U, 1, Bot)
8/20/09 20:26	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 13, Bot)
8/20/09 19:48	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 11, Bot)
8/6/09 19:54	Tag Arrive	Arrives at ANL - Bldg. 212 - (Zone 1, G, 11, Bot)
8/6/09 16:35	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, G, 11, Bot)
8/6/09 16:35	Tag Leave	Leaves location NTS - Bldg. 001 - (Zone 1, F, 1, Bot)
8/6/09 16:34	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, F, 1, Bot)
8/4/09 22:10	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, G, 13, Bot)
8/4/09 22:10	Tag Leave	Leaves location NTS - Bldg. 001 - (Zone 1, H, 1, Bot)
8/4/09 22:09	Tag Arrive	Arrives at NTS - Bldg. 001 - (Zone 1, H, 1, Bot)

Status of Sensors of Drum 070001

Time (GMT)	Tag Status	Event	Battery	Humidity	Seal	Shock	Temperature	Radiation	RSSI
8/28/09 20:10	Normal	Automatic	OK	Normal (50%)	OK	OK	Normal (27°C)	N/A	142
8/28/09 20:05	Normal	Automatic	OK	Normal (50%)	OK	OK	Normal (27°C)	N/A	142
8/28/09 20:00	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	N/A	142

Report 4: History of All Tags during Transport — This report shows the history of all tags that are associated with all drums located on transportation vehicles. Since the complete history of all tags can be thousands of lines, only the first 20 lines are shown on the web page.

History of Tags During Transportation

View Complete Report in Excel

Time (GMT)	Drum	Tag ID	Tag Status	Event	Battery	Humidity	Seal	Shock	Temperature	RSSI	Latitude	Longitude
8/28/09 20:10	070001	5703191	Normal	Automatic	OK	Normal (50%)	OK	OK	Normal (27°C)	142	41.732222	-88.035278
8/28/09 20:05	070001	5703191	Normal	Automatic	OK	Normal (50%)	OK	OK	Normal (27°C)	142	41.781111	-88.054167
8/28/09 20:00	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.807222	-88.054167
8/28/09 19:55	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.810278	-88.0625
8/28/09 19:50	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.806111	-88.156111
8/28/09 19:45	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.8	-88.261389
8/28/09 19:40	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.794722	-88.347778
8/28/09 19:35	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.8125	-88.448889
8/28/09 19:30	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.859167	-88.538333
8/28/09 19:25	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.894722	-88.639444
8/28/09 19:20	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.9	-88.7375
8/28/09 19:15	070001	5703191	Normal	Automatic	OK	Normal (48%)	OK	OK	Normal (27°C)	142	41.9	-88.7375
8/28/09 19:10	070001	5703191	Normal	Automatic	OK	Normal (49%)	OK	OK	Normal (27°C)	142	41.9	-88.739444
8/28/09 19:05	070001	5703191	Normal	Automatic	OK	Normal (49%)	OK	OK	Normal (27°C)	142	41.9	-88.739444
8/28/09 19:00	070001	5703191	Normal	Automatic	OK	Normal (49%)	OK	OK	Normal (27°C)	142	41.9	-88.814444
8/28/09 18:55	070001	5703191	Normal	Automatic	OK	Normal (49%)	OK	OK	Normal (27°C)	142	41.9	-88.913333
8/28/09 18:50	070001	5703191	Normal	Automatic	OK	Normal (49%)	OK	OK	Normal (27°C)	142	41.904167	-89.025
8/28/09 18:45	070001	5703191	Normal	Automatic	OK	Normal (49%)	OK	OK	Normal (27°C)	142	41.883333	-89.125
8/28/09 18:40	070001	5703191	Normal	Automatic	OK	Normal (50%)	OK	OK	Normal (27°C)	142	41.850833	-89.231111

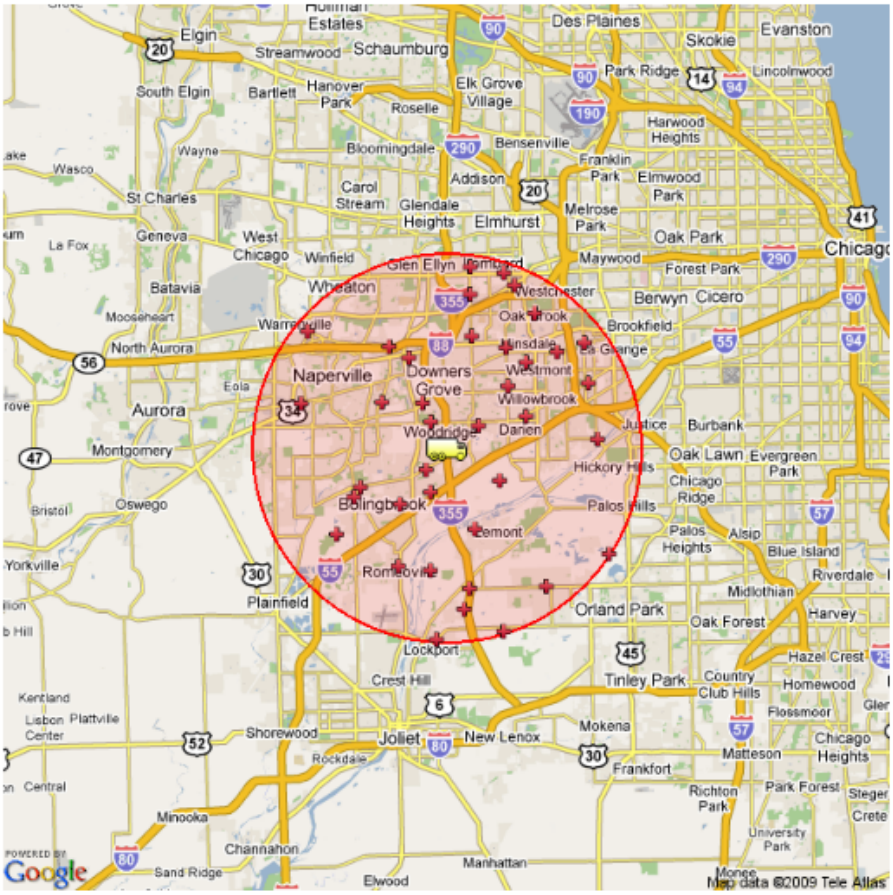
This report has been truncated to 20 rows. Click the button above to view the complete report in Excel.

Clicking on the ***View Complete Report in Excel*** button shows the entire report. When MS Internet Explorer is used, Excel will open automatically and the report will be displayed. If another browser (such as Firefox) is used, users can right-click on the report, save it as an XML file, and then use Excel to open the XML file. A portion of the Excel file is shown below:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Time (GMT)	Drum	Tag ID	Tag Status	Seal	Temperature	Humidity	Shock	Battery	RSSI	Event	Longitude	Latitude	LocationTS
2	8/28/09 20:10	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-88.03528	41.73222	8/28/09 20:11
3	8/28/09 20:05	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-88.05417	41.78111	8/28/09 20:06
4	8/28/09 20:00	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.05417	41.80722	8/28/09 20:01
5	8/28/09 19:55	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.0625	41.81028	8/28/09 19:56
6	8/28/09 19:50	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.15611	41.80611	8/28/09 19:51
7	8/28/09 19:45	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.26139	41.8	8/28/09 19:46
8	8/28/09 19:40	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.34778	41.79472	8/28/09 19:41
9	8/28/09 19:35	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.44889	41.8125	8/28/09 19:36
10	8/28/09 19:30	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.53833	41.85917	8/28/09 19:31
11	8/28/09 19:25	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.63944	41.89472	8/28/09 19:26
12	8/28/09 19:20	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.7375	41.9	8/28/09 19:21
13	8/28/09 19:15	070001	5703191	Normal	OK	Normal (27°C)	Normal (48%)	OK	OK	142	Automatic	-88.7375	41.9	8/28/09 19:21
14	8/28/09 19:10	070001	5703191	Normal	OK	Normal (27°C)	Normal (49%)	OK	OK	142	Automatic	-88.73944	41.9	8/28/09 19:11
15	8/28/09 19:05	070001	5703191	Normal	OK	Normal (27°C)	Normal (49%)	OK	OK	142	Automatic	-88.73944	41.9	8/28/09 19:06
16	8/28/09 19:00	070001	5703191	Normal	OK	Normal (27°C)	Normal (49%)	OK	OK	142	Automatic	-88.81444	41.9	8/28/09 19:01
17	8/28/09 18:55	070001	5703191	Normal	OK	Normal (27°C)	Normal (49%)	OK	OK	142	Automatic	-88.91333	41.9	8/28/09 18:56
18	8/28/09 18:50	070001	5703191	Normal	OK	Normal (27°C)	Normal (49%)	OK	OK	142	Automatic	-89.025	41.90417	8/28/09 18:51
19	8/28/09 18:45	070001	5703191	Normal	OK	Normal (27°C)	Normal (49%)	OK	OK	142	Automatic	-89.125	41.88333	8/28/09 18:46
20	8/28/09 18:40	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.23111	41.85083	8/28/09 18:41
21	8/28/09 18:35	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.33639	41.82278	8/28/09 18:36
22	8/28/09 18:30	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.43222	41.82278	8/28/09 18:31
23	8/28/09 18:25	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.53222	41.78944	8/28/09 18:26
24	8/28/09 18:20	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.63528	41.75917	8/28/09 18:21
25	8/28/09 18:15	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.67806	41.75083	8/28/09 18:18
26	8/28/09 18:10	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.68944	41.7625	8/28/09 18:11
27	8/28/09 18:05	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.68944	41.75083	8/28/09 18:06
28	8/28/09 18:00	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.775	41.75722	8/28/09 18:01
29	8/28/09 17:55	070001	5703191	Normal	OK	Normal (27°C)	Normal (50%)	OK	OK	142	Automatic	-89.87694	41.74472	8/28/09 17:56
30	8/28/09 17:50	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-89.98333	41.71861	8/28/09 17:51
31	8/28/09 17:45	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.08	41.69056	8/28/09 17:46
32	8/28/09 17:40	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.16333	41.6425	8/28/09 17:41
33	8/28/09 17:35	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.20917	41.58111	8/28/09 17:36
34	8/28/09 17:30	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.23417	41.5625	8/28/09 17:35
35	8/28/09 17:25	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.34056	41.51139	8/28/09 17:28
36	8/28/09 17:20	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.33417	41.48639	8/28/09 17:21
37	8/28/09 17:15	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.33417	41.48639	8/28/09 17:16
38	8/28/09 17:11	070001	5703191	Normal	OK	Normal (23°C)	Normal (48%)	OK	OK	142	Automatic	-90.33417	41.48639	8/28/09 17:12

Report 5: GIS Report — When a transportation vehicle is selected and this button is clicked, a report is generated that contains a map showing the current location of the vehicle, a 5-mile buffer zone around the vehicle, and various facilities within that zone. At this time, only emergency medical facilities are displayed. In addition to the map, a table is created that lists each facility, relevant contact information, and its approximate distance to the selected vehicle. A portion of this report is shown below.

GIS Report for DEMO Vehicle



EMS Facilities within 10 Miles of DEMO Vehicle (41.732222,-88.035278)
(As of 9/8/09 18:04 GMT)

Name: WESTERN SPRINGS FIRE DEPARTMENT
Description: AMBULANCE AND FIRE SERVICE COMBINED
Phone: 708-246-1182
Address: 4353 WOLF ROAD, WESTERN SPRINGS, IL 60558
County: COOK
Approximate Distance from DEMO Vehicle: 8.91 miles

Name: PALOS FIRE PROTECTION DISTRICT #2 AMBULANCE
Description: AMBULANCE AND FIRE SERVICE COMBINED
Phone: 708-448-0363
Address: 13010 SOUTH 104TH AVENUE, PALOS PARK, IL 60464
County: COOK
Directions: LOCATED ON WEST SIDE OF SOUTH 104TH STREET BETWEEN BLOOMFIELD DRIVE AND WEST 131ST STREET.
Approximate Distance from DEMO Vehicle: 9.96 miles

3 System Performance

To verify system performance after the ARG-US RFID equipment was installed in the "Big Bird" truck, three stationary communication tests and a 300-mile Road Test were performed.

3.1 Stationary Communication Tests

The three stationary communication tests were conducted with the "Big Bird" truck parked in an open lot at Argonne. The primary purpose of the stationary tests was to assess the reliability of the communication link — specifically, whether message lines sent from the truck are properly received at the Pilot RFID Command Center. A secondary purpose was to determine the time lags between when the message was sent and received (i.e., delays due to satellite transmission and processing at the intermediate hubs). Because the truck was positioned to enable an unobstructed view to the sky, the stationary tests represented the best possible conditions in terms of satellite communication. During the tests, the status line of the tags (Tables 1 and 2) was sent at 5-min intervals, and the internal polling rate at Qualcomm was set at 1-min intervals.

The first stationary test was conducted on March 18–19, 2010, with a single MK-II RFID tag in the trailer. The duration of the test was 15.3 h (920 min). All 186 message lines were received at the Pilot RFID Command Center correctly and, just as importantly, with no lines dropped. The successful installation of RFID equipment and the reliability of the communication link were therefore confirmed. The typical time lags between sent and receipt were in the 0.5–2.0-min range, as shown in Figure 8. Compared to the 2–7-min lags experienced in the previous MiniDemo road test, this is a marked improvement. (The time lags reported by DOE TRANSCOM using comparable Qualcomm OmniTRACS equipment are typically 4–7 min; see TRANSCOM 2009.) The main reason for the improved performance was apparently due to the increased internal polling rate at Qualcomm — from every 5 min to every 1 min — made at the request of Argonne.

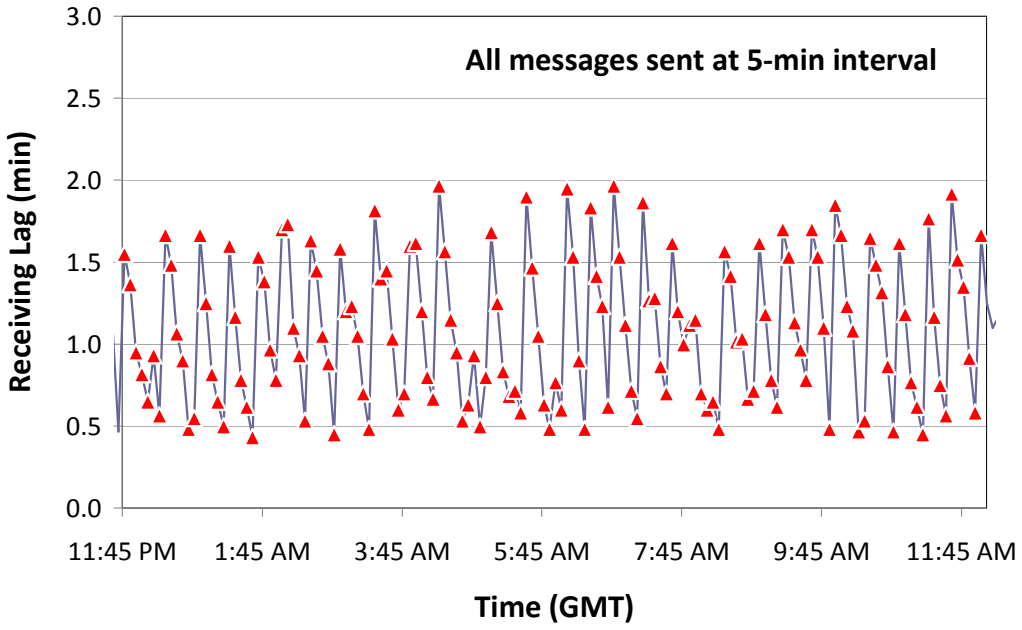


FIGURE 8 Typical Time Lags between Send and Receipt in Stationary Tests

In the second and third stationary tests, 8 and 10 tags, respectively, were deployed, resulting in a slightly larger data packet size (see Table 1). The test durations were 10.1 and 7.8 h, respectively. The results from these two tests were equally excellent — no messages were dropped, and the receiving time lag remained in the 0.5–2.0-min range. Figure 9 shows the temperature data received at the Pilot RFID Command Center for one of the tags during the third stationary test. The plot correctly showed the ambient temperature variation of that day.

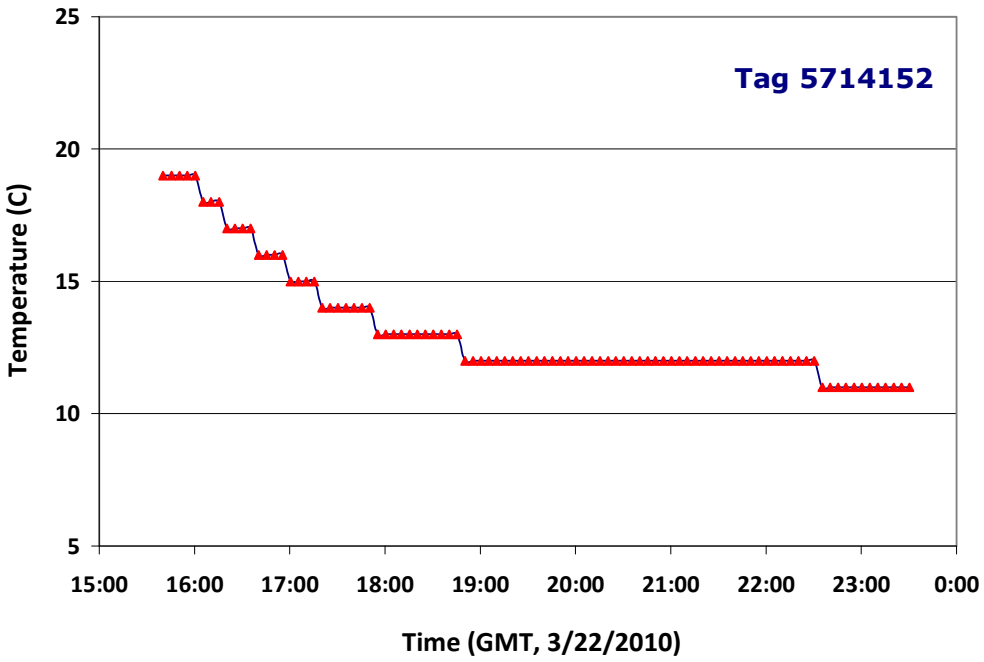


FIGURE 9 As-Received Data in the Third Stationary Test, Reflecting the Dropping Ambient Temperature in the Day

3.2 Road Test

The planned route of the Road Test of the RFID-enabled "Big Bird" is shown in Figure 10; the route was purposely chosen to be identical to that used in the 2009 MiniDemo. The vehicle started the trip at Argonne National Laboratory; went to East Moline, IL, via I-80; and returned to Argonne via I-88, for a total distance of approximately 300 mi. Four staged incidents were planned and conducted along the way to verify the alarm notification and GIS report functions. The staged incidents were performed with the truck parked at truck stops or roadside.

All aspects of the ARG-US RFID/OmniTRACS integration in the "Big Bird" truck were found to be functional in the Road Test, as described below. Appendix C shows the complete set of the recorded data.

The truck's locations per GPS at each message send ("breadcrumb") are shown in Figure 11. Latitude and longitude information was collected and added to each of the RFID message lines. The intervals between breadcrumbs were 5 min (nominally); the intervals were shorter if alert messages from staged incidents were inserted. The slight deviation from the planned route near North Aurora (indicated by a star) was a genuine event due to an unexpected detour.

FIGURE 10 Planned Route for the Road Test of "Big Bird"

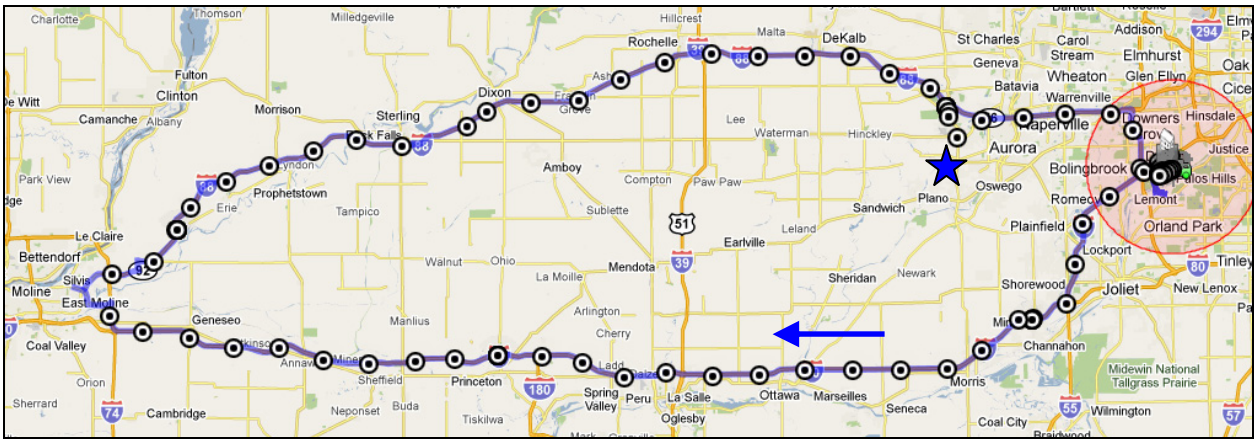


FIGURE 11 Breadcrumbs Depicting the Actual Route Traveled by "Big Bird"

The duration of the road test was 7 h and 16 min — starting from 12:57 and ending at 20:13 (GMT). A total of 93 message lines were generated — 88 regular lines and five alert lines from the four staged incidents. (One of the staged incidents dispatched two alerts as the alarm-clear action was not executed promptly.) The record received at the Pilot RFID Command Center showed that all message lines during the Road Test were properly sent and received via the integrated RFID/OmniTRACS system and Qualcomm satellite.

The time lags between messages during the Road Test (shown in Figure 12) were somewhat longer than those in the stationary tests conducted in an open field, which is a near ideal setting from the standpoint of satellite communication. During the Road Test, such obstructions as highway bridges, nearby tall buildings, or even vehicle turning may have affected the line-of-sight required for clear satellite communication. When an obstruction occurred, the data were stored in the queue and resent when the channel became open again, thus contributing to the time lag in message communication. However, even with the occasional interruptions, the lag time for the majority of the messages (83 out of 93) was less than 2 min, which is excellent in real-world operations. Even more significant is the fact that none of the five alert messages took more than 2 min to reach the Pilot RFID Command Center.

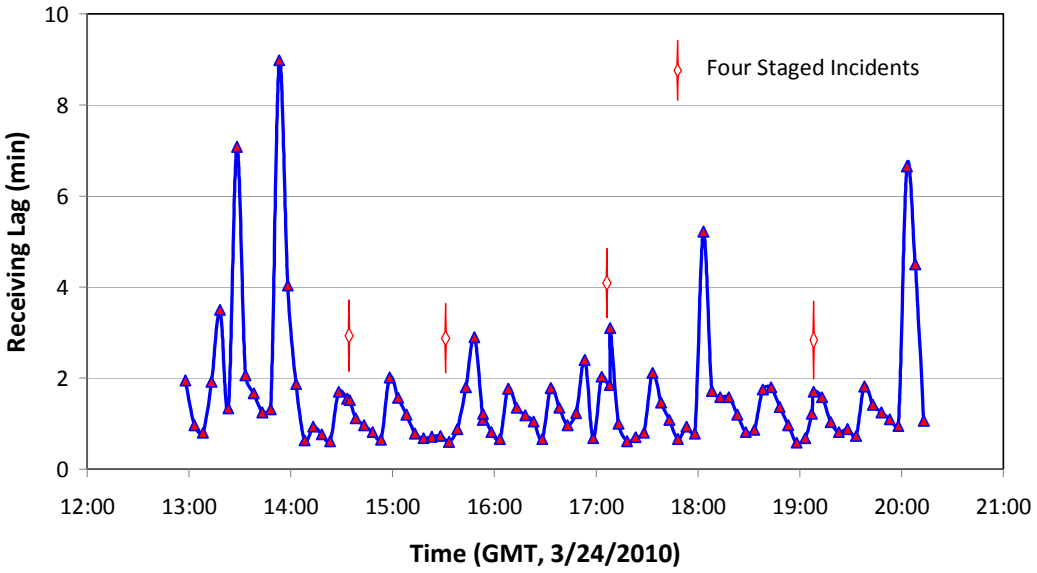


FIGURE 12 Time Lag in Receiving Messages during the "Big Bird" Road Test

All 10 tags functioned reliably during the Road Test, and the sensor readings were accurate the entire time. Figure 13 depicts the recorded temperature data from two of the tags, showing consistent temperature profiles. The full record of the sensor response during the Road Test is in Appendix C.

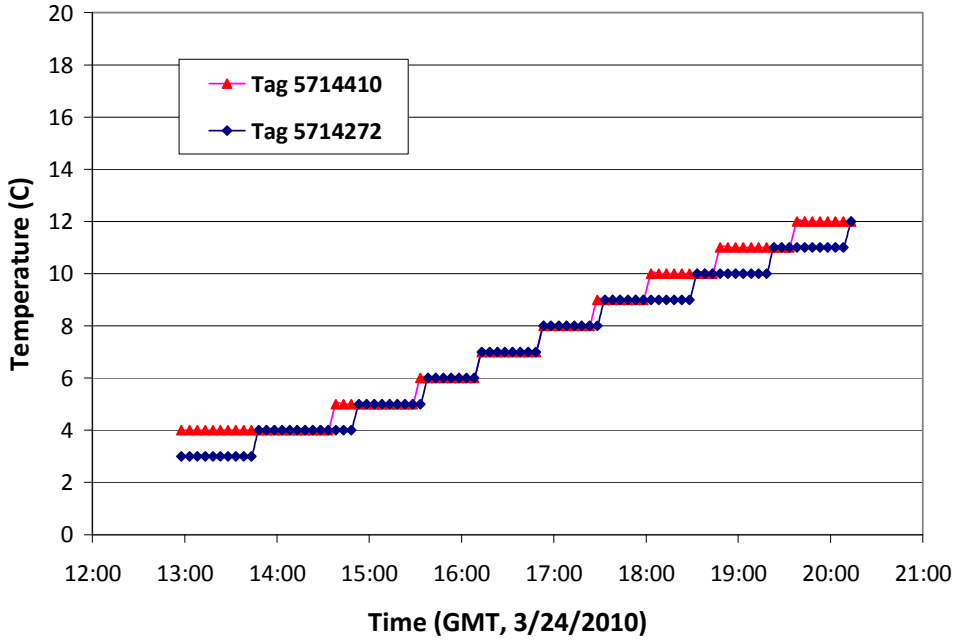


FIGURE 13 Temperature Data from Two of the Tags in "Big Bird" in the Road Test. The Road Test started in the morning (≈8 a.m. local time), hence the increasing temperature with travel.

At anytime during the transport, detailed or abbreviated information from the "tagged drums" in the vehicle can be viewed on the secure webpage, as illustrated in Figure 14, which is a screen capture saved during the trip. Other features, such as satellite or terrain information, may be superimposed on the map, if desired.

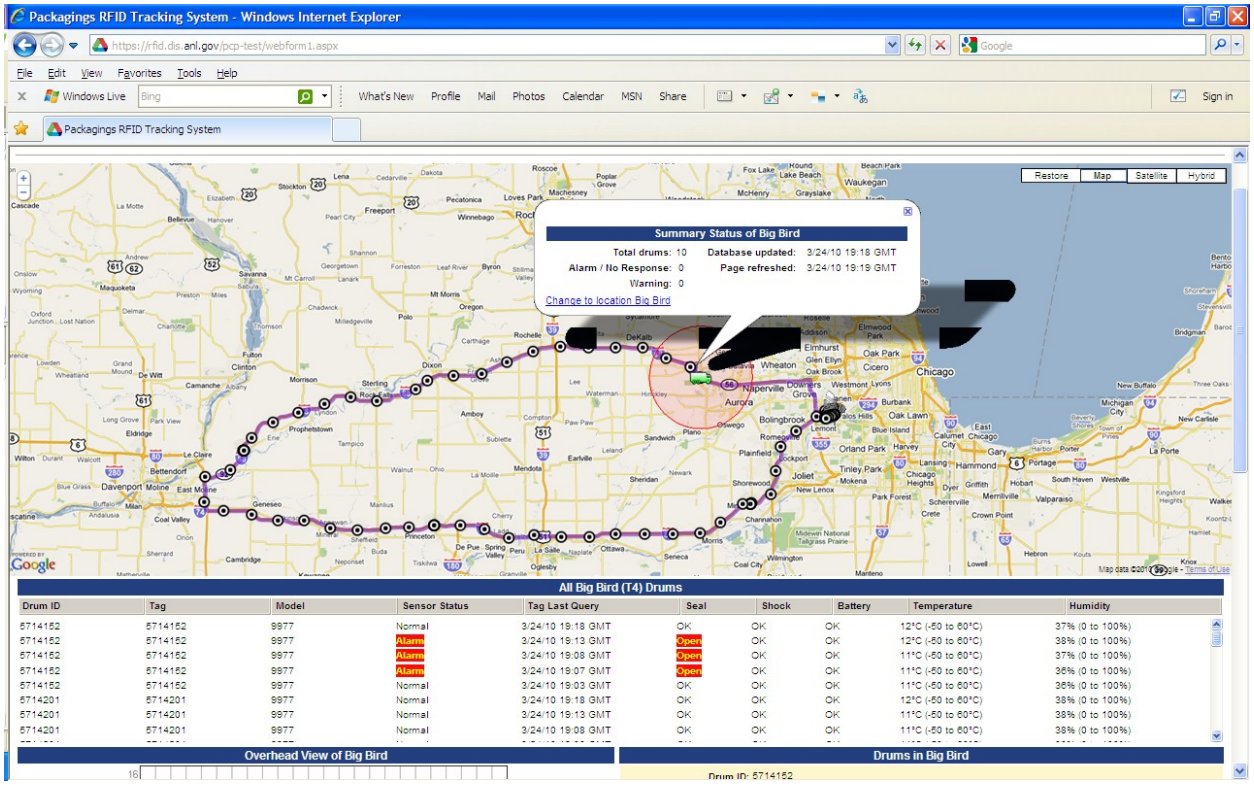


FIGURE 14 Summary Status of Tags, as Captured by a Screenshot Saved during the "Big Bird" Road Test

3.3 Staged Incidents during the Road Test

Four staged incidents, summarized in Table 3, were conducted, as planned, during the Road Test. The time, location, "offending" tag (drum), and nature of these incidents are highlighted in color in Appendix C. The two "excessive shock" alarms were produced by a hand tap of the tag casing, while the two "seal open" alarms were produced by loosening the seal bolts. All four tags responded to the simulated events as expected, and the alarm signals were successfully relayed to the Pilot RFID Command Center via the satellites. In all cases, the receiving lag time was less than 2 min. When an alarm was received at the Pilot RFID Command Center, it was promptly posted on the web page, and, concurrently, the designated recipients were sent a concise notification of the incident (Figure 15). After the cause of the incident was clarified and the fault condition rectified, an alert-clearing notification was then issued from the Pilot RFID Command Center to the same recipients. For the seal sensor alarm, the fault was rectified by retightening the seal bolt.

After each staged incident, mockup Geographic Information System (GIS) buffer zone reports were issued. Such reports, shown in Appendix D, were compiled on the basis of the existing geodatabases on the server and were issued within minutes. GIS reports, with a concise summary of local assets and

vulnerabilities, are important for first responders and an emergency management team in case of an actual transportation incident.

TABLE 3 Staged Incidents during the "Big Bird" Road Test

Time (GMT)	Tag	Alarm	Receiving Lag (min)
14:34	5714201	Excessive Shock	1.6
15:52	5714258	Seal Open	1.1
17:08	5714261	Excessive Shock	1.9
19:07	5714152	Seal Open	1.2

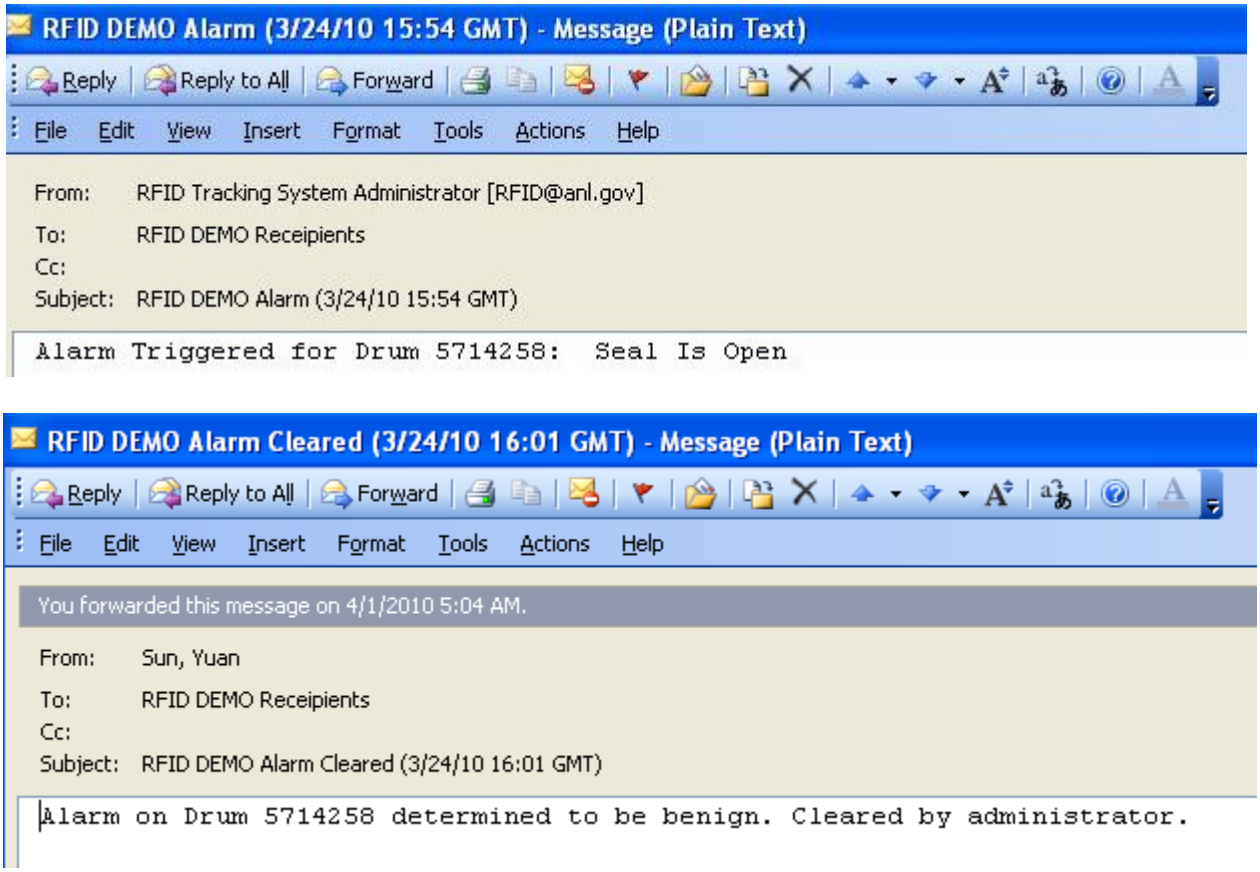


FIGURE 15 Typical Alert/Alarm Messages Sent from the Pilot RFID Command Center after an Incident

4 Discussion and Conclusions

The GTRI's OSRP has been recovering excess and unwanted sealed sources for 10 years (Whitworth et al. 2010). Through the OSRP, NNSA's GTRI has achieved many milestones and has recovered more than 23,000 sources to date. However, the closure of the Barnwell low-level waste disposal site in 2008 has left 36 states without a commercial disposal pathway for most sealed sources. In February 2009, a public-private sector Removal and Disposition of Disused Sources Focus Group was created by the Nuclear Sector Coordinating Council and Nuclear Government Coordinating Council under the Department of Homeland Security's Critical Infrastructure Partnership Advisory Council (CIPAC) framework to address the national security concerns raised by the lack of sealed source disposition options (Cuthbertson et al. 2010a). GTRI is also undertaking efforts to enhance the security of the OSRP shipments. A dedicated vehicle, equipped with real-time tracking, improved communications, and driver duress capabilities, has been acquired. Additional security technologies are being evaluated for reliability and performance (Cuthbertson et al. 2010b). Adding the ARG-US RFID system to the dedicated vehicle, the "Big Bird" LANL truck, significantly enhances transportation security because "the state of health" of the source containers is tracked and monitored inside the vehicle during transportation near real time, as is the physical location of the vehicle.

Deploying the ARG-US RFID system can achieve similar enhancements in security and effective management of disused sources in storage and disposal.

4.1 Installation of RFID Equipment

The steps required for the installation of ARG-US RFID equipment in the "Big Bird" truck were relatively simple and straightforward: mounting an RFID reader in the trailer, tapping the 12-V power line in the trailer to power the reader, installing an Ethernet cable from the reader to the cab, and connecting the Ethernet cable and the tablet communication terminal to the control computer. Once the processes were finalized and the work plan approved, the physical installation took less than half a day to accomplish. No special tools were required, and the overall cost was minimal.

There were no compatibility problems between the installed ARG-US RFID system and the Qualcomm communication gear already in the "Big Bird" truck. The integrated system worked at the first attempt.

The ARG-US RFID system in the "Big Bird" can be taken offline at any time, depending on the needs of the mission. Taking the RFID system offline entails simply detaching the two cables at the reader. The modified "Big Bird" can be tracked by DOE TRANSCOM as before, regardless of the status of the RFID system.

The positive outcome of the "Big Bird" test suggests that other OmniTRACS-equipped vehicles can be enabled with ARG-US RFID tracking and monitoring capabilities with minimal effort and cost.

Efforts are currently under way to enable DOE TRANSCOM to track and monitor shipments that employ the ARG-US RFID systems. When completed, the TRANSCOM web page will direct users to the ARG-US web page and secure server for full RFID item monitoring and vehicle tracking. TRANSCOM will store the original RFID messages, including alarms for ARG-US tag sensors, sent from the OmniTRACS transponder in a standard shipment report for message receipt verification.

The modification of the DOE TRASNCOM web page and testing of the ARG-US RFID monitoring is scheduled to be completed before the end of 2010.

4.2 Reliability of the Integrated System

The three stationary tests and the Road Test after the "Big Bird" installation and integration showed that structured ARG-US RFID data can be transmitted reliably via the satellite and received at the Qualcomm hub. Pulling the received data off the Qualcomm hub and transferring it into Argonne's secure sever can also be done reliably at high rate (once every 10 s) with minimal system overhead.

One of the most significant findings from these multi-hour post-integration tests was that all RFID message lines sent from the truck were received at the Pilot RFID Command Center and not a single message was dropped. Lost messages do occur in the commercial world with satellite communications, but high reliability is important for tracking shipments of sensitive nuclear materials, particularly under unusual or dangerous situations.

Longer-term reliability of the integrated system will be monitored closely when "Big Bird" is used for picking up excess sources for the OSRP with the RFID feature turned on. The staff at the Pilot RFID Command Center at Argonne will perform the necessary monitoring and arrange access of secure web pages at DOE TRANSCOM and ARG-US for authorized stakeholders across the country.

4.3 Two-Way Communication between Truck and Pilot RFID Command Center

Up to this point, including the "Big Bird" Road Test, the flow of the RFID data was one-way: from the reader, via the Qualcomm hub, to the Pilot RFID Command Center. While item tracking and monitoring can be performed satisfactorily in this manner, operational flexibility is constrained — the truck driver will have to undertake all of the hands-on actions. Such flexibility, including the ability of Pilot RFID Command Center personnel to reset a tag alarm or actively poll the status of a given tag, would be highly desirable in transportation applications. Two-way communication is already in place in commercial vehicle tracking, such as the DOE TRANSOM/Qualcomm system, including the ability to even disable a vehicle remotely from the Pilot RFID Command Center.

To implement two-way RFID communication, at least two parts of development work are needed. The first part is to send a command message from the Pilot RFID Command Center, via web link, to the Qualcomm hub. The second part is for the ARG-US software to receive the command message, in Free-Form Text format, from the OmniTRACS transponder and execute the command. The development is technically feasible and can be completed with minimal effort.

4.4 High-Frequency Polling in Vehicle

In the "Big Bird" Road Test, the tag polling frequency was set at every 5 min. The satellite transmission frequency was also set at every 5 min (i.e., after each poll).

Although polling tags at this rate is more than adequate for gathering most data from tag sensors, it may not be adequate in some cases. For instance, if a drum is diverted, it may take as long as 5 min for the reader to sense that the tag/drum is missing. Likewise, if a tag is malfunctioning or the battery is

exhausted, the event would not be detected until the next scheduled poll. For route-deviation tracking, or geofencing, higher-frequency vehicle position data may be necessary.

Indeed, if necessary, the drums in the truck can be polled continuously. The rate depends on the time required to complete a polling cycle of all the tagged drums in the truck — typically ≈10 s. The tag batteries should be able to handle this extra workload — it has been estimated that a single battery can last more than 10 days under continuous polling conditions, and a MK-II tag has four such batteries.

With high-frequency polling, when the conditions of all drums are normal, the interval for satellite transmission could still be 5 min, and only the last data set would be sent. Sending data to the satellite more frequently would not be economical and possibly unnecessary. When an abnormal event is encountered, the trigger information would be sent immediately, just as it was in the Road Test. Route-deviation tracking would be conducted in a similar manner — vehicle position data would be compared continuously with that of the pre-planned route, and only deviations would be reported immediately.

4.5 Pilot RFID Command Center at Argonne

At the time of the "Big Bird" Road Test, a Pilot RFID Command Center was being established at Argonne that will provide a test bed for the management of nuclear and radioactive materials in transportation and storage, for the development of state-of-the-art platform and protocol to enhance information assurance and cyber security, and for the training and certification of personnel for using the ARG-US RFID tracking and monitoring system. Major functions of the Pilot RFID Command Center include designing transportation routes, monitoring transport progression, responding to alert/alarm events and issuing GIS reports when warranted, storing and archiving RFID data, enabling the coordination of efforts with DOE TRANSCOM, and managing infrastructure interfaces with sponsors and users. Figure 16 shows the concept and photos of the Pilot RFID Command Center taken during a tour conducted for the participants of the National Transportation Stakeholders Forum in May 2010. Additional equipment and features added to the Pilot RFID Command Center after the Road Test included a second dedicated secure SQL server, desktop computers and monitors, and other visualization equipment. The Pilot RFID Command Center should be fully functional by the end of 2010.

FIGURE 16 Concept and Recent Photos of the Pilot RFID Command Center

4.5.1 Remote Sensing and Monitoring

The Pilot RFID Command Center is a key component of remote sensing and monitoring of containers of nuclear, radioactive, and hazardous materials during processing, storage, transportation, and disposal. Through a simple connection between the ARG-US system and a local IT network in multiple storage and disposal facility buildings, each system can function as a sensor node. ARG-US thereby enables local and authorized off-site users — including, for example, DOE Headquarters, the Nuclear Regulatory Commission (NRC), the Department of Homeland Security, and the IAEA (Figure 17) — to be connected to a central database and web server that allows access to information from anywhere in the world.

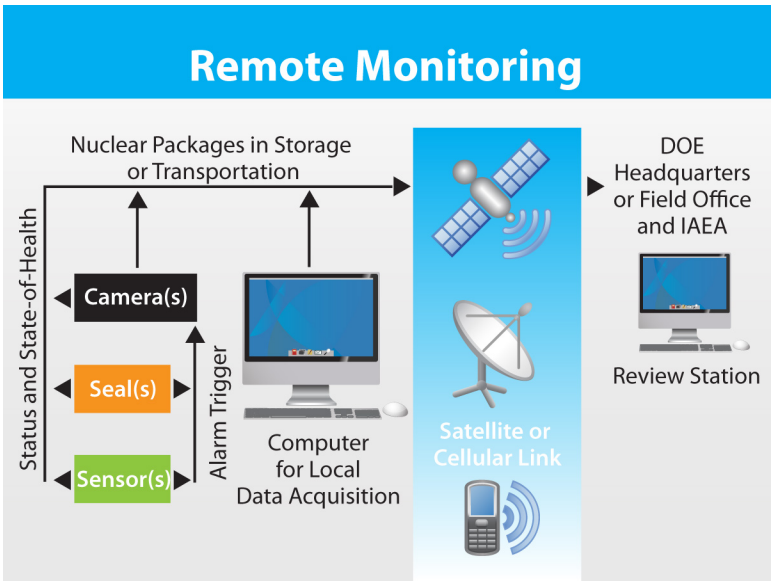


FIGURE 17 Remote Monitoring with Sensors and Alarms for the Status and State of Health of Nuclear Materials

4.5.2 Information Assurance and Cyber Security

The ARG-US RFID system at Argonne will continually adopt state-of-the-art measures for information assurance and cyber security to protect the wireless communication between the tags and readers and the integrity of the central database from tampering or alteration. These measures (Catlett 2008) may include:

- Anti-spoofing;
- Strong encryption;
- Authentication technologies for the wireless communications between the tags and readers;
- Scalable and secure technologies for database and remote access based on Virtual Private Network (VPN) one-time passwords, such as the RSA key fobs (e.g., RSA SecurID); and
- Consideration of failover systems to ensure continuous, mission-critical operation of the system.

A robust container-based RFID system — such as ARG-US with tamper-indicating seals, 24/7 remote monitoring (including camera), and automatic alarm notification via secured Internet — will greatly enhance safety, safeguards, security, and materials accountability during the life cycle of nuclear and radioactive materials, while maintaining chain of custody and continuity of knowledge. It will also reduce the exposure of workers to radiation, better protect the public and the environment, and result in overall cost savings to DOE.

5 References

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Tsai, H.C., et al., 2009, "Report on a 2009 Mini-Demonstration of the ARG-US Radio Frequency Identification (RFID) System in Transportation," (ANL/DIS-09-06) conducted for the DOE Packaging Certification Program of U.S. Department of Energy Environmental Management, Office of Packaging and Transportation, Washington, D.C., September 30.

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Appendix A: Message Format and Byte Array

Example 1: A Free-Form Text (FFT) Message

0910200920052957140000 0007701602800080B05714001
0003C01602800081305714002 0002C01602800081105714003
0004B01602800081305714004 0000901602800081005714005
0000501602800080B05714006 0005001602800080C05714007
0000601602800081205714008 0000A01602800081105714009
0003501602800080C05714010 0004501602800081105714011
0005201602800080B05714012 0003101602800080E05714013
0004801602800081305714014 0001E01602800080E05714015
0003C01602800081005714016 0004A01602800081305714017
0004301602800081005714018 0002701602800080F05714019
0007501602800080E05714020 0004001602800080C05714021
0002501602800081305714022 0006E01602800080B05714023
0000F01602800080A05714024 0007101602800080F0

Note: The above message contains the data for 25 RFID tags preceded by a time stamp.

Example 2: A Byte Array (shown in HEX) Sent Over-the-Air

C000070000000000303039313032303039323030353239353731343030302020203030303737
303136303238303030383042303537313430303120202030303033433031363032383030303831
333303537313430303220202030303032433031363032383030303831313035373134303033
202020303030344230313630323830303038313330353731343030342020203030303039303136
303238303030383130303537313430303520202030303030353031363032383030303830423030
353731343030362020203030303530303136303238303030383043303537313430303720202030
303030363031363032383030303831323035373134303038202020303030304130313630323830
303030383131303537313430303920202030303033530313630323830303038304330353731343
031302020203030303435303136303238303030383131303537313430313120202030303035323
031363032383030303830423035373134303132202020303030333130313630323830303038304
530353731343031332020203030303438303136303238303030383133303537313430313420202
030303031453031363032383030303830453035373134303135202020303030334330313630323
830303038313030353731343031362020203030303441303136303238303030383133303537313
430313720202030303034333031363032383030303831303035373134303137202020303030343
330313630323830303038313030353731343031362020203030303441303136303238303030383
133303537313430313820202030303032373031363032383030303830463035373134303139202
020303030373503031363032383030303830453035373134303230202020303030343030313630
323830303038304530353731343032302020203030303430303136303238303030383133303537
313430323120202030303032353031363032383030303831333035373134303232020203030303
645303136303238303030383042303537313430323320202030303030463031363032383030303
830413035373134303234202020303030373130313630323830303038304630313630323830303
038304130353731343032342020203030303731303136303238303030383046301E28C0

Appendix B: Sample Transmission XML

```
<?xml version="1.0" encoding="UTF-8" ?>
- <tranBlock>
  - <tran ID="24" companyID="QGOVTEST" auxID="0580215456">
    - <T.2.06.0>
        <eventTS>2009-08-27T20:15:27Z</eventTS>
        <equipment ID="0000954197" equipType="tractor" unitAddress="0000954197" mobileType="1" />
        <position lon="-87.978055555" lat="41.7125" posTS="2009-08-27T20:15:27Z" />
        <proximity postal="60540" country="US" stateProv="IL" city="Naperville" direction="ESE" distance="9.84" placeType="CITY" />
        <proximity postal="60561" country="US" stateProv="IL" city="Darien" direction="S" distance="2.80" placeType="TOWN" />
        <posType>3</posType>
        <ignitionStatus>1</ignitionStatus>
        <tripStatus>0</tripStatus>
        <ltdDistance>0.0</ltdDistance>
      </T.2.06.0>
    </tran>
  - <tran ID="25" companyID="QGOVTEST" auxID="0580215456">
    - <T.2.01.0>
        <eventTS>2009-08-27T20:16:56Z</eventTS>
        <equipment ID="0000954197" equipType="tractor" unitAddress="0000954197" mobileType="1" />
        <position lon="-87.978055555" lat="41.7125" posTS="2009-08-27T20:15:27Z" />
        <proximity postal="60540" country="US" stateProv="IL" city="Naperville" direction="ESE" distance="9.84" placeType="CITY" />
        <proximity postal="60561" country="US" stateProv="IL" city="Darien" direction="S" distance="2.80" placeType="TOWN" />
        <posType>3</posType>
        <ignitionStatus>1</ignitionStatus>
        <tripStatus>0</tripStatus>
        <GMH>255</GMH>
        <receivedTS>2009-08-27T20:17:31Z</receivedTS>
        <msgPriority>0</msgPriority>
        <msgBody>008272009201436570319 4 0000701603C00080005703197 0000801603E00080005714215 0000C0160370008000571422 0 0000901603800080005703185 0000A01603D000800057141 40
          0000B01503800080005714210 0001601603900080005714145 0000A01603800080005703188 0000001603E00080005703191 0001101603C00080005714205 0000A01603700080005714225
          0000701603700080005714255 0000601503A00080005703187 0001001603B00080005714200 0000801603700080005703186 0000801603E00080005703196 0000801603C00080005714230
          0000D01603600080005714150 0000901603700080005703195 0000D01603F00080005714170 0000A01603800080005714160 0000701603600080005714165 0000701603700080005714155
          0000801503600080005703193 0000301603D0008000</msgBody>
      </T.2.01.0>
    </tran>
</tranBlock>
```

Appendix C: Summary Recorded Data from "Big Bird" Road Test

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 12:57	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714152	5714152	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714152	5714152	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714152	5714152	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714152	5714152	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714152	5714152	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714152	5714152	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714152	5714152	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714152	5714152	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.75917	41.38639

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 16:23	5714152	5714152	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714152	5714152	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714152	5714152	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714152	5714152	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714152	5714152	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714152	5714152	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714152	5714152	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714152	5714152	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714152	5714152	Normal	OK	Normal (8°C)	Normal (35%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714152	5714152	Normal	OK	Normal (8°C)	Normal (35%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714152	5714152	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714152	5714152	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714152	5714152	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714152	5714152	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714152	5714152	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714152	5714152	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714152	5714152	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714152	5714152	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714152	5714152	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714152	5714152	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714152	5714152	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714152	5714152	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714152	5714152	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714152	5714152	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714152	5714152	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:07	**5714152**	**5714152**	**Alarm**	**Open**	Normal (11°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	**5714152**	**5714152**	**Alarm**	**Open**	Normal (11°C)	Normal (37%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	**5714152**	**5714152**	**Alarm**	**Open**	Normal (12°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714152	5714152	Normal	OK	Normal (12°C)	Normal (37%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714152	5714152	Normal	OK	Normal (13°C)	Normal (37%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714152	5714152	Normal	OK	Normal (13°C)	Normal (35%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714152	5714152	Normal	OK	Normal (13°C)	Normal (35%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.03222	41.71333

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 20:03	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714152	5714152	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714201	5714201	Normal	OK	Normal (3°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714201	5714201	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714201	5714201	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714201	5714201	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714201	5714201	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714201	5714201	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714201	5714201	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714201	5714201	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714201	5714201	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714201	5714201	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714201	5714201	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27389	41.46028
3/24/10 14:34	**5714201**	**5714201**	**Alarm**	**OK**	**Normal (4°C)**	**Normal (36%)**	**Shocked**	OK	-88.27389	41.46028
3/24/10 14:38	**5714201**	**5714201**	**Alarm**	**OK**	**Normal (5°C)**	**Normal (38%)**	**Shocked**	OK	-88.27389	41.46028
3/24/10 14:43	5714201	5714201	Normal	OK	Normal (6°C)	Normal (38%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714201	5714201	Normal	OK	Normal (6°C)	Normal (37%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714201	5714201	Normal	OK	Normal (6°C)	Normal (37%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714201	5714201	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714201	5714201	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714201	5714201	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714201	5714201	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714201	5714201	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714201	5714201	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714201	5714201	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714201	5714201	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714201	5714201	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714201	5714201	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714201	5714201	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714201	5714201	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714201	5714201	Normal	OK	Normal (7°C)	Normal (38%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714201	5714201	Normal	OK	Normal (7°C)	Normal (38%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714201	5714201	Normal	OK	Normal (7°C)	Normal (38%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714201	5714201	Normal	OK	Normal (7°C)	Normal (38%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714201	5714201	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-89.75917	41.38639

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 16:23	5714201	5714201	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714201	5714201	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714201	5714201	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714201	5714201	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714201	5714201	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714201	5714201	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714201	5714201	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714201	5714201	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714201	5714201	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714201	5714201	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714201	5714201	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714201	5714201	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714201	5714201	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714201	5714201	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714201	5714201	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-87.96972	41.71556

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 20:08	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714201	5714201	Normal	OK	Normal (12°C)	Normal (38%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714258	5714258	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714258	5714258	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714258	5714258	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714258	5714258	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714258	5714258	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714258	5714258	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714258	5714258	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714258	5714258	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714258	5714258	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714258	5714258	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714258	5714258	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714258	5714258	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714258	5714258	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714258	5714258	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714258	5714258	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714258	5714258	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	**5714258**	**5714258**	**Alarm**	**Open**	Normal (5°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	**5714258**	**5714258**	**Alarm**	**Open**	Normal (5°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714258	5714258	Normal	OK	Normal (6°C)	Normal (41%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714258	5714258	Normal	OK	Normal (8°C)	Normal (40%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714258	5714258	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714258	5714258	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714258	5714258	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-89.85917	41.39361

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 16:28	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714258	5714258	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714258	5714258	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714258	5714258	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-87.96333	41.71444

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 20:13	5714258	5714258	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714261	5714261	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714261	5714261	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714261	5714261	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714261	5714261	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714261	5714261	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714261	5714261	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714261	5714261	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714261	5714261	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714261	5714261	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714261	5714261	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714261	5714261	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714261	5714261	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714261	5714261	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714261	5714261	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714261	5714261	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714261	5714261	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714261	5714261	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714261	5714261	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714261	5714261	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714261	5714261	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714261	5714261	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714261	5714261	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714261	5714261	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714261	5714261	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714261	5714261	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.06028	41.41444

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 16:38	5714261	5714261	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714261	5714261	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714261	5714261	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714261	5714261	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714261	5714261	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714261	5714261	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	**5714261**	**5714261**	**Alarm**	**OK**	**Normal (9°C)**	**Normal (36%)**	**Shocked**	OK	-90.18750	41.61139
3/24/10 17:08	**5714261**	**5714261**	**Alarm**	**OK**	**Normal (9°C)**	**Normal (36%)**	**Shocked**	OK	-90.18750	41.61139
3/24/10 17:13	5714261	5714261	Normal	OK	Normal (10°C)	Normal (37%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714261	5714261	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714261	5714261	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714261	5714261	Normal	OK	Normal (12°C)	Normal (36%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714261	5714261	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714261	5714261	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714261	5714261	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714261	5714261	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714261	5714261	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714261	5714261	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714261	5714261	Normal	OK	Normal (13°C)	Normal (36%)	OK	OK	-87.96333	41.71444

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 12:57	5714272	5714272	Normal	OK	Normal (3°C)	Normal (35%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714272	5714272	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714272	5714272	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714272	5714272	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714272	5714272	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714272	5714272	Normal	OK	Normal (3°C)	Normal (34%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714272	5714272	Normal	OK	Normal (3°C)	Normal (35%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714272	5714272	Normal	OK	Normal (3°C)	Normal (35%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714272	5714272	Normal	OK	Normal (3°C)	Normal (35%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714272	5714272	Normal	OK	Normal (3°C)	Normal (35%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714272	5714272	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714272	5714272	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714272	5714272	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714272	5714272	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714272	5714272	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714272	5714272	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714272	5714272	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714272	5714272	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714272	5714272	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714272	5714272	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714272	5714272	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714272	5714272	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714272	5714272	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714272	5714272	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714272	5714272	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714272	5714272	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714272	5714272	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714272	5714272	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714272	5714272	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714272	5714272	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.15917	41.43111

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 16:43	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714272	5714272	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714272	5714272	Normal	OK	Normal (8°C)	Normal (37%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714272	5714272	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714272	5714272	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714272	5714272	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714272	5714272	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714272	5714272	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714272	5714272	Normal	OK	Normal (9°C)	Normal (37%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714272	5714272	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714272	5714272	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714272	5714272	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714272	5714272	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714272	5714272	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714272	5714272	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714272	5714272	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714272	5714272	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714272	5714272	Normal	OK	Normal (11°C)	Normal (37%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714272	5714272	Normal	OK	Normal (11°C)	Normal (37%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714272	5714272	Normal	OK	Normal (12°C)	Normal (37%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.96333	41.71444

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 13:08	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714410	5714410	Normal	OK	Normal (4°C)	Normal (30%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714410	5714410	Normal	OK	Normal (4°C)	Normal (31%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714410	5714410	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714410	5714410	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714410	5714410	Normal	OK	Normal (5°C)	Normal (32%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714410	5714410	Normal	OK	Normal (6°C)	Normal (32%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714410	5714410	Normal	OK	Normal (7°C)	Normal (32%)	OK	OK	-90.33833	41.46750

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 16:53	5714410	5714410	Normal	OK	Normal (8°C)	Normal (32%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714410	5714410	Normal	OK	Normal (8°C)	Normal (32%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714410	5714410	Normal	OK	Normal (8°C)	Normal (32%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714410	5714410	Normal	OK	Normal (8°C)	Normal (32%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714410	5714410	Normal	OK	Normal (8°C)	Normal (32%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714410	5714410	Normal	OK	Normal (8°C)	Normal (32%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714410	5714410	Normal	OK	Normal (8°C)	Normal (32%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714410	5714410	Normal	OK	Normal (9°C)	Normal (32%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714410	5714410	Normal	OK	Normal (9°C)	Normal (32%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714410	5714410	Normal	OK	Normal (9°C)	Normal (32%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714410	5714410	Normal	OK	Normal (9°C)	Normal (32%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714410	5714410	Normal	OK	Normal (9°C)	Normal (32%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714410	5714410	Normal	OK	Normal (9°C)	Normal (32%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714410	5714410	Normal	OK	Normal (9°C)	Normal (32%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714410	5714410	Normal	OK	Normal (10°C)	Normal (32%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714410	5714410	Normal	OK	Normal (11°C)	Normal (31%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714410	5714410	Normal	OK	Normal (11°C)	Normal (31%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714410	5714410	Normal	OK	Normal (11°C)	Normal (32%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714410	5714410	Normal	OK	Normal (12°C)	Normal (32%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714410	5714410	Normal	OK	Normal (12°C)	Normal (32%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714410	5714410	Normal	OK	Normal (12°C)	Normal (32%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714410	5714410	Normal	OK	Normal (12°C)	Normal (32%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714410	5714410	Normal	OK	Normal (12°C)	Normal (32%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714410	5714410	Normal	OK	Normal (12°C)	Normal (31%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714410	5714410	Normal	OK	Normal (12°C)	Normal (31%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714410	5714410	Normal	OK	Normal (12°C)	Normal (31%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96861	41.71028

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 13:18	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714411	5714411	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714411	5714411	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714411	5714411	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714411	5714411	Normal	OK	Normal (4°C)	Normal (35%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714411	5714411	Normal	OK	Normal (4°C)	Normal (36%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714411	5714411	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714411	5714411	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714411	5714411	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714411	5714411	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714411	5714411	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714411	5714411	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714411	5714411	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714411	5714411	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714411	5714411	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714411	5714411	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714411	5714411	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714411	5714411	Normal	OK	Normal (6°C)	Normal (37%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714411	5714411	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714411	5714411	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714411	5714411	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714411	5714411	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714411	5714411	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.23833	41.55833

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 17:03	5714411	5714411	Normal	OK	Normal (7°C)	Normal (38%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714411	5714411	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714411	5714411	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714411	5714411	Normal	OK	Normal (9°C)	Normal (38%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714411	5714411	Normal	OK	Normal (10°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714411	5714411	Normal	OK	Normal (11°C)	Normal (38%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.71333

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 13:28	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714415	5714415	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714415	5714415	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714415	5714415	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714415	5714415	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714415	5714415	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714415	5714415	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714415	5714415	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714415	5714415	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714415	5714415	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714415	5714415	Normal	OK	Normal (5°C)	Normal (36%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714415	5714415	Normal	OK	Normal (5°C)	Normal (35%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714415	5714415	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714415	5714415	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714415	5714415	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714415	5714415	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714415	5714415	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714415	5714415	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714415	5714415	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714415	5714415	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714415	5714415	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714415	5714415	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714415	5714415	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714415	5714415	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714415	5714415	Normal	OK	Normal (7°C)	Normal (37%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714415	5714415	Normal	OK	Normal (7°C)	Normal (38%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714415	5714415	Normal	OK	Normal (7°C)	Normal (38%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714415	5714415	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714415	5714415	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714415	5714415	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714415	5714415	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714415	5714415	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714415	5714415	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714415	5714415	Normal	OK	Normal (8°C)	Normal (38%)	OK	OK	-90.18750	41.61139

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 17:13	5714415	5714415	Normal	OK	Normal (9°C)	Normal (39%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714415	5714415	Normal	OK	Normal (9°C)	Normal (39%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714415	5714415	Normal	OK	Normal (9°C)	Normal (40%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714415	5714415	Normal	OK	Normal (9°C)	Normal (40%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714415	5714415	Normal	OK	Normal (9°C)	Normal (40%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714415	5714415	Normal	OK	Normal (9°C)	Normal (40%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714415	5714415	Normal	OK	Normal (9°C)	Normal (40%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714415	5714415	Normal	OK	Normal (9°C)	Normal (40%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714415	5714415	Normal	OK	Normal (9°C)	Normal (40%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714415	5714415	Normal	OK	Normal (10°C)	Normal (40%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714415	5714415	Normal	OK	Normal (11°C)	Normal (40%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714415	5714415	Normal	OK	Normal (12°C)	Normal (40%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714415	5714415	Normal	OK	Normal (12°C)	Normal (40%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714415	5714415	Normal	OK	Normal (12°C)	Normal (40%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714415	5714415	Normal	OK	Normal (12°C)	Normal (39%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714415	5714415	Normal	OK	Normal (12°C)	Normal (39%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714415	5714415	Normal	OK	Normal (12°C)	Normal (39%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.98111	41.70417

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 13:38	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.97278	41.71333
3/24/10 13:48	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714420	5714420	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714420	5714420	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714420	5714420	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714420	5714420	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714420	5714420	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714420	5714420	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714420	5714420	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714420	5714420	Normal	OK	Normal (4°C)	Normal (34%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714420	5714420	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714420	5714420	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714420	5714420	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714420	5714420	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714420	5714420	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714420	5714420	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714420	5714420	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714420	5714420	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714420	5714420	Normal	OK	Normal (7°C)	Normal (34%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714420	5714420	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714420	5714420	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714420	5714420	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714420	5714420	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714420	5714420	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.18750	41.61139

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 17:23	5714420	5714420	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714420	5714420	Normal	OK	Normal (8°C)	Normal (34%)	OK	OK	-90.18750	41.61139
3/24/10 17:33	5714420	5714420	Normal	OK	Normal (9°C)	Normal (34%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714420	5714420	Normal	OK	Normal (9°C)	Normal (34%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714420	5714420	Normal	OK	Normal (9°C)	Normal (34%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714420	5714420	Normal	OK	Normal (9°C)	Normal (34%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714420	5714420	Normal	OK	Normal (9°C)	Normal (34%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714420	5714420	Normal	OK	Normal (9°C)	Normal (34%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714420	5714420	Normal	OK	Normal (9°C)	Normal (34%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714420	5714420	Normal	OK	Normal (10°C)	Normal (34%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714420	5714420	Normal	OK	Normal (11°C)	Normal (34%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714420	5714420	Normal	OK	Normal (12°C)	Normal (34%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714420	5714420	Normal	OK	Normal (12°C)	Normal (34%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714420	5714420	Normal	OK	Normal (12°C)	Normal (33%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714420	5714420	Normal	OK	Normal (12°C)	Normal (34%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714420	5714420	Normal	OK	Normal (12°C)	Normal (34%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714420	5714420	Normal	OK	Normal (12°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714420	5714420	Normal	OK	Normal (12°C)	Normal (34%)	OK	OK	-87.96333	41.71444
3/24/10 12:57	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.96333	41.71444
3/24/10 13:03	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.96333	41.71444
3/24/10 13:08	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.96333	41.71444
3/24/10 13:13	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.96861	41.71028
3/24/10 13:18	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.98944	41.70083
3/24/10 13:23	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.98944	41.71333
3/24/10 13:28	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.97167	41.70833
3/24/10 13:33	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.98111	41.70417
3/24/10 13:38	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.99167	41.70500
3/24/10 13:43	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.97278	41.71333

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 13:48	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.96333	41.71444
3/24/10 13:53	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.96333	41.71444
3/24/10 13:58	5714425	5714425	Normal	OK	Normal (4°C)	Normal (32%)	OK	OK	-87.99250	41.72389
3/24/10 14:03	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.02389	41.70833
3/24/10 14:08	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.10083	41.66750
3/24/10 14:13	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.16333	41.62083
3/24/10 14:18	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.18000	41.55417
3/24/10 14:23	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.19889	41.48833
3/24/10 14:28	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27167	41.46333
3/24/10 14:33	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27389	41.46028
3/24/10 14:38	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27389	41.46028
3/24/10 14:43	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.27389	41.46028
3/24/10 14:48	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.30611	41.46028
3/24/10 14:53	5714425	5714425	Normal	OK	Normal (4°C)	Normal (33%)	OK	OK	-88.38639	41.40917
3/24/10 14:58	5714425	5714425	Normal	OK	Normal (5°C)	Normal (33%)	OK	OK	-88.46444	41.37806
3/24/10 15:03	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.56861	41.37694
3/24/10 15:08	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.67500	41.37583
3/24/10 15:13	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.78222	41.37694
3/24/10 15:18	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.88528	41.36861
3/24/10 15:23	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-88.99056	41.36750
3/24/10 15:28	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.09472	41.37278
3/24/10 15:33	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.18639	41.36444
3/24/10 15:38	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.27917	41.38833
3/24/10 15:43	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.37167	41.40000
3/24/10 15:48	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 15:53	5714425	5714425	Normal	OK	Normal (5°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 15:58	5714425	5714425	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46861	41.40083
3/24/10 16:03	5714425	5714425	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.46972	41.40194
3/24/10 16:08	5714425	5714425	Normal	OK	Normal (6°C)	Normal (34%)	OK	OK	-89.56667	41.39472
3/24/10 16:13	5714425	5714425	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.65500	41.39167
3/24/10 16:18	5714425	5714425	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.75917	41.38639
3/24/10 16:23	5714425	5714425	Normal	OK	Normal (6°C)	Normal (35%)	OK	OK	-89.85917	41.39361
3/24/10 16:28	5714425	5714425	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-89.95833	41.41444
3/24/10 16:33	5714425	5714425	Normal	OK	Normal (6°C)	Normal (36%)	OK	OK	-90.06028	41.41444
3/24/10 16:38	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.15917	41.43111
3/24/10 16:43	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.26250	41.44056
3/24/10 16:48	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.33833	41.46750
3/24/10 16:53	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.33333	41.53639
3/24/10 16:58	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.23833	41.55833
3/24/10 17:03	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.18944	41.61139
3/24/10 17:08	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:13	5714425	5714425	Normal	OK	Normal (7°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:18	5714425	5714425	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:23	5714425	5714425	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.18750	41.61139
3/24/10 17:28	5714425	5714425	Normal	OK	Normal (8°C)	Normal (36%)	OK	OK	-90.18750	41.61139

Time (GMT)	Drum	Tag ID	Status	Seal	Temperature	Humidity	Shock	Battery	Longitude	Latitude
3/24/10 17:33	5714425	5714425	Normal	OK	Normal (8°C)	Normal (35%)	OK	OK	-90.15722	41.64778
3/24/10 17:38	5714425	5714425	Normal	OK	Normal (8°C)	Normal (35%)	OK	OK	-90.07806	41.69056
3/24/10 17:43	5714425	5714425	Normal	OK	Normal (8°C)	Normal (35%)	OK	OK	-89.98111	41.71861
3/24/10 17:48	5714425	5714425	Normal	OK	Normal (8°C)	Normal (35%)	OK	OK	-89.88111	41.74167
3/24/10 17:53	5714425	5714425	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-89.78639	41.76028
3/24/10 17:58	5714425	5714425	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-89.68333	41.75083
3/24/10 18:03	5714425	5714425	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-89.53944	41.78333
3/24/10 18:08	5714425	5714425	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-89.49361	41.80722
3/24/10 18:13	5714425	5714425	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-89.39472	41.82278
3/24/10 18:18	5714425	5714425	Normal	OK	Normal (9°C)	Normal (35%)	OK	OK	-89.28944	41.82694
3/24/10 18:23	5714425	5714425	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-89.19472	41.86139
3/24/10 18:28	5714425	5714425	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-89.09583	41.88944
3/24/10 18:33	5714425	5714425	Normal	OK	Normal (9°C)	Normal (36%)	OK	OK	-88.99250	41.90500
3/24/10 18:38	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.88750	41.90000
3/24/10 18:43	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.78222	41.90083
3/24/10 18:48	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.68111	41.90083
3/24/10 18:53	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.59361	41.87167
3/24/10 18:58	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.50306	41.84667
3/24/10 19:03	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:08	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:13	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:18	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.46750	41.81667
3/24/10 19:23	5714425	5714425	Normal	OK	Normal (10°C)	Normal (36%)	OK	OK	-88.46139	41.80917
3/24/10 19:28	5714425	5714425	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.44250	41.76444
3/24/10 19:33	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-88.38750	41.79472
3/24/10 19:38	5714425	5714425	Normal	OK	Normal (11°C)	Normal (36%)	OK	OK	-88.29361	41.79778
3/24/10 19:43	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-88.20000	41.80417
3/24/10 19:48	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-88.10000	41.80500
3/24/10 19:53	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-88.05083	41.77806
3/24/10 19:58	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-88.03222	41.71333
3/24/10 20:03	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-87.96972	41.71556
3/24/10 20:08	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-87.96333	41.71444
3/24/10 20:13	5714425	5714425	Normal	OK	Normal (11°C)	Normal (35%)	OK	OK	-87.96333	41.71444

Appendix D: Geographic Information System (GIS) Reports

Four GIS reports were generated during the "Big Bird" Road Test. They are shown in the following pages.

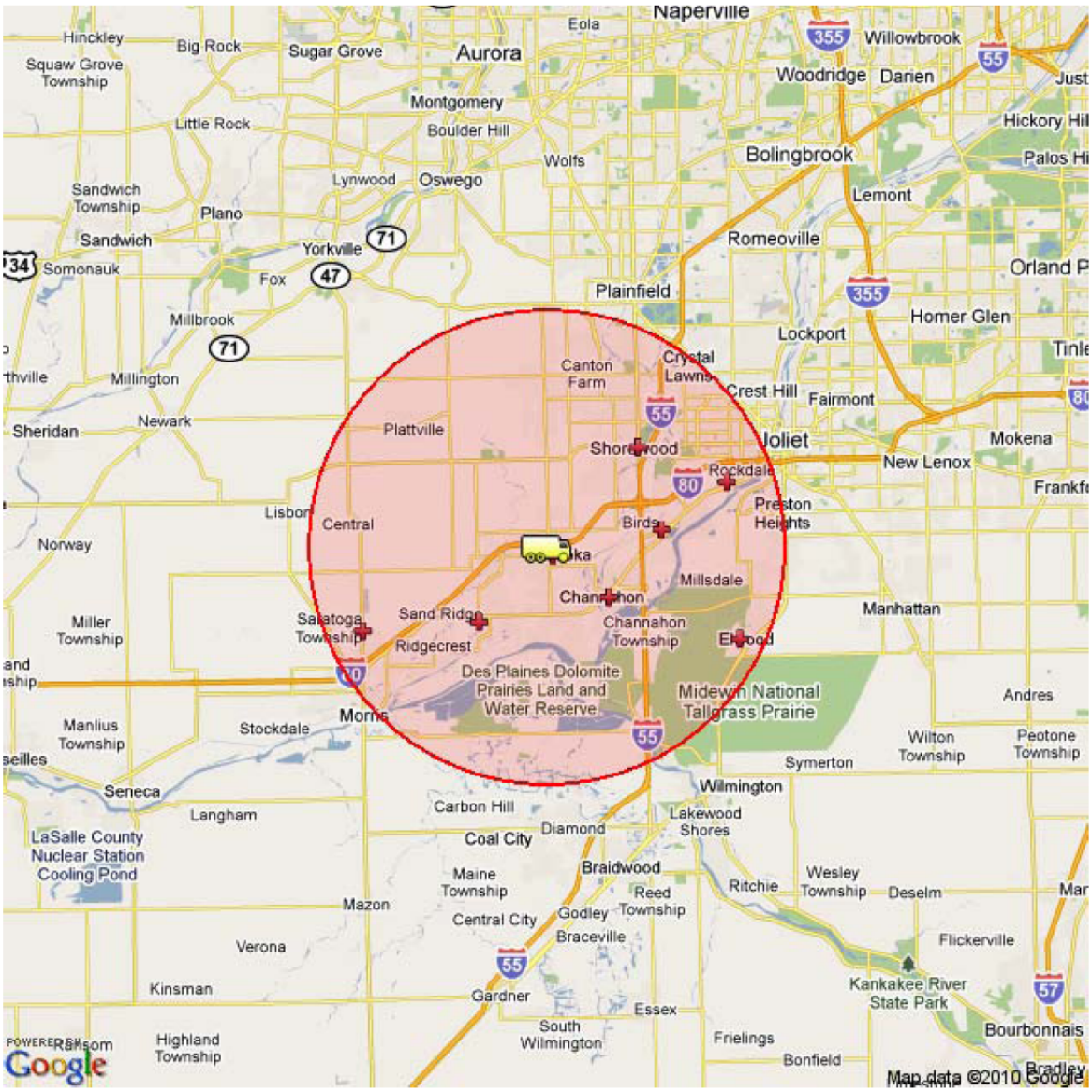
EMS Report for Big Bird Page 1 of 3

EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure
DOE Packaging Certification Program

Packagings RFID Tracking System

National Nuclear Security Administration

GIS Report for Big Bird



EMS Facilities within 10 Miles of Big Bird (41.460278,-88.273889)
(As of 3/24/10 14:38 GMT)

Name: CHANNAHON FIRE DEPARTMENT #2 AMBULANCE SERVICE **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 815-467-6767 **Address:** 23341 WEST MCCLINTOCK ROAD, CHANNAHON, IL 60410 **County:** WILL **Directions:** LOCATED ON THE SOUTH SIDE OF WEST MCCLINTOCK ROAD. 0.04 MILES NORTHEAST OF THE WEST JOHNATHON DRIVE INTERSECTION. **Approximate Distance from Big Bird:** 4.9 miles
Name: TROY FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 815-725-2149 **Address:** 107 WEST JEFFERSON STREET, SHOREWOOD, IL 60431 **County:** WILL **Directions:** LOCATED ON THE SOUTHWEST CORNER OF WEST JEFFERSON STREET AND DUPAGE STREET. **Approximate Distance from Big Bird:** 5.69 miles
Name: MED - CARE AMBULANCE INCORPORATED **Description:** AMBULANCE SERVICES, AIR OR GROUND **Phone:** 815-744-0880 **Address:** 1818 MOUND ROAD, ROCKDALE, IL 60436 **County:** WILL **Directions:** LOCATED ON THE S SIDE OF MOUND RD ABOUT .20 MILES W OF THE S LARKIN AVE AND MOUND RD INTERSECTION. **Approximate Distance from Big Bird:** 8.06 miles
Name: EQUISTAR FIRE DEPARTMENT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 815-942-7011 **Address:** 8805 NORTH TABLER ROAD, MORRIS, IL 60450 **County:** GRUNDY **Directions:** EAST SIDE OF NORTH TABLER ROAD APPROXIMATELY .02 MILES SOUTH FROM THE INTERSECTION OF WAREHOUSE PLACE AND NORTH TABLER ROAD **Approximate Distance from Big Bird:** 4.23 miles
Name: MINOOKA FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 815-467-5637 **Address:** 413 WEST MONDAMIN STREET, MINOOKA, IL 60447 **County:** GRUNDY **Directions:** LOCATED ON NORTH SIDE OF WEST MONDAMIN STREET BETWEEN NORTH RIDGE ROAD AND WEST STREET. **Approximate Distance from Big Bird:** 0.44 miles
Name: CHANNAHON FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 815-467-6767 **Address:** 24929 SOUTH CENTER STREET, CHANNAHON, IL 60410 **County:** WILL **Directions:** LOCATED ON THE EAST SIDE OF SOUTH CENTER ROAD. 0.05 MILES SOUTH OF THE WEST JOLIET STREET INTERSECTION. **Approximate Distance from Big Bird:** 3.37 miles
Name: GRUNDY COUNTY AGRICULTURAL DISTRICT FAIR AMBULANCE **Description:** AMBULANCE SERVICES, AIR OR GROUND **Phone:** 815-942-5958 **Address:** 8890 NORTH STATE HIGHWAY 47, MORRIS, IL 60450 **County:** GRUNDY **Directions:** LOCATED ON EAST SIDE OF STATE HIGHWAY 47, .45 MILE SOUTH OF NELSON RD **Approximate Distance from Big Bird:** 8.48 miles

EMS Report for Big Bird Page 3 of 3

Name: ELWOOD FIRE PROTECTION DISTRICT
Description: AMBULANCE AND FIRE SERVICE COMBINED
Phone: 815-423-5224
Address: 309 WEST MISSISSIPPI STREET, ELWOOD, IL 60421
County: WILL
Directions: LOCATED ON THE NORTH SIDE OF WEST MISSISSIPPI STREET. 0.07 MILES EAST OF THE DEER RUN DRIVE INTERSECTION.
Approximate Distance from Big Bird: 9.01 miles

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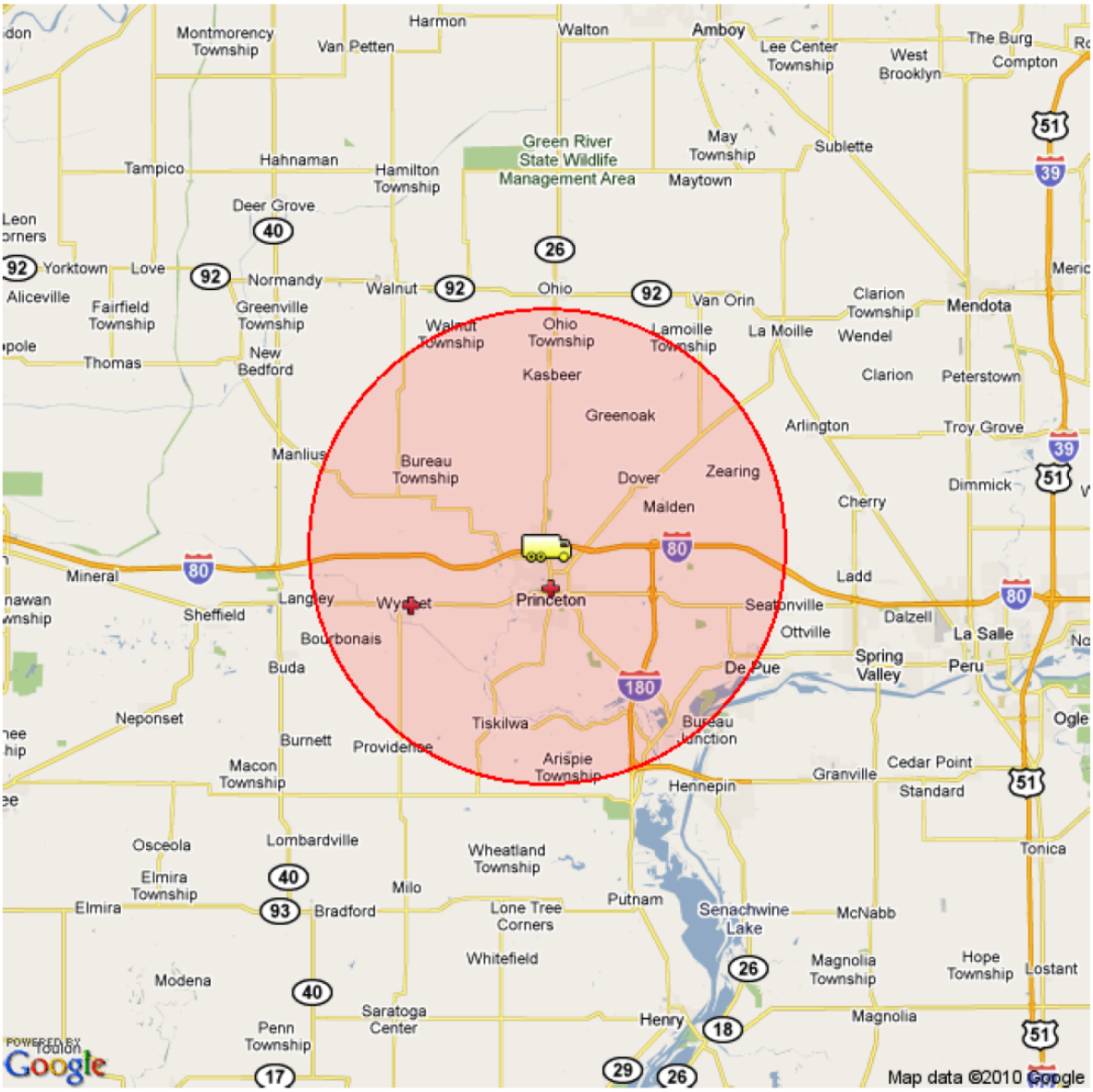
EMS Report for Big Bird Page 1 of 2

Environmental Management
safety ❖ performance ❖ cleanup ❖ closure
DOE Packaging Certification Program

Packagings RFID Tracking System

National Nuclear Security Administration

GIS Report for Big Bird



EMS Facilities within 10 Miles of Big Bird (41.400833,-89.468611)
(As of 3/24/10 15:56 GMT)

Name: WYANET RESCUE SQUAD
Description: RESCUE SERVICES, MEDICAL
Phone: 815-699-2200
Address: 100 SOUTH MAPLE STREET, WYANET, IL 61379
County: BUREAU
Directions: ENTITY LOCATED AT THE NORTHEAST CORNER OF SOUTH MAPLE STREET AND EAST FRONT STREET.
Approximate Distance from Big Bird: 6.21 miles

Name: PRINCETON EMERGENCY SERVICES
Description: AMBULANCE SERVICES, AIR OR GROUND
Phone: 815-875-1861
Address: 2 SOUTH MAIN STREET, PRINCETON, IL 61356
County: BUREAU
Directions: ENTITY LOCATED ON SOUTHWEST CORNER OF WEST CENTRAL AVENUE AND SOUTH MAIN STREET.
Approximate Distance from Big Bird: 1.78 miles

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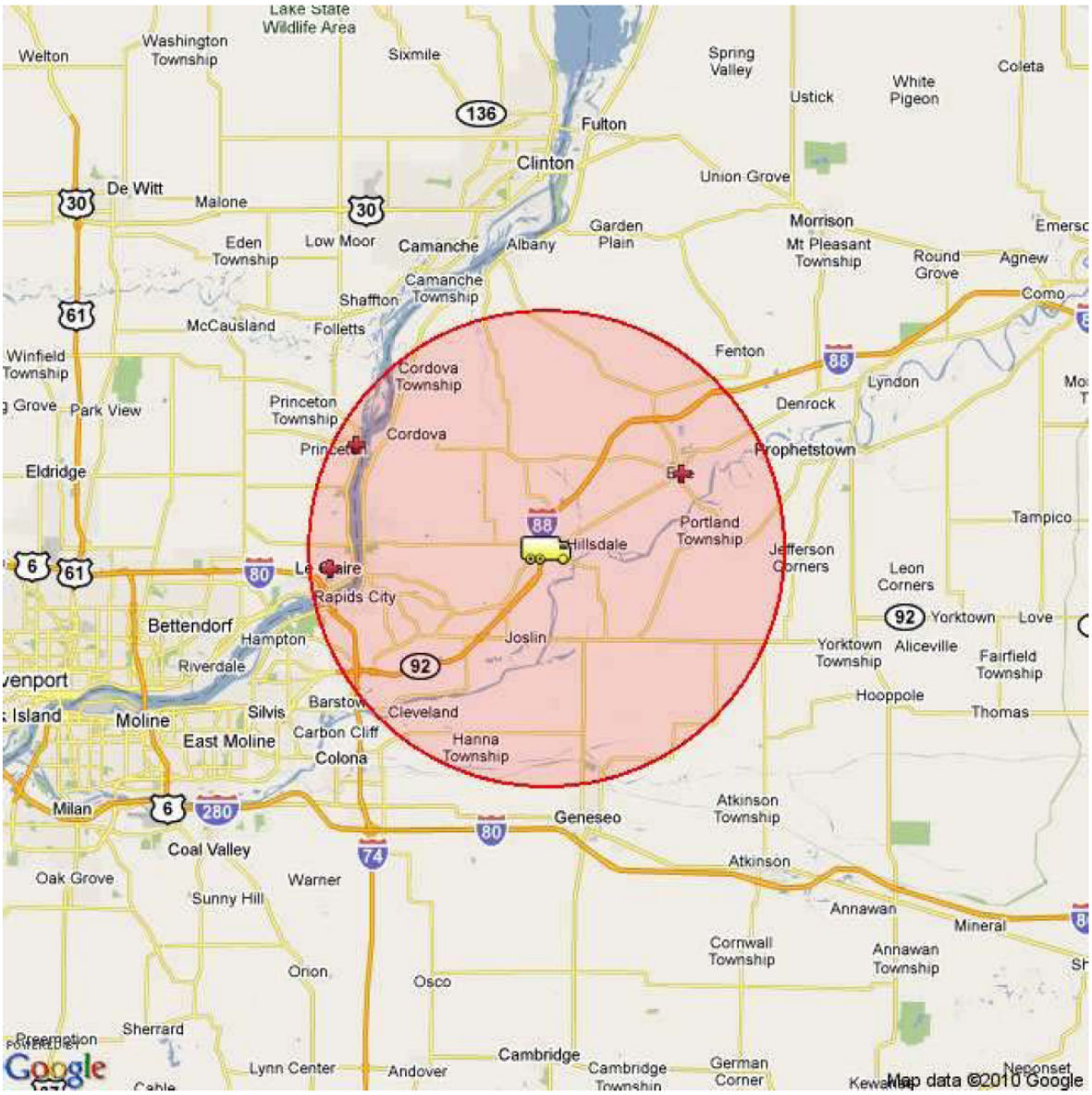
EMS Report for Big Bird Page 1 of 2

EM Environmental Management
safety ◆ performance ◆ cleanup ◆ closure
DOE Packaging Certification Program

Packagings RFID Tracking System

NNSA National Nuclear Security Administration

GIS Report for Big Bird



EMS Facilities within 10 Miles of Big Bird (41.611389,-90.1875)
(As of 3/24/10 17:12 GMT)

Name: ERIE AMBULANCE SERVICE **Description:** AMBULANCE SERVICES, AIR OR GROUND **Phone:** 309-659-7795 **Address:** 807 9TH AVENUE, ERIE, IL 61250 **County:** WHITESIDE **Directions:** LOCATED ON THE NORTHEAST SIDE OF 9TH AVENUE. BETWEEN MAIN STREET AND 8TH STREET. **Approximate Distance from Big Bird:** 6.5 miles
Name: LECLAIRE FIRE AND RESCUE DEPT **Description:** FIRE AND RESCUE SERVICE **Phone:** 563-289-5257 **Address:** 201 N 15TH ST, LE CLAIRE, IA 52753 **County:** SCOTT **Directions:** NORTHEAST CORNER OF JONES ST AND N 15TH ST INTERSECTION **Approximate Distance from Big Bird:** 9.12 miles
Name: PRINCETON VOLUNTEER FIRE DEPARTMENT AMBULANCE **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 563-289-4200 **Address:** 410 UNITED STATES 67, PRINCETON, IA 52768 **County:** SCOTT **Directions:** THE STATION IS ON THE WEST SIDE OF US HWY 67 BETWEEN WASHINGTON ST AND CLAY ST **Approximate Distance from Big Bird:** 9.08 miles

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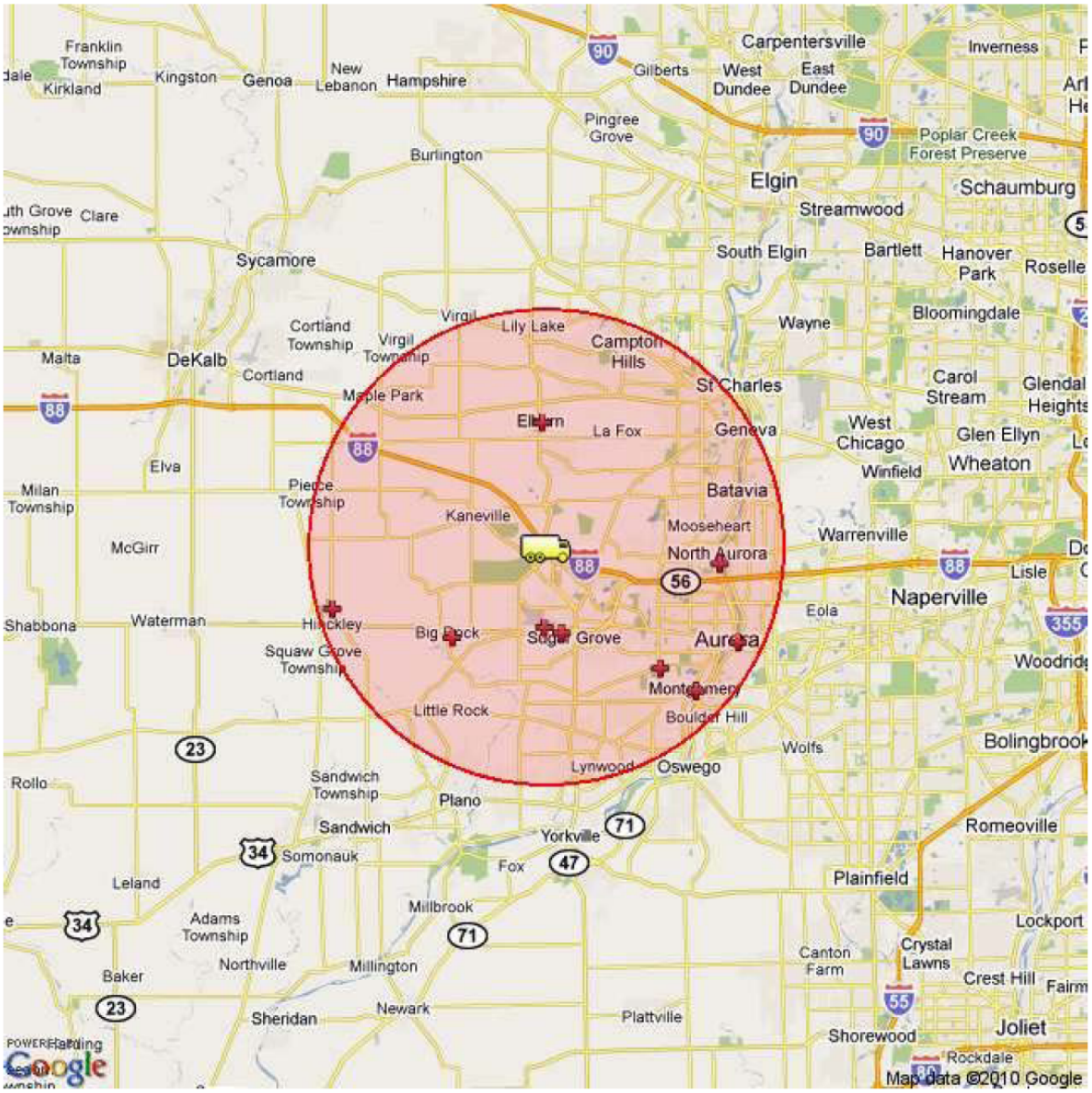
EMS Report for Big Bird Page 1 of 3

EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure
DOE Packaging Certification Program

Packagings RFID Tracking System

NNSA National Nuclear Security Administration

GIS Report for Big Bird



EMS Facilities within 10 Miles of Big Bird (41.816667,-88.4675)
(As of 3/24/10 19:11 GMT)

Name: SUGAR GROVE FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 630-466-4513 **Address:** 25 SOUTH MUNICIPAL DRIVE, SUGAR GROVE, IL 60554 **County:** KANE **Directions:** LOCATED ON THE SE CORNER OF S MUNICIPAL DR AND US-30. **Approximate Distance from Big Bird:** 3.67 miles
Name: AEROCARE AIR AMBULANCE SERVICE INCORPORATED **Description:** AIR AMBULANCE SERVICES **Phone:** 800-823-1911 **Address:** 43 W776 UNITED STATES HIGHWAY 30, SUGAR GROVE, IL 60554 **County:** KANE **Directions:** LOCATED ON THE AURORA MUNICIPAL AIRPORT GROUNDS, ON THE NORTH SIDE OF UNITED STATES HIGHWAY 30. 0.11 MILES WEST OF VETERANS MEMORIAL PARKWAY ON THE NORTH SIDE OF UNNAMED ACCESS ROAD. **Approximate Distance from Big Bird:** 3.38 miles
Name: NORTH AURORA FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 630-897-9698 **Address:** 2 MONROE STREET, NORTH AURORA, IL 60542 **County:** KANE **Directions:** NORTHWEST CORNER OF MONROE STREET AND WEST STATE STREET **Approximate Distance from Big Bird:** 7.35 miles
Name: RIDGE AMBULANCE SERVICE INCORPORATED **Description:** AMBULANCE SERVICES, AIR OR GROUND **Phone:** 630-898-2116 **Address:** 2252 CORNELL AVENUE, MONTGOMERY, IL 60538 **County:** KANE **Directions:** LOCATED IN THE COMPLEX ON THE NORTHEAST CORNER OF ORCHARD ROAD AND CORNELL AVENUE. **Approximate Distance from Big Bird:** 7.01 miles
Name: MONTGOMERY FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 630-897-0622 **Address:** 198 SOUTH RAILROAD STREET, MONTGOMERY, IL 60538 **County:** KANE **Directions:** LOCATED ON THE NORTHWEST SIDE OF SOUTH RAILROAD STREET. ADJACENT TO THE CLAY STREET INTERSECTION. **Approximate Distance from Big Bird:** 8.75 miles
Name: HINCKLEY FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 815-286-7711 **Address:** 911 NORTH SYCAMORE STREET, HINCKLEY, IL 60520 **County:** DEKALB **Directions:** ENTITY LOCATED APPROX 0.14 MILES NORTH OF INTERSECTION OF NORTH SYCAMORE STREET AND WEST AMIE AVENUE. **Approximate Distance from Big Bird:** 9.35 miles
Name: BIG ROCK FIRE PROTECTION DISTRICT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 630-556-3214 **Address:** 47W863 EAST 2ND STREET, BIG ROCK, IL 60511 **County:** KANE **Directions:** LOCATED ON THE SOUTH SIDE OF EAST 2ND STREET. LESS THAN 0.13 MILES EAST OF THE JEFFERSON AVENUE INTERSECTION **Approximate Distance from Big Bird:** 5.48 miles

Name: AURORA FIRE DEPARTMENT **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 630-897-7821 **Address:** 75 NORTH BROADWAY AVENUE, AURORA, IL 60505 **County:** KANE **Directions:** LOCATED ON THE SOUTH CORNER OF NORTH BROADWAY AND SPRING STREET **Approximate Distance from Big Bird:** 9.02 miles
Name: ELBURN-COUNTRYSIDE FIRE STATION **Description:** AMBULANCE AND FIRE SERVICE COMBINED **Phone:** 630-365-9226 **Address:** 210 EAST NORTH STREET, ELBURN, IL 60119 **County:** KANE **Directions:** LOCATED ON THE NORTH SIDE OF E NORTH ST, .04 MI E OF N 1ST ST. **Approximate Distance from Big Bird:** 5.24 miles

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