TRANSMIT - TRANSCOM'S SYSTEM FOR MANAGING INCIDENTS AND TRAFFIC

Tom Batz, TRANSCOM
Richard Newhouse, New York State Thruway Authority

ABSTRACT

TRANSMIT, TRANSCOM's System for Managing Incidents and Traffic, has been installed on approximately 19 miles of the New York State. Thruway and the Garden State Parkway in New Jersey. This system is an FHWA funded operational test to determine if Electronic Toll Traffic Management (ETTM) technology can be used for traffic surveillance and incident detection applications. It appears from preliminary output that TRANSMIT is operationally feasible and exhibits the potential for expansion throughout the New York/New Jersey/Connecticut metropolitan region as a very important tool for and use in transportation management.

INTRODUCTION

The TRANSCOM System for Managing Incidents and Traffic (TRANSMIT) was initiated to establish the feasibility of using Electronic Toll and Traffic Management (ETTM) equipment for traffic surveillance and incident detection applications. ETTM technology offers the potential for using vehicles equipped with toll tags to serve as vehicle probes within the traffic stream of the area for which surveillance is being established. It requires the installation of readers, similar to those used for toll collection, at periodic intervals along the roadway with each reader having the capability of identifying the "tagged" vehicles.

The operational test of TRANSMIT covers a 19 mile section along the New York State Thruway and the Garden State Parkway in New Jersey. It builds upon the New York State Thruway's use of the ETTM technology for automatic toll collection at their Tappan Zee, Spring Valley, Yonkers, and Harriman toll plazas. At the present time over 60,000 vehicles are equipped with the tags for this purpose and can be used in this operational test to determine speeds and travel times. Seventy to seventy five percent of the Tappan Zee Bridge's am rush hour transactions are made by EZ-Pass customers. Because of this use for toll collection, on a normal weekday, approximately 250,000 reads a day are received by the TRANSMIT system.

SYSTEM CONFIGURATION AND OPERATION

The field installation was completed in January of 1995 and included the installation of antennas and readers along the two highways at one to one and a half mile spacings. This spacing between readers was selected to maximize the probability of incident detection by minimizing the false alarm rate (maximum of 2%) and the mean time to detect an incident (maximum of 5 minutes). Twenty two locations were included in the project with a total of 65 antennas utilizing three types of mounts: placed between girders on over passes and attached to overhead sign bridges and light standards. The tags are typically attached to the wind shield behind the rear view mirror with removable velcro strips. When a vehicle with the tag passes an antenna, a signal is sent to the roadside equipment which scrambles the tags ID to make sure that the vehicle's privacy is assured and then sends it by modem over leased telephone lines (along with date and time) to the system center at TRANSCOM. In this way, a centralized architecture is used in which each field equipment configuration collects data from its local antennas and formats the data for transfer to the central computer. The process results are then transmitted to the New York State Thruway Authority and the New Jersey Highway Authority, who have operational responsibility for the two roadways.
Figure 1 shows the tag data as it is received on the workstation at the TRANSCOM center. Starting at the left you have the scrambled ID of the tag itself, then the date and time that vehicle was read. Next is the location of the antenna where that tag was read. 1 thru 28 are northbound locations while 101 thru 128 are southbound locations. Also shown is the antenna ID that will identify the lane in which the vehicle travelled.

Figure 2 depicts the main display of the system. It shows the area covered which extends from the south

near the Hillsdale toll plaza of the Garden State Parkway, heads north up the parkway to the Thruway and then along the Thruway from the Spring Valley Toll Plaza on the left, south to the Tappan Zee Toll Plaza on the right hand side of the map. The triangles represent the 22 antenna locations. The symbols which look like lollipops represent the sections between the antenna locations. These sections turn color, based on the average speed. For example it would be green until the speed drops to 50 mph. At that point, it will turn yellow. If speeds drop to 30 mph in this roadway section, it will turn red. These lollipops will also represent incidents recorded by the system. The lollipop would first change from their normal blue color to yellow to show that an alarm for that section of roadway has been signalled. Once it is verified as an actual incident, the lollipop will turn red until that incident is cleared, at which point it will revert to its original blue color. An option of zooming in or out on a particular part of the map also exists on this screen.

The most important information that the system produces is seen in Figure 3. It's the data for a particular section. It shows the location, for example in this case, link 26, which is southbound on the NYSTA between mileposts 19.5 and 17.9, a distance of 1.5 mile. It gives historical travel time in 15 minute intervals for specific types of days (weekdays, weekends and holidays) along with the current actual travel time and speed which is based on the last 10 vehicles that passed the end point in the section. It also gives the time in which those 10 vehicles have been read.

It also provides data on the number of non arriving vehicles which the system uses for incident detection. When a vehicle does not arrive within a specified time (three standard deviations of the average travel time), the system records it and increases the confidence level on the incident thermometer to the right. The more vehicles that are late, or the longer the time the vehicles do not arrive, the higher the confidence level. When this level gets to a user defined threshold the system triggers an alarm alerting the operator that there may be incident. The operator would then pull up this screen, analyze the data, and determine whether to call the Thruway or Parkway personnel to verify the incident at that location.

When an incident occurs, an operator can go in at any time and update the information about the incident. Figure 4 displays this edit screen. It includes the source of the information, the type and status of the incident, the time and date of the start of the incident, the estimated end time and date for the incident, the primary link involved as well as any related links, the number of lanes closed, and finally an alphanumeric description of the incident in the box on the right.

Finally, TRANSMIT maintains an historical data base. Figure 5 shows the historical data base for section 26 for the time period from 6:OOam - 7:OOam divided into 15 minutes periods. It gives you the average number of tags read for the period, the average speed for the period, and weighing factor for the historical data base. This data can also be produced for a specific type of day, that is, weekday, weekend day or a specific holiday.

The TRANSMIT System is seen as another tool that transportation operating agencies in the New York, New Jersey, Connecticut metropolitan area can use to better manage traffic and reduce delays on their roadways , while improving safety.

FUTURE DIRECTIONS

The TRANSMIT system offers significant opportunities for future growth. This growth can include geographic expansion to cover additional roadways within the greater metropolitan area, as well as modal expansion to transit vehicles to obtain up to the minute data on vehicle location and expected arrival times. Additionally, it can include functional enhancements such as the use of ETTM data for the derivation of O-D patterns, route selection, as well as the estimation of traffic volumes as the percentage of tags in the traffic flow stabilizes. Finally, perhaps one of the most significant areas of future expansion is the system's potential for supporting future two-way communications between the roadside and the vehicle. ETIM technology represents aunique opportunity for the synergistic use of a single technology for both toll collection and traffic management applications.

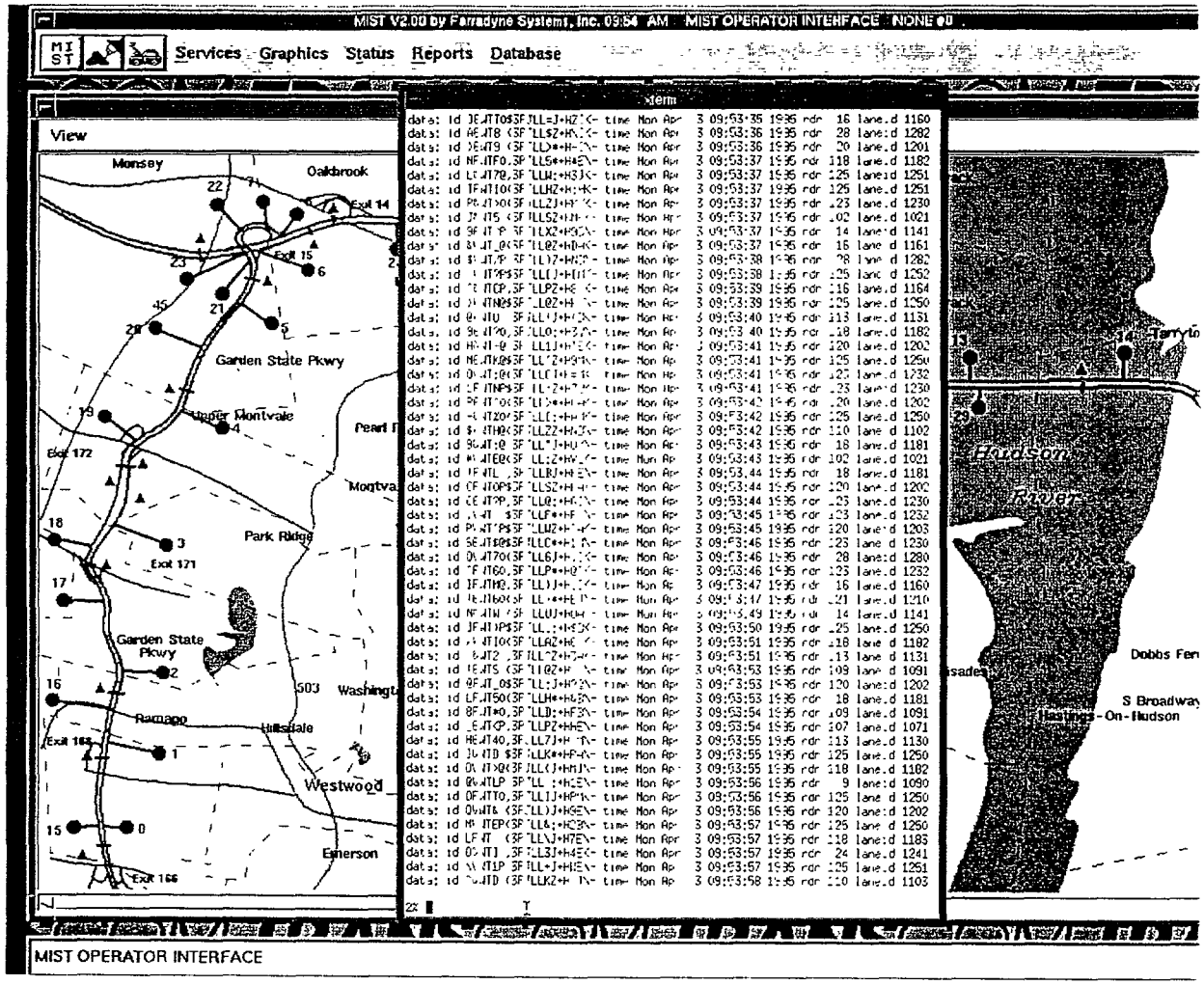

Fig.1 - Scrambled Tag Data

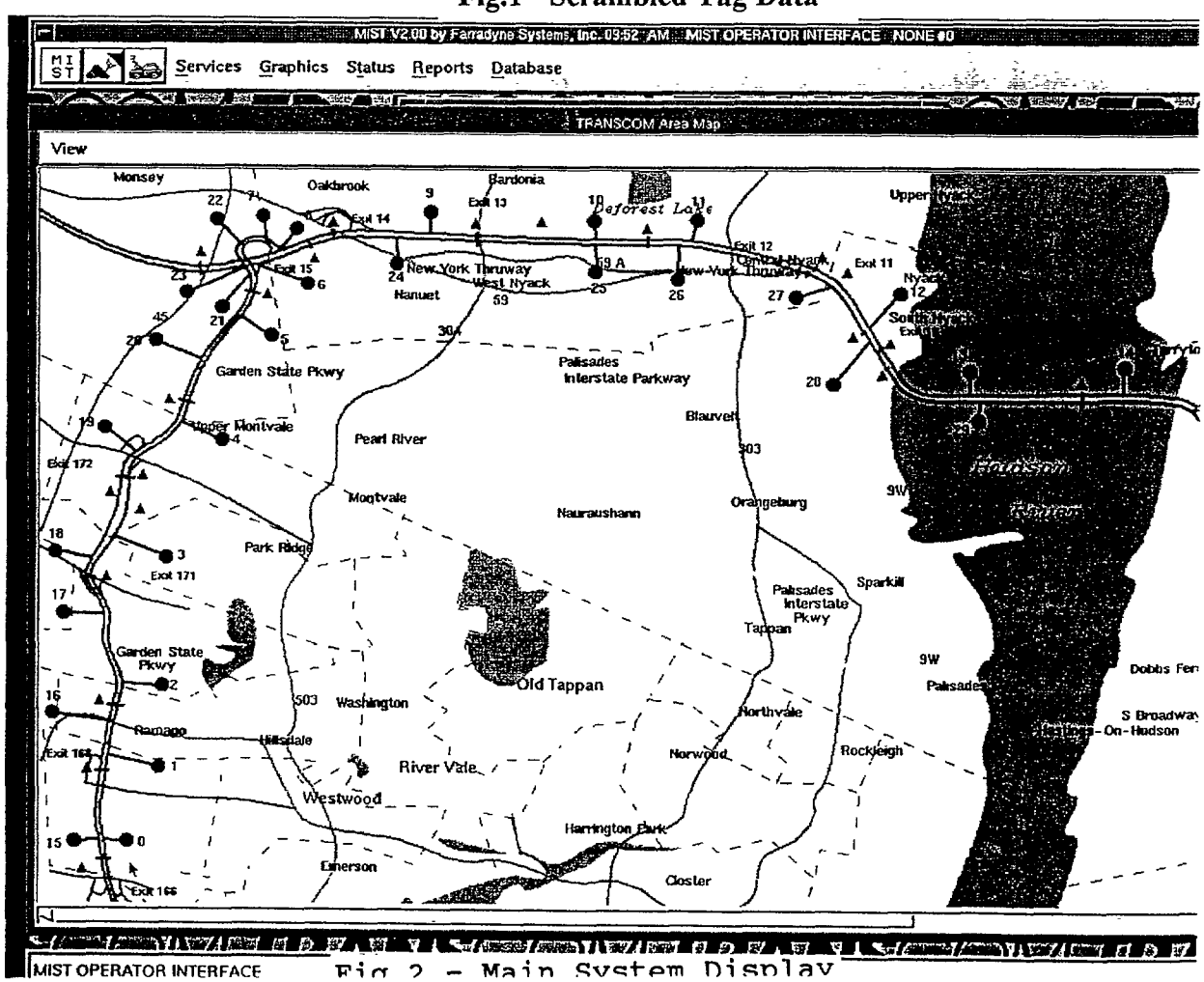

Fig.2 - Main System Display

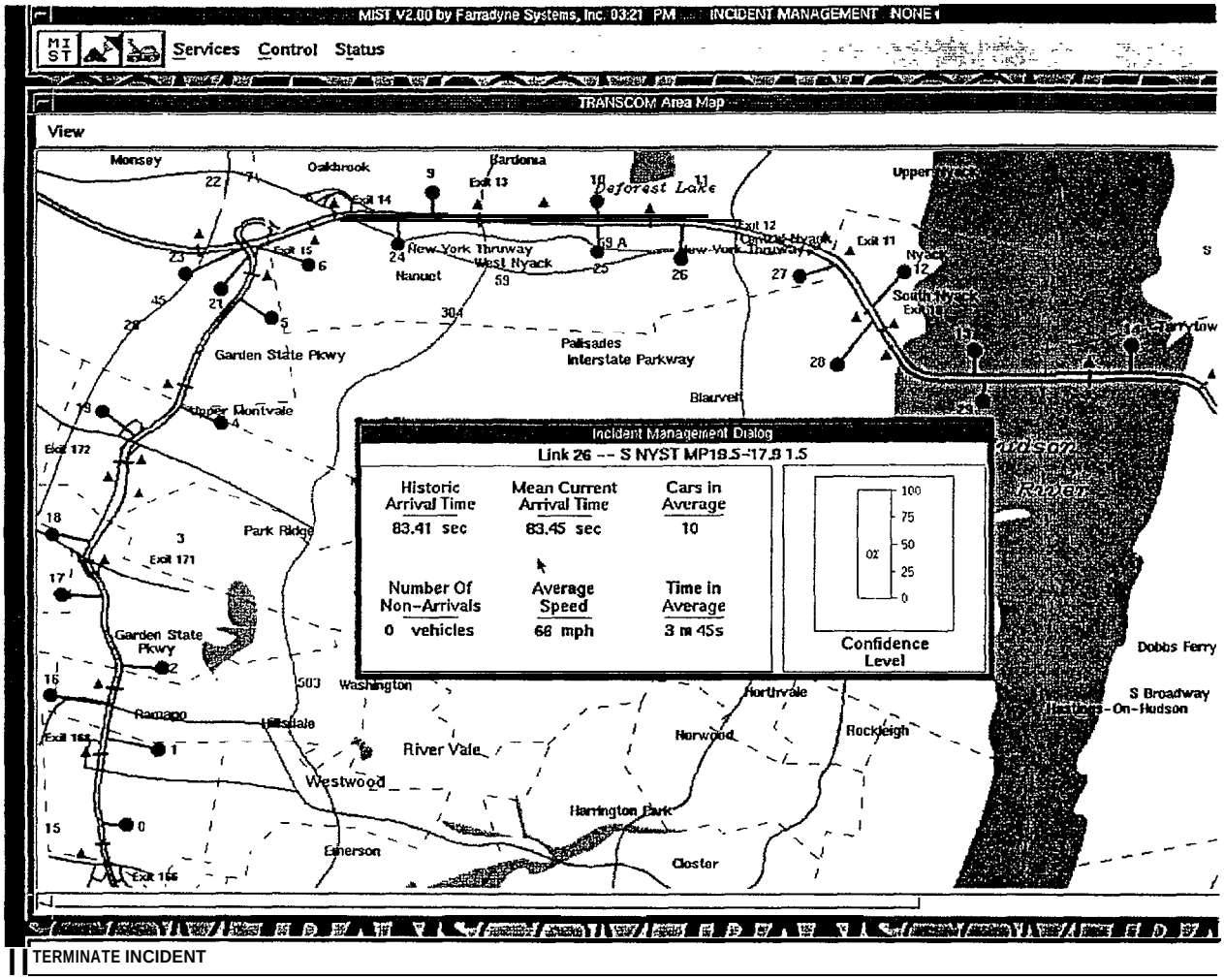

Fig.3 - Section Data

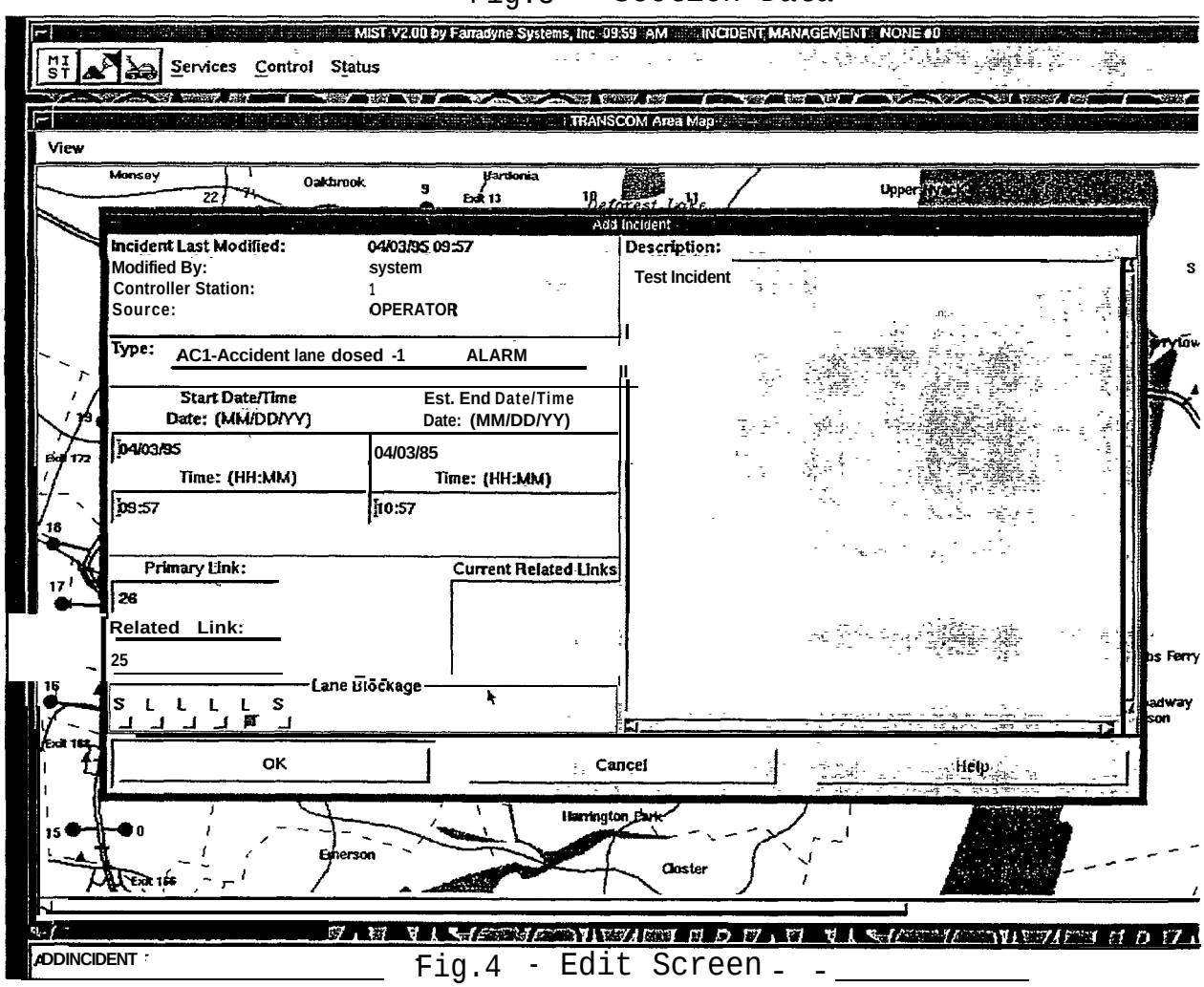

Fig.4 - Edit Screen

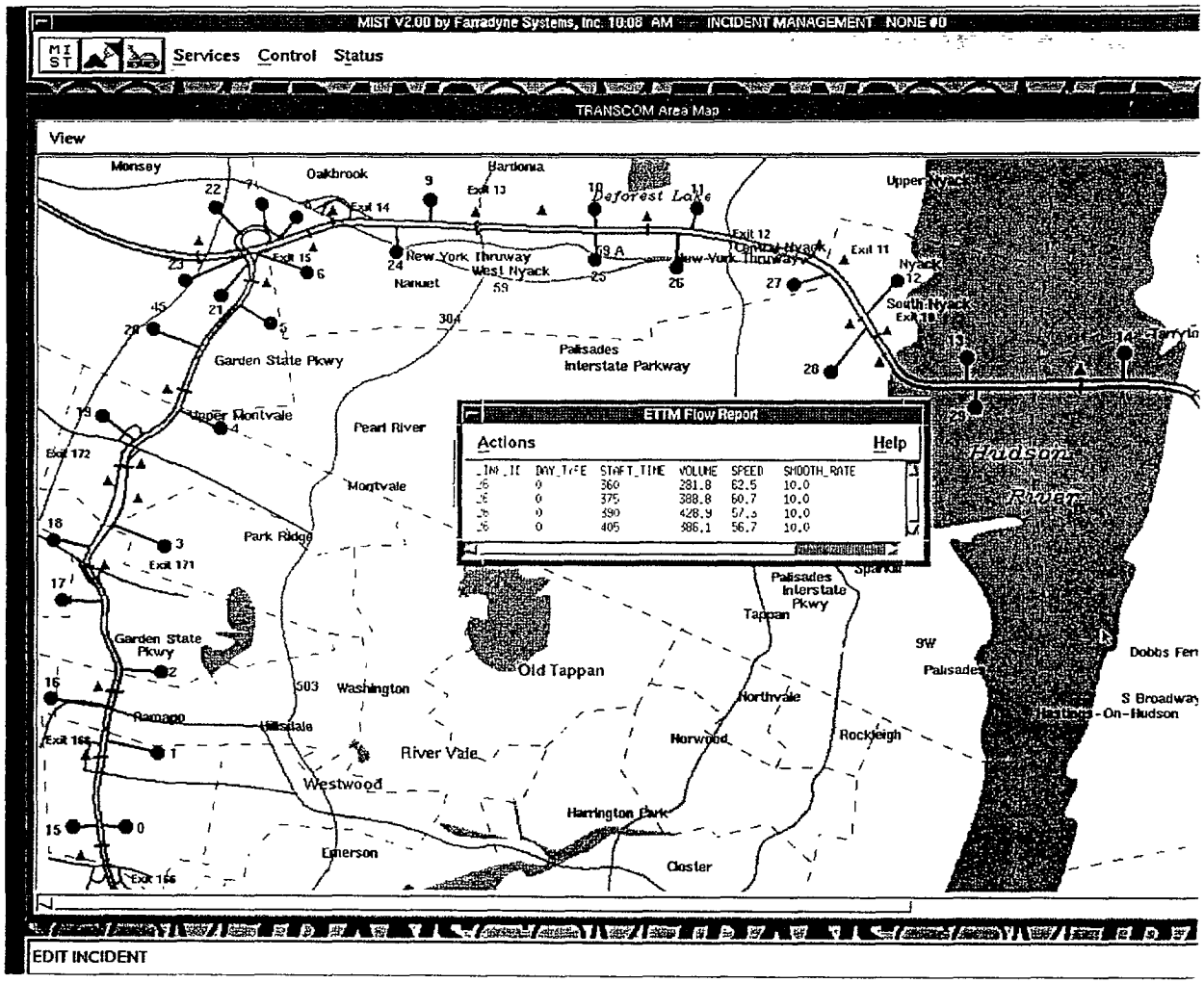

Fig.5 - Historical Data