I-95 Corridor Coalition – Vehicle Probe Project
Scope and Methodology

SCOPE

The I-95 Corridor Coalition (Coalition) contracted with INRIX Corporation in 2008 to provide travel time and speed on a network of roadways from New Jersey to North Carolina. The contract required the delivery of traffic data of specified quality to support various applications within the corridor. The goal of the project was to encourage innovate, non-intrusive methods for providing quality traffic data, as well as to simultaneously validate and document the effectiveness of such an approach. To the latter end, the Coalition has planned, budgeted, and initiated a quantitative review of data quality.

The Coalition envisioned both an initial validation, and an ongoing system to monitor the quality of the data throughout the project. The University of Maryland Department of Civil and Environmental Engineering performed the initial validation, and through the leadership of Dr. Ali Haghani, identified a cost effective ground truth data collection method based on Bluetooth traffic monitoring technology, established a data collection logistics template and schedule for use throughout the corridor, and put in place data analysis and reporting tools.

Details related to the method of data collection, processing and analysis are included in the Initial Validation Report completed in January of 2009, and serves as the basis for ongoing technical analysis. The University of Maryland Department of Civil and Environmental Engineering under the leadership of Dr. Ali Haghani will continue to validate the INRIX data on an ongoing basis. The ongoing validation will:

- Collect ground truth data on a periodic schedule that is geographically representative of the Vehicle Probe Project. The schedule reflects data collection and processing from one state or jurisdiction per month in the core region, but is subject to logistical constraints imposed by such things as weather, availability of state resources to assist in deployment. [Should additional expansions occur, the schedule will be adjusted accordingly]
- Analyze and report the results in a manner consistent with the requirements of the contract and in a form usable by Coalition members to assess quality in light of targeted applications.
    o Assess freeways for conformance to contract specifications, and on a monthly basis for input into the payment formula.
    o Assess arterials to determine the extent to which existing data meets desired specifications. Reporting on arterials will be performed as data and analysis progress in order to explore quality and issues specific only to arterials.
- Continue to explore and resolve issues related to ground truth data collection, anomalies in the data feeds, and other parameters associated with the project.
- Report freeway results monthly for use in assessing the quality and value of the data.
- In cooperation with the Coalition and INRIX, explore methods to better reflect data quality and better interpret data characteristics for use in targeted applications.

METHODOLOGY

Currently, the initial validation includes ground truth data from four states, namely Northern Virginia, Maryland, Delaware, and New Jersey. Ground truth data has been collected in North Carolina and Central Virginia, but has not been processed.   The sequential steps needed to carryout a validation on a set of segments include:

1. Prepare a template for the reporting of ongoing evaluation results that defines the cover format, pagination, explanation of methodology, definitions of terminology, presentation of results and conclusions.

2. Plan Data Collection:
    a. Coordinate with local jurisdiction for time frame and appropriate contacts
    b. Schedule a conference call to educate everyone on the project and process
    c. Study the area for candidate data collection locations in cooperation with the State and Coalition personnel
    d. Develop candidate TMC segment list for inclusion in the validation and provide opportunity for review by:
        i.   State (or appropriate jurisdiction)
        ii. INRIX
        iii. Coalition
    e. Schedule a face-to-face meeting to coordinate logistics.
    f. Secure assets to deploy and collect sensors (Vehicles and driver)
    g. Request incident, construction and other related data for validation segments during the time of that the sensors will be in place.
3. Collect Ground Truth Data:
    a. Develop a detailed logistical plan including all appropriate contact info
    b. Prep sensors, include charging and labeling
    c. Meet local representatives for transportation to deploy
    d. Meet local representatives for transportation to collect
    e. Iterate the last three steps for the number of weeks of data collection
4. Process Data
    a. Collect data from sensors
    b. Input data to database
    c. Process data for travel time and speeds
    d. Download corresponding INRIX data and input to data base
    e. Analyze and plot data on a segment or TMC basis
    f. Develop preliminary summary stats including
        i.   Summary statistics for SEB and AASE
        ii. Plots and charts comparing ground truth data with INRIX data
        iii. Data files containing all information necessary to replicate results
5. Review Preliminary Results
    a. Review TMC level detailed data for anomalies. (INRIX, UMD and the Coalition)
    b. Forward any incident, construction or related data provided by the Coalition members with the initial results
    c. Adjust analysis for any new issues that arise

d. Reprocess data as needed
    e. Iterate until issues are resolved (include INRIX in this process)
    f. Finalize summary stats
6. Compile and Report Results
    Format summary memo of results (in Word format)
        Use standard Coalition Report format
        Address any issues/comments from review
    Make detailed data and plots available electronically
    Transmit summary memo to project team and make available of project web site
7. Brief Coalition
    Present results to the Coalition project team on monthly conference call
    Brief jurisdiction of details of validation and obtain comments
    Report on status of validation effort periodically including
        Planned data collection activities
        Issues related to ground truth data, processing, or logistics
        Status of collected data and reports.

Primary responsibility of the various tasks and the anticipated timeframe is outlined in Table 1.

Table 1   Primary Tasks for Validation

TASKS	RESPONSIBLE PARTIES	TIMEFRAME
(1) Prepare Report Template	Coalition, UMD VT, and UMD PM	By end of January 2009
(2) Plan Data Collection	UMD VT, UMD PM (Review by Coalition and INRIX)	Start one month prior to data collection
(3) Collect Ground Truth Data	UMD VT	Two weeks
(4) Process Data	UMD VT	Two weeks
(5) Review Preliminary Results	UMD PM, Coalition, INRIX	Two weeks
(6) Compile and Report Results	UMD VT & Coalition	One week minimum, may be iterative
(7) Brief Coalition	UMD PM (support from UMD VT & Coalition)	Within one to four weeks

Definition of Parties

UMD VT	Univ. of Maryland Validation Team (Ali Haghani, Manager)
UMD PM	Univ. of Maryland Project Management (Phil Tarnoff, Lead)
INRIX	INRIX Corporation
Coalition	I95 Coalition Staff and Support (Bill Stoeckert, Manager, Karen Jehanian)

The timeline for a typical engagement for a single state is illustrated in the Table 2. The process begins with planning for data collection. A four week lead time is shown, although the time frame can be compressed provided all the planning elements are addressed. The four week lead time indicates that ground truth data collection for a specific state is identified a month in advance, and necessary coordination activities commence to enable placement of sensors within four weeks. Weeks 1 through 8 reflect the core activities of data collection, processing, review, and reporting. These activities are targeted for full completion within an 8 week timeframe from the commencement of data collection. The last step, that of briefing the Coalition and the respective state will be accomplished through the Project Team conference calls and state specific meetings or conference calls.

Table 2, Timeline for a typical validation process

STEPS	Weeks from Data Collection												
	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9
Plan Data Collection	░	░	░	░									
Collect Ground Truth Data					░	░							
Process Data							░	░					
Review Preliminary Results									░				
Compile and Report Results										░			
Brief Coalition and State											░	░	░

The deadline for results of any state validation effort (for inclusion in summary stats that may impact payment of invoice) is Friday of the fifth week after the start of data collection.
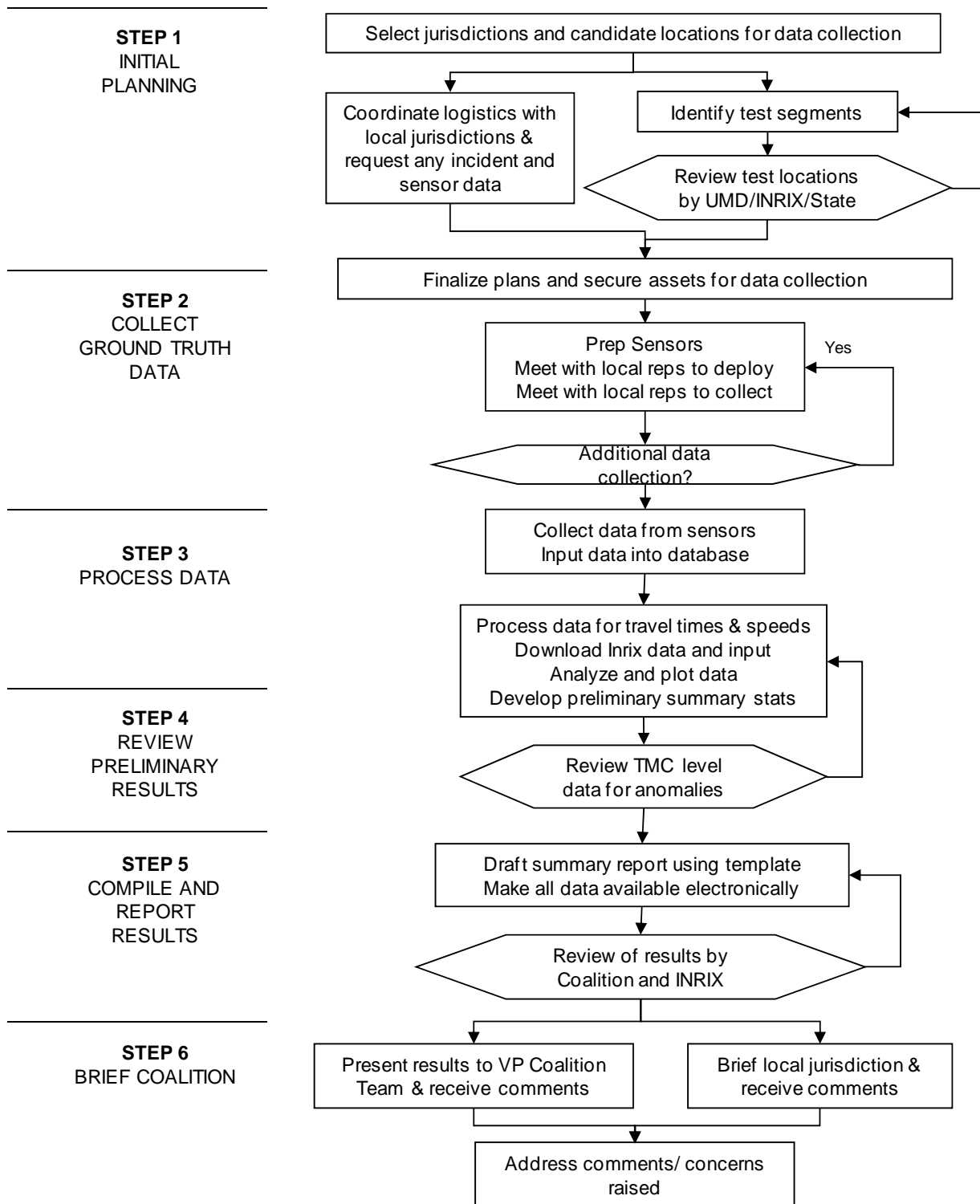
STEP 1
INITIAL
PLANNING

Select jurisdictions and candidate locations for data collection

Coordinate logistics with local jurisdictions & request any incident and sensor data

Identify test segments

Review test locations by UMD/INRIX/State

Finalize plans and secure assets for data collection

STEP 2
COLLECT
GROUND TRUTH
DATA

Prep Sensors
Meet with local reps to deploy
Meet with local reps to collect

Yes

Additional data collection?

STEP 3
PROCESS DATA

Collect data from sensors
Input data into database

Process data for travel times & speeds
Download Inrix data and input
Analyze and plot data
Develop preliminary summary stats

STEP 4
REVIEW
PRELIMINARY
RESULTS

Review TMC level data for anomalies

STEP 5
COMPILE AND
REPORT
RESULTS

Draft summary report using template
Make all data available electronically

Review of results by Coalition and INRIX

STEP 6
BRIEF COALITION

Present results to VP Coalition Team & receive comments

Brief local jurisdiction & receive comments

Address comments/ concerns raised

Figure 1   Flowchart of ongoing validation process

Anticipated Validation Schedule

The above timeline has been applied to ongoing validation activities as of April 2009.

Table 3.   Ongoing Validation Schedule – as of April 14, 2009

Month and Year	State / Location	Ground Truth Data Collection [By mid-month]	Data Processed and Preliminary Results Ready for Review [By end of Month]	UMD Review	INRIX Review	Publish [+ 2 weeks]	State Briefing [+ 2 weeks]
				[+ 2 weeks]			
Oct-08	North Carolina	*Oct 24-30 2008*	*15-Feb-09*	*1-Mar-09*	*3-Apr-09*	17-Apr-09	1-May-09
Nov-08	Central Virginia	*Nov 18 - Dec 1, 2008*	*15-Feb-09*	*1-Mar-09*	*1-Mar-09*	15-Mar-09	29-Mar-09
Feb-09	Delaware	*Feb 3 - 14, 2009*	*13-Apr-09*	*22-Mar-09*	27-Apr-09	11-May-09	25-May-09
Mar-09	Maryland	*March 2 - 11, 2009*	*3-Apr-09*	17-Apr-09	17-Apr-09	1-May-09	15-May-09
Apr-09	Northern NJ	4/15/2009	30-Apr-09	14-May-09	14-May-09	28-May-09	11-Jun-09
May-09	Northern Virginia	5/15/2009	31-May-09	14-Jun-09	14-Jun-09	28-Jun-09	12-Jul-09
Jun-09	Southern NJ	6/15/2009	30-Jun-09	14-Jul-09	14-Jul-09	28-Jul-09	11-Aug-09
Jul-09	NC	7/15/2009	31-Jul-09	14-Aug-09	14-Aug-09	28-Aug-09	11-Sep-09