FINAL TEST PLANS

FORETELL ™ Consortium Operational Test: Weather Information for Surface Transportation

March 2002

Prepared for:

U.S. Department of Transportation
ITS Joint Program Office, HVH -1 Room
400 Seventh Street,
Washington, D.C.

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U.S. Department of Transportation
Federal Highway Administration

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FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation – Highway Maintenance Personnel Test

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1.0 INTRODUCTION

The FORETELL™ project aims to provide detailed weather and road condition information in a meaningful format to various surface transportation users. The goal of the project is a safer, more efficient and accessible rural transportation system that is sensitive to environmental issues and encourages economic vitality. The Federal Highway Administration (FHWA), in cooperation with the FORETELL Consortium (Castle Rock Services and Iowa, Wisconsin, and Missouri departments of transportation) has undertaken the development and operational testing of a multi-regional road and weather forecasting/dissemination system.

A major factor in the success of the FORETELL project will be the acceptance of and the ability to use the FORETELL system. The first line of use will be by highway operations personnel. Highway operations include both highway maintenance and traffic operations. Traffic operations is further broken down into traffic managers, emergency services, and state police/patrol. Personnel in highway operations must make decisions to perform various functions. These decisions frequently must take into account the current and projected weather and pavement conditions. The decisions produce outputs that are work related, such as closing roads during adverse weather events and determining appropriate snow and ice control pavement strategies (deicing, anti-icing, plowing, etc.).

The FHWA is conducting an independent evaluation of the FORETELL project. The evaluation focuses on assessing the decision process of potential users and measuring the resulting outcomes. As part of the overall evaluation, several tests are planned. This document serves as a detailed test plan for one such test: surveying highway maintenance personnel in Iowa, Wisconsin, and Missouri. The evaluation of traffic operations personnel will be addressed in subsequent test plans.

The evaluation of the FORETELL project has five central areas of interest: user acceptance, decision effectiveness, safety and security, efficiency, and environmental conservation. The highway maintenance personnel surveys are designed to obtain specific information on each of these central evaluation areas. For example, the surveys will obtain, from

highway maintenance personnel, measures of their use of FORETELL (user acceptance) and measures of their ability to improve storm management decisions (decision effectiveness), reduce exposure to unsafe road conditions (safety and security), reduce congestion and delay (efficiency), and reduce chemical contamination of the environment (environmental conservation).

Section 2 presents an overview of the testing approach, Section 3 provides an anticipated schedule, and the remaining sections present specific details for implementing the testing program.

2.0 APPROACH SUMMARY

To measure the impacts of the FORETELL program on the user decisions and the transportation systems, three sets of survey information will be obtained: baseline information and follow-up information from two subsequent winter seasons. Baseline data will be collected from about 100 highway maintenance operators before the implementation of the FORETELL system. This preliminary information will be obtained through the use of hard-copy, self-administered questionnaires. The questionnaires will be mailed along with pre-survey letters and postage-paid, return envelopes in November 1999 to all potential survey respondents. The pre-survey letters will explain the purpose of the study and what can be expected in terms of survey questions and approximate time required to complete the questionnaire. Two sets of evaluation data will also be collected during two winter seasons in which information from the FORETELL system is available to these personnel. Questionnaires will be mailed to participants in April 2001 and April 2002 in order to obtain comparative details about highway maintenance operators' use and opinions of the FORETELL program from the 2000-2001 and 2001-2002 winter seasons, respectively.

In order to characterize the use of FORETELL information on a per-event basis, highway maintenance personnel will record information following each weather event from November through April for the 1999-2000, 2000-2001, and 2001-2002 winter seasons in activity/weather logs. These logs will contain information characterizing the weather events and the decisions made during these events, as well as the information used in the decisions and the sources from which the information was obtained. The logs will be mailed in November 1999 for the 1999-2000 winter season, in November 2000 for the 2000-2001 winter season, and in November 2001 for the 2001-2002 winter season.

Upon receipt, the collected questionnaires and activity/weather logs will be reviewed for completeness, accuracy, and consistency. Following the review, information from the questionnaires will be entered into a database suitable for analysis. The resulting data will be analyzed using SAS®.

As with any field test, there are several underlying assumptions. For example, the success of the test depends upon a sufficient number of highway maintenance personnel having access to FORETELL information, being aware of and utilizing FORETELL information in making decisions, and returning the completed surveys and activity/weather logs. Given the relationship between the highway maintenance personnel and members of the FORETELL Consortium, a high response rate is expected, with minimal follow-up.

3.0 SCHEDULE

An anticipated schedule for the completion of all activities related to this test is presented in Table 1.

Table 1. Anticipated Schedule for Test

Activity	1999-2000 Winter Season	2000-2001 Winter Season	2001-2002 Winter Season
Pre-Test Activities			
Data Collection Design	July 1999	January 2001	January 2002
Questionnaire Development	July 1999	February 2001	February 2002
Finalization of Contact List	July 1999		
Development of Activity/Weather Log Forms	July 1999		
Test Activities			
Baseline Questionnaires			
Mail Pre-Survey Letter and Questionnaire	November 1999		
Mail second questionnaire, if necessary	December 1999		
Send list of respondents to state agent for follow-up	December 1999		
Follow-up Questionnaires			
Mail Pre-Survey Letter and Questionnaire		April 2001	April 2002
Mail second questionnaire, if necessary		April 2001	April 2002
Send list of respondents to state agent for follow-up		April 2001	April 2002
Activity/Weather Logs			
Mail Advance Letter/Logs	November 1999	November 2000	November 2001
Mail Log-Completion Reminders	January 2000	January 2001	January 2002
Post-Test Activities			
Data Preparation	January 2000 - May 2000	May 2001 - July 2001	May 2002 - July 2002
Analysis and Reporting	May 2000	July 2001 – September 2001	July 2002 – September 2002

4.0 PRE-TEST ACTIVITIES

Before data collection begins, several Pre-Test activities must be performed. Specifically, the following activities will be conducted: development of the data collection design, development of the data collection instruments, and finalization of the contact list.

4.1 Data Collection Design

Section 2.0 provided an overview of the data collection design. The remaining sections describe additional details of activities related to the collection of data from highway maintenance personnel. All highway maintenance workers (approximately 100) will be surveyed, using hard-copy self-administered questionnaires, in November 1999 and following the winter seasons in April 2001 and April 2002. They will also complete hard-copy, self-administered activity/weather logs following each weather event from November through April for the 1999-2000, 2000-2001, and 2001-2002 winter seasons.

4.2 Questionnaire Development

The Evaluation Plan identifies several hypotheses that will be tested using information collected from the November 1999 (baseline) and the April 2001 and April 2002 (follow-up) questionnaires. Based upon the Evaluation Plan, preliminary drafts of the baseline and follow-up questionnaires have been developed and are included in Appendices A and B, respectively. As one of the initial Pre-Test activities, these questionnaires will be further refined and formatted.

The process of refining the questionnaires will include examining the preliminary questionnaires to ensure that the following issues are fully addressed:

- Which questions should be included in the questionnaires?
- Do the questions solicit appropriate responses?
- In what order should the questions appear?
- How long should the questionnaires be?

- What instructions are needed to ensure that the questionnaires are self-explanatory?
- Do the questionnaires adequately address the specific hypotheses the surveys were designed to test?

Once the specific questions have been finalized, the questionnaires will be formatted to enhance their understandability. In-house testing of the questionnaires will be performed as an additional step in the refinement. These tests will focus on ensuring that the questionnaires follow a logical flow, that the instructions are clear, and testing other logistical aspects to the questionnaires.

4.3 Development of Activity/Weather Log Forms

A form will be developed to collect information pertaining to weather events so that the highway maintenance personnel can characterize their use of FORETELL information in decision-making on a per-event basis. The log will be composed of three main types of information: weather-related, decision-related, and performance-related. First, the activity/weather log will solicit information characterizing winter weather events, such as temperature, wind speed, and type and amount of precipitation. The log will also inquire about the actions taken by the highway maintenance personnel, such as plowing or chemical application, during each weather event. The information that the highway maintenance personnel used in making these weather-related decisions, along with the source(s) of that information will be addressed in the log as well. Finally, the activity/weather log will solicit objective measures of performance, such as the time needed to return the roads to a targeted condition. The resulting activity/weather log will be similar to that presented in Appendix C.

4.4 Finalization of Contact List

Lists of potential respondents will be obtained from the FORETELL program to complete the contact list. The contact list will include the names, addresses, and e-mail addresses (if applicable) of potential respondents, as well as telephone numbers of their supervisors.

Supervisors of potential respondents will be contacted to obtain their approval of potential respondents' survey participation before the contact list is finalized.

5.0 TEST ACTIVITIES

This section describes the logistical details of implementing the questionnaires and activity/weather logs. Data collection will occur in November 1999 (baseline questionnaires), throughout the 1999-2000, 2000-2001, and 2001-2002 winter seasons (activity/weather logs), and in April 2001 and April 2002 (follow-up questionnaires) for all highway maintenance personnel in the sampling frame.

5.1 Baseline Questionnaires

In November 1999, packets containing pre-survey letters and baseline questionnaires, along with postage-paid return envelopes, will be mailed to all potential survey respondents. The letters will explain the purpose of the survey and what can be expected in terms of survey questions and approximate time required to complete the questionnaire. In addition, the packets will include a message from the State Maintenance Engineer in order to facilitate the timely completion and return of the questionnaires. Additional questionnaires will be mailed in mid-December 1999 to survey respondents who have not yet returned the questionnaire. At the end of December 1999, the list of all highway maintenance operators who have not returned a completed questionnaire will be sent to the office of the State Maintenance Engineer for further follow-up.

5.2 Follow-Up Questionnaires

Following the same protocol used during baseline data collection, letters and follow-up questionnaires will be mailed to potential survey respondents in April 2001 and 2002. The letters will explain the purpose of the second questionnaire and what can be expected in terms of survey questions and approximate time required to complete the questionnaire. As during baseline data collection, additional questionnaires will be mailed in mid-April 2001 and 2002, to survey respondents who have not yet returned the questionnaire. In late April 2001 and 2002,

the list of all highway maintenance operators who have not returned a completed questionnaire will be sent to the office of the State Maintenance Engineer for further follow-up.

5.3 Activity/Weather Logs

The first set of activity/weather logs will be mailed to the highway maintenance personnel in November 1999. The highway maintenance personnel will complete an activity/weather log immediately following each weather event from November 1999 through April 2000 and send it to Battelle via facsimile. Notices will be sent in January 2000 to the highway maintenance personnel to remind them to complete and return the activity/weather logs after each weather event. The reminders will be sent via e-mail where applicable and via United States Postal Service for those personnel without access to e-mail.

Similarly, a second and third set of activity/weather logs and reminders will be mailed to the highway maintenance personnel in 2000-2001 and 2001-2002 using the same general time frame as the 1999-2000 weather/activity log schedule (see Table 1).

5.4 Interim Reports

After completion of the baseline survey and the first set of activity/weather logs, a baseline data report will be developed that analyzes the data and establishes a baseline condition. The baseline report will be prepared in May 2000, after receipt of the 1999-2000 winter season activity/weather logs from the highway maintenance personnel.

A second interim report will be developed that analyzes data from the first season in which information from the FORETELL system is available to the highway maintenance personnel. The second interim report will be prepared upon completion of the first follow-up questionnaire in April 2001 and receipt of the 2000-2001 winter season activity/weather logs.

6.0 POST-TEST ACTIVITIES

During the data collection phase, completed activity/weather logs will be received via facsimile and completed questionnaires will be received by mail at Battelle, where editors who have been trained specifically for this project will manually edit the questionnaires and activity/weather logs for completeness, accuracy, and consistency. This editing will be verified by a 10 percent re-edit of each editor=s work. The collected data will then be electronically keyed into a database with double entry and 100 percent verification.

A data preparation manager will be responsible for maintaining documentation on all data preparation activities. The data preparation manager will work together with a programmer to produce file layouts with clear column specifications, data types, missing value codes, and editing specifications (range of value, logic checks, and automatic filling of skip patterns). A codebook will be produced for each data collection instrument. Each codebook will describe the computer data file in terms of the instrument used to store the data and will provide documentation for coders, programmers, and investigators. The codebook also serves as a vehicle to maintain documentation on editing and coding decisions.

After entry, the data will be checked by electronic data cleaning methods using a menu-driven software package called CROSSBOW. The CROSSBOW system can be used to perform numerous operations, including:

- Defining variables for a raw data set (ASCII file) in terms of type, location within the data file, and field width, and assigning labels (up to 40 bytes in length) describing each variable.

- Defining acceptable values with associated description labels for each variable, along with skip patterns, within the data file.

- Establishing formal documentation in the form of a formatted codebook containing variable locations, variable descriptions, and labels.

- Creating a cleaning program to check a range of acceptable values for fields and checking that skip patterns are generated from the specifications defined for each variable and are executed from within the system. The cleaning program will produce error listings.

- Modifying fields within a data set through transactional updates. Only fields verified by re-keying can be updated. A record of all changes made is produced.

- Generating automatically from the raw data set the specification files for creating SAS® data sets, including input/output statements, variable labels, and value formats.

- Maintaining automatic audit trails for all activities performed on the codebook, all programs executed against a data file, and all changes made to a data file.

All errors flagged during the electronic data cleaning effort will be researched, and the correct answer entered into the database.

7.0 DATA ANALYSIS

Statistical analyses will be performed using data collected from the highway maintenance personnel surveys and the activity/weather logs. These analyses will be performed using SAS®. A significant number of surveys and logs must be completed and returned to ensure that this test results in statistically sound analyses. Members of the FORETELL Consortium have indicated that the response rate for the highway maintenance personnel questionnaires should be near 100 percent. In addition to the response rate, the number of completed activity/weather logs ultimately depends on the number of weather events occurring from November through April for each year of the study.

The surveys and logs will provide valuable information that will be used to evaluate the acceptance and use of the FORETELL system by potential users. This information will also be used to evaluate the decision processes of the potential users and to measure the resulting outcomes. Other outcomes (e.g., number of accidents, amount of chemical applications) collected during tests not addressed in this document, will be used to evaluate use of the FORETELL system in addition to the survey and activity/weather log data. The information collected will also be used to test specific hypotheses related to awareness and use of the FORETELL system. Table 2 presents the hypotheses to be tested and the measures that will be used.

Table 2. Hypotheses and Evaluation Measures Related to Highway Maintenance Personnel Surveys

Evaluation Area	Hypothesis	Evaluation Measures
User Acceptance	FORETELL products are readily available to highway maintenance personnel	Percent of users who have access to the FORETELL information
	FORETELL products provide highway maintenance personnel the kind of information needed for them to perform their work	Percent of users who indicate that FORETELL provides the information they need
	Highway maintenance personnel take action based on the information provided by FORETELL™	Percent of users who take action based on the FORETELL products
	Highway maintenance personnel think the information is worth the investment (cost)	Percent of users that believe the benefits of having FORETELL product(s) outweigh the costs
	Highway maintenance personnel perform their work differently (better, quicker) now that they have access to FORETELL products	Percent of users that perform their work differently because of information from the FORETELL system
	FORETELL information affects highway maintenance personnel decisions	Percent of users that use FORETELL products in their decisions
	Highway maintenance personnel are more comfortable with their decisions using FORETELL information	Percent of users that are more confident in making decisions using FORETELL products
Decision Effectiveness	Staff are deployed more efficiently with FORETELL information	Percent of users who deploy staff more efficiently
	FORETELL information helps determine appropriate snow and ice control pavement treatments (deicing, anti-icing, plowing, etc.)	Percent of users who use products to help with treatment selections
	FORETELL information assists in determining where snow and ice control treatments are required	Percent of users who use products to help determine where treatments are required
Safety/Efficiency	Highway maintenance personnel are able to improve the traffic efficiency of roadways with snow and ice control measures using FORETELL information	Time to return roadways to a targeted road condition
Environmental Conservation	Fewer amounts of harmful chemicals are being applied to roadways for snow and ice control using FORETELL information	Amount of chemical applications (for chloride contamination)

7.1 Descriptive Statistics

A large amount of information will be collected from the baseline survey, the follow-up surveys, and the activity/weather logs. All of this information will be analyzed to some extent. Descriptive statistics, such as means, and standard deviations (for continuous responses) or contingency tables (for categorical responses), will be prepared. In addition, graphical summaries (histograms, mean and confidence interval plots, etc.) will be prepared for select items. First, they will provide an overall summary of the data. Second, the descriptive statistics will be used to examine differences in the responses between the baseline and the follow-up surveys (i.e., changes over time). Finally, the descriptive statistics will provide additional insights into the responses obtained following the deployment of FORETELL. The descriptive statistics will also be used to compare the survey responses obtained before and after the deployment of FORETELL. For example, these statistics will be used to examine the hypothesis that highway maintenance operators are using more weather-related information to make management decisions than they were before the deployment of FORETELL. Other hypotheses of a similar nature will also be examined.

The responses to Questions 7 and 8 in the follow-up survey (see Appendix B) will be used to categorize highway maintenance personnel into different categories of users (e.g., light and heavy) of the FORETELL system. For example, Figure 1 below is an illustration of a bar graph that would display the percent of highway maintenance personnel who use each component of information supplied by the FORETELL system. Comparisons of survey responses will then be made between these two types of users. For example, the percentage of heavy users that believe they can improve traffic efficiency by using information from the FORETELL system will be compared to the percentage of light users with the same belief using responses from the follow-up questionnaire. Odds ratios and their associated 95 percent confidence intervals will be calculated for such items of interest.

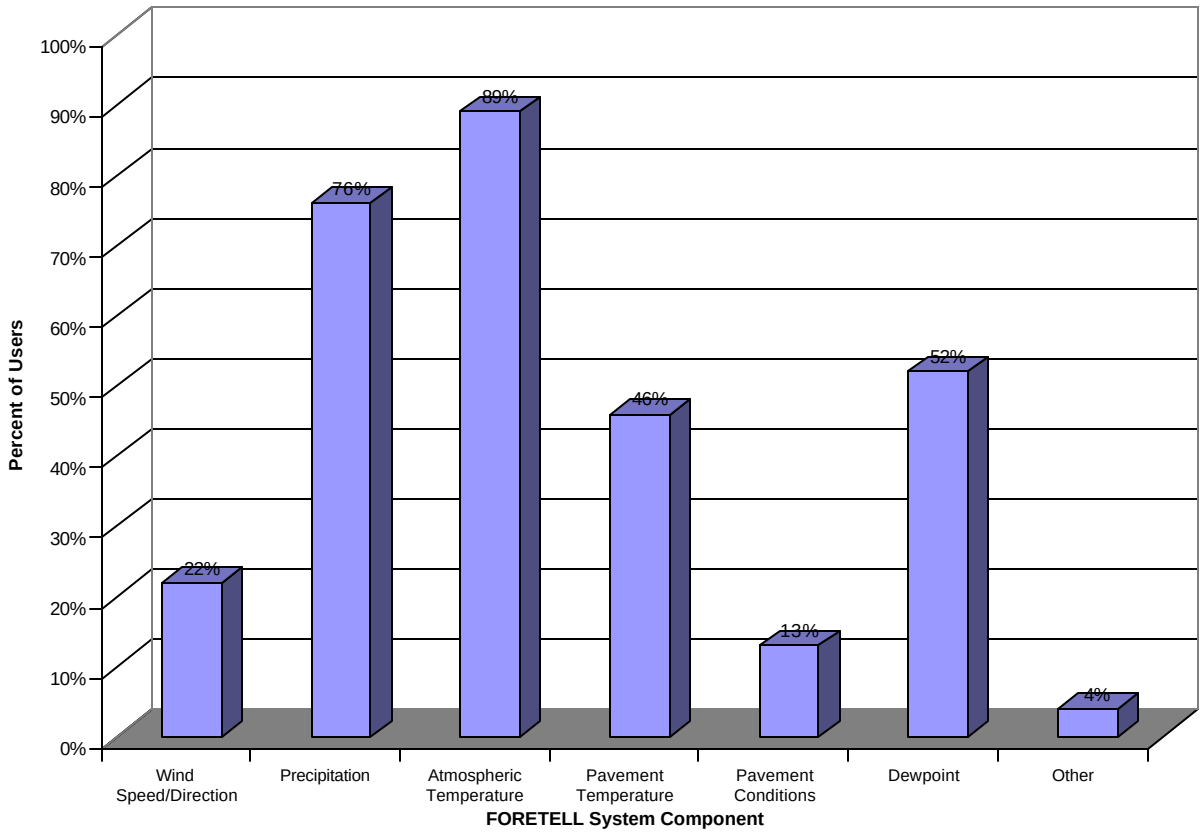

Figure 1. Example of a Bar Chart Displaying the Percent of Highway Maintenance Personnel Reporting Use of the FORETELL System Components.

7.2 Statistical Models

Measures of efficiency can be obtained from the activity/weather logs, as well as from other tests. For example, the time it takes for a roadway to return to a targeted condition can be obtained from the activity/weather logs, and data on the number of accidents/incidents and/or the amount of treatment applied to roadways will be available through other data collection efforts. Statistical models will be used, along with survey information, to determine the factors that influence these objective measures of efficiency.

In general, two types of models will be developed, those that involve a longitudinal component, and those that are more cross-sectional in nature (i.e., developed using data from a single point in time). The following describes, in general terms, both types of models.

7.2.1 Cross-Sectional Models

Cross-sectional models will primarily be used to explore the follow-up survey responses and other outcomes following the deployment of FORETELL. For example, these models might investigate differences in the number of accidents for various levels of FORETELL usage. These models will have the following form:

$$\text{Outcomes} = \beta_0 + \beta_i \text{ C Covariate}_i + \beta_j \text{ C User-Type}_j + \varepsilon,$$

where

- *Outcomes* are items of interest from the questionnaire and other tests (e.g., accidents),
- *Covariates* represent information characterizing the intensity and duration of the weather event or the size of the geographical district,
- *User-Type* is an indicator of the level of use of the FORETELL system (light or heavy), and
- ε is random noise assumed to be normally distributed with mean μ and variance σ^2, independent of the other explanatory variables.

For example, a possible model for the number of accidents for a heavy user of the FORETELL system:

$$\text{Number of Accidents} = \beta_0 + \beta_1 \cdot \text{Amount of ice} + \beta_2 \cdot \text{Amount of snow} + \beta_3 \cdot \text{Population} + \beta_4 \cdot \text{Pavement condition} + \beta_5 \cdot \text{Heavy user of the FORETELL system} + \varepsilon .$$

A negative estimate for the heavy user variable (β_5) would indicate that heavy use of the FORETELL system decreases the number of accidents, assuming all other conditions are held constant.

7.2.2 Longitudinal Models

Longitudinal models will be developed to examine differences in outcome variables across time. As discussed in previous sections, survey data will be collected from highway maintenance operators at different points in time (baseline and two follow-up surveys). Thus, one set of models will be developed using information from all surveys with the primary focus being comparisons across time. These models will have the following form:

$$\text{Outcomes} = \beta_0 + \beta_i \cdot \text{Covariate}_i + \beta_j \cdot \text{Survey Information}_j + \text{Operator}_k + \varepsilon,$$

where

- *Outcomes* are items of interest from the questionnaires or from other data collection activities (e.g., number of accidents, number of fatalities, etc.),

- *Covariates* represent information characterizing the intensity and duration of the weather event or the size of the geographical district,

- *Survey Information* is a placeholder for examining the effect of selected variables from the questionnaires (e.g., user of FORETELL, number of weather related data sources utilized, etc.),

- *Operator* is a random effect, associated with each highway maintenance operator, that accounts for the variability within a given operator, and

- ε is random noise assumed to be normally distributed with mean μ and variance σ^2, independent of the other explanatory variables.

The random effect for the operator must be included when developing these models because each operator provides responses for more than one point in time. This effect permits the models to account for the correlation between repeated observations from the same highway maintenance operator.

For example, a model to estimate the number of fatalities may use the following variables:

$$\begin{aligned}\text{Number of Fatalities} = {} & \beta_0 + \beta_1 \times \text{Amount of snow} \\ & + \beta_2 \times \text{Amount of ice} \\ & + \beta_3 \times \text{Population} \\ & + \beta_4 \times \text{Duration of Storm} \\ & + \beta_5 \times \text{User of FORETELL} \\ & + \beta_6 \times \text{Frequency of obtaining weather information} \\ & + \beta_7 \times \text{Snow and ice control strategies used} \\ & + \text{Operator} \\ & + \varepsilon\end{aligned}$$

Another set of longitudinal models will be developed to specifically analyze the information from the activity/weather logs. As discussed in Section 5.2, multiple weather/activity logs will be collected from the same highway maintenance operators over the course of an entire winter season. Stated another way, each highway maintenance operator will provide information at multiple points in time, thus necessitating the use of a model that will incorporate this longitudinal component. This set of models will have the following form:

$$\text{Outcomes} = \beta_0 + \beta_i \cdot \text{Covariate}_i + \beta_j \cdot \text{User-Type}_j + \text{Operator}_k + \varepsilon,$$

where

- *Outcomes* are items of interest from the activity/weather logs (e.g., time to return to a targeted road condition),
- *Covariates* represent information characterizing the intensity and duration of the weather event or the size of the geographical district,
- *User-Type* is an indicator of the level of use of the FORETELL system (light or heavy),
- *Operator* is a random effect, associated with each highway maintenance operator, that accounts for the variability within a given operator, and
- ε is random noise assumed to be normally distributed with mean μ and variance σ^2, independent of the other explanatory variables.

For example:

$$\text{Time to return to bare pavement} = \beta_0 + \beta_1 \cdot \text{Amount of snow} + \beta_2 \cdot \text{Wind speed} + \beta_3 \cdot \text{Temperature} + \beta_4 \cdot \text{Duration of Storm} + \beta_5 \cdot \text{Heavy user of the FORETELL system} + \text{Operator} + \varepsilon$$

Again, the random effect for operator is included to account for the repeated observations for each operator.

8.0 REPORT FORMAT

The results of this test will be summarized in interim and final technical reports. The reports will contain the following sections where applicable:

1. Executive Summary
2. Introduction and Background
3. Summary of Data
    - 3.1 Data Collection
        - 3.1.1 Activity/Weather Logs
        - 3.1.2 Questionnaires
    - 3.2 Data Preparation
    - 3.3 Summary of Data Problems
4. Analysis Methods
    - 4.1 Descriptive Statistics
    - 4.2 Statistical Models
        - 4.2.1 Cross-Sectional Models
        - 4.2.2 Longitudinal Models
5. Summary of the Results
    - 5.1 Questionnaires
        - 5.1.1 Baseline Questionnaires
        - 5.1.2 Follow-up Questionnaires
    - 5.2 Activity/Weather Logs
    - 5.3 Statistical Models
        - 5.3.1 Cross-Sectional Models
        - 5.3.2 Longitudinal Models

6. Conclusions

7. Recommendations for Future Evaluations

APPENDIX A:

BASELINE QUESTIONNAIRE

Appendix A: Baseline Questionnaire

U.S. Department of Transportation
Federal Highway Administration

FORETELL *Highway Maintenance Operator Field Operational Test*

1. Please check the box next to **each** type of road your location maintains and indicate **how many miles** of each type of road you maintain.

	MILES
☐ Single lane, bi-directional traffic	
☐ Two lane	
☐ Four lane and limited access	
☐ Suburban and Urban	

2. How many **Full Time** employees do you supervise? (Write in '000' if you supervise *no* employees.) Number of Employees .....

3. How many **Winter Seasonal** employees do you supervise? (Write in '000' if you supervise *no* employees.) Number of Employees .....

4. Do you have access to a computer at work? ☐ Yes ☐ No **Skip to Q7.**

   A. What kind of computer do you have access to (e.g., IBM-compatible PC, Macintosh, Unix, etc.)?

5. Do you have access to the Internet at work? ☐ Yes ☐ No

   A. Which browser (such as Netscape Communicator 4.5, etc.) do you use?

6. Do you have access to an email account at work? ☐ Yes ☐ No

   A. What is your email address?

7. From what sources have you obtained weather-related information? (Please ✓ all that apply.)
   - ☐ Roadside and in-pavement sensors
   - ☐ Tailored, site-specific forecast
   - ☐ National Weather Service forecast
   - ☐ Satellite data
   - ☐ Radar data
   - ☐ Other (please specify) _____

8. How have you obtained weather-related information? (Please ✓ all that apply.)
   - ☐ Internet/World Wide Web
   - ☐ Email
   - ☐ Fax
   - ☐ Phone/Cell Phone
   - ☐ Television
   - ☐ Radio
   - ☐ Pager
   - ☐ Digital Messaging
   - ☐ Satellite Delivery
   - ☐ Computer-based subscription services
   - ☐ Other (please specify) _____

9. How often do you obtain weather information?

	If YES, please answer Col. A.		A.			
	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily	❑	❑	❑	❑	❑	❑
b. Weekly	❑	❑	NOT APPLICABLE			
c. In advance of a weather event*	❑	❑	❑	❑	❑	❑
d. During a weather event*	❑	❑	❑	❑	❑	❑
e. After a weather event*	❑	❑	❑	❑	❑	❑

**A weather event can include high winds, precipitation, extreme atmospheric temperatures, etc.*

10. What snow and ice control strategies do you employ in your winter maintenance operations? (Please ✓ all that apply.)

	If YES, please answer Col. A.		A. For each "yes," indicate whether or not weather-related information is helpful in making decisions about employing the strategy. Please circle one number for each strategy you use.				
	YES	NO	NOT HELPFUL → HELPFUL				
a. Anti-Icing	❑	❑	1	2	3	4	5
b. De-Icing	❑	❑	1	2	3	4	5
c. Friction Enhancement (Abrasives)	❑	❑	1	2	3	4	5
d. Mechanical Removal (Plowing)	❑	❑	1	2	3	4	5
e. Some other strategy? *Please specify*	❑	❑	1	2	3	4	5

SPECIFY: _____

11. What weather information do you use in making storm management decisions? Do you use:

	If YES, please answer Col. A.		A. Do you use actual readings, forecast information, or both? (Please ✓ the appropriate box[es])	
	YES	NO	Actual Readings	Forecast Information
a. Wind speed or direction?	❑	❑	❑	❑
b. Precipitation?	❑	❑	❑	❑
c. Atmospheric temperature?	❑	❑	❑	❑
d. Pavement temperature?	❑	❑	❑	❑
e. Pavement conditions?	❑	❑	❑	❑
f. Dew point temperature?	❑	❑	❑	❑
g. Some other indicator? *Please specify*	❑	❑	❑	❑

SPECIFY: _____

Thinking about the weather information you use, that is, those you checked "yes" in Question 11, indicate how strongly you disagree or agree with the following statements. Please circle one number for each category you use.

12. You use the above weather information to:	A. Wind Speed/ Direction					B. Precipitation					C. Atmospheric Temperature					D. Pavement Temperature					E. Pavement Conditions					F. Dew Point Temperature				
	Strongly Disagree				Strongly Agree	Strongly Disagree				Strongly Agree	Strongly Disagree				Strongly Agree	Strongly Disagree				Strongly Agree	Strongly Disagree				Strongly Agree	Strongly Disagree				Strongly Agree
a. make storm management decisions, such as deciding **WHAT** road surface treatments should be used.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
b. help determine **WHERE** to apply road surface treatments during winter conditions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
c. help determine **WHEN** to apply road surface treatments during winter conditions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
13. The above weather information you receive is:																														
a. **UNDERSTANDABLE**	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
b. **USABLE**	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
c. **EASILY OBTAINABLE**	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
d. **ACCURATE**	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
e. **USEFUL** in making storm management decisions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Please indicate how strongly you disagree or agree with the following statements. Please circle your response.

		Strongly Disagree → Strongly Agree				
14.	The weather information you receive is sufficient for making storm management decisions.	1	2	3	4	5
15.	Having weather-related information makes your job easier.	1	2	3	4	5
16.	The weather information you receive helps you to improve the traffic efficiency of roadways.	1	2	3	4	5
17.	The weather information you receive helps you to target snow and ice control measures.	1	2	3	4	5
18.	Highway maintenance activities are conducted and/or managed more efficiently using weather-related information.	1	2	3	4	5
19.	The weather information you receive helps you return the roads to a targeted pavement condition quickly.	1	2	3	4	5
20.	Having weather information increases the safety of the Highway Maintenance Operator.	1	2	3	4	5
21.	The weather information you receive helps to lessen the amount of chemical applications and improve the quality of the environment.	1	2	3	4	5

22. If there is any weather-related information that would be helpful to you in your job that you cannot receive, please explain.

_____

_____

23. Is there any other information you would like to tell us about the weather-related information you receive, how you receive it, or how you use the information in your decision-making process?

_____

_____

Thank you for taking the time to complete this questionnaire.

FOR OFFICE USE ONLY

NO: ____ DATE: ____ EDITION: 0____

APPENDIX B:

FOLLOW-UP QUESTIONNAIRE

Appendix B: Follow-Up Questionnaire

FORETELL *Highway Maintenance Operator Field Operational Test*
Follow-Up Questionnaire

1. Please check the box next to **each** type of road your location maintains and indicate **how many miles** of each type of road you maintain.

	MILES
❑ Single lane, bi-directional traffic	☐☐☐☐☐☐
❑ Two lane	☐☐☐☐☐☐
❑ Four lane and limited access	☐☐☐☐☐☐
❑ Suburban and Urban	☐☐☐☐☐☐

2. How many **Full Time** employees do you supervise? (Write in '000' if you supervise *no* employees.) Number of Employees ..... ☐☐☐

3. How many **Winter Seasonal** employees do you supervise? (Write in '000' if you supervise *no* employees.) Number of Employees ..... ☐☐☐

4. When you use a computer at work,

A. what computer operating system do you use? .....
- ❑ Windows 3.1
- ❑ Windows 95
- ❑ Windows 98
- ❑ Windows NT
- ❑ Windows 2000
- ❑ Unix
- ❑ OS/390
- ❑ Linux ☐☐
- ❑ Other _____

B. which Internet browser (such as Netscape, Microsoft Explorer, etc.) do you use? .....
- ❑ Netscape
- ❑ Internet Explorer ☐☐
- ❑ Other _____

5. What is your email address? _____

6. What information do you use in making weather-related management decisions?

If YES, please go to box A. →

Do you use:	YES	NO	A. Do you use actual readings, forecast information, or both? (Please check the appropriate box[es]) Actual Readings	Forecast Information
a. Wind speed or direction?	❑	❑	❑	❑
b. Precipitation?	❑	❑	❑	❑
c. Atmospheric temperature?	❑	❑	❑	❑
d. Pavement temperature?	❑	❑	❑	❑
e. Pavement conditions?	❑	❑	❑	❑
f. Dewpoint?	❑	❑	❑	❑ ☐☐
g. Some other indicator? *Please specify.....*	❑	❑	❑	❑

SPECIFY: _____

7. **SOURCES OF INFORMATION**

A. Please check the box corresponding to the source you rely on most heavily for obtaining each type of information. If you do not use a given type of information to make decisions, please check "Do not use".

	Do Not use	automated weather station (e.g. RWIS, AWOS)	CNN	DTN	FORETELL	Intellicast	Local Weather	National Weather Service	SSI	Weather Channel	*Other
a. Wind speed or direction?	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
b. Precipitation?	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
c. Atmospheric temperature?.....	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
d. Pavement temperature?	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
e. Pavement conditions?.....	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
f. Dewpoint?	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
g. Some other indicator?	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Please specify: _____ **Please specify for other*: _____

B. For the types of information that you do **not** rely on FORETELL to provide, please describe the reason(s) why:

a. Wind speed or direction: _____

b. Precipitation: _____

c. Atmospheric temperature: _____

d. Pavement temperature: _____

e. Pavement conditions: _____

f. Dewpoint: _____

g. Other, please specify: _____

8. Do you obtain information from the FORETELL System…
(please check all that apply) ❑ →

	YES	NO	A. How Often? TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	❑	❑	❑	❑	❑	❑
b. Weekly?.....	❑	❑	NOT APPLICABLE			
c. In advance of a weather event*?....	❑	❑	❑	❑	❑	❑
d. During a weather event*?.....	❑	❑	❑	❑	❑	❑
e. After a weather event*?	❑	❑	❑	❑	❑	❑

**A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

9. Which feature(s) of FORETELL do you like most? (Please check all that apply)

- ❑ Animation
- ❑ Long-term forecast
- ❑ Scroll labeling
- ❑ Information Options
- ❑ Zoom capability
- ❑ Map display
- ❑ Current Conditions
- ❑ Other (SPECIFY) _____ ☐☐

10. Which feature(s) of FORETELL do you like least?

- ❑ Animation
- ❑ Long-term forecast
- ❑ Scroll labeling
- ❑ Information Options
- ❑ Zoom capability
- ❑ Map display
- ❑ Current Conditions
- ❑ Other (SPECIFY) _____ ☐☐

11. A. Do you employ the following snow and ice control strategies in your maintenance decisions? (Please check all that apply.)

If YES, please go to box A. →

For each "yes," indicate whether or not information from FORETELL was helpful in making decisions about employing the strategy. Please circle one number for each strategy you employ.

	YES	NO	**A.** NOT HELPFUL → HELPFUL				
a. Anti-Icing	❑	❑	1	2	3	4	5
b. De-Icing	❑	❑	1	2	3	4	5
c. Traction Enhancement (Abrasives)	❑	❑	1	2	3	4	5
d. Mechanical Removal (Plowing)	❑	❑	1	2	3	4	5

B. Do you employ other maintenance activities that can depend on weather information? (Please check all that apply.)

If YES, please go to box A. →

For each "yes," indicate whether or not information from FORETELL was helpful in making decisions about employing the activity. Please circle one number for each activity you employ.

	YES	NO	**A.** NOT HELPFUL → HELPFUL				
a. Normal (non-snow and ice control) highway maintenance	❑	❑	1	2	3	4	5
b. Between-storm activities (e.g., vehicle maintenance, equipment washing)	❑	❑	1	2	3	4	5
c. Other *Please specify*	❑	❑	1	2	3	4	5

SPECIFY: _____

Think about the information you obtain using the FORETELL System (e.g. wind speed/direction, precipitation, etc.). Please indicate how strongly you disagree or agree with the following statements. Circle one number for each category you use. Circle 'N/A' if you do not use FORETELL for a given decision process.

TYPES OF INFORMATION

12. You use the FORETELL System to:	**A. Wind Speed/ Direction**	**B. Precipitation**	**C. Atmospheric Temperature**	**D. Pavement Temperature**	**E. Pavement Conditions**	**F. Dewpoint**
	Strongly Disagree … Strongly Agree	Strongly Disagree … Strongly Agree	Strongly Disagree … Strongly Agree	Strongly Disagree … Strongly Agree	Strongly Disagree … Strongly Agree	Strongly Disagree … Strongly Agree
a. make weather-related management decisions, such as deciding **WHAT** road surface treatments should be used.	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A
b. help determine **WHERE** to apply road surface treatments during winter conditions.	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A
c. help determine **WHEN** to apply road surface treatments during winter conditions.	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A

Please indicate how strongly you disagree or agree with the following statements. Circle one number for each category you use. Circle 'N/A' if you do not use FORETELL to obtain a given type of information.

TYPES OF INFORMATION

		A. Wind Speed/ Direction	B. Precipitation	C. Atmospheric Temperature	D. Pavement Temperature	E. Pavement Conditions	F. Dewpoint
		Strongly Disagree 1 2 3 4 5 Strongly Agree N/A	Strongly Disagree 1 2 3 4 5 Strongly Agree N/A	Strongly Disagree 1 2 3 4 5 Strongly Agree N/A	Strongly Disagree 1 2 3 4 5 Strongly Agree N/A	Strongly Disagree 1 2 3 4 5 Strongly Agree N/A	Strongly Disagree 1 2 3 4 5 Strongly Agree N/A
13.	The information from the FORETELL System was						
a.	**UNDERSTANDABLE**	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A
b.	**USABLE**	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A
c.	**EASILY OBTAINABLE**	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A
d.	**ACCURATE**	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A
e.	**USEFUL** in making weather-related management decisions.	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A
14.	Information from the FORETELL System changed the weather-related management decisions you made.	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A	1 2 3 4 5 N/A

If you do not use FORETELL, please stop here. Thank you for taking the time to complete this questionnaire.

For questions 15 through 18, please indicate how strongly you disagree or agree with the following statements by circling the appropriate number.

		Strongly Disagree → Strongly Agree				
15.	The FORETELL system provides valuable information that is not available from other sources.	1	2	3	4	5
16.	You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.	1	2	3	4	5
17.	The information provided by the FORETELL System is sufficient for making weather-related management decisions.	1	2	3	4	5
18.	Your agency would be willing to pay for the benefit of having information from the FORETELL System, assuming it is reasonably priced.	1	2	3	4	5

For questions 19 through 27, think about your experience before FORETELL was implemented compared to your present experience. Please indicate how strongly you disagree or agree with the following statements by circling the appropriate number.

		Strongly Disagree → Strongly Agree				
19.	Having information from the FORETELL System makes your job easier.	1	2	3	4	5
20.	With the FORETELL System you are better able to improve the traffic efficiency of roadways.	1	2	3	4	5
21.	With the FORETELL System you are better able to target snow and ice control measures.	1	2	3	4	5
22.	Highway maintenance activities are conducted and/or managed more efficiently using information from the FORETELL System.	1	2	3	4	5
23.	You are more confident in making weather-related management decisions when you use information from the FORETELL System.	1	2	3	4	5
24.	You deploy staff more efficiently when using information from the FORETELL System.	1	2	3	4	5
25.	Information from the FORETELL System helps you return the roads to a targeted pavement condition more quickly than without FORETELL information.	1	2	3	4	5
26.	Having information from the FORETELL System increases the safety of the Highway Maintenance Operator.	1	2	3	4	5
27.	Information from the FORETELL System helps to lessen the amount of chemical applications.	1	2	3	4	5

For questions 28 and 29, think about your experience *before* FORETELL was implemented compared to your present experience.

28. Are you able to make highway maintenance decisions more effectively because of information received from the FORETELL System?

❑ Yes ❑ No **Go to Q29.**

A. On average, how much sooner do you learn about weather events prior to the event?

❑ 0-3 HOURS
❑ 3-6 HOURS
❑ 6-12 HOURS
❑ >12 HOURS

29. Are roads returned to an acceptable level of service more quickly because of information received from the FORETELL System?

❑ Yes ❑ No **Go to Q30.**

A. On average, how much more quickly are the roads returned to an acceptable level of service?

❑ 0-3 HOURS
❑ 3-6 HOURS
❑ 6-12 HOURS
❑ >12 HOURS

30. Would you like to use information from the FORETELL System in the future?

❑ Yes ❑ No

31. Is there anything you would change about the FORETELL System (for example, how you receive the information or the types of information you receive)? If so, what would it be?

_____

_____

32. Is there anything that would improve your experience with the FORETELL System? If so, what?

_____

_____

33. Is there any weather-related information that would be helpful to you in your job that you did not receive through the FORETELL System? If so, please explain.

_____

_____

34. Please provide us with any other comments. _____

_____

_____

Thank you for taking the time to complete this questionnaire.

FOR OFFICE USE ONLY

NO: ___-___ *DATE:* ___-___-___ *EDITOR:* 0___

APPENDIX C:

ACTIVITY/WEATHER LOG

Appendix C: Activity/Weather Log

U.S. Department of Transportation
Federal Highway Administration

FORETELL Activity/Weather Log for Weather Events*

Please mail or fax to Shawna Collins at Battelle Memorial Institute, Columbus, OH 43201, (614)424-4611 (fax).

ID Number 01

Event Location

	Event Start	Event End
Date:		
Time:	AM ☐ PM ☐	AM ☐ PM ☐

Event Temperatures and Wind Speed

Atmospheric	High: ☐ ° F	Low: ☐ ° F
Pavement	High: ☐ ° F	Low: ☐ ° F
Maximum Wind Speed	☐ mph	

Event Precipitation (Please ☰ all that apply)

Type	Amount in Inches (if applicable)	Type	Amount in Inches (if applicable)
☐ Freezing Rain		☐ Sleet	
☐ Snow		☐ Rain	
☐ Wet ☐ Dry ☐ Drifting		☐ Hail	
		☐ Frost	

Method of Treatment During Event (Please ☰ all that apply)

	Type	Amount (units / ln-mi)
☐ Plowing	— NA —	— NA —
☐ Deicing		
☐ Anti-icing		
☐ Abrasives		
☐ Other		
☐ None		

Information Used During Event

Did you use: (☰ all that apply)	Type (☰ all that apply)		Source (☰ all that apply)	
☐ Maximum Wind Speed/Direction	☐ Forecast	☐ Actual	☐ FORETELL	☐ Other
☐ Precipitation	☐ Forecast	☐ Actual	☐ FORETELL	☐ Other
☐ Atmospheric Temperature	☐ Forecast	☐ Actual	☐ FORETELL	☐ Other
☐ Pavement Temperature	☐ Forecast	☐ Actual	☐ FORETELL	☐ Other
☐ Pavement Conditions	☐ Forecast	☐ Actual	☐ FORETELL	☐ Other
☐ Other _____	☐ Forecast	☐ Actual	☐ FORETELL	☐ Other

Road Condition During Event

Condition	Worst Condition (☰ only one)	Duration at Worst Condition (hrs)	Target Condition (☰ only one)	Time to Achieve Target Condition (hrs)
Bare Pavement	☐		☐	
Patchy snow, ice, or slush	☐		☐	
Slush or loose snow (no packed snow or ice)	☐		☐	
Continuous packed snow or ice; wheel track(s) bare	☐		☐	
Build-up of compacted snow; plowed and treated with abrasives/chemicals	☐		☐	
Build-up of compacted, deep, unplowed snow; ruts in ice pack	☐		☐	
Road closed due to weather conditions	☐		☐	

* A weather event can include high winds, precipitation, extreme atmospheric temperatures, etc.

Comments: _____

FINAL TEST

FORETELL ™ Consortium Operational Test: Weather Information for Surface Transportation – Commercial Vehicle Operators Test

November

Prepared for:

U.S. Department of Transportation
ITS Joint Program Office, HVH -1 Room
400 Seventh Street,
Washington, D.C.

Prepared by:

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FINAL TEST PLAN

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation – Commercial Vehicle Operators Test

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Prepared for

U.S. Department of Transportation
Washington, D.C.

November 2001

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1.0 INTRODUCTION

The FORETELL™ project aims to provide detailed weather and road condition information in a meaningful format to various surface transportation users. The goal of the project is a safer, more efficient and accessible rural transportation system that is sensitive to environmental issues and encourages economic vitality. The Federal Highway Administration (FHWA), in cooperation with the FORETELL Consortium (Castle Rock Services and Iowa, Wisconsin, and Missouri departments of transportation) has undertaken the development and operational testing of a multi-regional road and weather forecasting/dissemination system.

A major factor in the success of the FORETELL project will be the acceptance of and the ability to use the FORETELL system. The FHWA is conducting an independent evaluation of the FORETELL project. The evaluation focuses on an assessment of the decision processes of potential FORETELL system users and measurement of the resulting outcomes. As part of the overall evaluation, several tests are planned. One user group identified as a part of this evaluation project was Commercial Vehicle Operators (CVOs). This document serves as a test plan that will be used to evaluate the effectiveness of the FORETELL system among CVOs, also known as motor carriers.

Evaluation of the FORETELL project has five central objectives: user acceptance, decision effectiveness, safety and security, efficiency, and environmental conservation. CVO dispatchers, drivers, or coordinators/managers will be contacted to address the first four of these central evaluation objectives. The interview guide and list of motor carrier companies used to obtain this and additional pertinent information are presented in Appendix A and Appendix B, respectively.

CVOs in the states involved in the FORETELL evaluation will presumably make use of the FORETELL system during the winter months of 2001/2002 to better understand winter road surface and weather conditions. FORETELL proposes to assist this user group to meet their respective needs with better and more timely weather and forecast information. The effectiveness of the FORETELL web site at disseminating this information to CVOs will be evaluated through telephone interviews and

records of their access to the web site. For example, telephone interviews will be used to assess the extent of CVO use of FORETELL (user acceptance) and to measure their ability to improve weather event decisions (decision effectiveness), reduce exposure to unsafe road conditions (safety and security), and reduce delay (efficiency). For the CVO user group, there is not a component within the evaluation planning aimed at addressing the environmental conservation objective of the original evaluation plan. An interview guide will be developed with the intent of providing consistency in the interviews and collecting information suitable for qualitative analysis.

2.0 APPROACH

This test plan will measure the impacts of the FORETELL system on CVO users' decisions and operations by collecting information from about 25 to 30 motor carriers following the 2001/2002 winter season. Information will be collected primarily through a telephone interview (a draft interview guide is provided in Appendix A). The telephone interviews will be conducted in the spring of 2002 along with a review of the records of the commercial vehicle operator's access to the web site. Completion of the interview process will include pre-testing activities such as finalization of the interview guide and contact list to ensure that the collection of data is comprehensive.

Below is a list of potential CVO users with operations in or through Iowa, Missouri, and/or Wisconsin, who have shown interest in this evaluation.

Menasha Transport, Inc
Madison Freight Systems
KCS International Inc
JLP Trucking
H&N Transport, Inc.
Great Lakes
Hudson Moving & Storage
Interstate Trans. Service
C.K.K.C Enterprises
Diamond Transportation Systems
Fratrans, Inc.
Frito-Lay, Inc
Mayflower Transit, Inc
Gardner Trucking, Inc.
Hot-line Freight Systems
Karl's Transport Inc.
Lakeville Motor Express
Larkin Lumber, Inc.
Knudsen Trucking
Kelley Supply, Inc.
Hometown Inc.
Umthun Trucking
A & H Inc.
Boehm-Madisen Lumber
Hogan Trucking, Inc.
United Van Lines, LLC
Echo Lake Transport
Fleming Co.
Bob Miller Trucking
ABI, Inc.
ABN Transit, Inc
Alliance Transportation
American Freightways
Condon Transport
Cresco Lines
Genesis Aggregate
Dairyland Depot
Unigroup Worldwide UTS

In addition to information on CVOs' use of the FORETELL system, baseline information will be collected using the telephone interview guide. The interview guide will be developed to address past company methods of obtaining road surface and weather information as well as FORETELL system use. Based on the objectives established for the evaluation, measures were developed to assess the usefulness of the FORETELL system to commercial vehicle operators. The following measures served as a guide in developing the interview form:

- Number of times they accessed system

- Total and individually
- For those that don't – why not?

- Carrier opinion of the value of the information toward productivity
  - Change in frequency of on-time deliveries
  - Safety/Changes in frequency of accidents
- Carrier opinion of the accuracy of the information
- Carrier opinion of the impact to their operations
  - Routing changes
  - Trip cancellations/postponements

Information collected during the interview will be used to answer the hypotheses established as part of the Evaluation Plan and to perform the qualitative and comparative analysis desired for the goal areas of this evaluation. The decision areas that will be addressed as part of this Test Plan, and the hypotheses and measures used to assess them, are presented in Table 1.

The results and success of this Test Plan rely on several underlying assumptions. It is expected that motor carriers will access the information at least a minimal number of times in order to determine if the information provided on the FORETELL web site is useful and beneficial in managing their operations. Furthermore, they will likely rely on several sources for weather information, at least until they gain confidence in one source or another. The success of the test also depends upon a sufficient number of CVO personnel having access to FORETELL information, being aware of and utilizing FORETELL information in making decisions, and participating in the interviews. The estimate of 25-30 personnel to be interviewed is based on a preliminary contact selection process that was conducted using motor carrier listings while this Test Plan was being prepared.

Table 1. Commercial Vehicle Operators Framework

Commercial Vehicle Operators				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
User Acceptance	Receipt of Info	% of users who have access to the information	CVOs* have access to *FORETELL* information	• Interviews • FORETELL Access History
		% of potential users who get the information (Phase II effort)	CVOs* received *FORETELL* information in timely manner	
		% of users who get the information they need	CVOs* get the kind of *FORETELL* information needed for them to perform their work	
	Use of Information	% of users who understand the products and their content	CVOs* understand the *FORETELL* products	• Interviews • FORETELL Access History
		% of users who can use the products	CVOs* know how to use the *FORETELL* products	
		% of users who take action based on the products	CVOs* take action based on the information provided by *FORETELL*	
		% of users who receive the products in time to make decisions	*FORETELL* information is available CVOs* when needed	
		% of users that use sources other than *FORETELL*	Personnel use products other than *FORETELL* to make decision (Phase II)	
		% of users that use *FORETELL* products	Personnel use products other than *FORETELL* as well as *FORETELL* products, to make decision (Phase II)	
		Increase in % of users who rely on the products	Users of *FORETELL* information will rely on it more over time than they do on alternative sources (Phase II)	

* CVOs include drivers, dispatchers and possibly owners, terminal managers, and safety coordinators.

Table 1. Commercial Vehicle Operators Framework (Continued)

Commercial Vehicle Operators (Continued)				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
User Acceptance (continued)	Perceived value	% of users that like the products	CVOs* like the *FORETELL* products	• Interviews
		% of users that believe the information is correct	CVOs* think the *FORETELL* information was correct	
		% of users that believe the product(s) have value	CVOs* think the information was worth their investment (cost)	
		% of users that want to continue receiving the product(s)	CVOs* wish to continue using *FORETELL* products	
		% of users that want to continue Foretell sponsorship	CVOs* wish to continue *FORETELL* sponsorship	
	Behavior change	% of users that perform their work differently using *FORETELL* products	CVOs* perform their work differently (better, quicker) now that they have access to *FORETELL* products	• Interviews
		% of users that use *FORETELL* products in their decisions	*FORETELL* information affects decisions by CVOs*	
		% of users that are more confident in making decisions using *FORETELL* products	CVOs* are more comfortable with their decisions using *FORETELL* information	
Decision Effectiveness	Trip delay	% of time users delayed trip	CVOs* delivered products on time using *FORETELL* information	• Interviews
	Route changes	% of time user changed route or itinerary	CVOs* altered route or itinerary to improve their delivery timing using *FORETELL* information	
	Operational parameters	% of time user changed operational parameters	CVOs* made a change to an operational parameter to benefit their trip using *FORETELL* information	

* CVOs include drivers, dispatchers and possibly owners, terminal managers, and safety coordinators.

Table 1. Commercial Vehicle Operators Framework (Continued)

Commercial Vehicle Operators (Continued)				
Evaluation Outcome	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
Safety	Improved safety for operators* especially during weather events	Perceived safety benefits during weather events	CVOs* delivered products safely due to *FORETELL* product information	• Interviews
		% of weather related incidents reported	CVOs* avoided harsh weather events by changing trip timing or routing using *FORETELL* information	
Efficiency	Environmental Conservation was a result of Foretell product use	% of time users delayed trip	CVOs* delivered products efficiently and on time using *FORETELL* information	• Interviews
	Mobility/Convenience increased	% users delivered goods using the most efficient route during weather events	CVOs* can deliver goods effeciently during severe weather conditions using *FORETELL* information	
Economic Vitality	Goods delivered on time	% users delivered goods on time during severe weather conditions	CVOs* can deliver goods on time during severe weather conditions using *FORETELL* information	• Interviews
	Improved access to rural communities	% users that improved access to rural communities	CVOs* could obtain access to rural areas easier during severe weather events using *FORETELL* information	

* CVOs include drivers, dispatchers and possibly owners, terminal managers, and safety coordinators.

3.0 SCHEDULE

An anticipated schedule for the completion of all activities related to this test is presented in Table 2.

Table 2. Anticipated Schedule for Test

Activity	Timing
Pre-test Activities	2001
Data Collection Design	October
Interview Guide Development	October – November
Finalization of Contact List	November – December
Contact and Provide User Name & Password	December
Test Activities	2002
Initial Telephone Interviews	March
Follow-up Telephone Interviews	April – May
Post-test Activities	
Data Preparation	April – May
Analysis and Reporting	June – September

4.0 PRE-TEST ACTIVITIES

Before interviews begin, several pre-test activities must be performed. Pre-test activities consist of the following: development of the data collection design, development of the data collection instrument, finalization of the contact list, and assigning user names and passwords.

4.1 Data Collection Design

Test Plan activities were developed using the Evaluation Plan as a guide. Approximately 25-30 CVOs, identified in Appendix B, will be interviewed by telephone in Spring 2002 using the interview guide in Appendix A. In addition, data collected by the FORETELL systems relative to the extent of system access by the various users, specifically the commercial vehicle operators will be provided by the FORETELL system managers. This information will be needed to provide a record of the number of web site visits by each user, the amount of time spent during each visit, and the screens accessed.

4.2 Interview Guide Development

Commercial vehicle operators will be interviewed using an interview guide specifically developed for use in this evaluation. The interview guide is being developed as a tool for conducting telephone interviews in order to measure motor carrier use of the FORETELL web site. The guide provides a method of accomplishing one-on-one interviews with FORETELL web site users through a variety of survey style questions. It is expected that user information will be collected using nominal and ordinal level, closed-ended quantitative scale questions with possible open-ended follow-up questions.

The Evaluation Plan identifies several hypotheses, which are shown in Table 1, which will be tested using information collected during the interviews. Based upon the goals and objectives of the Evaluation Plan, a preliminary draft of the interview guide has been developed and is included in Appendix A. As one of the initial pre-test activities, this interview guide will be further refined.

The process of refining the interview guide will include examining the draft interview guide to ensure that the following questions are fully addressed:

- Do questions solicit appropriate responses?
- Would closed or open-ended questions provide the best information?
- In what order should the questions appear?
- How long should the interview guide be?
- Does the interview guide adequately address the specific hypotheses the survey is designed to test?

Ideally, pre-testing will be conducted with 2 – 5 individuals (CVO personnel or members of the FORETELL consortium) to ensure the interview guide meets these criteria. Once specific questions have been finalized, formatting for readability and conversational flow enhancements will be performed.

4.3 Finalization of Contact List

A list of 25 to 30 potential participants is presented in Appendix B. Finalization of this list will be a part of the pre-test activities to ensure a comprehensive and well-represented cross-section of motor carrier operators in the region participate in the evaluation of the FORETELL system. Efforts will be made to update and add to the presented list as the evaluation progresses.

The list of 25 to 30 potential participants developed as a part of preliminary test plan efforts indicates motor carrier operations' interest in this evaluation. To develop this list, a 2000-2001 directory/list of some motor carriers who travel in or through Iowa, Wisconsin, and Missouri was obtained. From the directory, Meyer, Mohaddes Associates (MMA) selected several carriers for initial contact in order to assess their eligibility for inclusion in this evaluation.

Certain criteria legitimized the selection of motor carriers that were contacted. Although criteria were not scientific, selections were made on the basis of apparent company size, based on title and contact information, and on telephone contact availability. Contacts were made using these criteria while proceeding alphabetically through the directory until the approximate 25 – 30 interested participants were discovered. Using this method brief telephone conversations were held to solicit interest in the FORETELL system and participation in the evaluation. Specific contact information for

these 25 – 30 motor carriers was gathered to facilitate future pre-test discussions as needed and the post-test interviews.

FORETELL consortium personnel indicated that they might have additional lists of potential motor carrier interested in using the FORETELL system for each of the primary corridors in the three states involved. These will be added to the participant list as appropriate. The finalized contact list will include the names, addresses, telephone numbers, and e-mail addresses (if applicable) of potential respondents, as well as telephone numbers of their supervisors. Owners/supervisors will be contacted to obtain approval for potential respondents' survey participation and possible additional names for participation before the contact list is finalized.

4.4 Assigning of User Names and Passwords

A final pre-test activity to be completed after the contact list is finalized will be to assign user names and passwords to each of the motor carrier participants. Commercial vehicle operations participants will be assigned a user name and password for full FORETELL web site access and history tracking purposes. MMA will provide Castle Rock Services with the complete motor carrier participant list. Castle Rock personnel will assign each evaluation participant on the contact list a user name and password and provide that information to each participant. In addition to access information, participants will provided a brief user guide on use of the FORETELL system. Understanding that full training courses cannot be offered to CVO participants at this time, a help number will also be available to access assistance through Castle Rock Services, upon request. Based on preliminary telephone calls to the CVO organizations, it is expected that motor carriers selected for the evaluation will be familiar with the navigation of web sites. Motor carriers will be asked to use the access information provided during the winter of 2001-2002 to obtain information from the FORETELL system. This will assist in gathering information through system history records.

5.0 TEST ACTIVITIES

5.1 Information Gathering

Following the winter of 2001-2002, the commercial vehicle operations personnel will be contacted and interviewed by telephone to learn about their use of the FORETELL system. MMA will conduct the interviews with the participating motor carriers. Depending on the ability to contact those listed on the participant list, interviews will start in March 2002. Further follow-up telephone calls or interviews will be conducted in April and May 2002 as necessary.

5.2 Information Tabulation – Data Sheets

The interview guide will be developed with the intent of collecting information suitable for qualitative and comparative analysis. The guide will include the collection of some baseline information concerning motor carriers sources of road surface and weather information prior to the use of the FORETELL system. A majority of the data collected, however, will be aimed at understanding participants' use and success of the FORETELL system in obtaining and using road surface and weather-related information.

6.0 POST-TEST ACTIVITIES

During the data collection phase, completed interview guides will be organized for entering into the Excel database by MMA. MMA will then perform a manual review for completeness, accuracy, and consistency. The accumulated data will then be manually keyed into an Excel database. A 100% verification of the entered data will be performed.

7.0 DATA ANALYSIS

Through the data collection effort, information will be tabulated in spreadsheet format and analysis performed on each interview guide question. This analysis will attempt to address the hypotheses formulated in the Evaluation Plan. The data analysis activities will present organized information to compare with the baseline information collected as a part of this same interview guide. These collected data will provide a before and after FORETELL system use evaluation of motor carriers' access and use of road surface and weather information.

The general information asked as a part of the telephone interview, such as title, organization name, location, number of years in operation, and business type, provides a way to identify users and the breadth of the motor carriers interviewed. Percentages will be shown for the general information questions to categorize the motor carriers into different types of users.

After collecting company information, questions on the interview guide will concentrate on answering the hypotheses developed in the Evaluation Plan. In part 1 of the developing interview guide, questions 1 – 12 pertain to information and information sources available prior to motor carriers' use of the FORETELL web site. Initially, a list of possible sources is provided to illustrate available sources of information commercial vehicle operators used, the frequency of use, and type of use prior to their introduction to the FORETELL system. On a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree, specific questions will be asked concerning ease of access, content understandability, accuracy, whether information is kept up to date, and usefulness. Question 12 directly asks participants to identify the specific road surface and weather information they use in making decisions. It is expected that many of these participants, who are larger motor carriers, will have access to many other information sources (e.g. CB radio, Internet and etc.). For comparative purposes, the interview will collect baseline data concerning CVO use of road surface and weather information to improve operations. Interviewees will be provided an opportunity to give specific examples. There will be an assortment of responses concerning information sources' ability to provide usable road surface and weather information. These will be displayed in histograms and bar graphs.

Questions 13 – 25 pertain to motor carriers' access to the FORETELL web site and use of the information obtained from the FORETELL system. Initially, a follow-up question on what information CVOs use in making road condition and weather related decisions will be asked. If FORETELL is not used to its capacity in obtaining needed motor carrier information, the reasons for this will be exployed as a part of this initial Part 2 question. The telephone survey will have the operators indicate the number of times they accessed the FORETELL web site throughout the testing period. Even though this information will be obtained by the system history records based on their user names and passwords, this question will encourage the interviewees thoughts on particular FORETELL web site use. Presumably all participants will access the web site at least once so that opinions of FORETELL and its content can be formulated. It is preferred that participants utilize the web site enough to become familiar with FORETELL's capabilities.

The interview process will then ask the FORETELL web site user to indicate on a scale of 1 to 5, similar to the questions asked in part 1, the ease of access, content understandability, accuracy, currentness, and usefulness of the FORETELL provided information. Follow-up questions that ask for specific examples of how companies dealt with and used the obtained information will follow. These follow up questions will further investigate specific likes and dislikes of the FORETELL system in improving company operations. The data collected are expected to indicate whether the use of FORETELL improved efficiency and safety in commercial vehicle operations. For example, the data should provide an understanding of the web site's effectiveness at assisting dispatchers in decisions to alter trip timing and routing during weather events? We expect a variety of use and opinions concerning the web site. Finally, the telephone interview will investigate the CVOs' likeliness to continue accessing information on the FORETELL web site. The analysis will consist of percentages shown on graphs for each information source. These percentages will be compared with the baseline-collected information in part 1 of the telephone interview.

Finally, users will be asked what they think the shortcomings of the site are. This will help to understand users' thoughts regarding changes to the FORETELL web site or content that could be

made to provide greater usability by trucking companies and their drivers. In the end, we expect the interview guides will provide valuable information that will be used to evaluate the acceptance and use of the FORETELL system by potential users. Collected information and subsequent analysis will be used to evaluate the decision processes of these potential users and to measure the resulting outcomes.

7.1 Comparative Analysis

For each item in the interview guide, graphical summaries (histograms, bar graphs, etc.) will be prepared for select items. For example, Figure 1 provides an illustration of a bar graph that would display CVO personnel's views on the ease of accessing road surface and weather information to improve operation and efficiency from past information sources versus the FORETELL system. Since the sample population will be small, statistical procedures typically used to create confidence intervals and to compare responses for a particular question will not be employed.

However, comparisons of survey responses will be made between before and after FORETELL system use and between categorized users. For example, the percentage of frequent users that believe they can improve commercial vehicle efficiency by using information from the FORETELL system will be compared to the percentage of other users with differing beliefs.

7.2 Statistical Models

Due to the small sample size, statistical models will not be used. Information gathered in the interview process will be used to determine the factors that influence evaluation objectives and measures of efficiency and operation and answer Evaluation Plan hypotheses. Specific, question emphasis will indicate companies use of the FORETELL system to improve their operations and efficiency in comparison to how the company operated before introduced to the FORETELL web site.

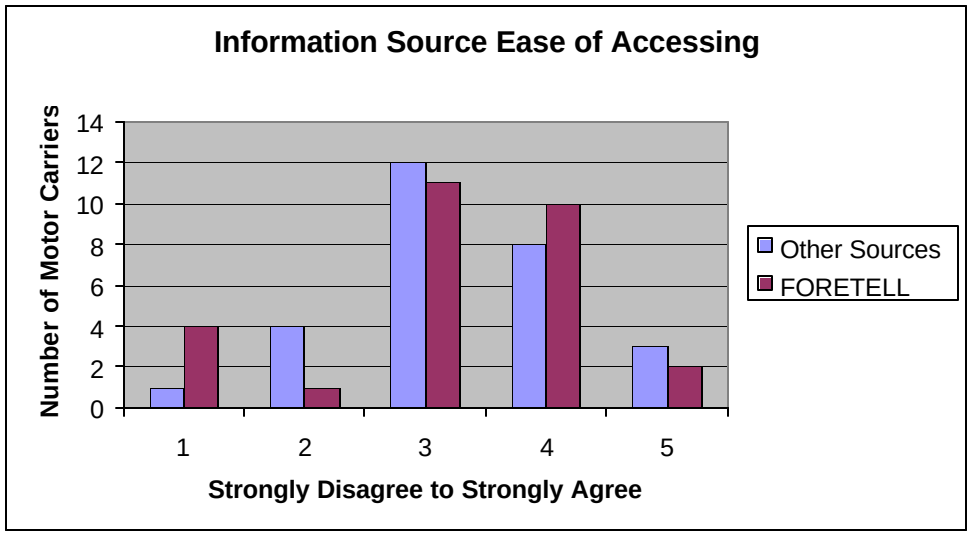

Figure 1. Example of a Bar Chart Displaying the Comparison of Ease of Access to Other Information Sources vs. FORETELL.

8.0 REPORT FORMAT

The results of this test will be summarized in a technical report. The report will contain the following sections:

1.0 Executive Summary

2.0 Introduction and Background

3.0 Summary of Data

- 3.1 Data Collection
- 3.2 Data Preparation
- 3.3 Summary of Data Problems

4.0 Analysis Methods

5.0 Summary of the Results

6.0 Conclusions

7.0 Recommendations

9.0 REQUIRED RESOURCES

Table 3 presents the approximate level of effort needed to conduct this test.

Table 3. Approximate Level of Effort (person hours)

Project Role	Task				
	Pre-Test Activities	Test Activities	Post-Test Activities	Analysis and Reporting	Total
Senior Analyst					
Middle Analyst					
Junior Analyst					
Support/Admin. Staff					

APPENDIX A:

DRAFT INTERVIEW GUIDE

COMMERCIAL VEHICLE OPERATORS INTERVIEW GUIDE

Introduction for discussion:

- We are assisting Battelle Memorial Institute to conduct an FHWA-sponsored independent evaluation of a new road surface/weather information system called FORETELL.
- We are conducting telephone interviews to evaluate who has used the FORETELL web site, how well the system works (accuracy), for what purpose the information is being used (e.g., routing or timing alterations), and whether or not it provides improvements in operations, mobility, and safety. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.
- You were contacted previously as a potential user and identified as one who is interested in using (or trying) the FORETELL web site and assisting us in this evaluation process
- Have you had an opportunity to familiarize and use the FORETELL system (if not, thank you for your time; this questionnaire was developed for evaluation of those who have experience in some minimal amount of FORETELL products). Are you willing to help us in this evaluation?

Be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only.

- This will take 15-25 minutes. Is this a good time to talk or would you prefer to talk at a different time? Would it be more appropriate to speak to a dispatcher, driver, or other person in your company?
- I appreciate your time. If you would like to interrupt the interview at any time, please let me know.

Name: _____ Title: _____

Organization: _____ Operating Area: _____

Office Location: _____ No. of Drivers: _____

Business Type/Haul: _____ No. of Trucks: _____

Date/Time: _____

The first set of questions pertain to information available prior to your use of the FORETELL web site.

1. Before introduced to the FORETELL web site, what information sources did you use for road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources were available, how often you used them, and when you used them (e.g., before a trip or en-route).

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Sometimes	Rarely	Never	Pre-trip	En-route
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

Note: If no previous sources were used to access road surface and weather information, skip to question 12 of this questionnaire.

Please indicate how strongly you disagree or agree with the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree.

.....→.....

.....Strongly Disagree Strongly Agree

2. The information sources used were easy to access.	1	2	3	4	5
3. Generally speaking, the content (information) from the above sources was easy to understand.	1	2	3	4	5
4. Of the information sources your organization accessed, the information was very accurate.	1	2	3	4	5
5. Your organization found the information to be up to date.	1	2	3	4	5
6. The road surface and weather information was very useful for your organizations operations.	1	2	3	4	5

If so, comment how: _____

_____

7. Information accessed was used to alter trip timing during a weather event.	1	2	3	4	5
8. Obtained information assisted your drivers and dispatchers in route decisions.	1	2	3	4	5

How? _____

_____

9. Use of information from these sources made you more confident in your decisions to alter your schedule or route during a weather related event.	1	2	3	4	5
10. The information from these sources assisted in overall driver safety during weather events.	1	2	3	4	5
11. During a weather event, road surface and weather information assisted in the efficiency of overall operations.	1	2	3	4	5

12. What information do you use in making weather-related management decisions?

If YES, please go to box A. →

Do you use:	YES	NO	Do you use actual readings, forecast information, or both? (Please check the appropriate box[es]) Actual Readings	Forecast Information
a. Wind speed or direction?	q	q	q	q
b. Precipitation?	q	q	q	q
c. Atmospheric temperature?.....	q	q	q	q
d. Pavement temperature?	q	q	q	q
e. Pavement conditions?.....	q	q	q	q
f. Dewpoint?.....	q	q	q	q
g. Some other indicator? *Please specify*....	q	q	q	q

SPECIFY: _____

The remaining questions pertain to information obtained through your use of FORETELL.

13. a) Have you or your organization received any training or training material regarding the FORETELL system?

p Yes p No

b) Was it useful? p Yes p No

14. Do you obtain the following information from FORETELL?

	YES	NO
a. Wind speed or direction.....	q	q
b. Precipitation.....	q	q
c. Atmosphere temperature	q	q
d. Pavement temperature.....	q	q
e. .....Pavement conditions	q	q
f. .....Dewpoint	q	q

15. If you don't use the information, why not? _____

_____

_____

16. How often do you obtain information from the FORETELL System…
(please check all that apply)

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	q	q	q	q	q	q
b. Weekly?	q	q	NOT APPLICABLE			
c. In advance of a weather event*?	q	q	q	q	q	q
d. During a weather event*?	q	q	q	q	q	q
e. After a weather event*?	q	q	q	q	q	q

** A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

Again, please rate the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree. [Interviewer: If an answer is Disagree or Strongly Disagree, ask the respondent to please explain.]

		Strongly Disagree →				Strongly Agree
17.	Information received from the FORETELL system is understandable.	1	2	3	4	5
18.	Information received from the FORETELL system is usable.	1	2	3	4	5
19.	Information received from the FORETELL system is easily obtainable.	1	2	3	4	5
20.	The FORETELL web site was easy to navigate.	1	2	3	4	5

Comment: _____

_____

21.	Information received from the FORETELL system is accurate.	1	2	3	4	5

Explain: _____

_____

22.	Information received from the FORETELL system is useful.	1	2	3	4	5

Comment: _____

_____

23.	Information provided by the FORETELL web site was up to date.	1	2	3	4	5
24.	You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.	1	2	3	4	5
25.	Use of the FORETELL web site provided information that played a role in altering trip timing.	1	2	3	4	5

How? _____

_____

26.	Information accessed on the FORETELL web site played a role in altering trip routes.	1	2	3	4	5

How? _____

_____

27.	You are more confident in making weather-related management decisions when you use information from the FORETELL System.	1	2	3	4	5

Explain: _____

_____

28.	Having information from the FORETELL System increases safety and/or reduces accidents.	1	2	3	4	5

How? _____

_____

29.	Information obtained on the FORETELL web site improved the overall efficiency of your operations.	1	2	3	4	5

Explain: _____

_____

30.	Your organization will likely continue to access information on the FORETELL web site.	1	2	3	4	5

Do you have other comments (e.g., ways to improve FORETELL)?: _____

_____

_____

_____

Thank you for taking the time to participate in this interview. If you have any questions concerning the evaluation, please call me at 208-345-4630. Do you think it would it be beneficial to speak to a dispatcher, a driver, or another person in your company?

Name: _____ Title: _____ Phone: _____

APPENDIX B:

LIST OF MOTOR CARRIER CONTACTS

Evaluation Participation	Company Name	Contact Person/Office Location Information	States Where Operating
1	Bob Miller Trucking	Jan Miller, Owner New Holstein, WI 53061	Wisconsin and others
2	Boehm-Madisen Lumber Co.	Susan Bishop, Trucking Cdr. Brookfield, WI 53008-0906	Wisconsin
3	C.K.K.C Enterprises	Dale Sutheimer, Dispatcher Stevens Point, WI 54481	Wisconsin and others
4	Diamond Transportation Systems	Randy Jenkins, Traffic Cdr. Racine, WI 53401	Wisconsin and others
5	Echo Lake Transport	Jason Warntjes, Traffic Spec. Burlington, WI 53105	Wisconsin and others
6	Fleming Co.	Mark Barth, Traffic Waukesha, WI 53186-6597	Wisconsin and others
7	Fratrans, Inc.	Ben Anderson, Safety Dir. Milwaukee, WI 53233	Wisconsin and others
8	Frito-Lay, Inc	Curt Sorenson, Fleet Mgr. Beloit, WI 53511	Wisconsin and others
9	Gardner Trucking, Inc.	Dave Brockman, Dispatcher Pittsville, WI 54466-0268	Wisconsin and others
10	Genesis Aggregate	Mary Beaudoin, Safety Cdr. West Allis, WI 53227	Local
11	H&N Transport, Inc.	James Hartung, Owner Arena, WI 53503	Iowa and Wisconsin
12	Hogan Transports, Inc.	David Lewis, Operations Mgr. St. Louis, MO 63106	Continental US
13	Hometown, Inc.	Brian Adams, Terminal Mgr. Milwaukee, WI 53202-1095	Wisconsin and others
14	Hot-line Freight System Inc.	Sandra Schmieg Safety Cdtr. Onalaska, WI 54650	Wisconsin and others
15	Hudson Moving & Storage	Johnny Osborn, Terminal Mgr. River Falls, WI 54022	Wisconsin and others
16	Interstate Transportation Service	James A. Matras, President Sun Prairie, WI 53590	Wisconsin, Missouri, Iowa plus other states

17	JLP Trucking	Bill Panetti, Dispatch Mgr. Horicon, WI 53032	Wisconsin and Missouri
18	KCS International	Barbara Brown, Traffic Mgr. Oconto, WI 54153	Wisconsin, Missouri, Iowa plus others
19	Kelley Supply, Inc.	Tom Schoenborn, Traffic Mgr. Abbotsford, WI 54405-0100	Wisconsin and others
20	Knudsen Trucking, Inc.	Bill Bergo, Safety Cdtr. Hager City, WI 54014-8151	Wisconsin and others
21	Lakeville Motor Express, Inc	Bob Feiss, Dispatch Mgr. Roseville, MN 55113-0280	Wisconsin and others
22	Larkin Lumber, Inc.	Dave Kilts, Dispatch Cdtr. Butler, WI53225-0426	Iowa and others
23	Madison Freight Systems	Kevin Wall, Terminal Mgr. Waunakee, WI 53597	Continental U.S.
24	Mayflower Transit, Inc	Unigroup Worldwide UTS St. Louis, Missouri 63026	Missouri and Continental U.S.
25	Menasha Transport, Inc	Dave Baldwin, Dir. of Operat. Neenah, WI 54957	Wisconsin, Missouri, Iowa plus other states
26	Umthun Trucking	Lynn Riley, Terminal Agent	Iowa and others
27	United Van Lines, LLC	Unigroup Worldwide UTS St. Louis, Missouri 63026	Continental U.S.

FINAL TEST PLAN

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation – Highway Patrol Test

December 2001

Prepared for:

U.S. Department of Transportation
ITS Joint Program Office, HVH -1
Room 3400
400 Seventh Street, S.W.
Washington, D.C. 20590

U.S. Department of Transportation
Federal Highway Administration

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Battelle
... Putting Technology To Work

Final Test Plan

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation – Highway Patrol Test

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Prepared for

U.S. Department of Transportation
Washington, D.C.

December 2001

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1.0 INTRODUCTION

The FORETELL™ project aims to provide detailed weather and road condition information in a meaningful format to various surface transportation users. The goal of the project is a safer, more efficient and accessible rural transportation system that is sensitive to environmental issues and encourages economic vitality. The Federal Highway Administration (FHWA), in cooperation with the FORETELL Consortium (Castle Rock Services and Iowa, Wisconsin, and Missouri departments of transportation) has undertaken the development and operational testing of a multi-regional road and weather forecasting/dissemination system.

A major factor in the success of the FORETELL project will be the acceptance of and the ability to use the FORETELL system. The FHWA is conducting an independent evaluation of the FORETELL project. The evaluation focuses on an assessment of the decision processes of potential FORETELL system users and measurement of the resulting outcomes. As part of the overall evaluation, several tests are planned. One user group identified as a part of this evaluation project was highway patrol personnel. This document serves as a test plan that will be used to evaluate the effectiveness of the FORETELL system among highway patrol users.

Evaluation of the FORETELL project has five central objectives: user acceptance, decision effectiveness, safety and security, efficiency, and environmental conservation. Highway patrol communication directors, managers/supervisors, and dispatchers will be contacted to address these central evaluation objectives. The interview guide and list of highway patrol personnel to obtain this and additional, pertinent information are presented in Appendix A and B.

Highway patrol communication personnel in the states involved in the FORETELL evaluation will presumably make use of the FORETELL web site during the winter months of 2001/2002 to better understand winter road surface and weather conditions. FORETELL proposes to assist this user group to meet their respective needs with better and more timely weather and forecast information. The effectiveness of the FORETELL web site at disseminating this information to highway patrol officers will be evaluated through telephone interviews and records of their access to the web site. For example,

telephone interviews will be used to assess the extent of highway patrol use of FORETELL (user acceptance) and to measure their ability to improve weather event decisions (decision effectiveness), reduce exposure to unsafe road conditions (safety and security), and reduce delay (efficiency). For the highway patrol user group, there is not a component within the evaluation planning aimed at addressing the environmental conservation objective of the original evaluation plan. An interview guide will be developed with the intent of providing consistency in the interviews and collecting information suitable for qualitative analysis.

2.0 APPROACH

The FORETELL evaluation will measure the impacts of the system on highway patrol users by collecting information from approximately 18-20 state highway patrol officers following the 2001/2002 winter season. Information will be collected primarily through a telephone interview (a draft interview guide is provided in Appendix A). The telephone interviews will be conducted in the spring of 2002 along with a review of the records of the officer's access to the web site. Completion of the interview process will include pre-testing activities such as finalization of the interview guide and contact list to ensure that the collection of data is comprehensive.

Below is a list of potential highway patrol users, who patrol in or through Iowa, Missouri, and/or Wisconsin, and have shown interest in this evaluation.

- Lieutenant Todd Misel, IA
- Captain Darrel Cox, IA
- Officer Sherry Kannegieter, IA
- Officer Bill Davis, IA Mngr
- Officer Chuck Burnett, IA Mngr
- Officer Mo Duffy, IA Mngr
- Officer Ron Roberts, IA Mngr
- Officer Paul Henze, IA Mngr
- Lieutenant Jim Biggerstaff, MO
- Captain Roger Strope, MO
- Officer Dan McGuire, WI
- Colonel R. B. Mendez, WI
- Tony Paulson, WI Supvsr
- Nancy Olig, WI Supvsr
- Tom Wrysinski, WI Supvsr
- Linda Luhman, WI Supvsr
- Ken Lesperance, WI Supvsr
- Mark Muraski, WI Supvsr
- Connie Catterall, WI Supvsr

Baseline information will also be collected as a part of this data collection effort using the telephone interview guide. The interview guide will be developed to address past company methods of obtaining road surface and weather information and FORETELL system use. Based on the objectives established for the evaluation, measures were developed to show the usefulness of the FORETELL web site to highway patrol officers. The measures served as a guide in developing the interview form and are as follows:

- Number of times they accessed system
  - Total and individually
  - For those that don't – why not?
- Carrier opinion of the value of the information toward productivity

- Change in frequency of on-time deliveries
- Safety/Changes in frequency of accidents

➢ Carrier opinion of the accuracy of the information

➢ Carrier opinion of the impact to their operations

- Routing changes
- Trip cancellations/postponements

Information collected during the interview will be used to answer the hypotheses established as part of the Evaluation Plan and to perform the qualitative and comparative analysis desired for the goal areas of this evaluation. Table 1 presents the hypotheses to be tested and the measures that will be used.

The results and success of this Test Plan approach rely on several underlying assumptions. It is expected that officers will access the information at least a minimal number of times in order to determine if the information provided on the FORETELL web site is useful and beneficial in managing their operations. Furthermore, they will likely rely on several sources for weather information, at least until they gain confidence in one source or another. For example, the success of the test depends upon a sufficient number of highway patrol personnel having access to FORETELL information, being aware of and utilizing FORETELL information in making decisions, and participating in the interviews. The estimate of 18-20 officers to be interviewed is based on a preliminary contact process.

Potential highway patrol users of FORETELL were suggested by key FORETELL consortium team members for evaluation purposes. Telephone calls were made to team members to obtain contact information for these potential contacts in the states of Iowa, Wisconsin, and Missouri. As further research and understanding is completed with the Highway Patrol organization, there will be additional names added to the list of potential communication officers.

Table 1. Highway Patrol Framework

Operations Personnel				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
User Acceptance	Receipt of Info	% of users who have access to the information	*FORETELL*™ products are readily available to highway patrol personnel	• Interviews
		% of potential users who get the information	*FORETELL*™ products are readily available to highway patrol personnel	
		% of users who get the information they need	*FORETELL*™ products provide highway patrol personnel the kind of information needed for them to perform their work	
	Use of Information	% of users who understand the products	Highway patrol personnel understand the *FORETELL*™ products	• Interviews • System activity logs
		% of users who can use the products	Highway patrol personnel know how to use the *FORETELL*™ products	
		% of users who take action based on the products	Highway patrol personnel take action based on the information provided by *FORETELL*™	
		% of users who receive the products in time to make decisions	*FORETELL*™ information is available to highway patrol personnel when needed	
		% of users that use sources other than Foretell	Personnel use products other than *FORETELL*™ to make decision	
		% of users that use sources other than *FORETELL*™ and *FORETELL*™ products	Personnel use products other than *FORETELL*™, as well as *FORETELL*™ products, to make decision	
		Increase in % of users who rely on the products	Users of *FORETELL*™ information will rely on it more over time than they do on alternative sources	

Table 1. Highway Patrol Framework (Continued)

Operations Personnel (cont.)				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
User Acceptance (continued)	Perceived value	% of users that like the products	Highway patrol personnel like the *FORETELL*™ products	• Interviews
		% of users that believe the information is correct	Highway patrol personnel think the *FORETELL*™ information was correct	
		% of users that believe the product(s) have value	Highway patrol personnel think the information was worth their investment (cost)	
		% of users that want to continue receiving the product(s)	Highway patrol personnel wish to continue using *FORETELL*™ products	
		% of users that want to continue *FORETELL*™ sponsorship	Highway patrol personnel wish to continue *FORETELL*™ sponsorship	
	Behavior change	% of users that perform their work differently using *FORETELL*™ products	Highway patrol personnel perform their work differently (better, quicker) now that they have access to *FORETELL*™ products	• Interviews
		% of users that use *FORETELL*™ products in their decisions	*FORETELL*™ information affects decisions by highway patrol personnel	
		% of users that are more confident in making decisions using *FORETELL*™ products	Highway patrol personnel are more comfortable with their decisions using *FORETELL*™ information	

Table 1. Highway Patrol Framework (Continued)

Operations Personnel (cont.)				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
Decision Effectiveness	Highway patrol	% of users who deploy staff more efficiently	Officers are deployed more efficiently with *FORETELL*™ information	• Interviews • System activity logs
		% of users who respond quicker to incidents	Officers respond quicker to incidents using *FORETELL*™ information	
		% of users who close roads quicker	Roads are closed quicker when needed? *(depends on who is responsible for closure)*	
		% of users who issue traffic advisories more efficiently	Traffic advisories are issued more efficiently	
		% of users who compile and disseminate road condition information more efficiently	Road condition information is compiled and disseminated more efficiently	
		# of times incident response used *FORETELL*™ information	Emergency management services respond to incidents using *FORETELL*™ products	• Interviews
		% of users who dispatch staff more efficiently	Officers are dispatched more efficiently	• Interviews • System activity logs

3.0 SCHEDULE

An anticipated schedule for the completion of all activities related to this test is presented in Table 2.

Table 2. Anticipated Schedule for Test

Activity	Timing
Pre-test Activities	2001
Data Collection Design	November
Interview Guide Development	November – December
Finalization of Contact List	November – December
Contact and Provide User Names & Passwords	December
Test Activities	2002
Initial Telephone Interviews	March
Follow-up Telephone Interviews	April – May
Post-test Activities	
Data Preparation	April – May
Analysis and Reporting	June – September

4.0 PRE-TEST ACTIVITIES

Before interviews begin, several pre-test activities must be performed. Pre-test activities consist of the following: development of the data collection design, development of the data collection instrument, finalization of the contact list, and assigning user names and passwords.

4.1 Data Collection Design

Test Plan activities were developed using the Evaluation Plan as a guide. Highway patrol officers will be interviewed using an interview guide designed specifically for this evaluation. It is anticipated that data will be gathered from these FORETELL web site users through telephone interviews and records of their activity regarding logging into the web site. This data will then be consolidated into a database for manipulation, display, and subsequent analysis. An Excel spreadsheet will be created for these purposes.

4.2 Interview Guide Development

Highway patrol personnel will be interviewed using an interview guide specifically developed for use in this evaluation. The interview guide is being developed as a tool for conducting telephone interviews in order to measure officers' use of the FORETELL web site. The guide provides a method of accomplishing one-on-one interviews with FORETELL web site users through a variety of survey style questions. It is expected that user information will be collected using nominal and ordinal level, closed-ended quantitative scale questions with possible open-ended follow-up questions.

The Evaluation Plan identifies several hypotheses (shown in Table 1), which will be tested using information collected during the interviews. Based upon the goals and objectives of the Evaluation Plan, a preliminary draft of the interview guide has been developed and is included in Appendix A. As one of the initial pre-test activities, this interview guide will be further refined.

The process of refining the interview guide will include examining the draft interview guide to ensure

that the following questions are fully addressed:

- Do questions solicit appropriate responses?
- Would closed or open-ended questions provide the best information?
- In what order should the questions appear?
- How long should the interview guide be?
- Does the interview guide adequately address the specific hypotheses the survey is designed to test?

Ideally, pre-testing would be done with 2-5 individuals (Highway Patrol personnel or members of the FORETELL consortium) to ensure the interview guide meets these criteria. Once specific questions have been finalized, formatting for readability and conversational flow enhancements will be performed.

4.3 Finalization of Contact List

A list of the 18-20 potential participants is presented in Appendix B. Finalization of this list will be a part of the pre-test activities to ensure a comprehensive and well-represented cross-section of highway patrol officers in the region participate in the evaluation of the FORETELL web site. Efforts will be made to update and add to the presented list as the evaluation progresses.

The list of potential participants was developed as a part of preliminary test plan efforts and indicates highway patrol personnel's interest in this evaluation. Potential highway patrol users of FORETELL were suggested by key FORETELL consortium team members for evaluation purposes. Telephone calls were made to team members by Meyer, Mohaddes Associates (MMA) to obtain contact information for these potential highway patrol contacts in the states of Iowa, Wisconsin, and Missouri. From preliminary calls to potential highway patrol contacts, MMA learned of the highway patrol organizational structures for all three states and potential users suitable for this evaluation and testing process. The following information was gathered:

- The state of Iowa is organized into 6 communication points called Communication Centers strategically located throughout the state. We obtained names and contact information for key administration and dispatch highway patrol personnel, called managers, in headquarters and each of the 6 Communication Centers for Iowa. These administration officers and six managers in the Communication Centers expressed interest in assisting us with this evaluation.

- The state of Wisconsin was similarly organized into 7 communication points called Dispatch Centers corresponding with the state's 7 Highway Patrol Districts. We also obtained names and contact information for these 7 key dispatch highway patrol supervisors in the Dispatch Centers and a couple of headquarter administration officers for Wisconsin that will assist us in this test.

- Although the state of Missouri is organized into 9 State Troops with Troop Dispatch Centers strategically located in all 9 troops, Missouri indicated that Internet use was currently limited to upper management only. Due to this limitation, help was petitioned from the administration. A couple of upper management personnel have indicated that they would be willing to access the web site for road surface and weather information. This information will be compared to information obtained from field officers. Although there is some question to the efforts that will be made to disseminate the FORETELL information, we see the upper management's input of value to the test.

Some highway patrol contacts had already attended FORETELL training sessions and had previous exposure to FORETELL. These contacts were ideal for this testing and evaluation process. Personnel who hadn't yet received training were encouraged to attend upcoming training sessions. These key contacts make up an initial contact list shown in the approach.

The finalized contact list will include the names, addresses, telephone numbers, and e-mail addresses (if applicable) of potential respondents, as well as telephone numbers of their supervisors. Administrators/supervisors will be contacted to obtain approval for potential respondents' survey participation and possible additional names for participation before the contact list is finalized.

4.4 Assigning of User Names and Passwords

A final pre-test activity to be completed after the contact list is finalized will be to assign user names and passwords to each of the highway patrol participants. These participants will be assigned a User-ID and password for full FORETELL web site access and history tracking purposes. MMA will provide Castle Rock with the complete highway patrol participant list. Castle Rock personnel will assign each evaluation participant on the contact list a user name and password and provide that information to each participant. While providing the access information, participants will briefly be instructed on FORETELL web site capabilities and use. Understanding that full training courses can not be offered to all highway patrol participants at this time, a help number and information package upon request will also be provided by Castle Rock. Based on our preliminary telephone calls to these organizations that currently have Internet access, we expect that state patrol personnel will be familiar with the navigation of web sites. Highway patrol personnel will be asked to use the access names during the winter of 2001-2002 when accessing information from the FORETELL web site to assist in the gathering of information through system history records.

5.0 TEST ACTIVITIES

5.1 Information Gathering

Following the winter of 2001-2002, the highway patrol personnel will be contacted and interviewed by telephone to learn about their use of FORETELL. MMA will conduct the interviews with the participating officers. Depending on the ability to contact those listed on the participant list, interviews will start in March 2002. We expect that interview forms will be completed for the 18 interested participants. Further follow-up telephone calls or interviews with key personnel may be made in April or May if it is determined that additional or clarifying information is needed.

5.2 Information Tabulation - Data Sheets

The interview guide will be developed with the intent of collecting information suitable for qualitative and comparative analysis. The guide will include the collection of some baseline information concerning state highway patrols' use of road surface and weather information prior to the use of the FORETELL web site. A majority of the data collected, however, will be directed to participants' use and success of the FORETELL web site in obtaining and using road surface and weather related information. The resulting information will be logged and assembled in an Excel spreadsheet for subsequent analysis.

6.0 POST-TEST ACTIVITIES

During the data collection phase, completed interview guides will be organized for entering into the Excel database by MMA. MMA will also perform a manual review for completeness, accuracy, and consistency. The accumulated data will then be electronically keyed into an Excel database. It is anticipated that any data entry errors will be visible due to the relatively small sample population.

7.0 DATA ANALYSIS

Through the data collection effort, information will be tabulated in spreadsheet format and analysis performed on each interview guide question. This analysis will attempt to address the hypotheses formulated in the Evaluation Plan. The data analysis activities will present organized information to compare with the baseline information collected as a part of this same interview guide form. This collected data will provide a before and after FORETELL system use evaluation of the officers' obtaining and use of road surface and weather information.

The general information asked as a part of the telephone interview such as name, title, state highway patrol, patrolling area, office location, and number of officers in the center provides a way to identify users and the breadth of the highway patrol personnel interviewed. It is expected that the complexity of operation and responsibility of the communication/dispatch centers will be shown from the general information questions to categorize the personnel who use FORETELL.

After collecting general information, questions on the interview guide will concentrate on answering the hypotheses developed in the Evaluation Plan. In part 1 of the developing interview guide, questions 1 – 8 pertain to information and information sources available prior to officers' use of the FORETELL web site. Initially, highway patrol personnel will be asked to list the information sources used to get road surface and weather information prior to their introduction to the FORETELL system. It is expected that users will indicate for what purpose the information was used (make decisions, perform actions - dispatch). On a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree, specific questions will be asked concerning ease of access, content understandability, accuracy, whether information is kept up to date, and content usefulness. Question 8 directly asks participants to identify the specific road surface and weather information they use in making decisions. It is expected that management and highway patrol participants will have access to many other information sources (e.g. CB radio, Internet and etc.). For comparative purposes, the interview will collect baseline data concerning center use of road surface and weather information to improve operation safety and efficiency. Interviewees will be provided an opportunity to give specific examples through open-ended questions. There will be an assortment of responses concerning information sources' ability to provide

usable road surface and weather information. These responses will be displayed in histograms and bar graphs to be compared with FORETELL use. It is expected that a variety of information sources have been employed to obtain all needed information for the highway patrol communication centers. We will discover the ease of access, information usability, and accuracy and display this in percentages and bar graphs for comparative analysis.

Questions 9 – 21 pertain to officers' access to the FORETELL web site and use of the information obtained from the FORETELL system. Initially, a follow-up question on what information highway patrol personnel use in making road condition and weather related decisions will be asked. If FORETELL is not used to its capacity in obtaining needed communication center information, the reasons for this will be explored as a part of this initial Part 2 question. The telephone survey will have the officers indicate the frequency in which they accessed the FORETELL web site throughout the testing period. Even though this information will be obtained by the system history records based on their user names and passwords, this question will encourage the interviewees thoughts on particular FORETELL web site use. Presumably all participants will access the web site at least once so that opinions of FORETELL and its content can be formulated. It is preferred that participants utilize the web site enough to become familiar with FORETELL's capabilities.

The interview process will then ask officers to indicate on a scale of 1 to 5, similar to the questions asked in part 1, the ease of access, content understandability, accuracy, currentness, and usefulness of the FORETELL provided information. Follow-up questions that ask for specific examples of how communication centers dealt with and used the obtained information will follow. These follow-up questions will further investigate specific likes and dislikes of the FORETELL system in improving operations. The data collected are expected to indicate whether the use of FORETELL improved efficiency and safety in operations through information dissemination. For example, the data should provide an understanding of the web site's effectiveness at assisting officers' decisions and performance. We expect a variety of use and opinions concerning the web site. It is expected that highway patrol center personnel will understand and take advantage of the vastness of road surface and weather information for current and forecasted information that FORETELL provides. Also, the telephone

interview will investigate the officers' likeliness to continue accessing information on the FORETELL web site. The analysis will consist of percentages shown on graphs for each information source. These percentages will be compared with the baseline-collected information in part 1 of the telephone interview.

Finally, FORETELL users will be asked what they think are shortcomings of the site. The effort here will be to collect users' suggestions regarding changes to the FORETELL web site or content that could be made to provide greater usability by communication and dispatch centers. In the end, we expect the interview guides will provide valuable information that will be used to evaluate the acceptance and use of the FORETELL system by potential users. Collected information and subsequent analysis will be used to evaluate the decision processes of these potential users and to measure the resulting outcomes.

7.1 Comparative Analysis

For each item in the interview guide, graphical summaries (histograms, bar graphs, etc.) will be prepared for select items. For example, Figure 1 provides an illustration of a bar graph that would display the highway patrol personnel's views on the ease of accessing road surface and weather information on past information sources to improve operation and efficiency versus access to the FORETELL web site to obtain similar information. Since the sample population will be small, statistical procedures typically used to create confidence intervals and to compare responses for a particular question will not be employed.

However, comparisons of survey responses will be made between before and after FORETELL system use and between categorized users. For example, the percentage of frequent users that believe they can improve highway patrol efficiency by using information from the FORETELL system will be compared to the percentage of other users with differing beliefs.

7.2 Statistical Models

Due to the small sample size, statistical models will not be used. Information gathered in the interview process will be used to determine the factors that influence evaluation objectives and measures of efficiency and operation and answer Evaluation Plan hypotheses. Specific, question emphasis will indicate companies use of the FORETELL system to improve their operations and efficiency in comparison to how the company operated before introduced to the FORETELL web site.

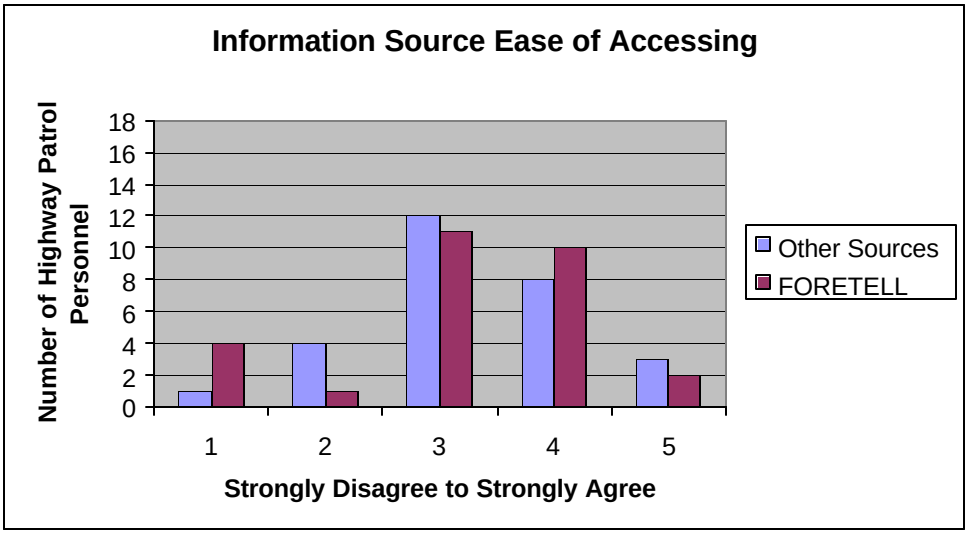

Figure 1. Example of a Bar Chart Displaying the Comparison of Ease of Access to Other Information Sources vs. FORETELL.

8.0 REPORT FORMAT

The results of this test will be summarized in a technical report. The report will contain the following sections:

1.0 Executive Summary

2.0 Introduction and Background

3.0 Summary of Data

- 3.1 Data Collection
- 3.2 Data Preparation
- 3.3 Summary of Data Problems

4.0 Analysis Methods

5.0 Summary of the Results

6.0 Conclusions

7.0 Recommendations for Future Evaluations

9.0 REQUIRED RESOURCES

Table 3 presents the approximate level of effort needed to conduct this test.

Table 3. Approximate Level of Effort (person hours)

Project Role	Task				
	Pre-Test Activities	Test Activities	Post-Test Activities	Analysis and Reporting	Total
Senior Analyst					
Middle Analyst					
Junior Analyst					
Support/Admin. Staff					

APPENDIX A:

DRAFT INTERVIEW GUIDE

HIGHWAY PATROL PERSONNEL INTERVIEW GUIDE

Introduction for discussion:

- We are assisting Battelle Memorial Institute to conduct an FHWA-sponsored independent evaluation of a new road surface/weather information system called FORETELL.
- We are conducting telephone interviews to evaluate who has used the FORETELL web site, how well the system works (accuracy), for what purpose the information is being used (e.g., routing or timing alterations), and whether or not it provides improvements in operations, mobility, and safety. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.
- You were contacted previously as a potential user and identified as one who is interested in using (or trying) the FORETELL web site and assisting us in this evaluation process
- Have you had an opportunity to familiarize and use the FORETELL system (if not, thank you for your time; this questionnaire was developed for evaluation of those who have experience in some minimal amount of FORETELL products). Are you willing to help us in this evaluation?

Be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only.

- This will take 15-25 minutes. Is this a good time to talk or would you prefer to talk at a different time? Would it be beneficial to speak to operations personnel?
- I appreciate your time. If you would like to interrupt the interview at any time, please let me know.

Name: _____ Title: _____

State Highway Patrol: _____ Patrolling Area: _____

Office Location: _____ Number of Officers: _____

Date/Time: _____

The first set of Questions pertain to information available prior to your use of the FORETELL web site.

1. Before introduced to the FORETELL web site, what information sources were used, if any, to get road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources are available, how often you used them, and your type of use.

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Sometimes	Rarely	Never	Operate	Disseminate
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

Note: If no previous sources were used to access road surface and weather information, skip to question 8 of this questionnaire.

Please indicate how strongly you disagree or agree with the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree.

.....→.....
.....
.....
.....Strong

	ly Disagree				Strongly Agree
2. The information sources used were easy to access and readily available.	1	2	3	4	5
3. The content (information) from the above sources was easy to understand.	1	2	3	4	5
4. Of the information sources your organization accessed, the information was accurate and up to date.	1	2	3	4	5
5. The road surface and weather information obtained was very useful for making decisions and performing your work.	1	2	3	4	5

Comment:_____

_____

6. Information pertained to your coverage area with the necessary detail.	1	2	3	4	5
7. Obtained information assisted you in making decisions and carrying out specific actions.	1	2	3	4	5

How?_____

_____

8. What information do you use in making weather-related management decisions?

If YES, please go to box A. →

Do you use actual readings, forecast information, or both? (Please check the appropriate box[es])

Do you use:

	YES	NO	Actual Readings	Forecast Information
a. Wind speed or direction?	q	q	q	q
b. Precipitation?	q	q	q	q
c. Atmospheric temperature?.....	q	q	q	q
d. Pavement temperature?	q	q	q	q
e. Pavement conditions?.....	q	q	q	q
f. Dewpoint?.....	q	q	q	q
g. Some other indicator? *Please specify*.....	q	q	q	q

SPECIFY: _____

The remaining questions pertain to information obtained through your use of FORETELL.

9. a) Have you or your organization received any training or training material regarding the FORETELL system?

   p1Yes p2No

   b) Was it useful? p1Yes p2No

10. Do you obtain the following information from FORETELL?

	YES	NO
a. Wind speed or direction	q	q
b. Precipitation	q	q
c. Atmosphere temperature	q	q
d. Pavement temperature	q	q
e. Pavement conditions	q	q
f. Dewpoint	q	q

If not, why not? _____

11. How often do you obtain information from the FORETELL System… (please check all that apply)

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	q	q	q	q	q	q
b. Weekly?	q	q	**NOT APPLICABLE**			
c. In advance of a weather event*?	q	q	q	q	q	q
d. During a weather event*?	q	q	q	q	q	q
e. After a weather event*?	q	q	q	q	q	q

**A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

Again, please rate the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree. [Interviewer: If an answer is Disagree or Strongly Disagree, ask the respondent to please explain.]

		Strongly Disagree → Strongly Agree				
12.	Information received from the FORETELL system is understandable.	1	2	3	4	5
13.	Information received from the FORETELL system is usable.	1	2	3	4	5
14.	Information received from the FORETELL system is easily obtainable.	1	2	3	4	5
15.	The FORETELL web site was easy to navigate.	1	2	3	4	5

Comment: _____

16.	Information received from the FORETELL system is accurate.	1	2	3	4	5

Explain: _____

17.	Information received from the FORETELL system is useful.	1	2	3	4	5

Comment: _____

18.	Information provided by the FORETELL web site was up to date.	1	2	3	4	5
19.	You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.	1	2	3	4	5
20.	The road surface and weather information obtained on the FORETELL web site was very useful for making decisions and performing your work.	1	2	3	4	5

How? _____

21.	Obtained information assisted you in making decisions and carrying out specific actions (road closures and advisories).	1	2	3	4	5

How? _____

22.	Road surface and weather information is compiled and disseminated more efficiently for dispatch purposes.	1	2	3	4	5

Explain: _____

_____

23.	You are more confident in making weather-related management decisions when you use information from the FORETELL System.	1	2	3	4	5

Explain: _____

_____

24.	Having information from the FORETELL System increases safety and/or reduces accidents.	1	2	3	4	5

How? _____

_____

25.	Information obtained on the FORETELL web site improved the overall efficiency of your operations.	1	2	3	4	5

Explain: _____

_____

26.	Your organization will likely continue to access information on the FORETELL web site and rely on it more over time than you do on other alternative sources.	1	2	3	4	5

Do you have other comments (e.g., ways to improve FORETELL)?: _____

_____

_____

_____

Thank you for taking the time to participate in this interview. If you have any questions concerning the evaluation, please call me at 208-345-4630. Do you think it would be beneficial to speak to a dispatch or communications officer?

Name: _____ Title: _____ Phone: _____

APPENDIX B:

LIST OF HIGHWAY PATROL CONTACTS

Evaluation Participation	Highway Patrol Contact Name	Information/Management Center Location	State Where Operating
1	Lieutenant Todd Misel, Plan & Techn. Officer. Headquarters	Iowa State Patrol Headquarters Des Moines, IA 50319	Iowa
2	Captain Darrel Cox, Communications Officer, Headquarters	Iowa State Patrol Headquarters Des Moines, IA 50319	Iowa
3	Bill Davis, Manager, Atlantic Communication Center	Atlantic Communication Center Lewis, IA 51544-9731	Iowa
4	Sue Wardlow, Acting Secretary, Cedar Falls Communication Center	Cedar Falls Communication Center, Cedar Falls, IA 50613-2168	Iowa
5	Chuck Burnett, Manager, Cedar Rapids Communication Center	Cedar Rapids Communication Center, Cedar Rapids, IA 52404-2240	Iowa
6	Mo Duffy, Manager, Des Moines Communication Center	Des Moines Communication Center Starc Armory, Johnston, IA 50131	Iowa
7	Ron Roberts, Manager, Fairfield, Communication Center	Fairfield Communication Center, Fairfield, IA 52556-8949	Iowa
8	Paul Henze, Manager, Storm Lake Communication Center	Storm Lake Communication Center, Storm Lake, IA 50588-2045	Iowa
9	Lieutenant James Biggerstaff, Director of Communications, Headquarters	Missouri State Highway Patrol Headquarters, Jefferson City, MO 65102-0568	Missouri

10	Captain Roger Strope, Projects Engineer, Headquarters	Missouri State Highway Patrol Headquarters, Jefferson City, MO 65102-0568	Missouri
11	Officer Dan McGuire, Director of the Bureau of Support Services Colonel Mendez, Dir Headquarters	Division Headquarters Highway Patrol, Madison, WI 53707-7912	Wisconsin
12	Dispatch Center - Supervisor Tony Paulson	District 1 – DeForest:	Wisconsin
13	Dispatch Center - Supervisor Connie Catterall	District 2 – Waukesha:	Wisconsin
14	Dispatch Center - Supervisor Nancy Olig	District 3 – Fond du Lac:	Wisconsin
15	Dispatch Center - Supervisor Tom Wrysinski	District 4 – Wausau:	Wisconsin
16	Dispatch Center - Supervisor Linda Luhman	District 5 – Tomah:	Wisconsin
17	Dispatch Center - Supervisor Ken Lesperance	District 6 - Eau Claire:	Wisconsin
18	Dispatch Center - Supervisor Mark Muraski	District 7 - Spooner:	Wisconsin

FINAL TEST PLAN

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation – School Administration Personnel

March 2002

Prepared for:

U.S. Department of Transportation
ITS Joint Program Office, HVH -1
Room 3400
400 Seventh Street, S.W.
Washington, D.C. 20590

U.S. Department of Transportation
Federal Highway Administration

Prepared by:

Battelle
505 King Avenue
Columbus, Ohio 43201-2693

Battelle
... Putting Technology To Work

Final Test Plan

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation - School Administration Personnel Test

Principal Authors

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Fred Kitchener (Meyer, Mohaddes Associates)
Ed Boselly (Weather Solutions Group)
Shawna Collins (Battelle)
Amy Thomas (Battelle)

Prepared for

U.S. Department of Transportation
Washington, D.C.

March 2002

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1.0 INTRODUCTION

The FORETELL™ project aims to provide detailed weather and road condition information in a meaningful format to various surface transportation users. The goal of the project is a safer, more efficient and accessible rural transportation system that is sensitive to environmental issues and encourages economic vitality. The Federal Highway Administration (FHWA), in cooperation with the FORETELL Consortium (Castle Rock Services and Iowa, Wisconsin, and Missouri departments of transportation) has undertaken the development and operational testing of a multi-regional road and weather forecasting/dissemination system.

A major factor in the success of the FORETELL project will be the acceptance of and the ability to use the FORETELL system. A primary issue is the safety of children traveling to and from school during harsh weather conditions or on adverse road conditions following a storm. School administration officials make decisions regarding school closures, delayed starts or early releases, and bus routing and scheduling changes. These decisions often require accurate and timely information related to current and projected weather conditions. The outcomes of these decisions affect safety, efficiency, and mobility.

The FHWA is conducting an independent evaluation of the FORETELL project. The evaluation focuses on an assessment of the decision processes of potential FORETELL system users and measurement of the resulting outcomes. As part of the overall evaluation, several tests are planned. This document serves as a detailed test plan for one such test: surveying school administration personnel in Iowa.

The FORETELL evaluation addresses five central objectives: user acceptance, decision effectiveness, safety and security, efficiency, and environmental conservation. The school administration personnel test is designed to obtain specific information on four of the five central evaluation objectives. For example, school administration personnel will be surveyed to obtain measures of their use of the FORETELL system (user acceptance) and measures of their ability to improve management decisions

(decision effectiveness), reduce exposure to unsafe road conditions (safety and security), and reduce school bus delay (efficiency). Environmental conservation will not be assessed directly due to a number of confounding variables, but may be assessed indirectly through measures of efficiency (e.g., reduced travel delay). The materials that will be used to obtain this and additional information are presented in the appendices.

2.0 APPROACH SUMMARY

To measure the impacts of the FORETELL program on the user decisions and outcomes, survey information will be obtained through the use of activity/weather logs and hard-copy, self-administered questionnaires. Approximately 10 school administration personnel who are part of a University of Northern Iowa program to disseminate weather information, including FORETELL, to schools will be asked to participate in the evaluation.

In order to characterize the use of FORETELL information on a per-event basis, school administration personnel will be asked to record information in activity/weather logs following each weather event during the 2001-2002 winter season. These logs will provide information characterizing a weather event and the decisions made during the event, as well as how far in advance decisions were made, the information used in making decisions, and the sources from which the information was obtained. The activity/weather logs will be mailed to school administration personnel in January 2002.

In April 2002, a hard-copy questionnaire will be sent to all school administration personnel participating in the University of Northern Iowa program. The questionnaires will evaluate FORETELL use during the 2001-2002 winter season. Additional information is expected to be obtained from members of the FORETELL Consortium regarding records of user access. Specifically, the number of users who access the FORETELL system, and the number of times they accessed the system, may be obtained from Castle Rock Services.

Upon receipt, the collected data will be reviewed for completeness, accuracy, and consistency. Following review, information from the questionnaires will be entered into a database suitable for analysis. The resulting data will be electronically cleaned and analyzed using SAS®.

As with any field test, there are several underlying assumptions. For example, the success of the test depends upon a sufficient number of school administration personnel having access to FORETELL information, utilizing FORETELL information in making decisions, and returning the completed surveys.

Although there are only approximately 10 potential respondents, a high response rate is expected, given the involvement of school administration personnel in the University of Northern Iowa program.

3.0 SCHEDULE

The anticipated schedule for the completion of all activities related to this test is presented in Table 1.

Table 1. Anticipated Schedule for Test

Activity	Schedule
Pre-Test Activities	
Data collection design	December 2001
Activity/Weather Log development	December 2001
Questionnaire development	January 2002
Finalization of contact list	December 2001
Test Activities	
Activity/Weather Logs	
Mail advance letter and logs	January - March 2002
Log-completion reminder E-mail	February 2002
Questionnaires	
Mail questionnaire with cover letter	April 2002
Follow-up E-mail, if necessary	April 2002
Post-Test Activities	
Data preparation	April - July 2002
Analysis and Reporting	July - September 2002

4.0 PRE-TEST ACTIVITIES

Before data collection begins, several Pre-Test activities must be performed. Specifically, the following activities will be conducted: development of the data collection design, development of the data collection instruments, and finalization of the contact list.

4.1 Data Collection Design

Section 2.0 provided an overview of the data collection design. This section describes additional details of pre-test activities related to the collection of data from school administration personnel. Approximately 10 school administration personnel will be surveyed in April 2002, following the 2001-2002 winter, using hard-copy self-administered questionnaires. They will also be asked to complete activity/weather logs for each weather event from January through April 2002.

4.2 Development of Activity/Weather Log Forms

A form will be developed to collect information pertaining to weather events so that school administration personnel can characterize their use of FORETELL information in decision-making on a per-event basis. The log will solicit information related to event conditions, type and source of information used during the event, decisions made during the event, and event outcomes (e.g., school bus delays or accidents). The log will also ask school administrators to estimate how far in advance decisions were made. A draft activity/weather log is provided in Appendix A.

4.3 Questionnaire Development

The Evaluation Plan identifies several hypotheses that will be tested using information collected from the school administration questionnaire. Based upon the Evaluation Plan, a draft of the questionnaire has been developed and is included in Appendix B. As one of the initial pre-test activities, the survey questionnaire will be further refined and formatted.

The process of refining the questionnaire will include examining the draft questionnaire to ensure that the following issues are fully addressed:

- Which questions should be included in the questionnaire?
- Do the questions solicit appropriate responses?
- In what order should the questions appear?
- How long should the questionnaire be?
- What instructions are needed to ensure that the questionnaire is self-explanatory?
- Does the questionnaire adequately address the specific hypotheses it was designed to test?

Once the specific questions have been finalized, the questionnaire will be formatted to enhance its understandability. In-house testing of the questionnaire will be performed as an additional step in refining the survey. These tests will focus on ensuring that the questionnaire follows a logical flow, that the instructions are clear, and that other logistical aspects of completing and returning the questionnaire are simplified.

4.4 Finalization of Contact List

A list of potential survey respondents will be obtained from the University of Northern Iowa program that is disseminating weather information, including information about FORETELL, to school administrators. The contact list will include the names, addresses, and E-mail addresses of Iowa school administration personnel participating in the university's program. The FORETELL user-IDs and passwords of these participants will be obtained from Castle Rock Services to link records of system access to survey respondents.

5.0 TEST ACTIVITIES

This section describes the logistical details of implementing the school administration personnel activity/weather logs and questionnaire, as well as collecting data from other sources. For all school administration personnel in the sampling frame, data collection will occur throughout the 2001-2002 winter season, with the survey taking place in April 2002.

5.1 Activity/Weather Logs

In January 2002, advance letters will be sent to 10 school administration personnel in Iowa who are participating in a University of Northern Iowa program to disseminate weather information to schools. The letters will describe the purpose of the FORETELL evaluation and the activity/weather logs and ask school administration personnel to complete a log after each weather event during the 2001-2002 winter. Activity/weather log forms and instructions on how to complete and return the form will be included with the letter. Participants will have the option of completing and returning hard-copy logs via fax or United States Postal Service. Log completion reminders will be sent by E-mail in February 2002 to remind school administration personnel to complete an activity/weather log for each winter weather event.

5.2 Questionnaire

In April 2002, hard-copy questionnaires, along with postage-paid return envelopes, will be distributed to all potential survey respondents. The questionnaires will include cover letters that explain the purpose of the questionnaire and what can be expected in terms of survey questions and approximate time required to complete the questionnaire. In April 2002, follow-up E-mails will be sent to school administration personnel who have not yet completed the questionnaire to encourage their participation in the FORETELL evaluation. The surveys will evaluate FORETELL use during the 2001-2002 winter season.

5.3 Additional Data Collection

In April 2002, information on the number of school administration personnel who accessed the FORETELL system and the number of times they accessed the system, from November 2001 through April 2002, will be requested from Castle Rock Services.

6.0 POST-TEST ACTIVITIES

During the data collection phase, completed activity/weather logs will be received by fax and/or mail and completed questionnaires will be received by mail at Battelle. Editors will review the questionnaires and activity/weather logs for completeness, accuracy, and consistency. The collected data will then be manually entered into a database suitable for analysis.

Once the data collection phase is completed, survey and activity/weather log data will be validated by supplemental SAS programs used in final preparation of the results. A number of operations constitute this stage, including:

- Response data and preset variable labels will be read into a SAS dataset via a SAS program that utilizes ODBC connections with the database. Data types and variable names will advance to the SAS dataset from their database definitions, thus, ensuring metadata uniformity.
- A SAS program will conduct any necessary supplemental data cleaning efforts, while maintaining a log of original and updated values. Reasons for each update will be supplied in the log file as well.
- A combination of database queries and macros and Visual Basic routines will be used to establish formal documentation in the form of a formatted codebook containing variable names, variable descriptions, and labels. The codebook will describe the data file in terms of the instrument used to store the data and will provide documentation for coders, programmers, and investigators. The codebook will also serve as a vehicle to maintain documentation on editing and coding decisions.
- A data preparation manager will be responsible for maintaining the documentation on all data preparation activities. The data preparation manager will work together with a programmer to produce final file layouts with clear column specifications, data types, missing value codes, and editing specifications (e.g., range of values, logic checks). All errors flagged during the electronic data cleaning effort will be researched, and the correct answer entered into the database.

7.0 DATA ANALYSIS

Statistical analyses will be performed using data collected from the school administration personnel survey and activity/weather logs. These analyses will be performed using SAS. Although members of the FORETELL Consortium have indicated that the response rate for the school administration personnel questionnaires should be high, the evaluation will not yield a large enough sample to warrant more than a detailed, descriptive analysis.

The surveys will provide valuable information that will be used to evaluate the acceptance and use of the FORETELL system by potential users. The activity/weather logs will provide data on the number of school bus crashes and injuries, as well as weather-related school delays and closings. The information collected will be used to evaluate the decision processes of potential users and to measure the resulting outcomes. The information will also be used to test specific hypotheses related to awareness and use of the FORETELL system. Table 2 presents the hypotheses to be tested and the measures that will be used.

Table 2. Hypotheses and Evaluation Measures Related to the School Administration Personnel Survey

Evaluation Area	Hypothesis	Evaluation Measures
User Acceptance	FORETELL information is readily available to school administration personnel	% of users who can easily obtain FORETELL information
	School administration personnel receive FORETELL information in a timely manner	% of users who indicate FORETELL provides timely information for making decisions
	FORETELL provides school administration personnel the kind of information needed for them to perform their work	% of users who use information that FORETELL provides to make decisions
	School administration personnel understand the information provided by FORETELL	% of users who indicate that the information provided by FORETELL was understandable
	School administration personnel use the information provided by FORETELL	% of users who use FORETELL information
	School administration personnel are willing to pay for FORETELL information	% of users who indicate they are willing to pay for FORETELL information
	School administration personnel wish to continue to receive FORETELL information	% of users who indicate they would like to continue to receive FORETELL information
	FORETELL information affects school administration personnel decisions	% of users who use FORETELL information in their decisions
	School administration personnel are more comfortable with their decisions using FORETELL information	% of users who are more confident in making decisions using FORETELL information
	FORETELL provides valuable information that is not available from other sources	% of users who indicate that FORETELL provides valuable information that is not available from other sources
Decision Effectiveness	Staff made more effective decisions to delay the start of schools using FORETELL information	% of users who indicate that FORETELL helped them make more effective decisions to delay the start of school
	Staff made more effective decisions to close school using FORETELL information	% of users who indicate that FORETELL helped them make effective decisions to close school
	Staff made more effective decisions regarding changes to bus routing or scheduling using FORETELL information	% of users who indicate that FORETELL helped them make more effective decisions to change school bus routing or scheduling
Safety	School bus safety was improved with FORETELL information	% of school bus trips that were party to a crash (weather related)
	Information from FORETELL improves safety/reduces accidents	% of users who indicate that FORETELL information improves safety/reduces accidents
Efficiency	School administration personnel improved vehicle routing and avoided travel delay using FORETELL information	% of users who indicate that they improved vehicle routing and avoided delay using FORETELL information

7.1 Descriptive Statistics

To analyze the data collected from school administration personnel, descriptive statistics such as means and standard deviations (for continuous responses) or contingency tables (for categorical responses) will be prepared to develop an overall summary of the data. In addition, graphical summaries (histograms, mean and confidence interval plots, etc.) will be prepared for select items. For example, Figure 1 is an illustration of a bar graph that would display the percent of school administration personnel who use each component of information supplied by the FORETELL system.

Descriptive statistics will be used to compare the outcomes of school administration decisions made with and without the use of FORETELL information. For example, descriptive statistics will be used to examine the hypothesis that school administration personnel who use FORETELL make more effective decisions than they do without the use of FORETELL. Other hypotheses of a similar nature will also be examined.

Records of system access will be used to categorize school administration personnel into different categories of users (e.g., light and heavy) of the FORETELL system. Comparisons of survey responses will then be made between these two types of users. For example, the percentage of heavy users who believe they are more confident in making decisions when they use FORETELL information will be compared to the percentage of light users with the same belief.

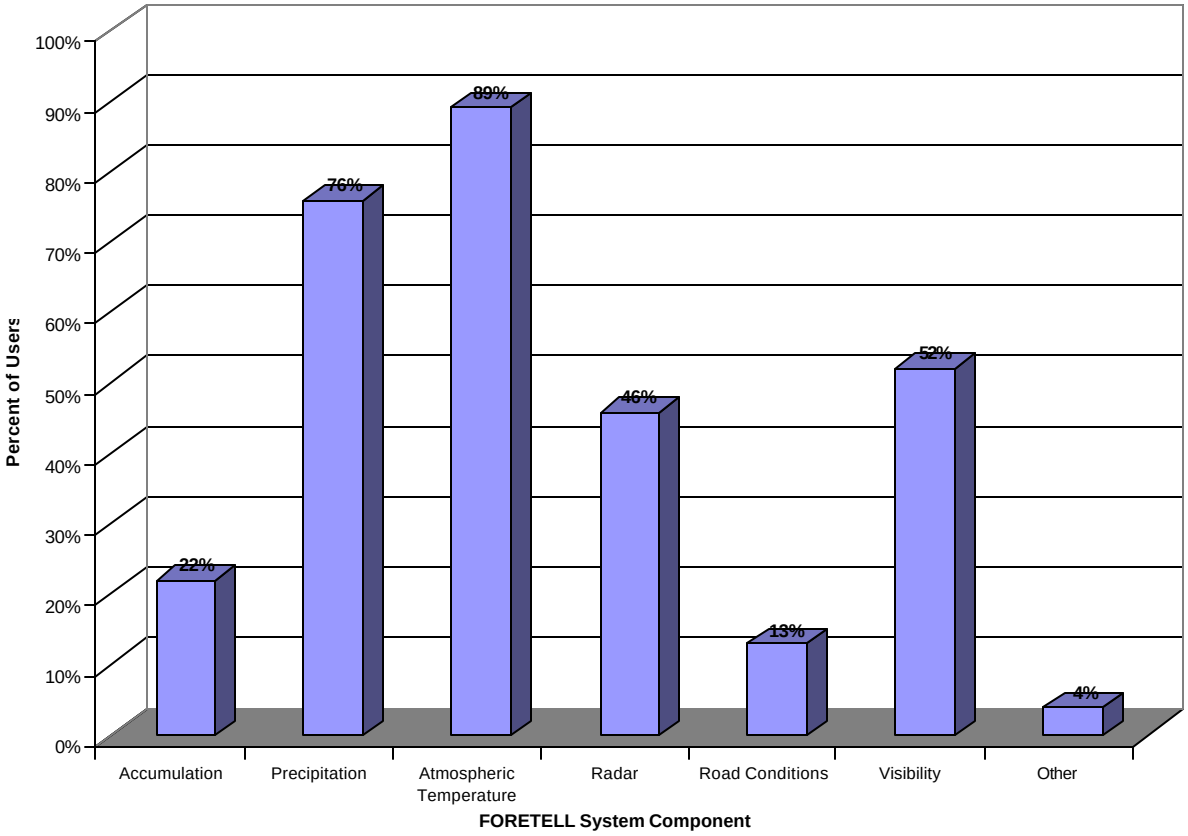

Figure 1. Example of a Bar Chart Displaying the Percent of School Administration Personnel Reporting Use of FORETELL System Components

8.0 REPORT FORMAT

The results of this test will be summarized in a technical report. The report will contain the following sections:

1.0 Executive Summary

2.0 Introduction and Background

3.0 Summary of Data
- 3.1 Data Collection
- 3.2 Data Preparation
- 3.3 Data Problems

4.0 Analysis Methods
- 4.1 Descriptive Statistics

5.0 Results
- 5.1 Activity/Weather Logs
- 5.2 Questionnaires

6.0 Conclusions

7.0 Recommendations

9.0 ANTICIPATED RESOURCES

Table 3 presents the anticipated resources, in person hours, required to complete the school administration test.

Table 3. Anticipated Resources (Person Hours)

Staff Level	Dec. 01	Jan. 02	Feb. 02	Mar. 02	Apr. 02	May 02	Jun. 02	Jul. 02
Secretarial		5						10
Programmer		12						
Data Entry		5	5	5	5	5		
Analysis						15	15	
Reporting							25	25
Total Hours	0	22	5	5	5	20	40	35

APPENDIX A:

DRAFT ACTIVITY/WEATHER LOG

U.S. Department of Transportation
Federal Highway Administration

FORETELL Activity/Weather Log for School Administrators

Please mail or fax to Amy Thomas at Battelle Memorial Institute, 505 King Ave., Columbus, OH 43201, (614)424-4250 (fax).

ID Number 01301

Event Date ☐☐/☐☐/☐☐

Administrator's Name: _____ School District: _____

Event* Conditions (Please ☰ all that apply)

- ☐ Fog
- ☐ Freezing rain
- ☐ Snow
  - ☐ Accumulation ☐ Drifting
- ☐ Black ice
- ☐ Sleet
- ☐ Rain
- ☐ Hail
- ☐ Frost
- ☐ Extreme temperature

Information Used During Event

Did you use: (☰ all that apply)	Type (☰ all that apply)	Source (☰ all that apply)
☐ Accumulation	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Road Decision Support	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Precipitation	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Atmospheric Temperature	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Road Snow Depth	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Road Conditions	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Radar	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Visibility	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other
☐ Other _____	☐ Forecast ☐ Actual ¶	☐ FORETELL ☐ Other

Decisions Made

(Please ☰ all that apply)

	How far in advance was decision made? (e.g., night before, 4 hrs, 2 hrs)
☐ Delayed start of school	
☐ Cancelled school for the day	
☐ Released school early	
☐ Cancelled AM Kindergarten	
☐ Cancelled PM Kindergarten	
☐ Rerouted bus(es)	
☐ Other _____	
☐ None _____	

Event Outcomes

(Please ☰ all that apply)

	How Many?
☐ Bus(es) delayed	
☐ Bus accident(s)	
☐ Student(s) injured	
☐ Other _____	
☐ None	

* A weather event can include fog, precipitation, extreme atmospheric temperatures, etc. ¶A nowcast provides actual information.

Comments: _____

APPENDIX B:

PRELIMINARY QUESTIONNAIRE

FORETELL™ *School Administration Field Operational Test*
Preliminary Questionnaire

This survey is designed to evaluate your use of the FORETELL system during the 2001-2002 winter season. Instructions are provided as needed for each question. Please complete the following questionnaire and return it to Battelle (505 King Avenue, Columbus, OH 43201) in the enclosed postage-paid return envelope by April 30, 2002. If you have any questions, please contact Shawna Collins at (614) 424-7486. Thank you for your participation in the evaluation of the FORETELL system.

1. Did you use the FORETELL system this past winter?

❑ Yes ❑ No

If you did not use the FORETELL system, please indicate why.

_____

_____

_____

_____

2. Please indicate how strongly you disagree or agree with the following statements. Circle 'N/A' if you have not used FORETELL.

The information from the FORETELL system was:

	Strongly Disagree				Strongly Agree	
a. Understandable	1	2	3	4	5	NA
b. Usable	1	2	3	4	5	NA
c. Accurate	1	2	3	4	5	NA
d. Easily Obtainable	1	2	3	4	5	NA
e. Useful	1	2	3	4	5	NA

3. Have you attended a FORETELL training class?

❑ Yes ❑ No

4. How often do you obtain information from the FORETELL System?
(Please check all that apply.)

			How Often?			
	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	EVERY HOUR
a. Daily?	q	q	q	q	q	q
b. Weekly?	q	q				
c. In advance of a weather event*?	q	q	q	q	q	q
d. During a weather event*?	q	q	q	q	q	q
e. After a weather event*?	q	q	q	q	q	q

**A weather event can include fog, precipitation, extreme atmospheric temperatures, etc.*

5. What information do you use in making weather-related management decisions?

If YES, please go to box A. →

Do you use:	YES	NO	A. Do you use actual readings, forecast information, or both? (Please check the appropriate box[es]) Actual Readings	Forecast Information
a. Accumulation	q	q	q	q
b. Precipitation	q	q	q	q
c. Atmospheric temperature	q	q	q	q
d. Radar	q	q	q	q
e. Road conditions	q	q	q	q
f. Visibility	q	q	q	q
g. Other measure (*Please specify below)*	q	q	q	q

SPECIFY: _____

6A. Please check the box corresponding to the source you rely on most heavily for obtaining each type of information. If you do not use a given type of information to make decisions, please check "Do not use".

	SOURCES OF INFORMATION								
	Do Not use	Automated weather station (e.g. RWIS, AWOS)	CNN	FORETELL	Intellicast	Local Weather	National Weather Service	Weather Channel	*Other
a. Accumulation?	q	q	q	q	q	q	q	q	q
b. Precipitation?	q	q	q	q	q	q	q	q	q
c. Atmospheric temperature?	q	q	q	q	q	q	q	q	q
d. Radar?	q	q	q	q	q	q	q	q	q
e. Road conditions?	q	q	q	q	q	q	q	q	q
f. Visibility?	q	q	q	q	q	q	q	q	q
g. Other measure?	q	q	q	q	q	q	q	q	q

Please specify: _____ **Please specify for other:* _____

6B. For the types of information that you do **not** rely on FORETELL to provide, please describe the reason(s) why:

a. Accumulation: _____

b. Precipitation: _____

c. Atmospheric temperature: _____

d. Radar: _____

e. Road conditions: _____

f. Visibility: _____

g. Other, please specify: _____

IF YOU DID NOT USE FORETELL THIS PAST WINTER, YOU MAY STOP HERE. Thank you for taking the time to complete the survey.

7. For each of the following school management decisions, please indicate whether information from FORETELL helped you to make more effective decisions. Please circle one number for each school management decision or Not Applicable (NA) if you were not faced with a given decision.

		NOT HELPFUL →				HELPFUL
a. Delay the start of schools	NA	1	2	3	4	5
b. Close schools early	NA	1	2	3	4	5
c. Close schools for the day	NA	1	2	3	4	5
d. Change bus routing or scheduling	NA	1	2	3	4	5
e. Other *Please specify*		1	2	3	4	5

For questions 8 through 12, think about your experience before FORETELL was implemented compared to your present experience. Please indicate how strongly you disagree or agree with the following statements by circling the appropriate number

	Strongly Disagree				Strongly Agree
8. You are more confident in making weather-related management decisions when you use information from the FORETELL system.	1	2	3	4	5
9. The FORETELL system provides timely information for making weather-related management decisions.	1	2	3	4	5
10. You are able to improve vehicle routing and avoid travel delay when you use information from the FORETELL system.	1	2	3	4	5
11. Information obtained on the FORETELL web site improves the overall efficiency of your operations.					
12. Having information from the FORETELL system improves safety/reduces accidents.	1	2	3	4	5
13. The FORETELL system provides valuable information that is not available from other sources	1	2	3	4	5
14. You would be willing to pay for the benefit of having information from the FORETELL system, assuming it is reasonably priced.	1	2	3	4	5

15. Would you like to use information from the FORETELL system in the future?

❑ Yes ❑ No

16. Do you have suggestions for ways to improve the FORETELL system?

Please provide us with any other comments you have.

FINAL TEST PLAN

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation - Transit/ Paratransit Operations Test

December 2001

Prepared for:

U.S. Department of Transportation
ITS Joint Program Office, HVH-1
Room 3400
400 Seventh Street, SW
Washington, DC 20590

Prepared by:

Battelle
505 King Avenue
Columbus, OH 43201-2693

Final Test Plan

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation - Transit/Paratransit Operations Test

Principal Authors

Bradley Skarpness, Ph.D. (Battelle)
Fred Kitchener (Meyer, Mohaddes Associates)
Ed Boselly (Weather Solutions Group)
Shawna Collins (Battelle)
Amy Thomas (Battelle)

Prepared for

U.S. Department of Transportation
Washington, D.C.

December 2001

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1.0 INTRODUCTION

The FORETELL™ project aims to provide detailed weather and road condition information in a meaningful format to various surface transportation users. The goal of the project is a safer, more efficient and accessible rural transportation system that is sensitive to environmental issues and encourages economic vitality. The Federal Highway Administration (FHWA), in cooperation with the FORETELL Consortium (Castle Rock Services and Iowa, Wisconsin, and Missouri departments of transportation) has undertaken the development and operational testing of a multi-regional road and weather forecasting/dissemination system.

A major factor in the success of the FORETELL system will be the acceptance of and the ability to use FORETELL. One set of users is projected to be dispatchers in transit and paratransit operations. These dispatchers make weather-related operational decisions. These decisions must take into account the current and projected weather and pavement conditions. The decisions produce outputs that are work related, such as implementing snow routing, closing some routes, chaining up vehicles, and implementing contingency shifts for operators and maintenance personnel.

The FHWA is conducting an independent evaluation of the FORETELL project. The evaluation focuses on assessing the ability of agencies to use the FORETELL information to make more efficient and effective decisions. The evaluation then measures the resulting outcomes to determine the effectiveness of the decisions. As part of the overall evaluation, several tests are planned. This document serves as a detailed test plan for one such test: surveying transit and paratransit operations personnel in Iowa, Wisconsin, and Missouri. The initial target user group for FORETELL is highway operations, especially highway maintenance personnel. Although Transit/Paratransit Operations is not the initial target group, transit and paratransit operations were identified as potential users of FORETELL. The development of this test plan assumes FORETELL market penetration to the transit and paratransit operations user group.

Transit/Paratransit Operations includes transit dependent travelers, transit operators (drivers and dispatch), and optional transit travelers (listed in order of priority as determined by the Evaluation Committee). Within this user category, the needs of the groups for weather information vary widely. However, the primary information that is needed is not so much the weather conditions, but rather, the impact of the weather on the roadways used by transit vehicles. This information has profound safety implications. The transit-dependent traveler depends on the rural transit or paratransit system to be there when he or she needs it, regardless of the weather. Transit and paratransit operators need to know what the conditions will be to make decisions regarding routing, scheduling and other operational parameters that determine how the system can be operated in the safest and most efficient manner to serve their clients (travelers). The optional transit traveler needs to know if the transit system will be there to serve his or her needs or whether or not to use another mode of travel. The weather and road conditions in rural areas that experience harsh conditions are important elements in these decisions. FORETELL proposes to help this user group meet their respective needs with information that is more accurate, more timely, and easier to access than currently available sources of weather information.

Evaluation of the FORETELL project has five central objectives: user acceptance, decision effectiveness, safety and security, efficiency, and environmental conservation. Transit dispatchers will be contacted by telephone to obtain specific information on each of these central evaluation objectives. For example, telephone interviews will obtain from dispatchers measures of their use of the FORETELL system (user acceptance) and measures of their ability to improve storm management decisions (decision effectiveness), reduce exposure to unsafe road conditions (safety and security), and reduce delay (efficiency). It is believed there is no easy way to determine if agencies have reduced emissions (environmental conservation). The interview guide that will be used to obtain this and additional pertinent information is presented in Appendix A.

Section 2 presents an overview of the testing approach, Section 3 provides an anticipated schedule, and the remaining sections present specific details for implementing the testing program.

2.0 APPROACH

To measure the impacts of the FORETELL system on the user decisions and the transportation systems, information will be collected from about 25 transit and paratransit personnel following the 2001/2002 winter. In order to characterize the use of FORETELL information, transit and paratransit operations dispatchers will be interviewed by telephone. The telephone interviews will begin in March 2002. Initial information-gathering calls will be made to selected transit agencies prior to the final development of the interview guide in order to assure that the interview guide is effective and complete.

Upon completion of an interview, the interview guide will be reviewed for completeness, accuracy, and consistency. Following the review, information from the interview guides will be entered into a database suitable for analysis. Due to the limited number of potential interviews, it is anticipated that the data will be entered into a Microsoft Excel spreadsheet and displayed graphically for analysis.

As with any field test, there are several underlying assumptions. For example, the success of the test depends upon a sufficient number of transit personnel having access to FORETELL information, being aware of and utilizing FORETELL information in making decisions, and participating in the interviews. The estimated 16 people to be interviewed is based on information obtained from FORETELL personnel as this Test Plan was prepared.

3.0 SCHEDULE

An anticipated schedule for the completion of all activities related to this test is presented in Table 1.

Table 1. Anticipated Schedule for Test

Activity	2002
Pre-test Activities	
Data Collection Design	January
Interview Guide Development	January
Finalization of Contact List	February
Test Activities	
Contact Letters	February
Preliminary Telephone Interviews	March
Formal Telephone Interviews	March-April
Post-test Activities	
Data Preparation	May
Analysis and Reporting	June-September

4.0 PRE-TEST ACTIVITIES

Before interviews begin, several pre-test activities must be performed. Specifically, the following activities will be conducted: development of the data collection instrument, and finalization of the contact list.

4.1 Data Collection Design

It is anticipated that data will be gathered from interviews and consolidated into a database for manipulation, display, and subsequent analysis. An Excel database will be created for entry of response data. The database and interview guide will be developed collaboratively for ease of interviewing and data entry. Data will also be obtained from FORETELL regarding the frequency of web site access by the transit and paratransit users.

4.2 Interview Guide Development

Transit/paratransit operations personnel will be interviewed using interview guides specifically developed for use in telephone interviews. Interviews will be conducted near the end of and after the winter season from March through April 2002. Preliminary interviews will assist in the development of the interview guide.

The Evaluation Plan identifies several hypotheses that will be tested using information collected during the interviews. Based upon the Evaluation Plan, a preliminary draft of the interview guide has been developed and is included in Appendix A. As one of the initial pre-test activities, this interview guide will be further refined.

The process of refining the interview guide will include examining the preliminary guide to ensure that the following questions are fully addressed:

- Which questions should be included in the interview guide?
- Do the questions solicit appropriate responses?
- In what order should the questions appear?
- How long should the interview guide be?
- Does the interview guide adequately address the specific hypotheses to test?

Once the specific questions have been finalized, the interview guide will be formatted to enhance its readability and conversational flow. In-house testing of the interview guide will be performed to ensure that the interview guide follows a logical flow. The interview guide will also be pre-tested in preliminary interviews with a few transit and paratransit operations personnel to assure that the interview will be both comprehensible and complete.

4.3 Finalization of Contact List

A lists of potential transit participants was obtained from the FORETELL Consortium to initiate the contact list development. The evaluation team also identified potential transit participants in Missouri from the American Public Transportation Association web site. The contact list, shown in Table 2, includes the names, locations, and telephone numbers of potential participants. Supervisors will be contacted to obtain additional names of potential interview participants before the contact list is finalized.

Table 2. Potential Transit Agency Participants

Organization Name	Contact	City Location	State	Phone
Iowa Northland Regional Transit Commission	Kenneth Swanson	Waterloo	IA	319-233-5213
HomeCare Services, Inc.	Lori Cochran	Adel	IA	515-993-4122
City of Ames/CyRide	Barbara Neal	Ames	IA	515-292-1105
Southern Iowa Trolley	Shonda Deranleau	Creston	IA	641-782-6571
Iowa Public Transit Association	Bev Thomas	West Des Moines	IA	515-277-4821
The Univ. of Iowa - Cambus	Brian McClatchey	Iowa City	IA	319-335-8632
MIDAS Council Of Governments	Cliff Weldon	Fort Dodge	IA	515-576-7183
Southwest Iowa Transit Agency	Debbie Archibald	Atlantic	IA	712-243-4196
Iowa DOT	Pamella Lee	Ames	IA	515-239-1872
Rosetta Mobile, Inc.	Serge Bushman	Overland Park	KS	913-707-8114
Laidlaw Transit	Bob Reddish	St. Joseph	MO	816-271-5367
Jefferson City Transit (JEFFTRAN)	Richard Turner	Jefferson City	MO	573-634-6477
Springfield City Utility Services (CUS)	Carol Cruise	Springfield	MO	417-831-8311
UMKC	Henry Marsh	Kansas City	MO	816-235-1383
KC Area Transportation Authority (ATA)	Mark Huffer	Kansas City	MO	816-346-0200
Liberty Access	Mary	Liberty	MO	816-792-6010
SWMSU Shuttle Service (Fisk Limo Services, contractor)	Howard Fisk	Springfield	MO	417-862-2900
Bi-State Development Agency	Tom Sehr	St. Louis	MO	314-982-1400

5.0 TEST ACTIVITIES

This section describes the logistical details of conducting interviews. Preliminary interviews will occur approximately mid-way through the 2001-2002 winter season in order to validate the Interview Guide. Formal evaluation interviews for all transit and paratransit personnel in the sampling frame will occur at the end of the 2001-2002 winter. Ed Boselly of Weather Solutions Group will conduct the interviews.

Interview guides will be used to collect information from about 25 transit/paratransit operations personnel. In mid-February, 2002, letters will be mailed to potential interview participants explaining the purpose of the interview, the anticipated time frame the interviews will be conducted, what can be expected in terms of interview questions, and the approximate time required to complete the interviews. Preliminary interviews will then be conducted during late February and formal interviews will be conducted in March and April. The first five or six or completed interview guides will be reviewed by FORETELL Evaluation Team members to ensure that the FORETELL central objectives, as described in Section 1.0, are being appropriately addressed.

After the completed interview guides are reviewed, final follow-up telephone calls may be made in late May if it is determined that additional or clarifying information is needed.

6.0 POST-TEST ACTIVITIES

During the data collection phase, completed interview guides will be consolidated at Weather Solutions Group. The collected data will be electronically keyed into an Excel database with 100 percent verification.

After entry, the data will be checked against the hard copy interview guides to ensure that data were entered accurately. Logic checks to identify out of range values will be performed.

7.0 DATA ANALYSIS

The interview guides will provide valuable information that will be used to evaluate the acceptance and use of the FORETELL system by transit and paratransit users. This information will also be used to evaluate the decision processes of the users and to measure the resulting outcomes. The information collected will also be used to test specific hypotheses related to awareness and use of the FORETELL system. Table 3 presents the hypotheses to be tested and the measures that will be used.

For selected items in the interview guide, graphical summaries (histograms, bar graphs, etc.) will be prepared. For example, Figure 1 is an illustration of a bar graph that would display the percent of transit and paratransit operations personnel who use each component of information supplied by the FORETELL system. The analysis of the data will include:

- For nominal data, frequencies and percentages; and
- For ordinal data, summary statistics, e.g., median, range, interquartile range.

Table 3. Hypotheses and Evaluation Measures Related to Transit/Paratransit Operations Personnel/Users Interviews.

Evaluation Output	Decision Area	Measures	Hypotheses
User Acceptance	Receipt of Info	% of users who have access to the information	Transit/Paratransit Operators/Users[+] have access to FORETELL information
		% of potential users who get the information	Transit/Paratransit Operators/Users received FORETELL information in timely manner
		% of users who get the information they need	Transit/Paratransit Operators/Users get the kind of FORETELL information needed for them to perform their work
	Use of Information	% of users who understand the information	Transit/Paratransit Operators/Users understand the FORETELL information
		% of users who can use the information	Transit/Paratransit Operators/Users know how to use the FORETELL information
		% of users who take action based on the information	Transit/Paratransit Operators/Users take action based on the information provided by FORETELL
		% of users who receive the information in time to make decisions	FORETELL information is available to Transit/ Paratransit Operators/Users when needed
		% of users that use sources other than FORETELL	Personnel use information other than FORETELL to make decisions
		% of users that use FORETELL information	Personnel use sources other than FORETELL, as well as FORETELL information, to make decisions
		Increase in % of users who rely on the information	Users of FORETELL information will rely on it more over time than they do on alternative sources
	Perceived value	% of users that like the information	Transit/Paratransit Operators/Users like the FORETELL information
		% of users that believe the information is correct	Transit/Paratransit Operators/Users think the FORETELL information was correct
		% of users that believe the information has have value	Transit/Paratransit Operators/Users think the information was worth their investment (cost)
		% of users that want to continue receiving the information.	Transit/Paratransit Operators/Users wish to continue using FORETELL information

+ Transit/Paratransit operators/users include transit-dependent travelers, transit operators (drivers and dispatch), and optional transit travelers (listed in order of priority).

Table 3. Hypotheses and Evaluation Measures Related to Transit/Paratransit Operations Personnel/Users Interviews (Continued).

Evaluation Output	Decision Area	Measures	Hypotheses
User Acceptance (continued)	Behavior change	% of users that perform their work differently using FORETELL information	Transit/Paratransit Operators/Users perform their work differently (better, quicker) now that they have access to FORETELL information
		% of users that use FORETELL information in their decisions	FORETELL information affects decisions made by Transit/Paratransit Operators/Users
		% of users that are more confident in making decisions using FORETELL information	Transit/Paratransit Operators/Users are more comfortable with their decisions using FORETELL information
Decision Effectiveness	Route changes	% of time users changed route, scheduling, or timing of trip	Transit/Paratransit Operators/Users altered route or schedule to improve service using FORETELL information
	Operational parameters	% of time users changed operational parameters	Transit/Paratransit Operators/Users changed an operational parameter to improve service using FORETELL information
Safety	Reduced crashes	% of users who were a party to a crash (weather related)	Transit/Paratransit Operators/Users safety was improved with FORETELL information
	Reduced injuries/ fatalities	% of users who were either injured or killed due to a crash	Transit/Paratransit Operators/Users safety was improved with FORETELL information
Efficiency	Reduced delay	% users who avoided traffic delay using FORETELL information	Transit/Paratransit Operators/Users reduced travel delay because of FORETELL
	Improved vehicle routing and diversion	% users who used FORETELL information to assist with vehicle routing during severe weather conditions	Transit/Paratransit Operators/Users improved vehicle routing during severe weather conditions using FORETELL information
E**nvironmental Conservation** ***(See Efficiency)***			
Mobility/Convenience Note: Only achievable through surrogates from operator perceptions	Improved availability and convenience of Transit/ Paratransit services	% of patrons that believe transit/paratransit services are more available and convenient during severe weather events	Transit/Paratransit travelers believe services are more available and convenient during severe weather conditions
	Improved access to and from Transit/Paratransit services	? % users who believe access to rural areas is easier ? % Patrons who believe access to Transit/Paratransit services is easier	? Transit/Paratransit Operators/Users can access rural areas more easily using FORETELL information ? Transit/Paratransit travelers can access services more easily using FORETELL information
Economic Vitality ***(See Mobility)***			

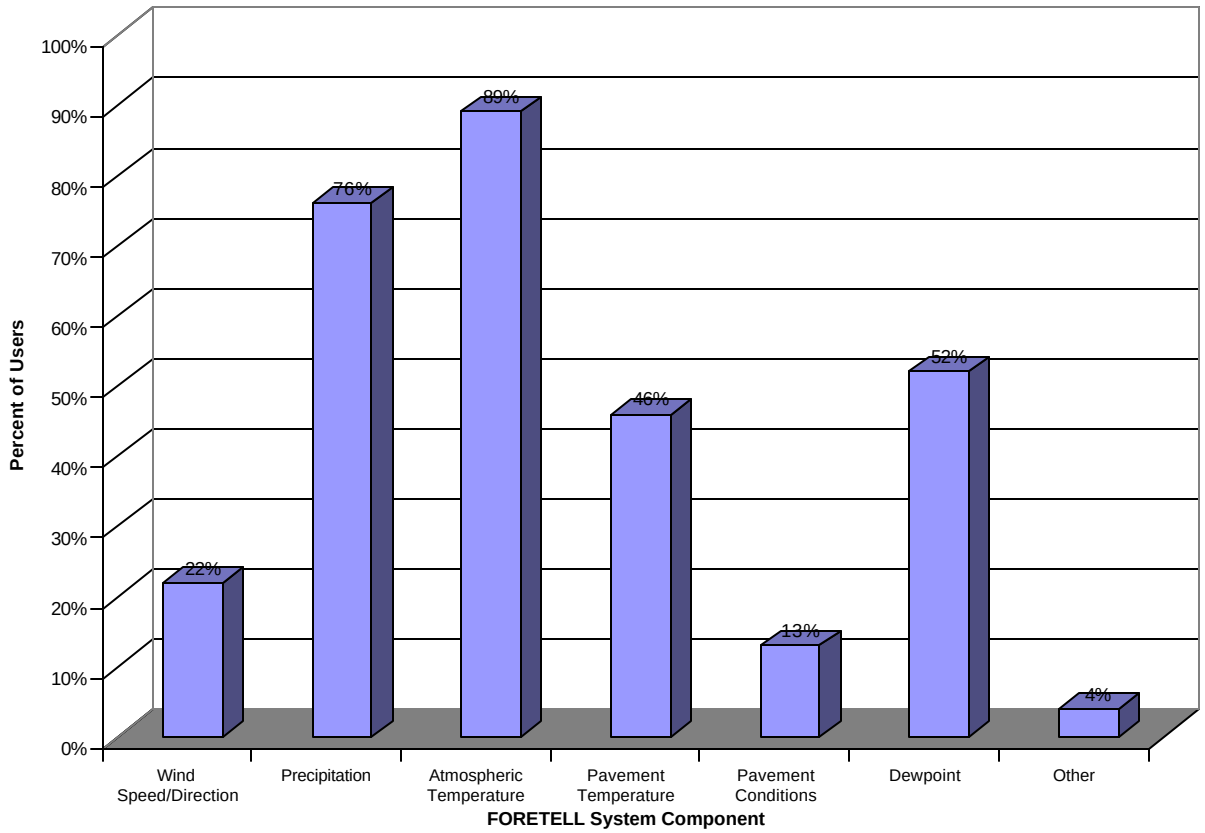

Figure 1. Example Bar Chart Displaying the Percent of Transit/Paratransit Operations Personnel Reporting Use of the FORETELL System Components.

8.0 REPORT FORMAT

The results of this test will be summarized in a technical report. The report will contain the following sections:

1.0 **Executive Summary.** This summary will briefly describe FORETELL, this particular evaluation, the data gathering and analysis process, results of the analysis, and conclusions and recommendations.

2.0 **Introduction and Background**. This section will describe the development of FORETELL and the involvement of transit/paratransit operations personnel in the evaluation process.

3.0 **Summary of Data**. The development of the interview guide and collection of data will be described.

4.0 **Analysis Methods**. The report will describe the qualitative data analysis process used in this evaluation.

5.0 **Results**. This section will summarize the results of the data analysis.

6.0 **Conclusions**. The report will document conclusions arrived at following the review of data collected.

7.0 **Recommendations**. The technical report will address ways FORETELL could be improved and considerations for future evaluations

9.0 REQUIRED RESOURCES

Table 4 presents the approximate level of effort needed to conduct this test.

Table 4. Approximate Level of Effort (person hours)

Project Role	Task				
	Pre-Test Activities	Test Activities	Post-Test Activities	Analysis and Reporting	Total
Battelle Staff	16	24	40	40	120
Test Plan (Boselly)	80	40	80	80	280
Interview (Boselly)	40	120	40		200
				Total	600

APPENDIX A:

INTERVIEW GUIDE

TRANSIT/PARATRANSIT INTERVIEW GUIDE

Name	_____	**Organization**	_____
Title	_____	**Location**	_____
Location	_____	**Date**	_____

Scheduled time of interview _____ am/pm

Good morning/afternoon. My name is Ed Boselly. I'm with Weather Solutions Group in Chesterfield, Missouri. I'm a member of the Battelle Memorial Institute's team that is under contract to the Federal Highway Administration to evaluate the FORETELL weather information system usage by transit and paratransit agencies. We understand that you have used this system and we would like to have your assistance in providing us information that we can use to try to quantify the benefits of FORETELL.

1. Data from FORETELL indicate you have been using the FORETELL system. (*Skip to* J

OR

1. Data from FORETELL indicate your agency has **NOT** been using the system. Why not?

_____

_____

_____

*Thank the interviewee for answering the question and **END** the interview.*

J Are you willing to help us in this evaluation? This interview may take as much as 20 minutes. Also, be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only. Is this a good time to talk or would you prefer to talk at a different time?

Now is OK ☐ Would prefer a different time. Date/Time: _____

2. How many miles of transit service do you provide from this location?

Commuter routes	_____	Urban routes	_____
Daily routes	_____	Rural routes	_____
Nighttime routes	_____	Weekend routes	_____

Suburban routes _____ Paratransit routes _____

3. How many full time employees do you supervise (FTEs)? ☐

Thank you. Now I'd like to ask the evaluation questions. There are five central objectives for evaluation. They are user acceptance of the concept and the technology, decision effectiveness, improvements in traffic or operational efficiency, safety, and environmental conservation. I will be asking questions related to each of these areas. You may or may not be able to determine how FORETELL has affected you in all of these areas, but we will do our best. I'll begin with User Acceptance.

4. What is your work email address? _____

5. We'd like to find out what information you use in making weather-related management decisions.

If YES, complete box →

Do you use:	YES	NO	Do you use actual readings, forecast information, or both? (Please check the appropriate box[es]) Actual	Forecast
a. Wind speed or direction?	q	q	q	q
b. Precipitation?	q	q	q	q
c. Atmospheric temperature?	q	q	q	q
d. Pavement temperature?	q	q	q	q
e. Pavement conditions?	q	q	q	q
f. Dewpoint?	q	q	q	q
g. Some other indicator?	q	q	q	q

Please Specify _____:

6. Please indicate how strongly you disagree or agree with the following statements. Circle 'N/A' if you have not used FORETELL.

The information from the FORETELL system was:

		Disagree				Agree
a.	Understandable	1	2	3	4	5
b.	Usable	1	2	3	4	5
c.	Accurate	1	2	3	4	5

d. Easily Obtainable 1 2 3 4 5

7. Before introduced to the FORETELL web site, what information sources did you use for road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources were available, how often you used them, and when you used them (e.g., before a trip or en-route).

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Some times	Rarely	Never	Pre-trip	En-route
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
Satellite Delivery	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

8. How often do you obtain information from the FORETELL System? (please check all that apply)

If YES, please go to box A. →

	YES	NO	A. How Often? TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	EVERY HOUR
a. Daily?	q	q	q	q	q	q
b. Weekly?	q	q	NOT APPLICABLE			
c. In advance of a weather event*?	q	q	q	q	q	q
d. During a weather event*?	q	q	q	q	q	q
e. After a weather event*?	q	q	q	q	q	q

**A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

9. Which feature(s) of FORETELL do you like most? (Please check all that apply)

- ❑ Animation
- ❑ Long-term forecast
- ❑ Scroll labeling
- ❑ Information Options
- ❑ Zoom capability
- ❑ Map display
- ❑ Current Conditions
- ❑ Other (SPECIFY) _____

10. Which feature(s) of FORETELL do you like least?

- ❑ Animation
- ❑ Long-term forecast
- ❑ Scroll labeling
- ❑ Information Options
- ❑ Zoom capability
- ❑ Map display
- ❑ Current Conditions
- ❑ Other (SPECIFY) _____

11. What types of decisions do you make using FORETELL information?

Type of Decision	How often?
❑ Route changes	_____
❑ Schedule changes	_____
❑ Chain up fleet	_____
❑ None	
❑ Other (Specify)	

12. For each of the following weather-related management decisions, please indicate whether information from FORETELL helped you to make more effective decisions. *Please circle one number for each management decision or Not Applicable (NA) if they were not faced with a given decision.*

		NOT HELPFUL →				HELPFUL
a. Route changes.....	NA	1	2	3	4	5
b. Schedule changes.....	NA	1	2	3	4	5
c. Chain up the fleet.....	NA	1	2	3	4	5
d. Other *Please specify*.....		1	2	3	4	5

13. What decisions do you make differently using the FORETELL information?

_____

_____

_____

For the next four questions, please indicate how strongly you disagree or agree with the following statements. Use 1 for Strongly Disagree to 5 for Strongly Agree.

	Strongly Disagree →				Strongly Agree
14. The FORETELL system provides valuable information that is not available from other sources.	1	2	3	4	5
15. You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.	1	2	3	4	5
16. The information provided by the FORETELL System is sufficient for making weather-related management decisions.	1	2	3	4	5
17. Your agency would be willing to pay for the benefit of having information from the FORETELL System, assuming it is reasonably priced.	1	2	3	4	5

	Strongly Disagree				Strongly Agree
18. You are more confident in making weather-related management decisions when you use information from the FORETELL system.	1	2	3	4	5
19. The FORETELL system provides timely information for making weather-related management decisions.	1	2	3	4	5
20. You are able to improve vehicle routing and avoid travel delay when you use information from the FORETELL system.	1	2	3	4	5
21. Having information from the FORETELL system improves safety and/or reduces accidents.	1	2	3	4	5
22. The FORETELL system provides valuable information that is not available from other sources	1	2	3	4	5
23. You would be willing to pay for the benefit of having information from the FORETELL system, assuming it is reasonably priced.	1	2	3	4	5

24. Would you like to use information from the FORETELL system in the future?

❑ Yes ❑ No

25. Do you have suggestions for ways to improve the FORETELL system?

_____

_____

_____

26. Please provide us with any other comments you have relative to FORETELL.

_____

_____

_____

_____

_____

_____

Thank you for taking the time to participate in this interview. Your information will be held in confidence and only included in data summaries. If you can think of anything else, please call me at 636-230-5672, or if you have access to e-mail, you can reach me at:

boselly@weathersolutions.com

FINAL TEST

FORETELL ™ Consortium Operational Test: Weather Information for Surface Transportation – Traffic Managers Test

November

Prepared for:

U.S. Department of Transportation
ITS Joint Program Office, HVH -1 Room
400 Seventh Street,
Washington, D.C.

Prepared by:

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FINAL TEST PLAN

FORETELL™ Consortium Operational Test: Weather Information for Surface Transportation – Traffic Managers Test

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Prepared for

U.S. Department of Transportation
Washington, D.C.

November 2001

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1.0 INTRODUCTION

The FORETELL™ project aims to provide detailed weather and road condition information in a meaningful format to various surface transportation users. The goal of the project is a safer, more efficient and accessible rural transportation system that is sensitive to environmental issues and encourages economic vitality. The Federal Highway Administration (FHWA), in cooperation with the FORETELL Consortium (Castle Rock Services and Iowa, Wisconsin, and Missouri departments of transportation) has undertaken the development and operational testing of a multi-regional road and weather forecasting/dissemination system.

A major factor in the success of the FORETELL project will be the acceptance of and the ability to use the FORETELL system. The FHWA is conducting an independent evaluation of the FORETELL project. The evaluation focuses on an assessment of the decision processes of potential FORETELL system users and measurement of the resulting outcomes. As part of the overall evaluation, several tests are planned. One user group identified as a part of this evaluation project was traffic managers. This document serves as a test plan that will be used to evaluate the effectiveness of the FORETELL system among the traffic manager user group.

Evaluation of the FORETELL project has five central objectives: user acceptance, decision effectiveness, safety and security, efficiency, and environmental conservation. Traffic managers at the Transportation Information Center in St. Louis, Missouri and the Freeway Management Center in Milwaukee, Wisconsin will be contacted to address these central evaluation objectives. The interview guide presented in Appendix A will be used to obtain this and additional pertinent information.

Traffic managers involved in the FORETELL evaluation will presumably make use of the FORETELL web site during the winter season of 2001/2002 to better understand winter road surface

and weather conditions. FORETELL proposes to assist this user group to meet their respective needs with better and more timely weather and forecast information. The effectiveness of the FORETELL web site at disseminating this information to traffic managers will be evaluated through telephone interviews with management personnel and records of web site access. For example, telephone interviews will be used to assess the extent of use by traffic managers of FORETELL (user acceptance) and to measure their ability to improve weather event decisions (decision effectiveness), reduce exposure to unsafe road conditions (safety and security), and reduce delay (efficiency). For the traffic managers user group, there is not a component within the evaluation planning aimed at addressing the environmental conservation objective of the original evaluation plan. An interview guide form will be developed with the intent of providing consistency in the interviews and collecting information suitable for qualitative and comparative analysis.

2.0 APPROACH

The FORETELL evaluation will measure the impacts of the system on traffic management and information center users by collecting information from about 2 or 3 traffic managers following the 2001/2002 winter season. Information will be collected through a telephone interview (draft interview guide provided in Appendix A). The telephone interviews will be conducted in the spring of 2002. Completion of the interview process will include pre-testing activities such as finalization of the interview guide and contact list to ensure that the collection of data is comprehensive. Below is an initial list of potential traffic managers with functioning centers operating in Missouri and Wisconsin showing interest in this evaluation.

Teresa Krenning, Traffic Manager	Transportation Information Center St. Louis, Missouri
John Corbin, Traffic Manager	Freeway Management Center Milwaukee, Wisconsin

In addition to information on use of the FORETELL system, baseline information will be collected as a part of this data collection effort using the telephone interview guide. The interview guide will be developed to address past center methods of obtaining road surface and weather information, as well as, FORETELL system use. Based on the objectives established for the evaluation, measures were developed to assess the usefulness of the FORETELL system to information and management centers. The measures served as a guide in developing the interview form and are as follows:

- Number of times traffic managers accessed the system
  - Total and individually (assuming the system can track access)
  - For those that don't – why not?
- Opinion of the value of the information toward productivity (Do they find the information valuable enough to make regular use of the site?)
- Changes to incident response and clearance times (Does having the FORETELL information

available assist in preparation for the impacts of weather events on traffic?)

- Opinion of the accuracy of the information
  - FORETELL information accurate
  - Accurate enough to continue the use of the web site
- Opinion of the impact to managers operations (Does having the FORETELL information available assist them in preparation for the impacts of weather events on traffic?)
  - Information aided in making traffic management decisions and taking action
  - What types of decisions and actions were affected – road closures, messages disseminated (DMS, HAR, Internet, etc), and units dispatched

Information collected during the interview will be used to answer the hypotheses established as part of the Evaluation Plan and to perform the qualitative and comparative analysis desired for the goal areas of this evaluation. The decision areas that will be addressed as part of this test plan, and the hypotheses and measures used to assess them, are presented in Table 1.

The results and success of this Test Plan approach rely on several underlying assumptions. It is expected that traffic managers will access the information at least a minimal number of times in order to determine if the information provided on the FORETELL web site is useful and beneficial in managing their operations. Furthermore, due to the small number of participating managers, they will represent the awareness and utilization of typical information and management centers of the three states involved in the FORETELL project.

Table 1. Traffic Managers Framework

Operations Personnel				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
User Acceptance	Receipt of Info	% of users who have access to the information	*FORETELL*™ products are readily available to traffic operations personnel+	• Interviews
		% of potential users who get the information	*FORETELL*™ products are readily available to traffic operations personnel+	
		% of users who get the information they need	*FORETELL*™ products provide traffic operations personnel+ the kind of information needed for them to perform their work	
	Use of Information	% of users who understand the products	Traffic operations personnel+ understand the *FORETELL*™ products	• Interviews
		% of users who can use the products	Traffic operations personnel+ know how to use the *FORETELL*™ products	
		% of users who take action based on the products	Traffic operations personnel+ take action based on the information provided by *FORETELL*™	
		% of users who receive the products in time to make decisions	*FORETELL*™ information is available to traffic operations personnel+ when needed	
		% of users that use sources other than Foretell	Personnel use products other than *FORETELL*™ to make decision	
		% of users that use sources other than *FORETELL*™ and *FORETELL*™ products	Personnel use products other than *FORETELL*™, as well as *FORETELL*™ products, to make decision	
		Increase in % of users who rely on the products	Users of *FORETELL*™ information will rely on it more over time than they do on alternative sources	

+ Traffic Managers are traffic managers.

Table 1. Traffic Managers Framework (Continued)

Operations Personnel (cont.)				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
User Acceptance (continued)	Perceived value	% of users that like the products	Traffic operations personnel+ like the *FORETELL*™ products	• Interviews
		% of users that believe the information is correct	Traffic operations personnel+ think the *FORETELL*™ information was correct	
		% of users that believe the product(s) have value	Traffic operations personnel+ think the information was worth their investment (cost)	
		% of users that want to continue receiving the product(s)	Traffic operations personnel+ wish to continue using *FORETELL*™ products	
		% of users that want to continue *FORETELL*™ sponsorship	Traffic operations personnel+ wish to continue *FORETELL*™ sponsorship	
	Behavior change	% of users that perform their work differently using *FORETELL*™ products	Traffic operations personnel+ perform their work differently (better, quicker) now that they have access to *FORETELL*™ products	• Interviews
		% of users that use *FORETELL*™ products in their decisions	*FORETELL*™ information affects decisions by traffic operations personnel+	
		% of users that are more confident in making decisions using *FORETELL*™ products	Traffic operations personnel+ are more comfortable with their decisions using *FORETELL*™ information	

+ Traffic Managers are traffic managers.

Table 1. Traffic Managers Framework (Continued)

Operations Personnel (cont.)				
Evaluation Output	**Decision Area**	**Measures**	**Hypotheses**	**Measurement Method**
Decision Effectiveness	Traffic Operations+	% of users who deploy staff more efficiently	Information is disseminated more efficiently with *FORETELL*™ information	• Interviews
		% of users who close roads quicker	Roads are closed quicker when needed? *(depends on who is responsible for closure)*	
		% of users who issue traffic advisories more efficiently	Traffic advisories are issued more efficiently	
		% of users who compile and disseminate road condition information more efficiently	Road condition information is compiled and disseminated more efficiently	
Efficiency	HCRS	Timeliness of closure notifications for road use efficiency	Roads are closed or restricted more efficiently using *FORETELL*™ information	• Interviews

+ Traffic Managers are traffic managers

3.0 SCHEDULE

An anticipated schedule for the completion of all activities related to this test is presented in Table 2.

Table 2. Anticipated Schedule for Test

Activity	Timing
Pre-test Activities	2001
Data Collection Design	October – November
Interview Guide Development	October – November
Finalization of Contact List	November – December
Initial Contact and Assigning of User-ID/Password	November – December
Test Activities	2002
Initial Telephone Interviews	March
Follow-up Telephone Interviews	April
Post-test Activities	
Data Preparation	April - May
Analysis and Reporting	June – September

4.0 PRE-TEST ACTIVITIES

Before interviews begin, several pre-test activities must be performed. Pre-test activities consist of the following: development of the data collection design, development of the data collection instrument, finalization of the contact list, and assigning user names and passwords.

4.1 Data Collection Design

A brief overview of the data collection design was provided in Section 2.0. Test Plan activities were developed using the Evaluation Plan as a guide. At least two traffic managers will be interviewed using interview guides designed specifically for this portion of the project. It is anticipated that data will be gathered from interviews and system records to be consolidated into a database for manipulation, display, and subsequent analysis. A Microsoft Excel spreadsheet will be created for these purposes.

4.2 Interview Guide Development

Traffic managers will be interviewed using an interview guide specifically developed for use in this evaluation. The interview guide will be designed for telephone interview use and measurement of traffic management personnel use of the FORETELL system. It is expected that the measures will be collected using nominal and ordinal level, closed-ended quantitative scale questions with possible open-ended questions.

The Evaluation Plan identifies several hypotheses as shown in Table 1 that will be tested using information collected during the interviews. Based upon the goals and objectives of the Evaluation Plan, a preliminary draft of the interview guide has been developed and is included in Appendix A. As one of the initial pre-test activities, this interview guide will be further refined.

The process of refining the interview guide will include examining the draft guide to ensure that the following questions are fully addressed:

- Do questions solicit appropriate responses?
- Would closed or open-ended questions provide the best information?
- In what order should the questions appear?
- How long should the interview guide be?
- Does the interview guide adequately address the specific hypotheses the survey is designed to test?

Ideally, pre-testing will be conducted with 2 individuals (management personnel or members of the FORETELL consortium) to ensure the interview guide meets these criteria. Once specific questions have been finalized, formatting for readability and conversational flow enhancements will be performed.

4.3 Finalization of Contact List

A list of the 2 potential participants is presented below and shown in the Approach section.

Teresa Krenning, Traffic Manager	Transportation Information Center St. Louis, Missouri
John Corbin, Traffic Manager	Freeway Management Center Milwaukee, Wisconsin

Attempts to expand this list will be part of the pre-test activities. The above listed contacts indicate center managers. It is possible that these managers will assign multiple personnel in their centers to utilize the FORETELL system for evaluation input. However, it is anticipated that the number of users in this group will remain small due to the apparent lack of traffic management centers actively using forecast weather and roadway information. Efforts will be made to update and add to the list as the evaluation progresses and any knowledge of additional functioning centers is obtained.

The list of 2 traffic managers was developed as part of preliminary test plan efforts. The list indicates interested and operative information centers in the three-state evaluation area. Indications are that there may be additional management centers in the project area; however, they are not anticipated to be in operation during the upcoming winter. Additional information regarding this and their interest in

this evaluation is being gathered.

4.4 Assigning of User Names and Passwords

A final pre-test activity to be completed after the contact list is finalized will be to assign user names and passwords to each management center participant. Traffic manager participants will be assigned a user name and password for full FORETELL web site access and history tracking purposes. MMA will provide Castle Rock Services with the participant list. Castle Rock personnel will assign each evaluation participant a user name and password and provide that information to each participant. Although managers may have received training, participants will briefly be instructed on FORETELL web site capabilities and use. Castle Rock will also provide a help number and information package upon request. Traffic Managers will be asked to use the assigned access information during the winter of 2001-2002 for accessing information from the FORETELL web site. This will assist in gathering information through system history records.

5.0 TEST ACTIVITIES

5.1 Information Gathering

Following the winter of 2001-2002, the traffic managers will be contacted and interviewed by telephone to learn about their use of the FORETELL system. MMA will conduct the interviews with participating traffic managers. Depending on the ability to contact those listed on the participant list, interviews will be completed during March 2002. Further follow-up telephone calls or interviews with key management center personnel may be made if it is determined that additional or clarifying information is needed.

5.2 Information Tabulation - Data Sheets

The draft interview guide presented in Appendix A will continue to be developed with the focus on collecting information suitable for qualitative and comparative analysis. The guide will include the collection of some baseline information concerning traffic managers' sources of road surface and weather information prior to the use of the FORETELL system. The resulting information will be logged and assembled in a Microsoft Excel spreadsheet for subsequent analysis.

6.0 POST-TEST ACTIVITIES

During the data collection phase, completed interview guides will be organized for entering into the Excel database by MMA. MMA will also perform a manual review for completeness, accuracy, and consistency. The accumulated data will then be manually keyed into an Excel database. It is anticipated that data entry errors, if any, will be readily evident and eliminated due to the small sample population.

7.0 DATA ANALYSIS

Through the data collection effort, information will be tabulated in spreadsheet format and analysis performed on each interview guide question. This analysis will attempt to address the hypotheses formulated in the Evaluation Plan. The data analysis activities will present organized information to compare with the baseline information collected as a part of this same interview guide. The collected data will provide a before and after FORETELL system use evaluation of traffic managers' collection and use of road surface and weather information.

The general information asked as a part of the telephone interview, such as name, title, organization, operating area, location, and number of employees, provides a way to identify users and their type of operations. It is expected that responses to the general information questions will be sufficient to categorize managers by the complexity of operation and responsibility of a center.

After collecting center information, questions on the interview guide will concentrate on answering the hypotheses developed in the Evaluation Plan. In part 1 of the developing interview guide, questions 1 – 8 pertain to information and information sources available prior to traffic managers' use of the FORETELL web site. Initially, traffic managers will be asked to list the information sources used to get road surface and weather information prior to their introduction to the FORETELL System. It is expected that users will indicate for what purpose the information was used (center operation, dissemination). On a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree, specific questions will be asked concerning ease of access, content understandability, accuracy, whether information is kept up to date, and content usefulness. Question 8 directly asks participants to identify the specific road surface and weather information they use in making decisions. It is expected that management and information center participants will have access to many other information sources (e.g. CB radio, Internet and etc.). For comparative purposes, the interview will collect baseline data concerning center use of road surface and weather information to improve operation efficiency. Interviewees will be provided an opportunity to give specific examples through open-ended questions. There will be an assortment of responses concerning information sources' ability to provide usable road

surface and weather information. These responses will be displayed in histograms and bar graphs to be compared with FORETELL product use. It is expected that a variety of information sources have been employed to obtain all needed information for the centers. The ease of access, information usability, and accuracy will be discovered and displayed as percentages and/or in bar graphs for comparative analysis.

Questions 9 – 22 pertain to traffic managers' access to the FORETELL web site and use of the information obtained from the FORETELL System. Initially, a follow-up question on what information traffic managers' use in making road condition and weather related decisions will be asked. If FORETELL is not used to its capacity in obtaining needed center information, the reasons for this will be explored as a part of this initial Part 2 question. The telephone survey will have the operators indicate the number of times they accessed the FORETELL web site throughout the testing period. Even though this information will be obtained by the system history records based on their user names and passwords, this question will encourage the interviewees thoughts on particular FORETELL web site use. Presumably all participants will access the web site at least once so that opinions of FORETELL and its content can be formulated. It is preferred that participants utilize the web site enough to become familiar with FORETELL's capabilities. To encourage utilization, a consortium member could call managers in mid-January to promote managers use of the FORETELL system.

The interview process will then ask traffic managers to indicate on a scale of 1 to 5, similar to the questions asked in part 1, the ease of access, content understandability, accuracy, currentness, and usefulness of the FORETELL provided information. Follow-up questions that ask for specific examples of how centers dealt with and used the obtained information will follow. These follow-up questions will further investigate specific likes and dislikes of the FORETELL System in improving operations. The data collected are expected to indicate whether the use of FORETELL improved efficiency and safety in operations through information dissemination. For example, the data should provide an understanding of the web site's effectiveness at assisting managers' decisions. We expect a variety of use and opinions concerning the web site. It is expected that information center personnel will understand and take advantage of the vastness of road surface and weather information for current and forecasted

information that FORETELL provides. Also, the telephone interview will investigate the traffic managers' likeliness to continue accessing information on the FORETELL web site. The analysis will consist of percentages shown on graphs for each information source. These percentages will be compared with the baseline-collected information in part 1 of the telephone interview.

Finally, users will be asked what they think are shortcomings of the site. The effort here will be to collect users' suggestions regarding changes to the FORETELL web site or content that could be made to provide greater usability by information and management centers. In the end, we expect the interview guides will provide valuable information that will be used to evaluate the acceptance and use of the FORETELL System by potential users. Collected information and subsequent analysis will be used to evaluate the decision processes of these potential users and to measure the resulting outcomes.

7.1 Comparative Analysis

For each item in the interview guide, graphical summaries (histograms, bar graphs, etc.) will be prepared for select items. For example, Figure 1 provides an illustration of a bar graph that would display a traffic manager's views on the ease of accessing road surface and weather information, to improve operation and efficiency, from past information sources versus FORETELL. Since the sample population is small, statistical procedures typically used to create confidence intervals and to compare responses for a particular question will not be employed.

However, comparisons of survey responses will be made between before and after FORETELL system use and between centers.

Information gathered in the interview process will be used to determine the factors that influence evaluation objectives and measures of efficiency and operation and answer Evaluation Plan hypotheses.

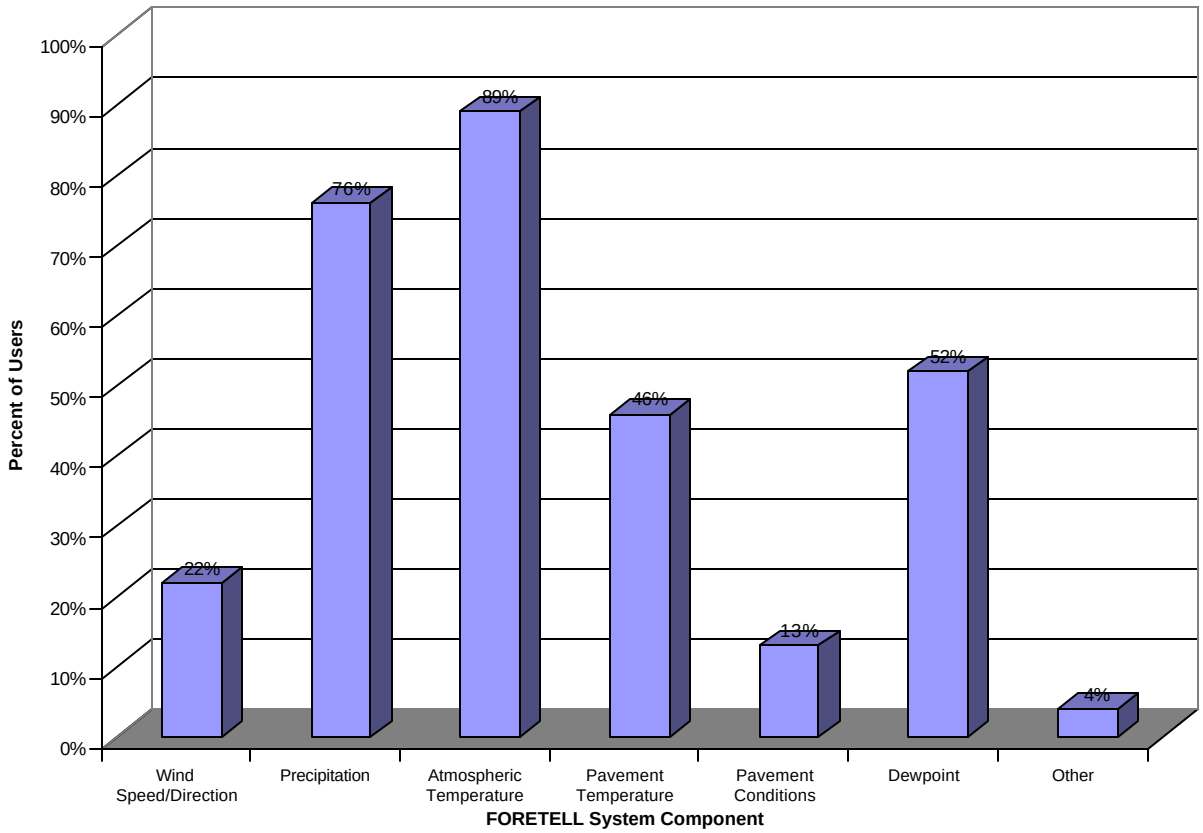

Figure 1. Example of a Bar Chart Displaying a Comparison of Access to Other Information Sources vs. FORETELL.

8.0 REPORT FORMAT

The results of this test will be summarized in a technical report. The report will contain the following sections:

1.0 Executive Summary

2.0 Introduction and Background

3.0 Summary of Data

- 3.1 Data Collection
- 3.2 Data Preparation
- 3.3 Summary of Data Problems

4.0 Analysis Methods

5.0 Summary of the Results

6.0 Conclusions

7.0 Recommendations

9.0 REQUIRED RESOURCES

Table 3 presents the approximate level of effort needed to conduct this test.

Table 3. Approximate Level of Effort (person hours)

Project Role	Task				
	Pre-Test Activities	Test Activities	Post-Test Activities	Analysis and Reporting	Total
Senior Analyst					
Middle Analyst					
Junior Analyst					
Support/Admin. Staff					

APPENDIX A:

DRAFT INTERVIEW GUIDE

TRAFFIC MANAGERS INTERVIEW GUIDE

Introduction for discussion:

- We are assisting Battelle Memorial Institute to conduct an FHWA-sponsored independent evaluation of a new road surface/weather information system called FORETELL.
- We are conducting telephone interviews to evaluate who has used the FORETELL web site, how well the system works (accuracy), for what purpose the information is being used (e.g., routing or timing alterations), and whether or not it provides improvements in operations, mobility, and safety. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.
- You were contacted previously as a potential user and identified as one who is interested in using (or trying) the FORETELL web site and assisting us in this evaluation process.
- Have you had an opportunity to familiarize and use the FORETELL system (if not, thank you for your time; this questionnaire was developed for evaluation of those who have experience in some minimal amount of FORETELL products). Are you willing to help us in this evaluation?

Be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only.

- This will take 15-25 minutes. Is this a good time to talk or would you prefer to talk at a different time? Would it be more appropriate to speak to a dispatcher, driver, or other person in your company?
- I appreciate your time. If you would like to interrupt the interview at any time, please let me know.

Name: _____ Title: _____

Organization: _____ Operating Area: _____

Office Location: _____ Number of Employees: _____

Date/Time: _____

The first set of questions pertain to information available prior to your use of the FORETELL web site.

1. Before introduced to the FORETELL web site, what information sources did you use to obtain road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources are available, how often you used them, and when you used them (e.g., before a trip or en-route).

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Sometimes	Rarely	Never	Operate	Disseminate
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

Note: If no previous sources were used to access road surface and weather information, skip to question 8 of this questionnaire.

Please indicate how strongly you disagree or agree with the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree.

.....→.....
.....
.....
.....Strongly Disagree Strongly Agree

2. The information sources used were easy to access and readily available.	1	2	3	4	5
3. The content (information) from the above sources was easy to understand.	1	2	3	4	5
4. Of the information sources your organization accessed, the information was accurate and up to date.	1	2	3	4	5
5. The road surface and weather information obtained was useful for performance of your work.	1	2	3	4	5

How?_____

_____

6. Information pertained to your coverage area with the necessary detail.	1	2	3	4	5
7. Obtained information assisted you in carrying out specific actions.	1	2	3	4	5

What actions?_____

_____

How?_____

_____

8. What information do you use in making weather-related management decisions?

If YES, please go to box A. →

Do you use actual readings, forecast information, or both? (Please check the appropriate box[es])

Do you use:

	YES	NO	Actual Readings	Forecast Information
a. Wind speed or direction?	q	q	q	q
b. Precipitation?	q	q	q	q
c. Atmospheric temperature?.....	q	q	q	q
d. Pavement temperature?.....	q	q	q	q
e. Pavement conditions?.....	q	q	q	q
f. Dewpoint?.....	q	q	q	q
g. Some other indicator? *Please specify*.....	q	q	q	q

SPECIFY: _____

The remaining questions pertain to information obtained through your use of FORETELL.

9. a) Have you or your organization received any training or training material regarding the FORETELL system?

p Yes p No

b) Was it useful? p Yes p No

10. Do you obtain the following information from FORETELL?

	YES	NO
a. Wind speed or direction	q	q
b. Precipitation	q	q
c. Atmosphere temperature	q	q
d. Pavement temperature	q	q
e. Pavement conditions	q	q
f. Dewpoint	q	q

If you don't use the information, why not?

_____

_____

11. How often do you obtain information from the FORETELL System…
(please check all that apply)

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	q	q	q	q	q	q
b. Weekly?	q	q	**NOT APPLICABLE**			
c. In advance of a weather event*?	q	q	q	q	q	q
d. During a weather event*?	q	q	q	q	q	q
e. After a weather event*?	q	q	q	q	q	q

**A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

Again, please rate the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree. [Interviewer: If an answer is Disagree or Strongly Disagree, ask the respondent to please explain.]

		Strongly Disagree → Strongly Agree				
12.	Information received from the FORETELL system is understandable.	1	2	3	4	5
13.	Information received from the FORETELL system is usable.	1	2	3	4	5
14.	Information received from the FORETELL system is easily obtainable.	1	2	3	4	5
15.	The FORETELL web site was easy to navigate.	1	2	3	4	5

Comment: _____

16.	Information received from the FORETELL system is accurate.	1	2	3	4	5

Explain: _____

17.	Information received from the FORETELL system is useful.	1	2	3	4	5

Comment: _____

18.	Information provided by the FORETELL web site was up to date.	1	2	3	4	5
19.	You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.	1	2	3	4	5
20.	The road surface and weather information obtained on the FORETELL web site was useful for the performance of your work.	1	2	3	4	5

How? _____

21.	Obtained information assisted you in carrying out specific actions.	1	2	3	4	5

How? _____

22.	Road surface and weather information is compiled and disseminated more efficiently.	1	2	3	4	5

Explain: _____

_____

23. Notifications of road closures or restrictions are issued more efficiently with FORETELL information.	1	2	3	4	5

Comment: _____

_____

24. You are more confident in making weather-related management decisions when you use information from the FORETELL System.	1	2	3	4	5

Explain: _____

_____

25. Having information from the FORETELL System increases safety and/or reduces accidents.	1	2	3	4	5

How? _____

_____

26. Information obtained on the FORETELL web site improved the overall efficiency of your operations.	1	2	3	4	5

Explain: _____

_____

27. Your organization will likely continue to access information on the FORETELL web site and rely on it more over time than you do on other alternative sources.	1	2	3	4	5

Do you have other comments (e.g., ways to improve FORETELL)?: _____

_____

_____

_____

Thank you for taking the time to participate in this interview. If you have any questions concerning the evaluation, please call me at 208-345-4630. Do you think it would it be beneficial to speak to operations personnel?

Name: _____ Title: _____ Phone: _____