System Usage Test Plan

Model Deployment of a Regional, Multi-Modal 511 Traveler Information System

Task Order BA7746

Prepared for:

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1.0 Introduction and Background

This document presents the detailed plan to conduct the system usage data analysis, one of several test activities to be conducted as part of the national evaluation of the regional, multi-modal 511 Traveler Information System Model Deployment. The model deployment is an enhancement of an existing statewide 511 telephone traveler information system operated by the Arizona Department of Transportation. As a United States Department of Transportation (U.S. DOT) Intelligent Transportation System (ITS) Model Deployment, the project is intended to generate findings that will help shape U.S. DOT approaches to 511 and that will be of use to others implementing and operating 511 systems. The national evaluation is the primary mechanism for documenting the performance of the model deployment and the lessons learned.

1.1 511 Model Deployment

The Arizona Department of Transportation (ADOT) is leading the 511 Model Deployment in partnership with other transportation agencies in the Phoenix and Tucson regions, including local traffic jurisdictions, airports and public transit operators. The 511 Model Deployment implements a number of key enhancements to the existing statewide 511 system that became operational in March 2002, when ADOT converted their ten-digit system that had been operational for several years to 511. The enhancements to the system include:

- New content on arterial streets, airports, neighboring states (Utah), transit (major service disruptions and estimated arrival times), weather, and downtown Phoenix special events and parking;
- A complete redesign of the menu system, conversion from a keypad system to voice recognition, conversion from a highway route-based reporting to segment-based reporting; and
- Enhanced 511 marketing.

Planning for the Model Deployment began in earnest in August 2002 when ADOT convened the 511 Task Force, composed of representatives of the various participating agencies. Planning and design continued through early 2003. Since that time, the focus has been on implementation, with a certain degree of final design occurring as part of the implementation process. The model deployment enhancements are planned to become operational in a phased manner, beginning in late November 2003 and continuing through early-mid 2003.

The current menu system contains only three options: "roadways", "transit" and "comments" (callers can leave voicemail comments). No transit information is available directly on the current 511 system; all transit selections are routed to the Phoenix and Tucson transit agencies' customer service lines. Under "roadways" callers can either input the route number of the roadway or, for local street information, the first three letters of a city name. However, the current approach to gathering city street information (which relies on local traffic jurisdictions to enter information) is not effective and essentially, no city information is available.

The roadway information available on the current 511 system is oriented largely toward intercity travelers. Much of the information that is available is for so-called "planned incidents"—non-real-time information entered by ADOT in advance describing roadway construction, route closures and restrictions. Although information on incidents is included, ADOT enters information only on incidents to which they respond to, which leaves out many of the "minor" incidents that occur during commute periods and which can have significant adverse impact on traffic flow and travel times. Also, information is provided by Interstate and State Highway *routes*, rather than *route segments*, and is reported by milepost. Therefore, someone interested in a quick report on commute conditions on I-10 in central Phoenix, located in the central part of Arizona, would have to listen through (or know enough to skip past) all the information for I-10 between California and Phoenix. The statewide system does cover major metropolitan areas like Phoenix but information of interest to commuters, like travel times and information on local streets, is not available. One important goal of the model deployment is to make the 511 system more useful for commuters in the two largest urbanized areas in Arizona: the Tucson region and the Phoenix region.

Little is known about current usage of the 511 system. The only statistics that are tracked are total hourly call volumes, which are aggregated to daily and monthly totals. That data indicates that prior to converting to the 511 number in March 2002, the usage of the ADOT traveler information telephone system ranged from about 4,000 calls per month upwards to about 20,000 calls during winter storms or during unusual events like major forest fires. After the conversion to 511, usage spiked from around 7,000 calls in January and February to about 20,000 calls per month in March. Since that time, usage has remained at that level or higher, ranging up to as high as 100,000 calls per month (in December 2002). A preliminary analysis of the pre-enhanced 511 system can be found in the Interim Analysis Report of the Model Deployment of a Regional, Multi-Modal 511 Traveler Information System (November 15, 2003).

The only interaction ADOT has had with 511 users has occurred as part of the development of the model deployment, when they convened focus groups in Phoenix, Tucson and Flagstaff. A total of 67 people participated in the six focus groups. Very few of the focus group participants had used 511 prior to being recruited, at which time they were asked to familiarize themselves with the system. Most focus group participants found the existing system at best only moderately useful (average ranking of 4.7 out of 10) but indicated that with improvements, they would expect to find the system very useful (8.8 out of 10). Desired improvements included many of the planned model deployment enhancements, including voice recognition; segment-based and sub-region-based reporting; more information on incidents; and "quick reports" highlighting conditions in specific geographic areas, similar to commercial radio traffic reports.

1.2 Evaluation Plan Overview

The overall plan for the national evaluation of the 511 model deployment is presented in the Evaluation Plan[1] report. This section highlights the major elements of the evaluation.

[1] Evaluation Plan Model Deployment of a Regional, Multi-Modal 511 Traveler Information System, Battelle Memorial Institute, October 15, 2003

The Statement of Work for the national evaluation identifies the following purposes:

- Document how the model deployment was implemented, including system costs and how technical and institutional (especially cross-modal and interstate) issues were resolved.
- Provide an independent review of the performance of the model deployment.
- Deliver lessons learned to other 511 system development and deployment efforts.

The evaluation consists of three phases. Phase I consists of the evaluation planning activities, including developing the Evaluation Strategy, Evaluation Plan and Detailed Test Plans, and preliminary analysis of baseline data. Phase I is scheduled to conclude in early 2004. Phase II consists of the analysis of the implementation phase portion of the enhancement process, including conclusion of baseline data analysis and documentation of management and deployment issues. Phase II is scheduled to be completed in February 2004. Phase III consists of the analysis of post-enhancement system performance, concluding with the Evaluation Report that will present all findings. Phase III is scheduled to be completed in April 2005.

Evaluation analyses have been organized into individual "tests", with each test focusing on a particular type of data. The tests and their relationship to the major focal points of national Intelligent Transportation System (of which 511 systems are an example) evaluations are shown in Table 1. This report presents the test plan for the usage logs and HCRS input. Test plans for the Key Informant Interviews and User Survey are presented in separate documents.[2] In addition to these formal tests, a cost analysis will be performed and various other types of supporting data will be collected and utilized either to aid in the interpretation of test results or to identify management and deployment issues and lessons learned.

Table 1
Evaluation Tests

	Tests		
Analysis Area	**Usage Log[3]**	**User Survey**	**Key Informant Interviews**
Customer Satisfaction	**X**	**X**	
Mobility	**X**	**X**	
Efficiency	**X**	**X**	**X**
Management and Deployment Issues			**X**

[2] Draft Key Informant Interviews Test Plan, Battelle Memorial Institute, September 30, 2003; User Survey Test Plan to be developed.

[3] The analysis of system usage will include consideration of detailed 511 call records (call origins, time, duration, menu selections, etc.) and system data content (inputs from the various agencies that supply data to the system) and the reliability (system downtime) and availability (phone line utilization) of the system.

1.3 Report Organization

This report is the Test Plan for the System Usage Data Analysis. Following this Introduction, this report contains the following sections:

- Test Plan Objective – including the hypotheses to be tested and key supporting conditions necessary to successfully complete the test.
- Test Data – a description of data requirements, data sources, and data collection methods.
- Analysis Methods
- Test Schedule
- Results Report Format and Contents
- Estimated Resource Requirements

2.0 Test Plan Objective

As outlined in the evaluation plan, the usage data analysis consists of three main components. The primary component of the test is the analysis of 511 system usage data, which consist of Voice Response Activated System (VRAS) server log files, and in the case of the baseline analysis, electronic phone bill records. The two secondary components of the usage test focus on data and issues that provide context to the interpretation of the usage data. Those secondary, supporting components include an analysis of agency data inputs to the 511 system, and the performance of the 511 system, in terms of system downtime and phone line availability and utilization.

As indicated in Table 1 on page 5, the system usage data analysis will serve three purposes. First, the analysis of 511 usage data (e.g., call origins, repeat callers, duration, menu/contents selection) allows understanding of how the system is utilized by the users, and provides quantitative measures, in conjunction with user survey and key informant interviews, for assessing customer satisfaction. Second, the analysis of usage data will help support the evaluation of the project partners' objectives related to improving the mobility of the 511 system users. Third, the analysis of agency data inputs to the 511 system and system performance data allows the evaluation of several of the project partners' objectives related to improving the efficiency of the 511 system operation. Those objectives are further elaborated using the evaluation hypotheses described in the following section.

2.1 Hypotheses

The evaluation hypotheses to be addressed by this test are summarized in Table 2. The last column in Table 2 identifies the role of the system usage data (in bold typeface) and, where applicable, identifies other data that will support the hypothesis testing. The other data types are the subject of other test plans.

Table 2
Hypotheses to Be Addressed by System Usage Test

National ITS Goal Area	Objective	Hypothesis	Applicable System Usage (in Bold) and Other Data[4]
Customer Satisfaction	Improve usage and customer satisfaction by increasing the ***quantity*** of information.	The addition of arterial street travel time information will contribute to increased use of 511 and customer satisfaction.	• **HCRS system input data** • **511 system usage data (log files)** • Survey of 511 users • 511 user focus groups (optional)
		The addition of airport information will contribute to increased use of 511 and customer satisfaction.	• **System input data** • **511 system usage data (log files)** • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
		The addition of transit service disruption and estimated bus arrival times will contribute to increased use of 511 and customer satisfaction.	• **System input data** • **511 system usage data (log files)** • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records • **Transit center call volume data**
		The addition of information on Utah will contribute to increased use of 511 and customer satisfaction.	• **System input data** • **511 system usage data (log files)** • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
		The addition of segment weather reports for travelers will contribute to increased use of 511 and customer satisfaction.	• **System input data** • **511 system usage data (log files)** • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
		The addition of downtown Phoenix special event and parking information will contribute to increased use of 511 and customer satisfaction.	• **System input data** • **511 system usage data (log files)** • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
	Increase usage and customer satisfaction through ***enhanced marketing***.	Usage will increase as a result of installation of static road signs.	• **511 system usage data (log files)** • ADOT records on sign installations • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records

[4] Other data (other than system usage data) is addressed in other test plans. These other data sources are shown here to illustrate how system usage data will be used in conjunction with other data.

National ITS Goal Area	Objective	Hypothesis	Applicable System Usage (in Bold) and Other Data[4]
		Usage will increase as a result of radio and television advertising.	• **511 system usage data (log files)** • ADOT records on television and radio ads (dates, content, channels) • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
		Usage will increase as a result of VMS advertising.	• **511 system usage data (log files)** • ADOT records on VMS advertising • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
	Attract repeat users	More repeat users as a result of the overall enahncement of the 511 service	• **511 system usage data (log files)**
Mobility	Help travelers reduce travel times by identifying roadways with conditions that create unusually long travel times, and providing estimates of point-to-point travel times for four parallel arterial streets in north Phoenix.	Travelers will be able to avoid routes with non-recurring congestion, thus reducing travel time and travel time variability.	• Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records • ADOT reported arterial street travel time data files (system inputs) • **511 system usage data (log files)**
	Facilitate access to the Grand Canyon and downtown Phoenix special events.	Moving Grand Canyon travel information to the top-level menu and adding information on downtown Phoenix special events and parking will facilitate access to these destinations.	• **System input data** • **511 system usage data (log files)** • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
	Enhance consideration of transit as an alternate mode choice.	Increases in 511 usage will expose more travelers to transit information who would not normally consider transit, thus increasing their consideration of transit as an alternate mode.	• **511 system usage data (log files)** • Survey of 511 users. • 511 user focus groups (optional) • ADOT 511 caller comment records
		Increased marketing of 511 as a source of multi-modal information, including transit, and/or increased marketing aimed at transit users, will increase the use of 511 for transit information.	• ADOT marketing materials and strategy documents • **511 system usage data (log files)**

National ITS Goal Area	Objective	Hypothesis	Applicable System Usage (in Bold) and Other Data[4]
Efficiency	Maintain acceptable system availability.	Doubling phone line capacity and the implementation of call waiting will assure a high level of system availability.	• **ADOT VRAS system data** • Survey of 511 users • 511 user focus groups (optional) • ADOT 511 caller comment records
		Improved VRAS server and HCRS server reliability will improve system availability.	• **ADOT HCRS and VRAS system data** • Interviews with ADOT technical staff • ADOT 511 caller comment records
	Minimize the number of incomprehensible caller inputs in the voice recognition system.	A good menu structure, intelligible system speech and a good voice recognition system will keep the number of incomprehensible caller inputs to a minimum.	• **VRAS system logs**
	Increase the effectiveness of capturing arterial street incident data.	Having ADOT Traffic Operations Center Staff monitor law enforcement scanners will increase the amount of arterial street traffic information.	• **System input data** • Interviews with ADOT TOC HCRS operators and supervisors
		Providing Tucson area agencies the ability to enter information to 511 will increase the amount of Tucson area information.	• **System input data** • Interviews with Tucson area agency HCRS operators and supervisors

2.2 Key Supporting Conditions

The key supporting conditions for successful execution of this test are described as the following:

- Dr. Mark Hickman of University Arizona will lead the data collection and analysis efforts for the analysis of system usage data and system availability, with support from Battelle.

- In support of baseline analysis, archived data including detailed phone bill records, VRAS usage data, logs of agency data inputs to 511, and system availability (downtime) information will be made available to the evaluation team. ADOT will be the provider of their system data and the point of contact for third party data such as phone bill information.

- In support of post-deployment usage data analysis, additional system performance monitoring and reporting features will be included in the enhanced 511 system. The evaluation team has been working closely with the ADOT 511 implementation team in identifying additional system functionalities, including the measurement of wait time, dropped calls and other service quality indicators, and the capturing of "call detail records" (CDR). CDR is the electronic transaction data, embedded in each phone call, that provides accurate information of call origin, type of phone (wireless, wireline), etc. This information can be decoded and saved by a computer (in this case VRAS) with proper programming at the receiving end. CDR data are commonly used in the telecommunications industry for call routing, billing, and analysis. This information will be essential to the post-enhancement evaluation after the Federal Communications Commission (FCC) allows the wireline numbers to be converted to cell phone numbers starting November 24, 2003[5]. After that time it will no longer be possible to determine the type of phone using the caller ID and block assignment information (which identifies the operating ownership of telephone numbers by the block of thousand, attachment 1.)

- Given the incremental implementation of the Arizona 511 system (i.e., new contents will be added incrementally), the evaluation team will work closely with ADOT to obtain the system update history regarding the addition of new features and modifications to the existing content format and menu structure of the 511 system. Such update information will be needed for VRAS, HCRS and other relevant subsystems.

[5] FCC News Release November 10, 2003: "…Wireline carriers operating in the 100 largest MSAs must support wireline-to-wireless number porting in accordance with today's order by November 24, 2003, unless they can demonstrate that complying with these requirements would be technically infeasible. Wireline carriers operating outside the 100 largest MSAs are not required to comply with the order until May 24, 2004, which is the earliest date that wireless carriers serving these areas are required to implement LNP."

- Information of major events that could significantly affect the use of 511 service (e.g., forest fire, major traffic incidents, major freeway constructions, winter road closures, marketing of 511 using road side signs, use of dynamic message signs to promote 511) will be needed in support of the analysis of system usage. While some data may be collected electronically, others will rely on anecdotal sources or manual data entry with cooperation from the ADOT traffic operations.

3.0 Test Data

3.1 Data Requirements

This section describes the data requirements for the conduct of 511 system usage data analysis, organized in the following categories:

- VRAS usage data
- Agency data inputs to 511 system via HCRS
- System availability data

Figure 1 provides a graphical representation of the high-level configuration of the existing and the enhanced 511 systems to illustrate the evaluation data requirements. The VRAS consists of a number of computers that provide interactive voice service by converting HCRS data using a text-to-speech process. The 511 calls are received over T1 communication lines provided by Qwest.

The existing 511 system consists of 2 VRAS computers, each associated a T1 line, with each T1 line providing 24 lines of capacity (for a total system capacity of 48 lines.) The enhanced system will employ 4 VRAS computers (each handling 23 lines[6]) using 4 T1 lines, with a total system capacity of 92 lines. As shown in Figure 1, the enhanced 511 system will feature a voice recognition interface (as opposed to the existing touch tone interface) with expanded contents. The contents provided on the 511 service are generated by the VRAS computers using the inputs from HCRS and, in a few cases, from direct digital voice recordings (.WAV files) on the VRAS, made by the participating agencies (e.g., major transit service disruption announcements and other canned messages).

HCRS supports several ADOT travel information functions including 511, AZ511 web site (http://www.az511.com), and provides data to third party Information Service Providers (ISP). HCRS is a central database that allows all ADOT district offices and other participating agencies to enter road condition and travel related data using a web-based interface. Several new data sources will be added to HCRS as part of the 511 Model Deployment, including arterial street travel time (piloted on selected arterial streets in Phoenix), Utah road condition data, segment weather reports, bus arrival times (Phoenix), parking information (Phoenix), Grand Canyon information, etc.

As shown in Figure 1, additional system usage data will be available for the evaluation of the enhanced 511 system, including several service quality related measures such as customer wait time (when the demand exceeds maximum line capacity) and dropped calls. Most significantly, the new VRAS will be capable of preserving the call detail records (CDR) data embedded in each phone call. Among the CDR, ANI II information provides accurate information for analyzing call origin and wireless vs. wireline services and repeat callers. A discussion of ANI II can be found in Section 3.2.2.

[6] Each computer has 24 lines, 23 for voice service and 1 reserved for internal system data use

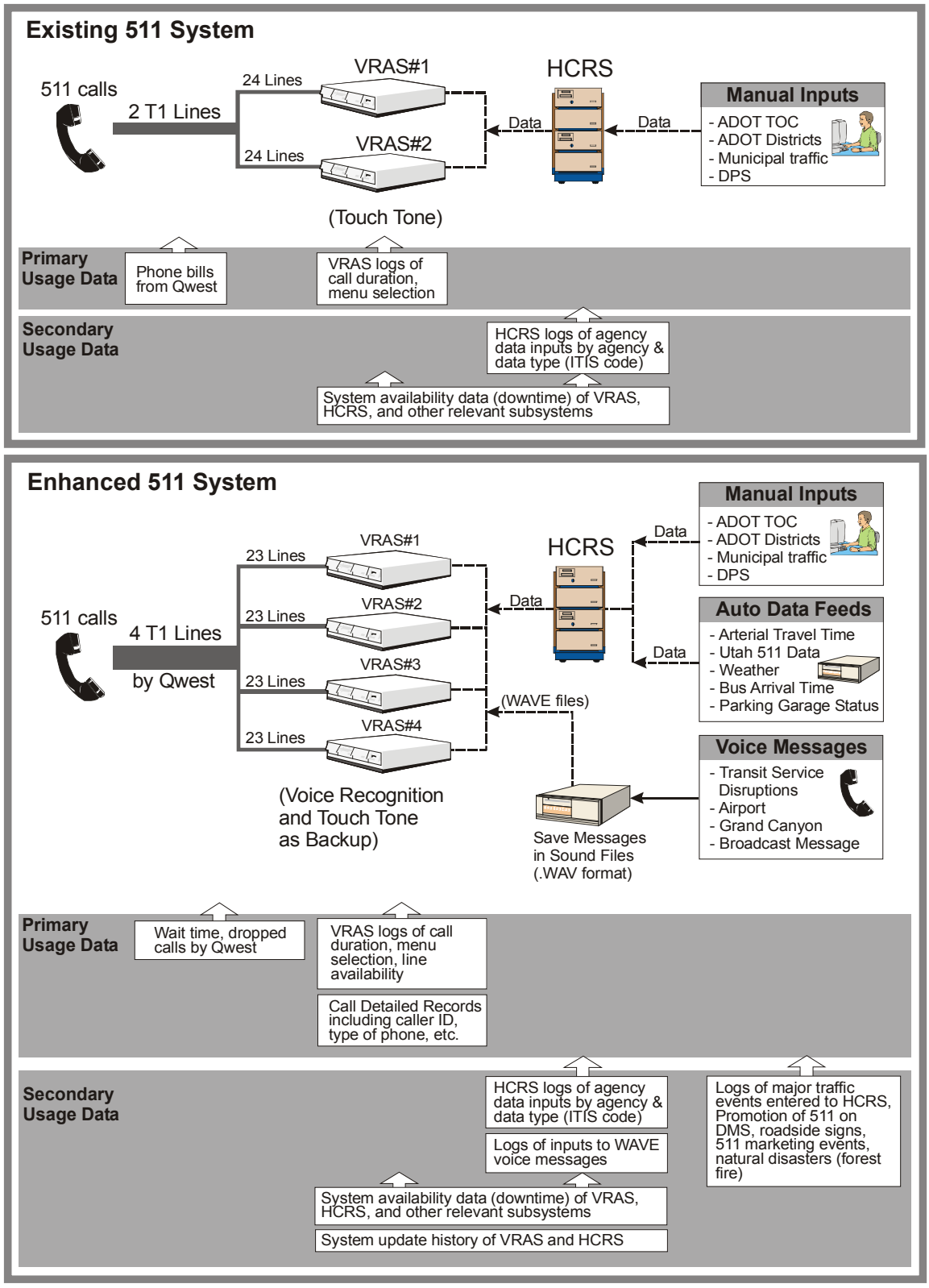

Figure 1. 511 System Usage Data Requirements

Table 3 describes the data requirements and sources of the proposed analysis of 511 system usage.

Table 3
511 System Usage Data Requirements

Type[7]	Data Description	Purpose	Source
VRAS	10-digit caller ID	In support of analysis of call geographic location, wireless vs. wireline, and repeat callers.	For baseline analysis, detailed phone bill records will be used. For enhanced 511 system, Caller ID will be included in the VRAS logs.
VRAS	Date and time of call	In support of analysis of call patterns.	Both existing and new VRAS record the date and time stamps of each call.
VRAS	Duration of call	In support of analysis of call patterns.	Both existing and new VRAS record the duration of each call.
VRAS	ANI II number	As part of the Call Detail Records, ANI II number can be used to determine wireless vs. wireline calls.	This data will be captured by the new VRAS available for the post-enhancement usage analysis.
VRAS	Wait time	Indicate the amount of time a caller waited in the system when call volume exceeds the line capacity.	This data will be captured by Qwest for the post-enhancement usage analysis.
VRAS	Dropped call	Indicate number of calls terminated by users before reaching the 511 service. This information is in support of assessment of line capacity.	This data will be available from new VRAS logs for the post-enhancement usage analysis.
VRAS	Repeated attempt	Indicate the number of repeated attempts a caller tried to access a menu item using voice recognition.	This data will be available from new VRAS logs for the post-enhancement usage analysis.
VRAS	Menu selection	Indicate the 511 contents accessed by a user.	This data are available both for existing and enhanced 511 systems.
HCRS	HCRS agency data input logs	As a secondary data, HCRS data input logs will be used for assessing the quality of 511 contents.	HCRS maintains detailed logs of data input by agency, type of information, and route number.
SYSTEM	VRAS downtime	Indicate daily downtime of VRAS.	Available from ADOT system performance reports.
SYSTEM	HCRS downtime	Indicate daily downtime of HCRS.	Available from ADOT system performance reports.
SYSTEM	Line availability	Indicate number of concurrent calls in the system in comparison to total line capacity.	This information will be derived from VRAS logs which provide the usage data by individual phone line.
SUPPORT	VRAS system update history	Document incremental deployment of VRAS in terms of changes in contents and functions.	This information will be available from version control document maintained by VRAS vendor for

[7] VRAS, HCRS, SYSTEM denote the 3 major system data of interest, namely, VRAS logs, agency data inputs to HCRS and system availability. SUPPORT denotes other data that help set context for the 511 usage analysis.

Type[7]	Data Description	Purpose	Source
			the post-enhancement analysis.
SUPPORT	HCRS system update history	Document new data sources and changes in content format.	Available from version control document maintained by HCRS vendor for both baseline and post-enhancement periods.
SUPPORT	Logs of input to WAVE files	Indicate the frequency of data input to WAVE messages by agency and type of information.	Available from log files on the WAVE server.
SUPPORT	Major event logs	Information on major traffic impeding events that could promote the use of 511 use.	Manual data entry by ADOT traffic operations personnel using a data collection form.
SUPPORT	DMS operations logs	Information on use of DMS to promote 5111 use during major events, including DMS ID, date and time, message content, and duration.	Manual data entry by ADOT traffic operations personnel using a data collection form.
SUPPORT	511 marketing campaigns	Information on planned ADOT 511 campaigns, including roadside signs, media events, etc.	ADOT 511 marketing plan.

3.2 Data Sources and Collection Methods

This section provides a description of the sources and collection methods for data outlined in Table 3 Data Requirements and Sources. Limitations of particular data will be discussed where applicable.

3.2.1 Phone Bills

The phone bills are the primary source of data for the usage analysis of the existing 511 system. The phone bills provided by Qwest contain individual call records, among which caller ID (ten digits phone number), date and time of call, and duration are of evaluation interest. Caller ID will be used to analyze the new and repeat callers, call geographic locations, and wireless vs. wireline.

For post-enhancement analysis, call detail records (CDR) recorded by the new VRAS computers will be used and thus eliminate the need for phone bills. A discussion of the CDR is provided in next section.

The phone bills for the baseline analysis period will be obtained from Qwest, via the ADOT 511 evaluation contact. The monthly phone bills will be provided in Excel spreadsheet format to the evaluation team via e-mail.

3.2.2 VRAS Usage Logs

Existing 511

The VRAS of the existing 511 system maintains logs of call time, duration, and menu selection (represented as a series of touch tone codes). These logs, however, do not include the caller ID information. For baseline system analysis, phone bills must be used in supplement to the VRAS logs for analyzing call geographic location, type of phone, and repeat callers. The VRAS logs of existing 511 system are saved on the respective VRAS computers as semi-structured text files and are, by design, automatically overwritten every 3~4 months. To avoid the data being overwritten by the VRAS system, the evaluation team will request the data before the end of each month. ADOT technical personnel will provide the raw log files and the data dictionary to the evaluation team.

Enhanced 511

The VRAS of the enhanced 511 system will provide significant improvements in usage data collection and reporting. Usage data recorded for each call will include 10 digits caller ID, date and time of call, wait time, drop call indicator, line use, menu selection, number of repeat attempts on a particular menu item (for assessing the performance of voice recognition algorithm), and selected data from call detail records (CDR) for indicating type of phone and other attributes of interest (e.g., calls made from PBX systems).

As mentioned in Section 2.2 Key Supporting Conditions, call detail records information is essential to the post-enhancement usage analysis due to the new Federal Communications Commission (FCC) rule that allows wireline numbers to be switched over to cell phones, starting November 24, 2003. That is, the proposed method for analyzing the existing 511 usage which relies on the comparison of 10-digit caller ID with phone number block assignment (by providers and type of service) is no longer feasible for identifying type of phone under the new Federal rule. The solution to the problem lies in the call detail records.

The call detail records are data embedded in each phone call that contain useful information primarily for call routing and billing purposes. Among the call detail records, the two digits ANI II number (advanced ANI) provides information on calling station, including payphone, cell phone, PBX, etc. ANI II uses an industry standard definition provided in Attachment 2. The proposed analysis method using ANI II is discussed in Section 4.1.

The preservation of ANI II number and other attributes from the call detail records will require additional programming on the VRAS. ADOT has been coordinating with the VRAS vendor, Call Processing, and the communications service provider, Qwest, on this issue.

For the enhanced 511system, ADOT plans to implement an automatic procedure that will periodically backup the log files (on 4 VRAS computers) to the ADOT SyBase database (the main database used for ADOT traffic management in Phoenix). This will prevent the loss of data due to system problems or being inadvertently overwritten.

3.2.3 HCRS Logs of Agency Data Input to 511

Understanding the data content of the 511 system is important for establishing context in which to interpret usage and customer satisfaction findings. Given that no record of actual 511 messages is preserved, the content of 511 system can be effectively gauged by examining the HCRS data entry records. Each HCRS data entry is automatically converted to an equivalent 511 message using the text-to-speech engine employed in the VRAS.

The HCRS maintains detailed logs of data entry by contributing agency, date and time, type of event (using International Traveler Information Interchange Standard (ITIS) data dictionary), and by highway route number. This information has been systematically archived for the existing 511 system since March 2000 and will be available in the same format for the enhanced system. Attachment 3 provides a list of high level ITIS data categories and examples of event descriptions used for data entry to HCRS.

The agencies currently participating in the HCRS system consist of all ADOT district offices and a number of municipal cities and state agencies[8] that were added as part of the AZTech Metropolitan Model Deployment Initiative (MMDI). As part of the 511 enhancements, more agencies will be encouraged to participate in manual data entry. In addition, HCRS will receive additional data feeds from the Utah 511, arterial street travel time pilot, and Phoenix bus arrival time, as shown in Figure 1.

HCRS access logs have been systematically archived by ADOT. The access logs along with the data dictionary will be provided to the evaluation team in Access database format.

3.2.4 System Availability

System availability consists of two components, including system outage and 511 system line availability. The project partners have not identified system outage as an issue to be addressed by the 511 model deployment. Therefore, the examination of system outage (downtime) is mainly to provide context for the interpretation of usage data and customer satisfaction findings.

The data source for system outage is the standard ADOT monthly system performance monitoring report that documents the downtime of various ADOT subsystems including the HCRS and VRAS. Such reports indicate daily system availability using color codes (white for no outages, yellow for outage less than 60 minutes, and red for outage over 60 minutes). In addition, total downtime per month and specific comments of system problems are provided. ADOT has agreed to provide the system performance reports for the available baseline period and future reports on a monthly basis.

In terms of line availability, the enhanced 511 system will provide almost twice as many concurrent lines as the existing 511 system (92 vs. 48 lines), in anticipation of a significant increase in call volume associated with the improved service and marketing campaign. Individual line usage data can be obtained from VRAS logs both for existing and enhanced systems. Statistics on the number of concurrent callers in the system can be derived from the individual line usage data. Excessive demand can be examined by the number of customers experiencing wait time, using statistics provided by Qwest. The existing 511 system, however, does not record wait time statistics and thus provides no measures of the excessive demand, if any.

[8] The agencies connected through AZTech include DPS (Dept Public Safety), Phoenix Transit, Phoenix Fire, Maricopa County Department of Transportation, Cities of Phoenix, Mesa, Chandler, Gilbert, Glendale, Scottsdale, Paradise Valley, Peoria, Tempe.

3.2.5 Supporting Data

In post-enhancement usage data analysis, several additional supporting data will be acquired, as shown in Figure 1. The sources for those data are described as follows.

VRAS System Update History

Due to the incremental turn-on of new 511 contents, it is important to maintain detailed records of the configuration of different versions of the VRAS software. Such information should indicate the changes in log file format, variable definitions, descriptions of new content, changes in menu structure, changes in "canned" instruction/announcement, modification to text-to-speech engine, modification to voice recognition engine, etc. The evaluation team has asked ADOT to create a version control document that systematically describes the evolution of the new VRAS after the initial deployment.

HCRS System Update History

Similar to VRAS, the update history of HCRS is of interest as the new data feeds or participating agencies would be incrementally included as the enhanced 511 system expands its contents. The vendor of HCRS has been maintaining a version control document that will be made available to the evaluation.

Logs of Input to WAVE Files

One of the new features of the enhanced 511 system is the ability for participating agencies to directly interject voice announcements (as WAVE files) to the VRAS without going through the HCRS, as shown in Figure 1. This will include the broadcast (floodgate) messages, transit service disruption announcements, airport, and Grand Canyon National Park service information.

The enhanced 511 will maintain access logs for the WAVE server that record contributing agency, date and time, message type, and the corresponding 511 menu item. The evaluation team has learned that the recorded messages will not be preserved because of the large file size and the effort involved in reviewing a large number of voice messages retrospectively. The log files will be made available to the evaluation monthly after the new system is deployed.

Major Event Logs

To allow for closer examination of the likely association between 511 usage and major traffic-impeding events, information such as major traffic incidents, road closures due to winter conditions or forest fire, and major freeway construction will be collected. The form of the information is expected to be anecdotal from the ADOT operations which will support major 511 data input functions such as creation of broadcast (floodgate) messages, and quick reports.

ADOT is working on a method of inserting "sticky notes" onto the VRAS data that will note major events. It would be a manual exercise and Darrell Bingham of ADOT would perform it based on input from operations staff. The notes will be created in a separate database, and can be automatically inserted into any reports (VRAS, HCRS, etc.).

Dynamic Message Sign Operations Logs

ADOT has preliminarily experimented with the promotion of 511 using DMS during major construction on State Route 51 and found an increase in overall call volume. In post-enhancement usage analysis, the change in 511 usage resulting from similar applications will be examined. With the improved ability to identify call geographic location and type of phone, the increased 511 calls attributable to a specific event can be more accurately measured. The data source for DMS operations is the message logs that are maintained by ADOT. The information of interest includes the DMS ID, date and time, message contents, and duration. The logs will be collected by the end of each month during the post-enhancement analysis period.

511 Marketing Campaigns

Another event that could improve the usage of 511 is the marketing campaign by ADOT. The effect of major marketing efforts such as implementation of a 511 sign along a freeway and planned media events will be closely examined. ADOT has prepared a marketing plan identifying the overall marketing strategy. However, it will be necessary to collect information on actual marketing activities directly from ADOT. The evaluation team has explained to ADOT the importance of recording the specific timing and nature of marketing activities and has requested that ADOT provide frequent updates. ADOT has expressed a strong interest in examining the relationship between usage and individual marketing activities.

4.0 Analysis Methods

The overall approach of the usage data analysis is to compare the existing with the enhanced 511 system and produce quantitative measures for characterizing the changes in usage patterns attributable to the enhancements. Such analysis will be conducted along the lines of call volumes, wait time, dropped calls, type of phone (wireless vs. wireline), call geographic location, new and repeat users, and consumption of information, as required in the statement of work.

There are two general types of analysis. First, is the usage pattern analysis as described in Section 4.1. The analysis of overall usage patterns over a period of interest (e.g., baseline or post-enhancement) will be examined by conducting descriptive statistical analysis using a single variable of interest (e.g., distribution, frequency, mean, etc.). For example, percentage of wireline vs. wireless calls, call distribution by time of day, frequency by type of contents accessed, etc. Cross-tabulations using two or more variables can be used to further explore the 511 usage of a particular market segment; for example, percentage of 511 inquiries for bus arrival time information using cell phone. Statistical techniques such as Analysis of Variance (ANOVA) and χ -square test will be used for assessing the statistical difference of the variables of interest for the pre and post-enhancement 511 systems.

Another type of analysis will focus on specific scenarios of interest, and these are described in Section 4.2. Scenarios are generally defined as the major roadway capacity-reducing events that could potentially promote the use of 511. For example, road closures due to major traffic accidents, winter/snow storms in northern Arizona, road closures due to forest fire, etc. The scenario-based analysis also includes the assessment of correlation between the usage level and promotion of 511 service using dynamic message signs (DMS) (during major traffic accidents) and planned 511 marketing events (e.g., fixed 511 signs along freeways).

4.1 Usage Pattern Analysis

Overall Call Volumes

The analysis of overall call volumes concerns the distribution of 511 calls by time of day (hourly), day of week (weekdays vs. weekend), and month of year (seasonal variation). Before and after comparisons will be made for the same time period (e.g., month) to control for the season variation. The spikes in the call volume will be examined more closely in the scenario-specific analysis to be discussed in Section 4.2.

Wait Time and Dropped Calls

Wait time is the amount of time a caller was put on hold before reaching the 511 service, when the total demand is greater than the maximum line capacity provided by the 511 system. Dropped calls are those which disconnect while being put on hold. Both

statistics are considered important service quality indicators and are only available from the enhanced 511 system. The candidate measures for wait time include total (cumulative) wait time and average wait time per caller who waited, during a period of interest. These measures along with system (line) availability data will allow the assessment of the adequacy of the proposed 92 (23 x 4) lines of the enhanced 511 for handling the expected increase in demand.

Type of Phone

This analysis concerns the 511 calls from wireline and wireless phones. In baseline (pre-enhancement) data analysis, caller ID information in the detailed phone bills will be used. Calls made by cell phone can be determined by comparing caller ID to block assignment information. Cell phone operators are assigned telephone numbers in blocks of one thousand. Attachment 1 presents a sample of such assignment for the State of Arizona. However, this approach will not be feasible as FCC allows users to change the wireline number to wireless service effective November 24, 2003.

An alternative exists for identification of cell phone callers after November 2003. As discussed in Section 3.2.2, the enhanced 511 system will be capable of recording ANI II number transmitted along with each phone call. The definition of ANI II is provided in the attachment II of this report. ANI II number can be used to identify wireless calls (code 61, 62, 63) with the exception of code 23 which could be a number of things including cell calls. The evaluation team has requested the ANI II data from ADOT, and they along with the VRAS developer and Qwest (who provides the T1 communication lines to the 511 system) are currently investigating the matter.

Call Geographic Location

For wireline calls, the call geographic location can be easily determined using the combination of the area code and the prefix (associated with the local telephone exchange). That is, caller ID in the 511 detailed phone bills (for existing 511) or caller ID in VRAS logs (for enhanced 511) can be used for analyzing the call geographic location of wireline calls.

This approach, however, is problematic for analyzing the origin of wireless calls, because the caller ID from a wireless call only displays the registered number of the cell phone which may not indicate the location where the call was initiated.

It is evident in the detailed phone bills that the origin of each cell call is recorded and used by the wireless service providers for billing purpose. Unfortunately, such information is not shared outside the respective service providers (i.e., not part of the call detailed records transmitted electronically along with each phone call). Therefore, there is no reliable way for this evaluation to determine the geographic origin of cell phone calls.

New and Repeat Users

It is expected that enhanced 511 will attract more first time and repeat users due to the marketing campaign of 511 service and the improved user interface and data content. The basic approach for analyzing new users is relatively straight forward by comparing the caller ID information of 511 calls before and after and the enhancement. The existing users are represented by caller IDs accumulated over the baseline (pre-enhancement) period since the inception of the Arizona 511 system. Intuitively, the new users of the enhanced 511 may be represented by the caller IDs that are not matched to those of the baseline period. Similarly, the repeat users may be identified by the duplicate phone numbers over a period of interest.

The potential threat to the validity of this approach is that a user may own or have access to different telephone numbers (residence, work, cell phone) and thus using caller ID may over-represent the number of new users. Conversely, multiple persons might share the same telephone number as the case of residence and sometimes work place. However, it is possible to include a question in the proposed caller intercept survey to help understand this subject.

Another problem of using caller ID for new and repeat user analysis stems from the inability to differentiate calls made from Private Branch Exchange (PBX) system or forwarded using a telephone company's trunk line. PBX is a private telephone system that allows many users to share a fewer number of physical phone lines within an organization.

When a user initiates a call within the PBX, the system arbitrarily assigns one of the available phone lines (and thus inherits the number in the caller ID). As a result, 511 users from an organization (of the same PBX system) will be underrepresented when caller ID is analyzed. On the other hand, this could inflate the repeat user measure by showing abnormally high call volume from the same number (that is shared by the PBX).

In the case of call forwarding by trunk line, caller ID information can be lost when a call is routed from one carrier to another (sometimes within the same carrier) due to code incompatibility. In such events, the routed call might inherit the phone number used by the trunk line as the caller ID. As a result, it appears that a large number of calls were made from the same number.

The problems associated with the PBX and trunk line may be mitigated, to some extent, by using ANI II. As shown in the definitions in the Attachment II, ANI II may be used to indicate PBX (code 20) and trunk line (code 23). Note that code 23 indicates a number of things including trunk line and thus needs to be interpreted with care.

Contents Accessed

The data source of this analysis is the VRAS logs that record the detailed menu selection of each 511 call. For the existing 511 system, the menu selection is logged as a series of command lines executed by the VRAS (e.g., Input <10#>). These commands can be

translated into information contents (of various levels in the menu) using a data dictionary provided by ADOT. The measures of interest include the access frequency of each content category and the number of information selections per call.

The enhanced 511 is expected to include a number of new content categories including:

- Arterial street travel time
- Bus arrival information
- Grand Canyon
- Airport
- Parking garage status
- Utah 511 information

Due to the incremental implementation of 511, new content categories will be added at different times after the new VRAS is deployed. The analysis of content accessed will require accurate information (provided by ADOT) regarding the changes to the menu structure over the course of the implementation.

4.2 Scenario-Specific Usage Analysis

The scenario-specific analysis applies only to the post-enhancement period which will examine the 511 usage during major traffic events and the effectiveness of 511 promotional activities using DMS, marketing campaign (e.g., fixed 511 signs along freeways), and other advertisement outlets.

During the post-enhancement period, in support of the evaluation, a major event log will be maintained by ADOT to record regional events that could potentially promote the use of 511, including major traffic accidents, inclement weather conditions, forest fires and other events of significance. In addition, DMS operations that contain 511 promotional messages will be logged by ADOT operations. Major 511 marketing campaigns will be communicated to and documented by the evaluation. The above information will be reviewed during the post-enhancement analysis for feasible scenarios that warrant further study.

The general criteria for identifying study scenarios include events associated with:

- Significant traffic impacts
- Extended time period
- Extensive geographic coverage (number of freeways affected) and/or significance of location

Once a study scenario is identified, relevant information during the same time period will be retrieved from respective data sources, including the 511 usage log (i.e., VRAS log), the DMS log (of the affected area, if available), and other anecdotal sources (e.g., verification with the ADOT traffic operations staff).

The analysis will focus on those calls that accessed the 511 information content relevant to the event of interest within (or slightly beyond) the duration of the event. The

information content accessed will be identified through the VRAS logs and the duration of the event will be obtained from the HCRS input (of the specific event) that includes the start and end times of the event.

The analysis of usage not only will look at the change in overall call volumes during the period of event but also number of calls from the specific segments of users. The segmentation variables of interest might include call geographic location (within and from areas leading into the affected location) and type of phone. For example, number and percentage of calls for forest fire-related road closure information from Phoenix or Tucson metropolitan area versus northern Arizona using cell versus wireline phones. The call geographic location will be identified using the prefix in the caller ID available in the VRAS logs. The type of phone will be identified through ANI II number also available in the VRAS logs, as discussed in Section 4.1.

In support of the above analysis, the HCRS inputs during the course of an event will be examined. Especially for progressive events like the forest fire, the evaluation would be interested in the frequency of 511 information updates. For example, it is likely that there would be more repeat users (within the duration of the event) looking for updates on the situation if information is updated more frequently.

In addition, specific efforts will be made to examine the system availability, in terms of system down time and line availability, during the course of the event. The system down time information will be from ADOT's monthly report on system performance monitoring and verification with the ADOT system manager/administrator. The line availability will be examined using VRAS logs that contain usage information on individual phone lines and correlated with Qwest information on number of calls in queue and wait time, in the case of excessive demand.

5.0 Test Schedule

Exploration of the available system usage data began at the inception of the evaluation project in September 2002. The identification and discussion of specific system functionality in support of evaluation started in January 2003. This effort was closely coordinated with Dr. Mark Hickman of the University of Arizona and the ADOT 511 implementation team.

In September 2003, Battelle identified the need to capture the ANI II data in support of the analysis of type of phone. The issue of ANI II was communicated to and supported by ADOT in October 2003.

Most baseline system usage data was collected for the period of October 2002 through September 2003. HCRS logs (data input to 511) are available dating back to April 2000. Analysis of baseline data started in September 2003 and baseline analysis results were reported in the draft Interim Analysis Report dated November 15, 2003.

Given ADOT's current plan to debut the new VRAS by the end of December 2003, the post-enhancement data collection will start as soon as the new system is in place. However, as noted in Section 4.1 the capturing of ANI II data is still being investigated by ADOT, the VRAS developer, and Qwest (which provides T1 communication lines to 511). Thus, at the time of preparation of this test plan (December 2003) ANI II data was not expected to be available to the evaluation team at the debut of the enhanced system. The evaluation team will continue to work closely with ADOT to insure the highest priority for resolution of this issue.

The post-enhancement data collection and analysis will be completed January 31, 2005. System usage analysis results will be reported in a draft evaluation report February 28, 2005 and the final evaluation report April 30, 2005.

6.0 Results Report Format and Contents

The results of this test will be documented in two parts. First, the results of system usage analysis of the existing 511 system will be reported in the Interim Analysis Report as part of the deliverables of the Phase I. Excerpts of the system usage analysis findings may be included in the enhancement process briefing planned for February 2004. The full results, including both the baseline and post deployment analysis will be included in the draft and final versions of the Model Deployment Evaluation Report scheduled for February 28 and April 30, 2005 respectively.

The usage analysis results in baseline and final reports will include the following components:

- Summary of the Model Deployment
- High-Level Summary of the Evaluation Plan
- Analysis Results
    - Information Contents and Quality
        - HCRS Information Content and Update Frequency
        - Quality of 511 Information
    - System Availability
        - System Outage
        - Line Utilization
    - Usage Analysis Results
        - Call Distribution by Time and Date
        - Call Duration
        - New and Repeat Callers
        - Wireless vs. Wireline
        - Call Distribution by Geographic Location
        - Menu Selection
    - Scenario-Specific Analysis Results
    - Factors Affecting the System Usage
- Summary Observations

7.0 Estimated Resource Requirements

The estimated budget for executing the System Usage Analysis Test is presented in Table 4. Note that the analysis of system usage and system availability will be carried out by Dr. Mark Hickman of the University of Arizona, who serves as the self evaluator as part of the ADOT 511 implementation team. Battelle will conduct analysis of the HCRS data inputs to 511 and additional research and analysis in support of the overall test activities. The resource requirements presented in Table 4 only include the Battelle staff hours and do not include the efforts from the University of Arizona.

Table 4
Estimated Resource Requirements

	Battelle Staff Hours			
Tasks	**Zimmerman**	**Jenq**	**Burt**	**Total**
Collect Baseline Usage Data	0	20	32	52
Baseline Analysis & Report	2	22	20	44
Collect After Usage Data	0	16	0	16
Final Analysis & Report	8	20	10	38
Total	10	78	62	**150**

Attachment 1. Example of Telephone Number Prefix Assignment of Arizona

The prefix assignment by type of phone service (i.e., wireless, wireline) data is obtained from NEUSTAR, an organization that maintains the information under the oversight of the telecommunications industry and the FCC. The web site of NUSTAR is http://www.neustar.com. An example of the prefix assignment for identifying wireless and wireline numbers is provided in this attachment. Due to the length of the document, only data definition and a small portion of the assignment data are presented.

Arizona Assigned Blocks Inventory - As of 10-04-2003
Source: October LERG and PAS
Note: A designation of "L" in Block Column is CO code holder for all blocks not specifically assigned.

RBOC - Regional Bell Operating Company (wireline)
CLEC - Competitive Local Exchange Company (wireline)
WIRELESS - CMRS wireless and paging
PCS – wireless
General - probably wireline
ICO - Independent Telephone Company (wireline)
CAP - Competitive Access Provider (wireline)

NPA	NXX	Block	CATEGORY
480	200	L	WIRELESS
480	201	L	WIRELESS
480	202	L	WIRELESS
480	203	0	WIRELESS
480	203	2	CLEC
480	203	L	PCS
480	204	L	WIRELESS
480	205	L	WIRELESS
480	206	0	WIRELESS
480	206	L	PCS
480	207	L	WIRELESS
480	208	L	WIRELESS
480	209	1	CLEC
480	209	4	WIRELESS
480	209	5	WIRELESS
480	209	6	WIRELESS
480	209	7	WIRELESS
480	209	8	WIRELESS
480	209	9	WIRELESS
480	209	L	CLEC
480	210	L	CLEC
480	212	L	CLEC
480	213	L	WIRELESS
480	214	L	CLEC
480	215	L	WIRELESS
480	216	L	WIRELESS
480	217	L	PCS
480	218	L	RBOC
480	219	L	CLEC
480	220	L	WIRELESS

480	221	L	PCS

Attachment 2. ANI II Number Definition

ANI II DIGITS

ASSIGNMENTS AS OF FEBRUARY 2, 1999

DIGIT PAIR	DESCRIPTION
00	Plain Old Telephone Service (POTS) - non-coin service requiring no special treatment
01	Multiparty line (more than 2) - ANI cannot be provided on 4 or 8 party lines. The presence of this "01" code will cause an Operator Number Identification (ONI) function to be performed at the distant location. The ONI feature routes the call to a CAMA operator or to an Operator Services System (OSS) for determination of the calling number.
02	ANI Failure - the originating switching system indicates (by the "02" code), to the receiving office that the calling station has not been identified. If the receiving switching system routes the call to a CAMA or Operator Services System, the calling number may be verbally obtained and manually recorded. If manual operator identification is not available, the receiving switching system (e.g., an interLATA carrier without operator capabilities) may reject the call.
03-05	Unassigned
06	Station Level Rating - The "06" digit pair is used when the customer has subscribed to a class of service in order to be provided with real time billing information. For example, hotel/motels, served by PBXs, receive detailed billing information, including the calling party's room number. When the originating switching system does not receive the detailed billing information, e.g., room number, this "06" code allows the call to be routed to an operator or operator services system to obtain complete billing information. The rating and/or billing information is then provided to the service subscriber. This code is used only when the directory number (DN) is not accompanied by an automatic room/account identification.
07	Special Operator Handling Required - calls generated from stations that require further operator or Operator Services System screening are accompanied by the "07" code. The code is used to route the call to an operator or Operator Services System for further screening and to determine if the station has a denied-originating class of service or special routing/billing procedures. If the call is unauthorized, the calling party will be routed to a standard intercept message.
08-09	Unassigned
10	Not assignable - conflict with 10X test code
11	Unassigned
12-19	Not assignable - conflict with international outpulsing code
20	Automatic Identified Outward Dialing (AIOD) - without AIOD, the billing number for a PBX is the same as the PBX Directory Number (DN). With the AIOD feature, the originating line number within the PBX is provided for charging purposes. If the AIOD number is available when ANI is transmitted, code "00" is sent. If not, the PBX DN is sent with ANI code "20". In either case, the AIOD number is included in the AMA record.
21-22	Unassigned
23	Coin or Non-Coin - on calls using database access, e.g., 800, ANI II 23 is used to indicate that the coin/non-coin status of the originating line cannot be positively distinguished for ANI purposes by the SSP. The ANI II pair 23 is substituted for the II pairs which would otherwise indicate that the non-coin status is known, i.e., 00, or when there is ANI failure. ANI II 23 may be substituted for a valid 2-digit ANI pair on 0-800 calls. In all other cases, ANI II 23 should not be substituted for a valid 2-digit ANI II pair which is forward to an SSP from an EAEO.

Some of the situations in which the ANI II 23 may be sent:

- Calls from non-conforming end offices (CAMA or LAMA types) with combined coin/non-coin trunk groups.
- 0-800 Calls
- Type 1 Cellular Calls
- Calls from PBX Trunks
- Calls from Centrex Tie Lines

24 Code 24 identifies a toll free service call that has been translated to a Plain Old Telephone Service (POTS) routable number via the toll free database that originated for any non-pay station. If the received toll free number is not converted to a POTS number, the database returns the received ANI code along with the received toll free number. Thus, Code 24 indicates that this is a toll free service call since that fact can no longer be recognized simply by examining the called address.

25 Code 25 identifies a toll free service call that has been translated to a Plain Old Telephone Service (POTS) routable number via the toll free database that originated from any pay station, including inmate telephone service. Specifically, ANI II digits 27, 29, and 70 will be replaced with Code 25 under the above stated condition.

26 Unassigned

27 Code 27 identifies a line connected to a pay station which uses network provided coin control signaling. II 27 is used to identify this type of pay station line irrespective of whether the pay station is provided by a LEC or a non-LEC. II 27 is transmitted from the originating end office on all calls made from these lines.

28 Unassigned

29 Prison/Inmate Service - the ANI II digit pair 29 is used to designate lines within a confinement/detention facility that are intended for inmate/detainee use and require outward call screening and restriction (e.g., 0+ collect only service). A confinement/detention facility may be defined as including, but not limited to, Federal, State and/or Local prisons, juvenile facilities, immigration and naturalization confinement/detention facilities, etc., which are under the administration of Federal, State, City, County, or other Governmental agencies. Prison/Inmate Service lines will be identified by the customer requesting such call screening and restriction. In those cases where private paystations are located in confinement/detention facilities, and the same call restrictions applicable to Prison/Inmate Service required, the ANI II digit for Prison/Inmate Service will apply if the line is identified for Prison/Inmate Service by the customer.

30-32 Intercept - where the capability is provide to route intercept calls (either directly or after an announcement recycle) to an access tandem with an associated Telco Operator Services System, the following ANI codes should be used:

- 30 Intercept (blank) - for calls to unassigned directory number (DN)
- 31 Intercept (trouble) - for calls to directory numbers (DN) that have been manually placed in trouble-busy state by Telco personnel
- 32 Intercept (regular) - for calls to recently changed or disconnected numbers

33 Unassigned

34 Telco Operator Handled Call - after the Telco Operator Services System has handled a call for an IC, it may change the standard ANI digits to "34", before outpulsing the sequence to the IC, when the Telco performs all call handling functions, e.g., billing. The code tells the IC that the BOC has performed billing on the call and the IC only has to complete the call.

35-39 Unassigned

40-49 Unrestricted Use - locally determined by carrier

50-51 Unassigned

52	Outward Wide Area Telecommunications Service (OUTWATS) - this service allows customers to make calls to a certain zone(s) or band(s) on a direct dialed basis for a flat monthly charge or for a charge based on accumulated usage. OUTWATS lines can dial station-to-station calls directly to points within the selected band(s) or zone(s). The LEC performs a screening function to determine the correct charging and routing for OUTWATS calls based on the customer's class of service and the service area of the call party. When these calls are routed to the interexchange carrier via a combined WATS-POTS trunk group, it is necessary to identify the WATS calls with the ANI code "52".
53-59	Unassigned
60	TRS - ANI II digit pair 60 indicates that the associated call is a TRS call delivered to a transport carrier from a TRS Provider and that the call originated from an unrestricted line (i.e., a line for which there are no billing restrictions). Accordingly, if no request for alternate billing is made, the call will be billed to the calling line.
61	Cellular/Wireless PCS (Type 1) - The "61" digit pair is to be forwarded to the interexchange carrier by the local exchange carrier for traffic originating from a cellular/wireless PCS carrier over type 1 trunks. (Note: ANI information accompanying digit pair "61" identifies only the originating cellular/wireless PCS system, not the mobile directory placing the call.
62	Cellular/Wireless PCS (Type 2) - The "62" digit pair is to be forwarded to the interexchange carrier by the cellular/wireless PCS carrier when routing traffic over type 2 trunks through the local exchange carrier access tandem for delivery to the interexchange carrier. (Note: ANI information accompanying digit pair "62" identifies the mobile directory number placing the call but does not necessarily identify the true call point of origin.)
63	Cellular/Wireless PCS (Roaming) - The "63" digit pair is to be forwarded to the interexchange carrier by the cellular/wireless PCS subscriber "roaming" in another cellular/wireless PCS network, over type 2 trunks through the local exchange carrier access tandem for delivery to the interexchange carrier. (Note: Use of "63" signifies that the "called number" is used only for network routing and should not be disclosed to the cellular/wireless PCS subscriber. Also, ANI information accompanying digit pair "63" identifies the mobile directory number forwarding the call but does not necessarily identify the true forwarded-call point of origin.)
64-65	Unassigned
66	TRS - ANI II digit pair 66 indicates that the associated call is a TRS call delivered to a transport carrier from a TRS Provider, and that the call originates from a hotel/motel. The transport carrier can use this indication, along with other information (e.g., whether the call was dialed 1+ or 0+) to determine the appropriate billing arrangement (i.e., bill to room or alternate bill).
67	TRS - ANI II digit pair 67 indicates that the associated call is a TRS call delivered to a transport carrier from a TRS Provider and that the call originated from a restricted line. Accordingly, sent paid calls should not be allowed and additional screening, if available, should be performed to determine the specific restrictions and type of alternate billing permitted.
68-69	Unassigned
70	Code 70 identifies a line connected to a pay station (including both coin and coinless stations) which does not use network provided coin control signaling. II 70 is used to identify this type pay station line irrespective of whether the pay station is provided by a LEC or a non-LEC. II 70 is transmitted from the originating end office on all calls made from these lines.
71-79	Unassigned
80-89	Reserved for Future Expansion "to" 3-digit Code
90-92	Unassigned
93	Access for private virtual network types of service: the ANI code "93" indicates, to the IC, that the originating call is a private virtual network type of service call.
94	Unassigned
95	Unassigned - conflict with Test Codes 958 and 959
96-99	Unassigned

Attachment 3. HCRS Event Type

The HCRS events are described using International Traveler Information Interchange Standard (ITIS) "category" and "description" information. There are a total of 22 ITIS categories. Each ITIS category includes anywhere from a few to several hundred specific messages, or "descriptions". There are a total of 1,374 ITIS descriptions. The table below lists the ITIS categories and a couple of ITIS description examples from each category.

ITIS Categories Used in HCRS Event Entries and Example ITIS Descriptions

ITIS Categories	Examples of Associated ITIS Descriptions
Level of Service	Stop and go traffic for 3 miles
	Expect Traffic Congestion
Incidents/Accidents	Disabled vehicle. Delays
	Overturned vehicle
Closures	Road blocked ahead. Long delays
	On- and off-ramps blocked
Lane Restrictions	Narrow lanes. Expect slow traffic
	Right lane closed
Road Maintenance	Road marking operations. Two lanes closed
	Road construction. Heavy traffic.
Obstruction Hazards	Object on roadway
	Flooding. Expect heavy traffic.
Road Conditions	Fuel on roadway
	Loose gravel. Caution
Weather	Rain. Visibility reduced.
	Partly cloudy weather
Winds	Tornado watch
	Strong winds
Environment	Sandstorms
	Patchy fog
Activities	Sports event. Traffic building up
	Closed due to parade
Delays/Cancellations	Delays for buses. Irregular service
	Delays up to 20 minutes
Dangerous Vehicles	Objects falling from moving vehicle
	High-speed chase
Exceptional Loads	Wide load
	Military convoy
Traffic Equipment Status	Traffic lights working incorrectly. Delays
	Railroad crossing failure. Slow traffic
Traffic Regulations	Police directing traffic
	Temporary axle load limit
Headways	30 minute headway
	5 minute headway
Travel Times	5 minute travel time
	20 minute travel time
Parking	No parking
	Parking garage full
Information	Gas station closed
	Rest area closed
Winter Storm Codes	Ice
	Winter storm advisory