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16. Abstract

The primary purpose of this research was to assess the needs and logistics associated with the development of a multi-source, multi-use travel speed database. Data were, consequently, collected and/or analyzed for ultimate use in the TransGuide Advanced Transportation Management system (ATMS) area-wide database. The travel speed data used to populate the database fall into the categories of: 1) ATMS loop detector data; 2) Automatic Vehicle Identification (AVI) data; 3) Global Positioning System (GPS) data via travel time runs; and 4) theoretical data.

The theoretical data were the product of a statistical analysis of travel speed data and respective roadway geometric and operating characteristics associated with over 2,000 GPS-based travel time runs conducted on arterial roadways in the San Antonio urban area. A predictive algorithm was successfully developed using a tree-based regression methodology to formulate the theoretical data. These data generally apply to low-speed, low-volume arterials which experience limited recurrent congestion. Adjustment factors for incidents and varying operating conditions (e.g., rain vs. no rain, peak vs. off-peak operations, etc.) were also examined. It was, however, determined that these additional factors could not be adequately analyzed due to sample size limitations.

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ASSESSMENT OF TRAVEL CHARACTERISTICS REQUIRED FOR THE DEVELOPMENT OF AN IN-VEHICLE ADVANCED TRAVELER INFORMATION SYSTEM

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Sponsored by the
Texas Department of Transportation

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IMPLEMENTATION STATEMENT

The primary goal of this study was to examine data needs associated with the development of a multi-purpose database to be used for the Advanced Traveler Information System (ATIS) component of a traffic management center. The TransGuide System in San Antonio was used as the case study for development and analysis purposes.

The specific approach utilized in the TransGuide System development and analysis consisted of incorporating travel speed data from several sources into one common database. The sources of speed data specifically consisted of: 1) loop detectors from the TransGuide Advanced Traffic Management System (ATMS); 2) Automatic Vehicle Identification (AVI)-based voluntary vehicle probes; and 3) Global Positioning System (GPS)-equipped vehicle probes. The development of an integrated, multi-source and multi-use database was successfully accomplished. The specific procedures and results documented herein should be valuable to other urban areas around the state and nation which are in varying stages of planning and/or implementation of ATMSs.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation, nor is it meant for construction, bidding, or permit purposes. This report was prepared by Jennifer Ogle, Shawn Turner (Texas certification 82781), Joseph Baumgartner, and Russell Henk (Texas certification number 74460).

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I. INTRODUCTION

In October of 1996, San Antonio, Texas was selected as one of four metropolitan areas to participate in the Federal Highway Administration's Model Deployment Initiative (MDI) program. This selection was due in part to TransGuide--San Antonio's extensive Advanced Traffic Management System (ATMS), an Intelligent Transportation System (ITS) that has been in operation since July 1995.

At the time that San Antonio was selected as a model deployment city, the TransGuide ATMS collected travel speed information on approximately 42 center-line kilometers (26 center-line miles) of San Antonio freeways and was being expanded to cover 44 additional kilometers (27 miles) (Figure 1). Through the MDI program, TransGuide is adding an Automated Vehicle Identification (AVI) system and a database of historical travel speed data, which is based on measurements taken with Global Positioning System (GPS) receivers. These additions will expand the coverage to approximately 966 kilometers (600 center-line miles).

In addition to these new travel speed data collection systems, several Advanced Traveler Information Systems (ATIS) are being added as well. These include traveler information kiosks, in-vehicle navigation units, a real-time operations map, and an enhanced World Wide Web page and low-power television system.

In order to accommodate these additional data sources and computer systems in the TransGuide environment, the Texas Transportation Institute (TTI), in partnership with Southwest Research Institute, developed a comprehensive information system to collect, maintain, and distribute a variety of traffic and travel-related data. This effort resulted in the development of a data repository, the San Antonio Travel Speed Areawide Database, and a software application, the MDI DataServer, which provide a centralized information system for the collection and distribution of data within the TransGuide environment.

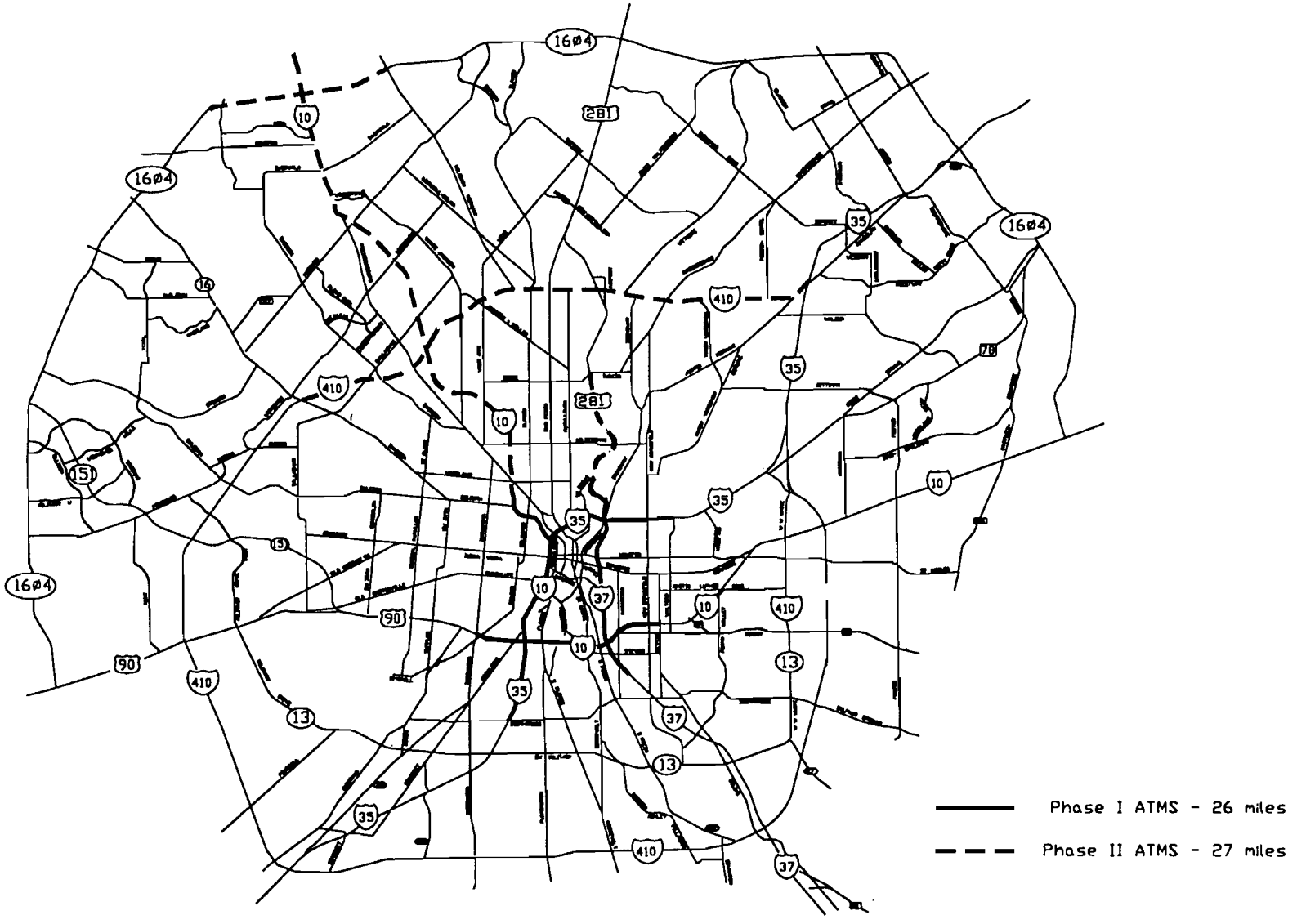

Figure 1. ATMS Coverage

The MDI Data Server is responsible for managing a variety of data including travel speeds, traffic incidents, weather conditions, public transit routes, and equipment status. The system currently collects data from the TransGuide ATMS, the MDI Automated Vehicle Identification system, a historical database of travel speed data, VIA Metropolitan Transit System, the San Antonio International Airport, a road closure database, and the San Antonio Police Department. Data are currently distributed to a variety of system components, including the TransGuide Operations Real-Time Map, the MDI Traveler Information Kiosk system, the MDI In-Vehicle Navigation system, the TransGuide Low-Power Television station, and the TransGuide World Wide Web page.

The San Antonio Areawide Travel Speed Database is the central repository for the travel speed data within the data server. A large part of the effort in the development of the database revolved around the issues of collecting, maintaining, and distributing large quantities of rapidly changing travel speed data.

This Areawide Travel Speed Database was developed in order to optimize the effectiveness of the various ATIS systems. Unlike the majority of commercially available navigational databases which use static estimates of speed, the San Antonio Areawide Travel Speed Database contains up-to-the-minute speed information obtained from approximately 1600 loop detectors and 53 AVI receiver/transmitter stations located around San Antonio. This effort creates the foundation for the ATIS by allowing the utilization of real-time data to provide accurate route guidance, and more importantly, aiding the motoring public in selecting the most time-efficient route for their desired trip.

This report documents the alternatives that researchers considered in developing a system to collect and disseminate real-time and historical travel speed data from a variety of sources. Detailed data descriptions, data storage requirements, and data transmission issues are also discussed, and the benefits of this approach are considered.

II. SYSTEM ARCHITECTURE

The design of the system architecture within the TransGuide environment was an important consideration for two reasons. First, through the MDI program, several new systems had to be integrated without disturbing the existing ATMS system. Second, with the rapid changes in ITS technology, provisions had to be made to accommodate the addition of new systems in the future.

One possible architecture would be a completely distributed system, where data consumers (or systems that need traffic and travel data) request the data directly from the data generators (i.e., the systems that produce the data). This architecture is depicted in Figure 2.

Figure 2. Completely Distributed Architecture

While this type of architecture is certainly plausible, it has several disadvantages. First, every system must develop a separate interface with every other system. Second, adding new systems in the future becomes increasingly difficult because changes must be made to each system to accommodate the new interface.

A more efficient architecture, and the one chosen for the TransGuide information system, is a distributed system with a centralized data repository. This system is depicted in Figure 3. The centralized repository reduces the total number of interfaces by providing a single interface for each subsystem. Another benefit is that future subsystems can be added by making a modification to the central repository. Other subsystems do not have to be modified.

Figure 3. Distributed System with Centralized Repository

Data Server

The information system presented in this report follows the architecture depicted in Figure 3. The TransGuide Data Server, which is the central server, collects the information from the data generators, stores the data in the San Antonio Areawide Database, and supplies the data to data consumers.

The DataServer must interface with a variety of systems. These are depicted in Figure 4, which shows a graphical representation of the DataServer environment with the data generators and data consumers of the TransGuide system. The data generators include the TransGuide ATMS and the MDI AVI system which can be accessed to obtain real-time travel speed data, and the GPS and Theoretical travel speed database systems which generate travel speed data by time of day. Data generators that are not related to the areawide travel speed database are also shown and include: bus information, airport information, police reports, and the road closure database. The figure also shows several data consumers including the traveler information kiosk, in-vehicle navigation, and World Wide Web server (WWW), which all use travel speed data in different ways. These systems are discussed in more detail in the following sections.

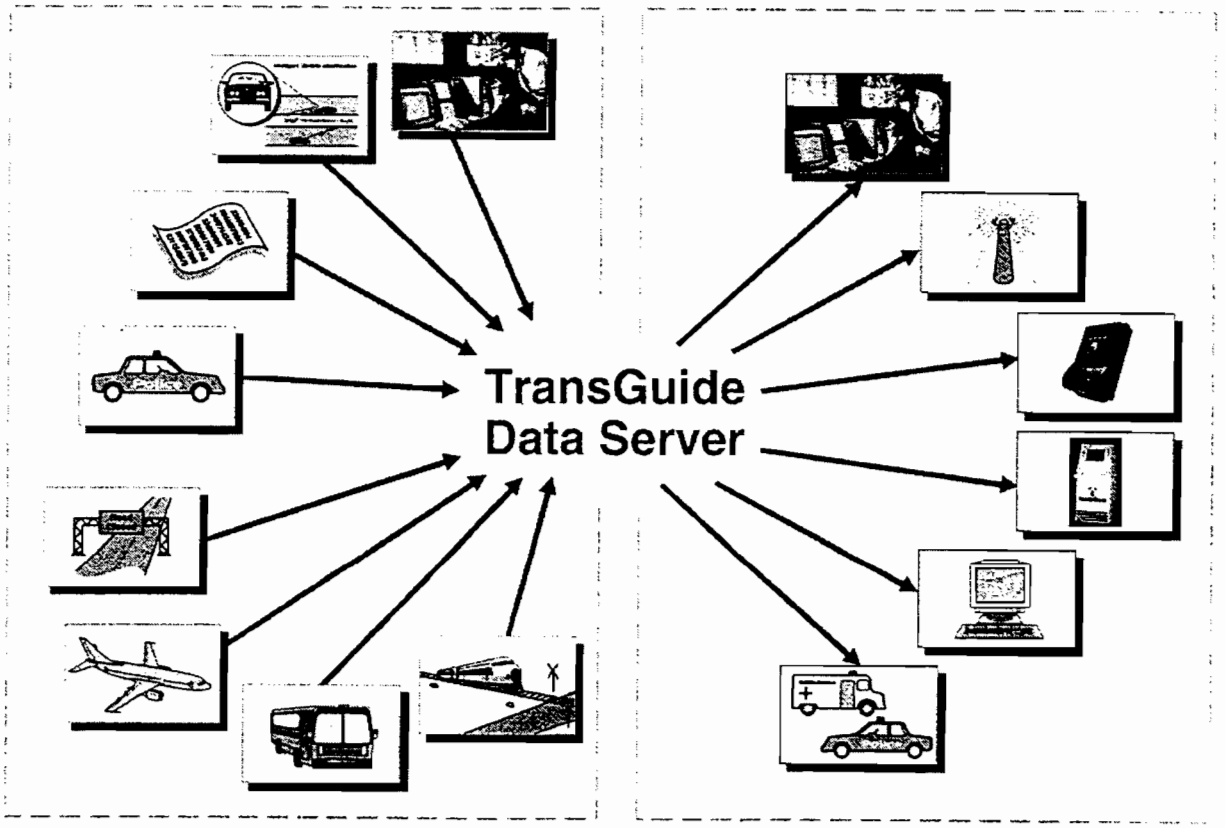

Figure 4. Data Generators and Data Consumers

Data Consumer Requests

It is estimated that the Data Server will receive between 500 and 1,000 data requests each second. To determine the most effective way to accommodate this demand, researchers investigated several data storage techniques in the design phase of the Data Server system. One option would be to use a traditional database management system (DBMS) as a data storage mechanism. However, due to the volume of requests, the need to respond as rapidly as possible, the real-time dynamic nature of the data, and the cost to purchase and maintain a DBMS, the research team determined that a DBMS would not be the best solution. Therefore, the Data Server is implemented as a memory-based application in which the only data available for retrieval are the most recent data. Data can still be archived so that it can later be loaded into a database for analysis and post-processing.

To provide a robust and consistent interface to data generators and consumers, the Data Server provides several Application Program Interfaces (APIs) which are used to access the Data Server. These interfaces, which were implemented in the form of software libraries, allow data generator and consumer applications to easily issue requests to store or retrieve data to the Data Server.

Data Transmission System

In the TransGuide operational environment, it is common to have at least 15 different data consumers active at any one time. This includes the FM Subcarrier Traffic Information Channel (STIC) transmission as well as the map that is displayed on each ATMS operator workstation. If each of these clients independently requested data from the Data Server, the Data Server would quickly be overwhelmed by requests. Since these requests are for the same data (i.e., travel speed data, incident data), a more efficient data transmission paradigm needed to be established.

To satisfy the requirement of efficiently distributing the large amounts of real-time data, a *"real-time broadcast"* subsystem was developed. This subsystem extracts the real-time data from the Data Server and encapsulates it into a packed-byte TCP/IP broadcast package. Using this mechanism, all of the TransGuide MDI real-time data can be compressed to approximately 3,100 bytes. This data package is broadcast once every five seconds over the TransGuide operational network. A program on each operator's workstation receives the data and decompresses it into its full format. This real-time broadcast system allows the TransGuide maps to be updated every five seconds and minimizes the overall Ethernet traffic required to communicate the real-time data to all active consumers.

To disseminate information to remote systems like the kiosks and In-Vehicle Navigation (IVN) units, it is necessary to use a wireless medium. A technology called FM STIC is employed that takes the real-time data broadcast of the Data Server and attaches it to the subcarrier signal of an FM radio broadcast. FM STIC receivers in each kiosk and IVN unit receive the signal and convert it into a data stream that can be processed by the unit. This is depicted in Figure 5 which shows the data being sent to the FM STIC system and then broadcast over the FM subcarrier to the IVN unit.

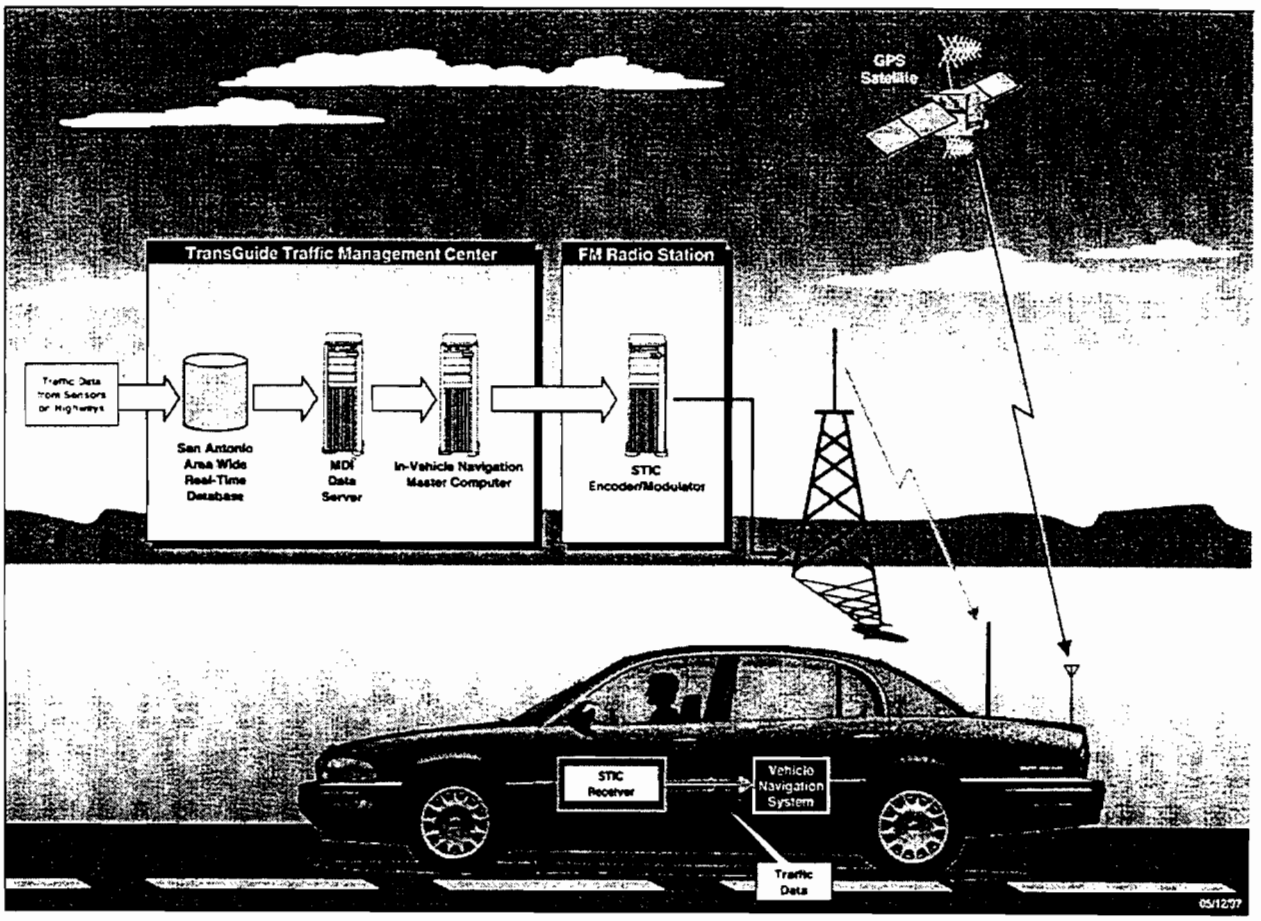

Figure 5. FM STIC Broadcast Scheme

III. TRAVEL SPEED DATA GENERATORS

Although the San Antonio Areawide Database must store a variety of travel-related data, one of the most important functions of the database is to store real-time travel speed data. These data come from a variety of sources including:

- TransGuide ATMS—real-time travel speed data collected from loop detectors;
- AVI System—real-timetravel speed data collected by sensors that detect tagged vehicles acting as probes;
- GPS Data System—a historical database of travel speeds compiled by making travel time trips in differential GPS-equipped vehicles at scheduled intervals; and
- Theoretical Data System—a historical database extrapolated from the GPS data through a decision matrix based on common roadway characteristics.

Together, these data sources make up a network of over 969 kilometers (602 miles) of travel speed data (see Figure 6). These data are continuously written to the San Antonio Travel Speed Database and distributed to the data consumers for use in ATIS applications. Each of these data sources possesses its own unique characteristics which were considered in developing the central repository. These characteristics are discussed in more detail in the following sections.

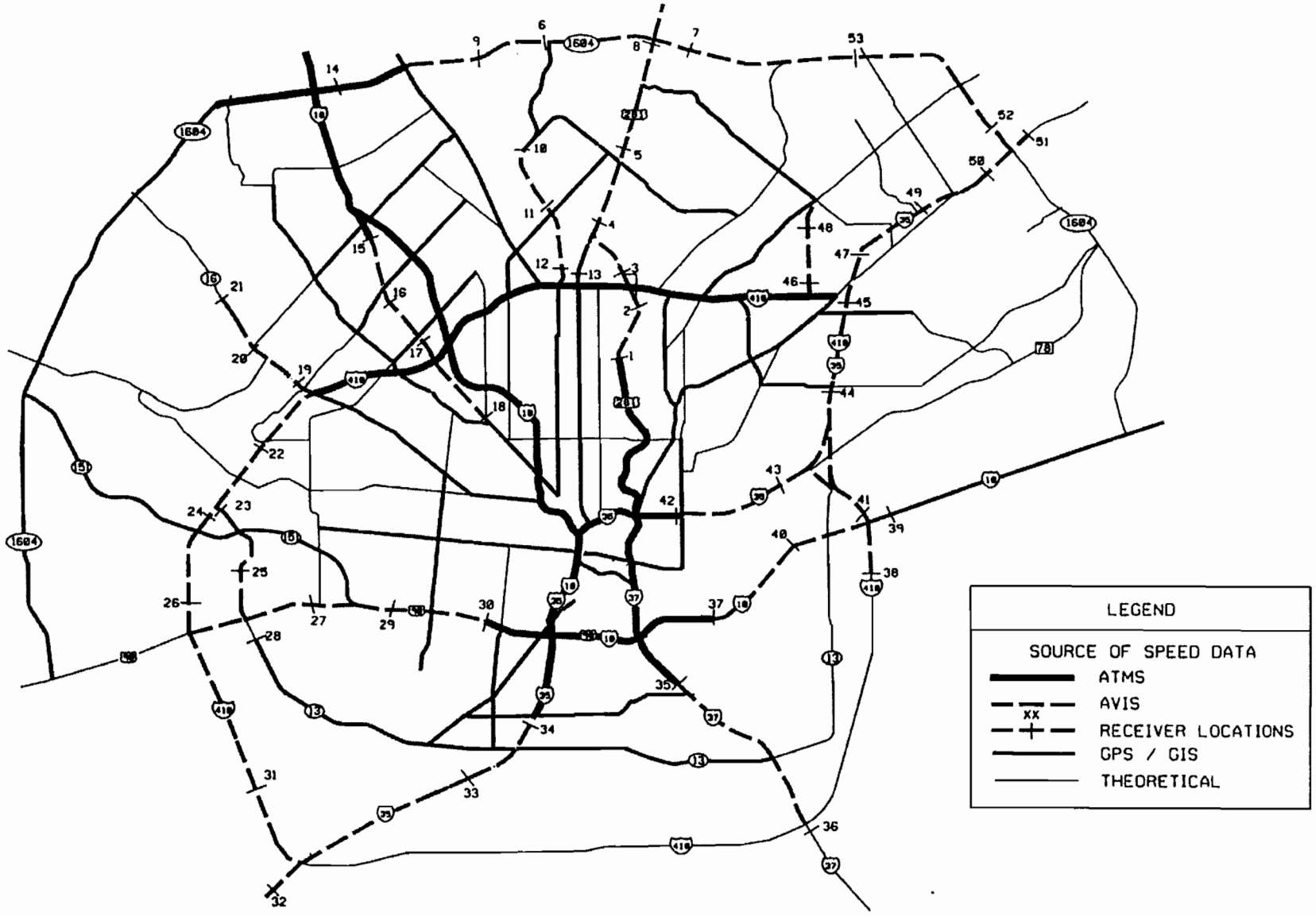

Figure 6. Travel Speed Data Source Inventory

Coverage vs. Segmentation

After segmenting the 969 kilometers (602 center-line miles) of coverage, the system consists of 1,426 directional link segments. During system design, the number of links had to be limited in order to allow the final transmission system protocol to be developed. The transmission system uses the aforementioned sub-carrier radio frequency which is limited in bandwidth. In a situation with more than 1,500 TransGuide links, the transmission would have to be broken into two separate transmissions. Thus, the updating of the link travel speeds in an in-vehicle navigation system would take twice as long.

The differing sources of speed information required different segmentation methodologies and ultimately produced varying length vs. link ratios. The following table shows the data source type, and the number and length of directional links in the current TransGuide system.

Table 1. Coverage Type vs. Number of Links

Coverage Type	Length, kilometers(miles)	# of Directional Links
TransGuide ATMS (real-time)	96 (60)	240
AVI (real-time)	158 (98)	103
GPS (historical)	238 (148)	465
Theoretical (historical)	477 (296)	618
TOTAL	969 (602)	1,426

Link Identification

In order to uniquely name each link in the TransGuide system, a naming convention was established. The source roadway sections were broken down into "link" segments using methodologies appropriate for the corresponding data types. Each directional link was given a unique ID that

describes the data type, direction of travel, roadway name, and closest cross-street or mile-marker information. Since the original TransGuide ATMS used 19 character link names, this convention was continued in order to avoid a costly overhaul of the existing ATMS software. The format of the link ID follows:

ABCCCCC-DDDDD-EEEEE

where, A = type of data (I = AVI, G = GPS, T = Theoretical)
B = direction of travel (N = North, S = South, E = East, W = West)
C = first five letters of the roadway name (e.g., Milit = Military Hwy)
D = first five letters of the northernmost or easternmost cross-street, and
E = first five letters of the southernmost or westernmost cross-street.

An example would be:

GNCALLA-BABCO-0010I

which would represent a GPS link, with a northerly direction of travel, on Callaghan between Babcock and Interstate Highway 10.

A standard format was determined for all highway designations and roadways with less than five characters in the name. Also, several roadways in the San Antonio area have similar names, so a street name database was developed to avoid confusion. The following formats were used in these special cases:

- Highway designations

The four characters following the direction will determine the highway being identified:

0035 = IH 35

0010 = IH 10

0281 = US 281

1604 = Loop 1604

The following character will represent the type of highway:

I = Interstate Highway

S = State Highway

U = US Highway

L = Loop

F = Farm to Market

- Roadways with less than five characters in the full name follow the following conventions:

  MILL_ = Mill Road

  9^{TH_S} = 9^{th} Street

  OXBOW = Ox Bow Drive

- Roadways with similar names have been given unique ID names (See Appendix A):

  NWMIL = NW Military Highway

  MILIT = Military Drive SE

The many ATIS components employ a privatized navigation database that uses a link identifier system that is different from the TransGuide link identifier system. Because of this, a translation must be provided to map the TransGuide link identifiers to the navigation database identifiers. Since some of the TransGuide data (i.e., ATMS) are collected at the lane level, the lane-level speed data are aggregated to link-level speed data before they are sent to each ATIS component. This is done by combining the lane speeds into a link speed using the volume of each lane to compute a weighted average of the lane speeds.

IV. ADVANCED TRAFFIC MANAGEMENT SYSTEM

The ATMS currently monitors 42 kilometers (26 miles) of highway in the San Antonio area using loop detectors. The system is planned to cover an additional 43 kilometers (27 miles) by late 1998 and will employ a mix of sonic and loop detector equipment. The detectors of the ATMS are spaced approximately every 0.8 kilometer (½ mile) and collect speed, volume, and occupancy data for each lane of highway. The ATMS software polls the detectors every 20 seconds to collect their data and computes a two minute rolling average of the speed for use in the ATMS.

Coverage

The Texas Department of Transportation (TxDOT) determined the placement of the ATMS loop sensors. From the start of the database development, 42 kilometers (26 miles) of sensors were already in place, and the 43 kilometers (27 additional miles) were already under contract for installation (see Figure 1). The system covers the mainlanes of the freeway, as well as the entry and exit ramps.

Link Segmentation Methodology

The ATMS link sections are dependent upon the location of the data collection equipment in the field. The ATMS loop sensors are located on every lane at approximately 0.8 kilometer (half-mile) intervals. The ATMS links are defined from a node just prior to a loop sensor speed trap to a node upstream just prior to the next loop sensor speed trap (see Figure 7). The speeds determined by the sensors are more or less considered spot speeds but are used in this application as estimates of link speed.

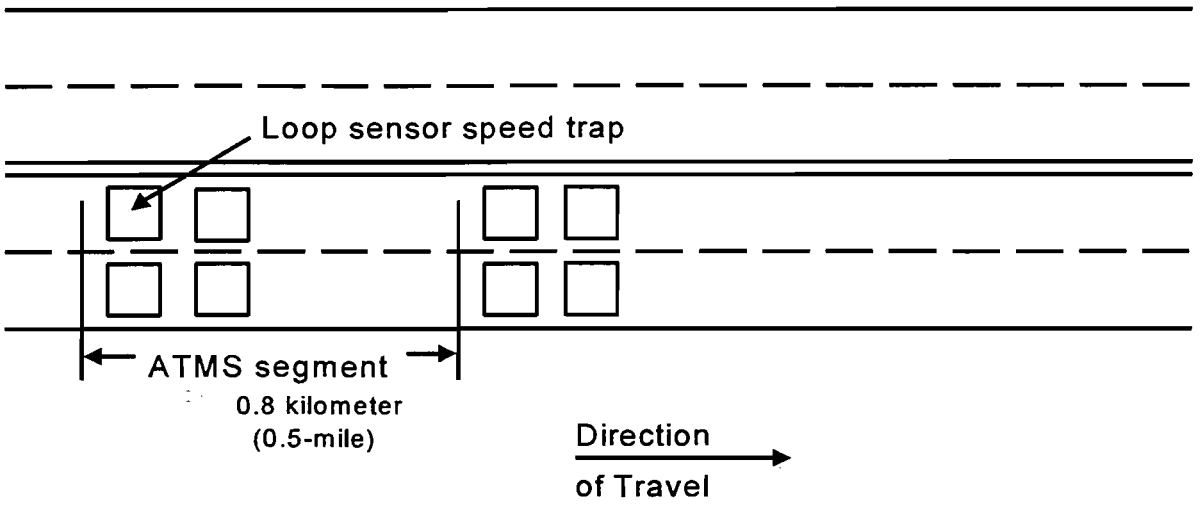

Figure 7. ATMS Link Segment Definition

Data Description

The ATMS polling software computes a two minute rolling average of the speed values for use by the ATMS. The detector data are fed into the ATMS incident detection software and transmitted to the Data Server so that the data can be disseminated to the data consumers. The data that are sent to the Data Server are described in Table 2.

Table 2. ATMS Data Field Definitions

Lane Identifier	the unique TransGuide lane identifier of the segment
Average Speed	a two minute rolling average of the speed
Speed	the actual speed reported by the detector
Volume	the number of vehicles detected since the last poll
Occupancy	the duration that vehicles spent over the sensor
Status	the status of the detector

The speeds are reported by the system on a per lane basis. However, the ATIS systems are only capable of utilizing one speed reading for each directional link segment. For this reason, an algorithm was developed to use the lane volume and average speed readings per lane to calculate a weighted average speed. This allows a single speed reading to be broadcast to the various ATIS components for this link.

Data Archive System of the ATMS

Loop detectors for Phase One are located in every lane and spaced approximately every 0.8 km (0.5 mi). The TransGuide system also includes loop detector stations on all entrance and exit ramps for the 42 km (26 miles) of freeway in Phase One. Each loop detector station on the main freeway lanes is located in a trap, or double-loop configuration, where two loops are spaced about 10 m (30 ft) apart. The first loop detector collects vehicle counts and lane occupancy (e.g., percent of time that the loop is occupied by vehicles). The arrival time difference between consecutive loops is used with assumptions about vehicle length to calculate a spot speed at the loop detector station. Local controller units (LCUs) in the field store and aggregate the collected information, and two computer servers at the TransGuide center poll, or retrieve, the aggregated data from the LCUs in a sequential pattern. The system gathers the following information from each lane loop detector station every 20 seconds:

- average spot speed in kph (mph);
- vehicle volume (number of vehicles); and,
- lane occupancy (percent of time loop is occupied).

An example of the data obtained from each loop detector station is shown in Figure 8. Recent data are posted to a computer (file transfer protocol, or FTP) server at "ftp://www.transguide.dot.state.tx.us/lanedata/", and is available to anyone with Internet access. The TransGuide loop detector data are currently being archived for a number of purposes, although most are related to research at this time. The TransGuide loop detector data files contain a date and time

stamp, a location code, and the corresponding speed, volume, and occupancy measurements. The location code (e.g., L1-0U35N-155.252) consists of three parts separated by a dash:

1. Lane location and designation (e.g., L1):

   L = main freeway lanes, EN = entrance lanes, and EX = exit lanes

   Sequential numbering starts from the median and goes to outside lanes

2. Freeway and direction designation (e.g., 0U35N):

   0010 = I-10 and N = North

   0L10 = I-10, lower deck E = East

   0U10 = I-10, upper deck S = South

   0035 = I-35 W = West

   0L35 = I-35, lower deck

   0U35 = I-35, upper deck

   0037 = I-37

   0090 = US 90

   0281 = US 281

3. Milepost: freeway milepost of loop detector station (e.g., 155.252)

DATE	TIME	LOCATION	SPEED[a]	VOLUME	OCCUPANCY[b]
07/15/97	07:00:03	L1-0L10E-568.241	Speed=75	Vol=009	Occ=007
07/15/97	07:00:03	L1-0U10E-568.248	Speed=64	Vol=007	Occ=005
07/15/97	07:00:03	L2-0L10E-568.241	Speed=63	Vol=006	Occ=006
07/15/97	07:00:03	L2-0U10E-568.248	Speed=72	Vol=006	Occ=004
07/15/97	07:00:03	L3-0U10E-568.248	Speed=57	Vol=006	Occ=006
07/15/97	07:00:04	EN1-0U10E-568.845	Speed=-1	Vol=006	Occ=018
07/15/97	07:00:04	EX1-0U10E-568.764	Speed=-1	Vol=002	Occ=003
07/15/97	07:00:04	L1-0L10E-568.802	Speed=67	Vol=005	Occ=004
07/15/97	07:00:04	L1-0U10E-568.807	Speed=62	Vol=006	Occ=005
07/15/97	07:00:04	L2-0L10E-568.802	Speed=67	Vol=001	Occ=001
07/15/97	07:00:04	L2-0U10E-568.807	Speed=60	Vol=008	Occ=007
07/15/97	07:00:04	L3-0U10E-568.807	Speed=46	Vol=008	Occ=008
07/15/97	07:00:04	EN1-0010E-569.671	Speed=-1	Vol=003	Occ=006

Notes: [a] Speed = -1 means that no speed has been measured (single loop detector).

[b] Occupancy is the percentage of time the loop detector is occupied.

Figure 8. Example of Loop Detector Data from TransGuide

All data from the loop detectors (as well as the AVI system mentioned previously) are being archived in string data, unaggregated format (i.e., in its original form).

V. AUTOMATIC VEHICLE IDENTIFICATION SYSTEM

The AVI system consists of 53 reader sites along highway and arterial roadways. The readers are spaced between 2 and 6 kilometers (1 and 4 miles) apart and cover one or more lanes of the roadway. Each reader site has a sensor that detects vehicle probe tags that are placed on vehicle windshields. When the reader equipment detects a probe tag, it relays the information to the AVI system. The information includes: the reader site identifier, the time the read occurred, and the probe tag identifier. The AVI system collects the tag read data and processes it to match the tags of vehicles as they pass from one reader site to another. Based on these matches, the AVI system computes a rolling average of the travel time and travel speed along the link between the two readers.

Coverage

The original number of AVI receiver/transmitter locations was reduced from 83 (shown in Figure 9) in the original MDI proposal, to 53 (Figure 10) after the award, due to budgetary constraints. At that time, the Texas Transportation Institute was asked to re-evaluate the positioning of the AVI stations and determine optimal locations for the remaining 53 stations. This methodology was also used to determine source coverage for both the GPS and theoretical systems.

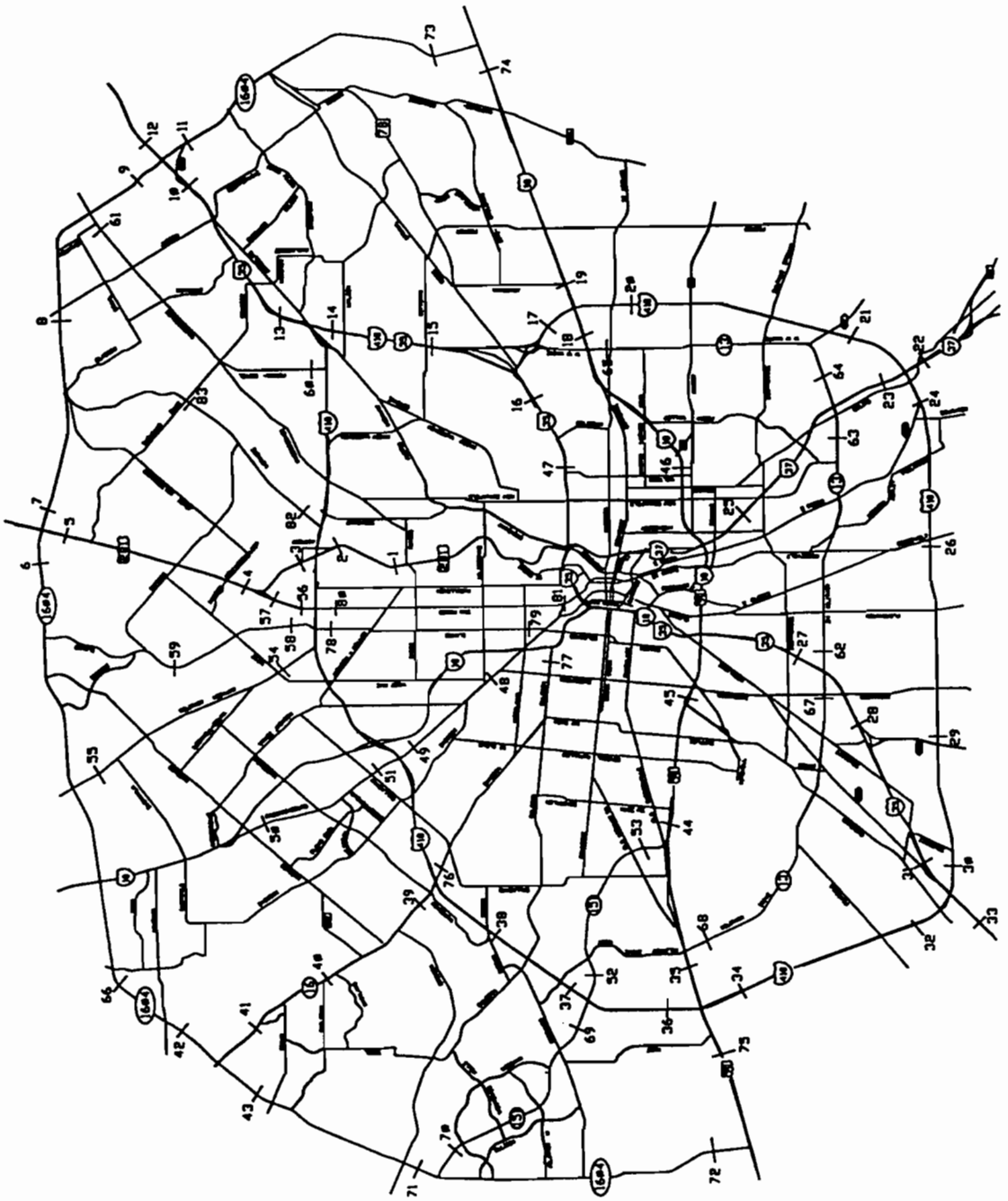

Figure 9. Eighty-three Original AVI Reader Sites

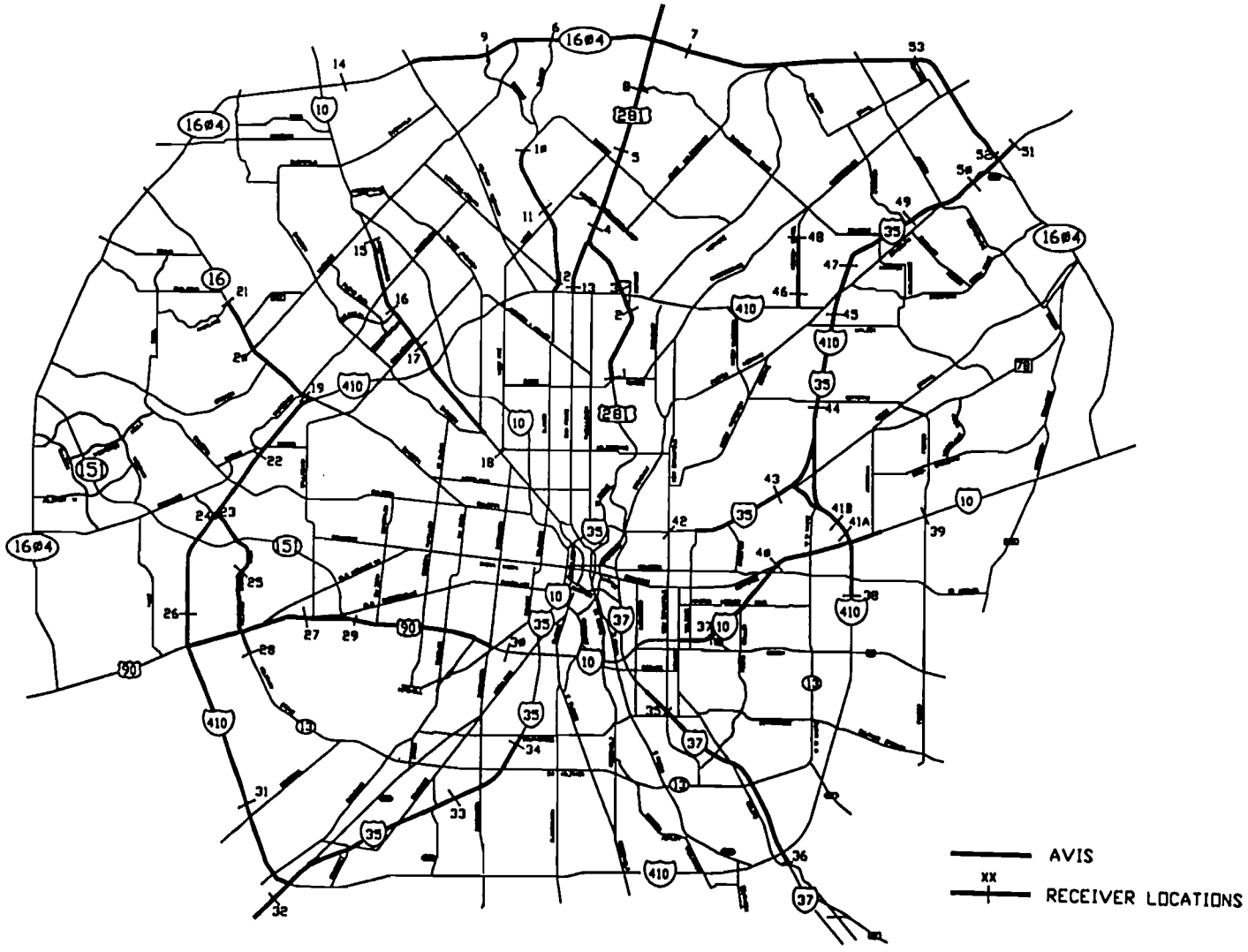

Figure 10. Fifty-three Final AVI Reader Sites

Several information sources were referenced prior to the development of the methodology. Included in these were the *Quantifying Congestion User's Guide*[1] by the Texas Transportation Institute, the San Antonio Metropolitan Planning Organization *Travel Rate Study Technical Memorandum*[2], and a report by Mitretek Systems entitled, *Review of ITS Benefits: Emerging Successes*[3]. The Mitretek report indicated that the majority of AVI system benefits can be obtained by locating receiver/transmitter devices in the most congested locations in an urban area. Specifically, this report concluded that reporting travel times for the most congested links provides 90 percent of the system benefit at a lower cost. Following this suggestion, the roadway segments were prioritized to focus data collection activity on the segments where congestion was most significant. Using a volume-to-capacity (V/C) ratio factor, the roadway segments with the highest congestion were ranked as "high priority."

To maintain adequate and effective coverage with the reduced number of AVI readers, findings from the Mitretek report were applied to the San Antonio Model Deployment effort. In accordance with the report, an analysis was performed to determine where congestion exists on transportation facilities in San Antonio. After earmarking the sites mentioned in the "Travel Rate Study Technical Memorandum," traffic volumes from the TxDOT 1995 District Highway Traffic Map of the San Antonio area were correlated with the proposed AVI reader locations. These traffic volumes were representative of the annual average daily traffic (AADT) volume for a 24-hour period. In order to determine the peak hour traffic volume, peak hour percentages of AADT were taken from the TxDOT 1995 Permanent Automatic Traffic Recorder Station Data and applied to the daily volumes. The determination of relative congestion was based on the ratio of peak hour traffic volume of the roadway versus capacity of the roadway. Capacity was estimated for each AVI station using

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[1] *Travel Rate Study Technical Memorandum.* Department of Planning, City of San Antonio, Metropolitan Planning Organization, 1995.

[2] Lomax, T., Turner, S., and Shunk, G. *Quantifying Congestion: User's Guide.* Draft. NCHRP, TRB, NRC, 1996.

[3] Mitretek Systems. *Review of ITS Benefits: Emerging Successes.* Report FHWA-JPO-97-0001. FHWA, U.S. Department of Transportation, 1997.

information on the total number of lanes in the roadway section and the occurrence of traffic signals, if any. As the peak hour volume approaches hourly capacity, the V/C ratio approaches one, signifying increasing congestion. The resultant V/C ratios represented a macroscopic view used only to show relative estimates of congestion in the San Antonio area in order to methodically determine more effective AVI reader placement locations. These ratios are shown for all 83 original locations in Table 3.

Table 3. V/C Ratios for Original AVI Reader Site Locations

AVI Reader #	Proposed Cut	V/C Ratio
1		0.88
2		0.74
3		0.5
4		0.79
5		0.42
6		0.53
7		0.45
8		0.45
9		0.51
10		0.59
11	Yes	0.28
12		0.59
13		0.76
14		0.96
15		1.13
16		0.87
17		0.73
18	Yes	0.34
19		0.68
20		0.51
21	Yes	0.31
22		0.49
23	Yes	0.39
24	Yes	0.3
25		0.79
26	Yes	0.21
27		0.55
28	Yes	0.28
29	Yes	0.17
30	Yes	0.2
31	Yes	0.23
32	Yes	0.27
33		0.31
34	Yes	0.51
35		0.34
36		0.54
37		0.6
38		0.72
39		0.97
40		0.85
41		0.53
42	Yes	0.19

AVI Reader #	Proposed Cut	V/C Ratio
43	Yes	0.14
44		0.34
45		0.5
46		0.56
47		0.97
48		0.59
49		0.77
50		0.76
51		0.81
52	Yes	0.3
53		0.66
54		0.58
55		0.19
56		0.96
57		0.89
58		0.94
59		0.86
60		1.03
61		0.42
62	Yes	0.46
63	Yes	0.39
64	Yes	0.47
65	Yes	0.34
66		0.28
67	Yes	0.37
68		1.06
69		0.58
70	Yes	0.15
71		0.67
72		0.66
73	Yes	0.26
74	Yes	0.3
75	Yes	0.3
76		0.74
77		0.64
78	Yes	–
79	Yes	–
80	Yes	–
81	Yes	–
82	Yes	–
83	Yes	–

Lastly, the *Quantifying Congestion User's Guide* was used to determine the appropriate linear spacing of the receiver/transmitter stations. A few of the spacing guidelines were:

- Freeway/expressways: high access frequency, 2- to 5-kilometer (1- to 3-mile) segments
- Freeway/expressways: low access frequency, 5- to 8-kilometer (3- to 5-mile) segments
- Arterial streets: high cross-street and driveway frequency, 2- to 3-kilometer (1- to 2-mile) segments
- Arterial streets: low cross-street and driveway frequency, 3- to 5-kilometer (2- to 3-mile) segments.

The final spacing of the stations was typically in the range of 2- to 3-kilometer (1- to 2-mile) segments. The AVI readers were located primarily on freeway sections not covered by the ATMS, and a few were located on arterials in the extremely congested north and northwest side of San Antonio.

Link Segmentation Methodology

The AVI readers are located, on average, at 2- to 3-kilometer (1- to 2-mile) spacings. The link endpoints are defined directly at the reader locations (see Figure 11). The information that is received by these readers is the vehicle tag number and time stamp, from which a travel time is determined by matching two consecutive readings from a single vehicle tag in the same direction of travel. The travel time can then be converted to travel speed using the known distance between the two reader locations. A full list of link segment IDs can be found in Appendix B.

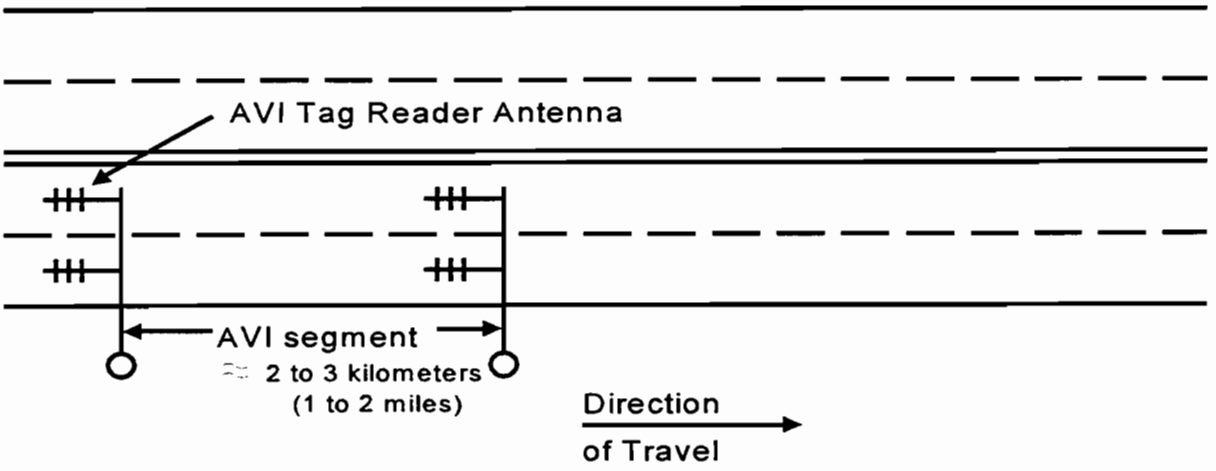

Figure 11. AVI Link Segment Definition

AVI Reader Sites

Much like the ATMS loop detection system, the AVI system requires two reader sites to determine a travel time over a link. However, due to the cost of the AVI reader sites, the readers are spaced at a moderate distance rather than at the short loop speed trap spacing of 3 meters (10 feet). The 2- to 3-kilometer (1 to 2 mile) spacing requires that each reader station be identified separately. The combination of two reader sites defines the links listed above. The naming convention of the AVI reader stations follows a similar 19 character structure. The format of the link ID follows:

RXAAAAA-BBBBB-CCCCC

where, R = designation for AVI Reader Site

X = bi-directional or N, S, E, or W for directional

A = first five letters of the roadway name (e.g., Milit = Military Hwy)

B = first five letters of the closest major cross-street, and

C = indication of support structure type

where, support structure types are:

OSB__ = Overhead Sign Bridge

WIRE_ = Wood Poles with Span Wire

SPOLE = Metal Signal Poles

BRIDG = Overpass Bridge Structure.

An example would be:

RX0281U-BASSE-0SB__

Table 4. AVI Reader ID List

SITE #	READER ID	STREET NAME	X-STREET NAME
1	RX0281U-BASSE-OSB__	US 281	BASSE
2	RX0281U-AIRPO-BRIDG	US 281	AIRPORT
3	RX0281U-NORTN-OSB__	US 281	NORTHERN BLVD.
4	RX0281U-SANDA-BRIDG	US 281	SANDAU
5	RX0281U-OAKSH-OSB__	US 281	OAK SHADOW
6	RX1604L-BLANC-BRIDG	LOOP 1604	BLANCO RD.
7	RX1604L-GOLDC-BRIDG	LOOP 1604	GOLD CANYON DR.
8	RX0281U-DONEL-OSB__	US 281	DONELLA DR.
9	RX1604L-BITTE-BRIDG	LOOP 1604	BITTERS RD.
10	RXBLANC-CADIL-WIRE_	BLANCO	CADILLAC RD.
11	RXBLANC-PARLI-WIRE_	BLANCO	PARLIAMENT
12	RXBLANC-LHSEL-WIRE_	BLANCO	LOCKHILL SELMA
13	RXSANPE-ISOM_-OSB__	SAN PEDRO	ISOM
14	RX1604L-TRADE-BRIDG	LOOP 1604	TRADESMAN DR.
15	RXFREDE-RESEA-SPOLE	FREDERICKSBURG	RESEARCH RD.
16	RXFREDE-DATAP-SPOLE	FREDERICKSBURG	DATA POINT
17	RXFREDE-MAGIC-SPOLE	FREDERICKSBURG	MAGIC DR.
18	RXFREDE-HILDE-SPOLE	FREDERICKSBURG	HILDEBRAND
19	RXBANDE-WURZB-WIRE_	BANDERA	WURZBACH
20	RXBANDE-HUEBN-WIRE_	BANDERA	HUEBNER
21	RXBANDE-MAINL-WIRE_	BANDERA	MAINLAND
22	RX0410I-FAIRG-OSB__	IH 410	FAIRGROUNDS
23	RXMILIT-0410I-WIRE_	MILITARY	IH 410
24	RX0410I-MILIT-OSB__	IH 410	MILITARY
25	RXMILIT-TIMBE-SPOLE	MILITARY	TIMBERCREEK
26	RX0410I-0090U-OSB__	IH 410	US 90
27	RX0090U-CALLA-OSB__	US 90	CALLAGHAN
28	RXMILIT-BERQU-BRIDG	MILITARY	BERQUIST
29	RX0090U-SW36T-OSB__	US 90	SW 36TH ST.
30	RX0090U-NOGAL-OSB__	US 90	NOGALITOS
31	RX0410I-PEARS-OSB__	IH 410	PEARSALL
32	RX0035I-FISCH-BRIDG	IH 35	FISCHER RD.
33	RX0035I-ZARZA-OSB__	IH 35	ZARZAMORA
34	RX0035I-SOUTH-OSB__	IH 35	SOUTHCROSS
35	RX0037I-NEWBR-BRIDG	IH 37	NEW BRAUNFELS
36	RX0037I-CORPU-OSB__	IH 37	CORPUS CHRISTI RD.
37	RX0010I-ROLAN-BRIDG	IH 10	ROLAND AVE.
38	RX0410I-HOUST-OSB__	IH 410	HOUSTON
39	RX0010I-FOSTE-BRIDG	IH 10	FOSTER RD.
40	RX0010I-HOUST-OSB__	IH 10	HOUSTON
41A	RS0410I-DIETR-OSB__	IH 410	DIETRICH
41B	RN0410I-CENTE-OSB__	IH 410	CENTERPIECE DR.
42	RX0035I-NEWBR-BRIDG	IH 35	NEW BRAUNFELS
43	RX0035I-SEGUI-OSB__	IH 35	SEGUIN RD.
44	RX0410I-RITTI-OSB__	IH 410	RITTIMAN
45	RX0035I-WALZE-OSB__	IH 35	WALZEM
46	RXPERRI-SUNSH-SPOLE	PERRIN-BEITEL	SUN SHADOW
47	RX0035I-RANDO-OSB__	IH 35	RANDOLPH BLVD.
48	RXPERRI-NACOP-WIRE_	PERRIN-BEITEL	NACO-PERRIN
49	RX0035I-OCONN-OSB__	IH 35	O'CONNOR
50	RX0035I-TOEPP-OSB__	IH 35	TOEPPERWEIN
51	RX0035I-OLYMP-BRIDG	IH 35	OLYMPIA PKWY.
52	RX1604L-POINT-BRIDG	LOOP 1604	POINT NE PKWY.
53	RX1604L-GREEN-BRIDG	LOOP 1604	GREEN MOUNTAIN RD.

Data Description

Unlike the ATMS data which are measured for each lane, the AVI travel speed data are measured for each link, where a link may be composed of several lanes. The AVI system computes a rolling average speed and rolling average travel time for each of the links. The AVI data are collected and sent to the Data Server where they can be stored and disseminated to the data consumers. The AVI travel speed data elements are described in Table 5.

Table 5. AVI Data Field Definitions

Source Station	originating station of the link O-D pair
Source Time Stamp	time when vehicle passed by origin of the link
Destination Station	terminating station of the link O-D pair
Dest. Time Stamp	time when vehicle passed by the destination of the link
Link Identifier	the unique TransGuide identifier of the link
Link Length	the measured length of the link
Time Interval	the measured average travel time of the vehicles on the link
Speed	the calculated average speed of the vehicles on the link

The AVI data are currently being archived within the Texas Transportation Institute College Station facility. Similar to the ATMS loop data archive interface, programs could be written to summarize and query the AVI archive. This will be a very important source of information for arterial streets in the near future.

VI. GEOGRAPHIC POSITIONING SYSTEM TRAVEL SPEED DATA

Due to obvious financial constraints, it would be impossible to collect real-time travel speeds for an entire city the size of San Antonio using ATMS loop detectors and AVI technology. Therefore, in addition to the real-time data, the Texas Transportation Institute used GPS travel-time data collection technology to collect point speed and location information to supplement the Areawide Database. This GPS data source provides information for an additional 242 kilometers (150 miles) of major arterials and collector-distributorroadways. The GPS point data are aggregated by segment and used to develop "typical" historical travel speeds for those roadway links. The data are also used, along with information on signal spacing, number of lanes, and speed limit, to develop theoretical travel speeds on roadways for which no actual data were obtained. In some cases, this theoretical information will be replaced with actual information upon future expansion of the data collection system.

Coverage

The project proposal allowed for extensive GPS travel time data collection on 242 centerline kilometers (150 miles) of roadway comprised of 32 corridors. The GPS coverage was comprised of the remaining congested roadways identified in the AVI analysis, as well as many other major/minor arterials. (see Figure 12). Care was taken to ensure that a wide sample of roadway characteristics, including speed limit, number of travel lanes, and signal spacing were covered so the data could be used to predict travel speeds in the theoretical data analysis. The majority (217 kilometers out of 242 [135 out of 150 miles]) of GPS corridors were of the principal arterial classification, while the remaining were on various freeway.

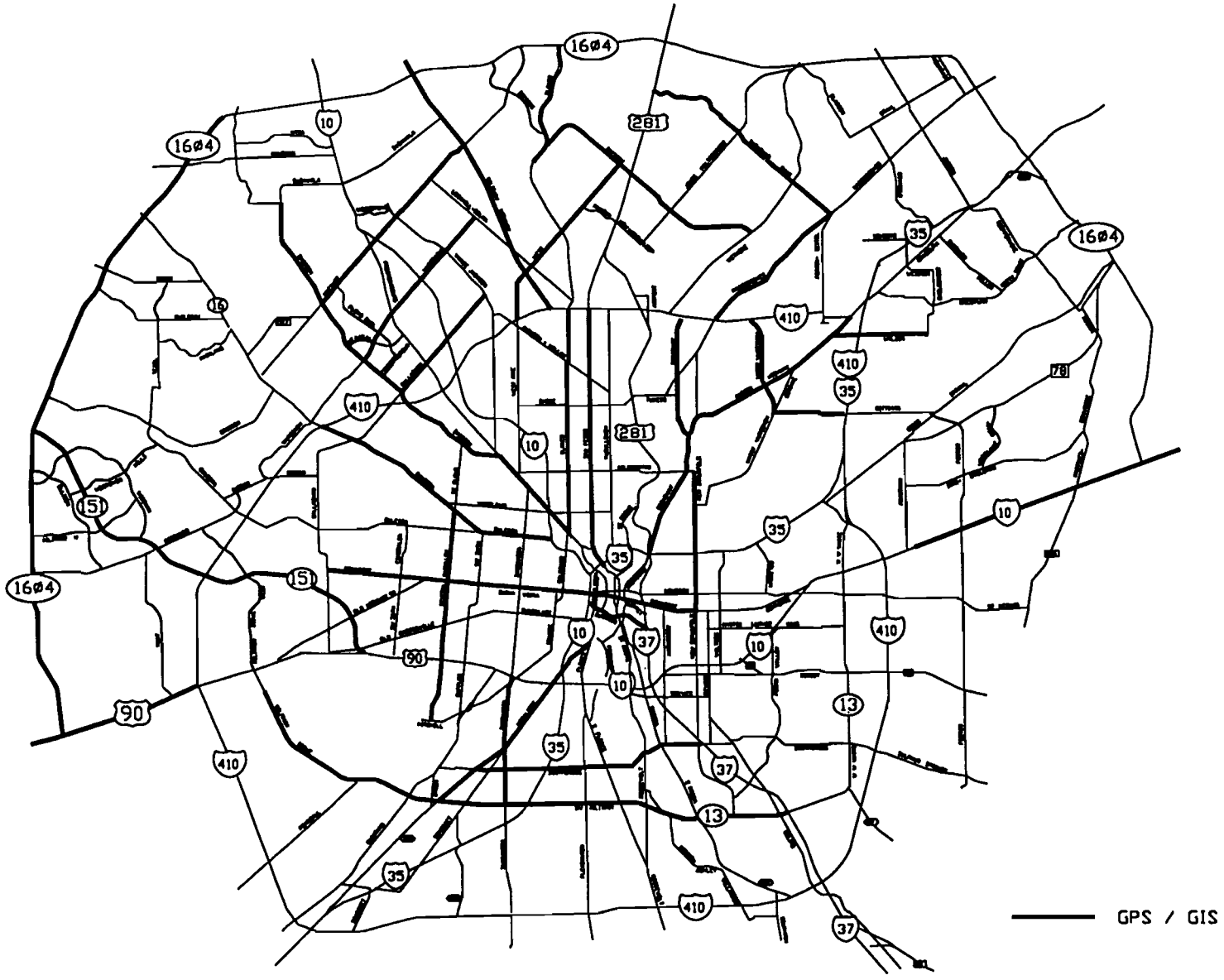

Figure 12. GPS Coverage

Link Segmentation Methodology

The GPS and theoretical link segments were primarily determined by the characteristics of the various roadway sections. Characteristics of concern included number and density of lanes, number of signals, speed limit boundaries, and the location of major intersections. The links are defined to encompass sections with homogeneous characteristics and typically range in length from 1 to 1.5 kilometers (0.5- to 1-mile) for GPS sections, and 1 to 4 kilometers (0.5 to 2.5 miles) for theoretical sections. A report by Darcy Bullock[4], entitled "A GPS Methodology for Conducting Travel Time Studies" states that GPS travel time data become increasingly vague with the use of sections greater than 1 kilometer (0.5 miles) in length. Unfortunately, some of the links were significantly larger than 1 kilometer (0.5 miles) due to the limitations in the bandwidth of the FM STIC Subcarrier Broadcast System that will be used to disseminate the link speeds to users. GPS/Theoretical links are typically defined at the first discontinuity in roadway characteristic (i.e., change in speed limit, addition or drop of a travel lane, significant changes in frequency of signal spacing, and some major intersection locations), as shown in Figure 13.

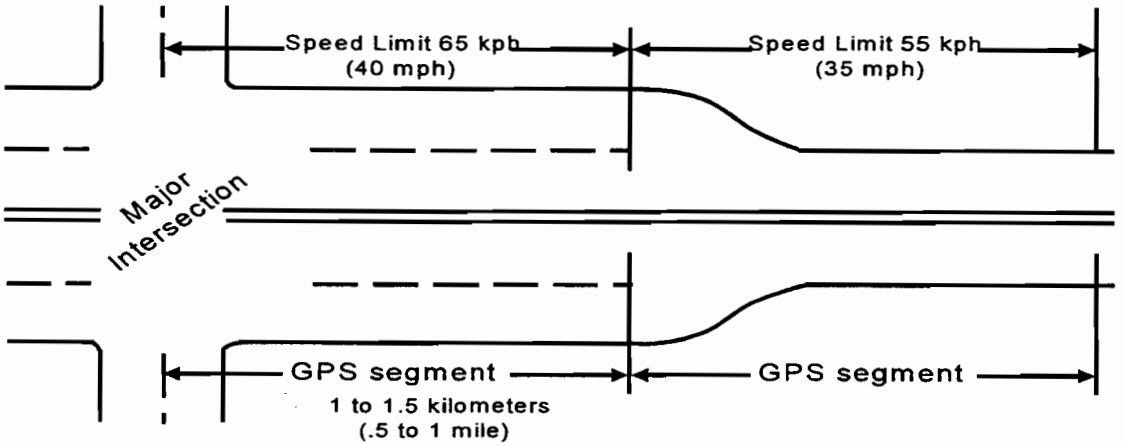

Figure 13. GPS/Theoretical Link Segment Definition

[4] Bullock, D., and Quiroga, C. "A GPS Methodology for Conducting Travel Time Studies." Submitted to ASCE Journal of Transportation Engineering, 1996.

Over the 480 directional kilometers (300 directional miles) for which GPS data were collected, there are 485 link segments. Segments can be defined in various ways for travel time data collection. The process of segmentation should always take into account the study purpose. For this study, the segment end nodes were defined at major street crossings. This was a logical breaking point, because the ultimate purpose of the database was to supplement information used by navigational systems. The complete listing of GPS link IDs and the corresponding roadway segment characteristics can be found in Appendix C.

GPS Data Collection

One of the most time-consuming and costly portions of the project was the GPS travel-time data collection. The GPS system encompasses 480 directional kilometers (300 directional miles) of arterials and collector-distributorroadways, and is composed of over 30 routes of approximately 11 to 19 kilometers (7 to 12 miles) in length. Over 2,000 trip files have been recorded and included in a summarized travel speed database. In an effort to provide a macroscopic overview of the total database development, only a high level of detail will be given on the major points of the GPS data collection process in the main body of this report. More details on the GPS data collection can be found in Appendix D.

Eight differentially corrected geographic positioning system data collection units were purchased and assembled by the Texas Transportation Institute. The units consisted of: a Trimble Navigation Placer 400 GPS receiver and antenna and a Differential Corrections Inc. RDS 3000 differential corrections receiver and antenna. Four Hewlett Packard HP1000CX palmtop computers with 2M of ram for data storage were purchased to provide field data logging capability while maintaining maximum portability. The other four units were wired to connect to external laptops in the field. The base units were placed in portable carrying cases, so the drivers could easily transport them between the office and the field.

A detailed data collection scheme was developed, with explicit instructions, and driver training. The GPS data were collected in both peak and off-peak periods, on school days and non-school days, on holidays and in bad weather and incident conditions. The idea was to not only acquire "typical data," but also to determine the effects of these events on the travel speed. However, only the typical travel times will be used by the Data Server in dissemination to the motoring public. The intent of collecting data during atypical periods was to determine incident/delay factors that could be applied to typical speeds as adjustments.

The travel time trip files were stored on the palmtops for a period of several days, until they could be downloaded to a hard-drive and backup files. The average file for a 15 minute data collection trip uses only 15Kb of memory. The costs and time involved in GPS data collection are moderate, and it is important that no information be lost. In order to conserve computer storage space, the raw GPS data were checked for quality, and extraneous data (i.e., points collected outside the study areas) were removed from the files.

The GPS data conversion was simplified by the use of an existing Navtech GIS map and ArcView software. GPS data points representing the location of the vehicle were overlaid onto the base GIS map. The raw GPS files included the following information: latitude and longitude, time stamp, day of week, direction, heading, and speed. Information for GPS links were merged with the location and speed point data by associating each point with the nearest link. The GPS links had related attribute data for speed limit data, number of lanes, classification, roadway name, signal location, etc.

After the merging process was completed, the point data were associated with the appropriate GPS links. A travel time was calculated by determining the earliest time stamp associated with a particular link for a given trip and subtracting it from the latest time stamp associated with the link. This process produced well over 10,000 segment travel time records (Appendix B) from the 2,000 plus trips that were made over the 32 corridors. A quality control check was done on the travel time record database, and approximately 5 percent of the records were cut due to questionable data

characteristics (i.e., unattainable speeds, missing data points, etc.). The remaining records were averaged by link and by time of day to develop the typical travel speed database for the 32 routes.

Data Descriptions

The GPS database is a historical database that resides on a workstation that is linked to the Data Server. Within the workstation, an automated polling program is run to query the resident data by time of day. The data sent to the Data Server are described in Table 6.

Table 6. GPS Data Field Definitions

Link Identifier	the unique TransGuide identifier of the link
Speed	the calculated average speed of the vehicles on the link
Length	the length of the segment
Time	the measured travel time from the start of the link to the end

VII. THEORETICAL DATA

The final type of travel speed data that resides in the area-wide Travel Speed Database is the theoretical data. This portion consists of theoretical values developed for arterial and collector streets using data collected for the GPS travel speed database. A hierarchal tree-based regression technique was used to determine an appropriate regression equation for predicting the travel speeds.

Coverage

Approximately 480 kilometers (300 miles) of the remaining major/minor arterials and collectors were placed in the theoretical data evaluation group (see Figure 14). These roadway sections typically consisted of lower volume, and lower speed roadways that were not characterized by recurrent congestion. Generally, the roadway selection process was organized to have the most accurate real-time information being collected on the most seriously congested roadways, and the historically-based information on the less congested roadways. Again, as the system matures and grows, the information will be replaced by more intelligent information sources in these latter coverage areas.

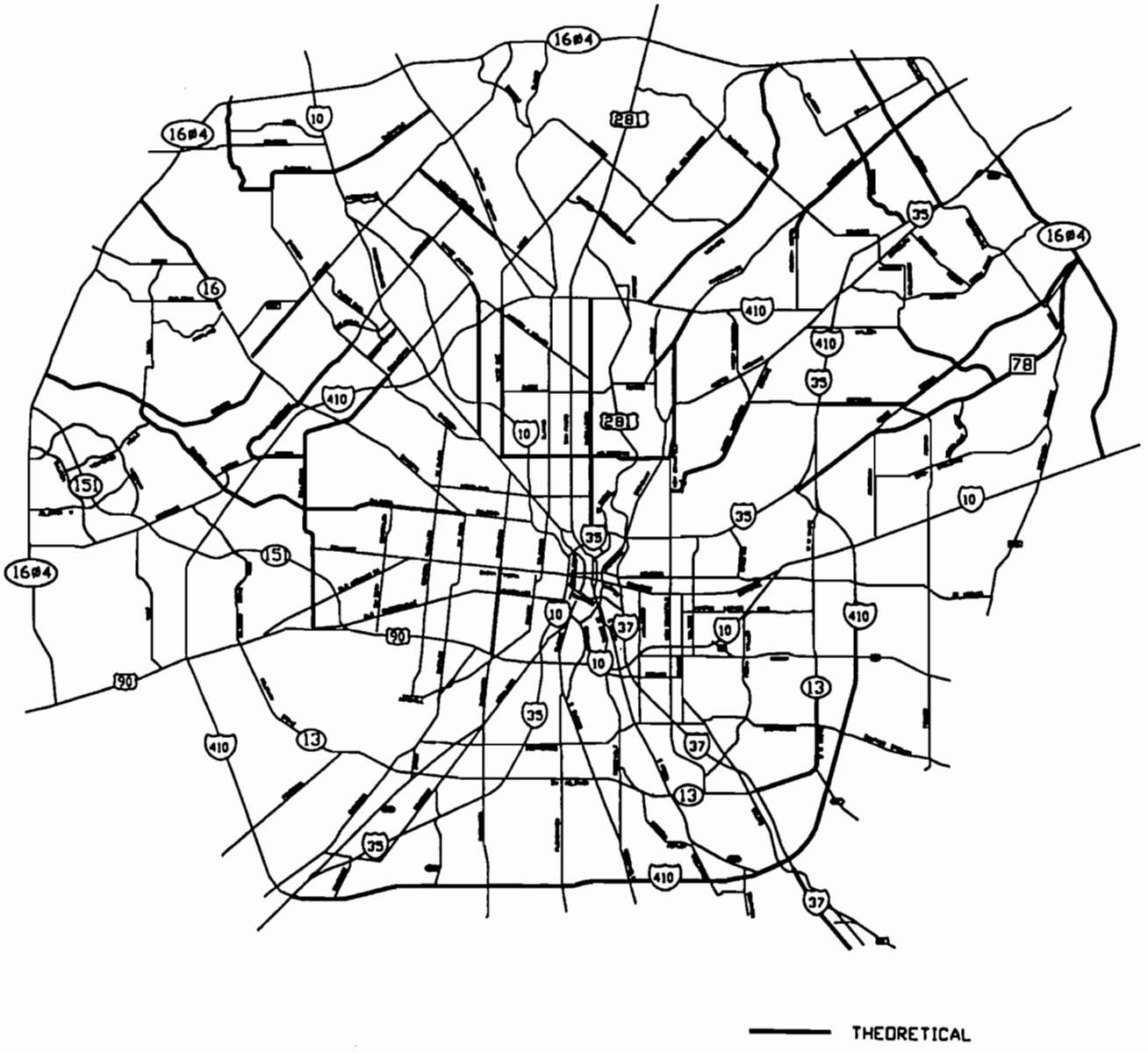

Figure 14. Theoretical Coverage

Link Segmentation Methodology

As with the GPS links, the theoretical links were primarily determined by the characteristics of the roadway sections. These characteristics included signal density, posted speed limit, volume per lane, and the location of major intersections. The links were defined to encompass sections with homogeneous characteristics and were typically in the range of 1 to 4 kilometers (0.5 to 2.5 miles) in length (see Figure 13). Because this is the least robust of the speed data types, the segments need not be segmented to such detail. This also helped maintain a smaller amount of links to transmit via FM STIC. The theoretical links were also defined at the first discontinuity in roadway characteristic. A full list of link IDs can be found in Appendix E.

Theoretical Algorithm Development

From the 10,000 records contained in the aggregated GPS speed database, a statistical analysis was performed to develop a speed prediction algorithm. The analysis was based on the characteristics of each link segment that were collected from the field. The characteristics of concern were signal density, posted speed limit, and volume per lane roadway type (freeway vs. arterial). Separate analyses were performed for freeways vs. arterials since the key parameters for the two facility types are very different. The analyses was performed using an hierarchal tree-based regression (HTBR) software package called CART, (Salford Systems, San Diego, California, 1991-1995).

HTBR can be thought of as a forward stepwise variable selection method, akin to forward stepwise regression. The methods used to estimate regression trees have been around since the early 1960s and are sometimes referred to as classification and regression trees, or CARTs. The method proceeds by interactively asking (and answering) the following two questions: (a) which variable of all of the variables offered in the model should be selected to produce the maximum reduction in variability of the responses? and (b) which value of the selected variable (discrete or continuous) results in the maximum reduction in variability of the response? The method continually asks and answers these questions (through numerical search procedures) until a desirable end-condition is

met, at which time the tree model is estimated. Tree terminology is similar to that of a real tree; there are branches, branch splits or internal nodes, and leaves or terminal nodes[5].

A sample of 3,000 arterial records were selected from the 10,000 record database variables included in this analysis:

- signal density (mean = 3.673, Std. Dev. = 2.574)
- speed limit (mean = 39.432, Std. Dev. = 4.302)
- lanevol (mean = 4830, Std. Dev. = 2170)
- school (mean = 1.119, Std. Dev. = 0.323)
- peak (mean = 1.883, Std. Dev. = 0.865)
- speed (mean = 32.485, Std. Dev. = 11.359)

The dependent variable was speed. The school and peak variables were factors from the GPS file. School = 1 meant school was in session (September 1st through May 31st, except for holidays), and school = 2 represented school holidays. Peak = 1 (AM peak - 07:00—09:00), Peak 2 (midday or off-peak - 09:00—16:00 minus lunch period), and Peak = 3 represented the PM peak period between 16:00—18:00 hours.

The output tree shown in Figure 15 was produced from running the CART software. To use the tree, start at the first level [speed limit < = 37.50]. If this is correct for the case that you are trying to predict, you will follow the branch to the left. If it is not correct, you will proceed to the right. True always goes left, and false always goes right. Each branch is conditional upon the earlier responses, so the tree decision points are determinates. The terminal nodes show the average speed in mph for each specific case. Once the tree has been produced, it is a matter of applying the step algorithm to the characteristics found for each link in the Theoretical Link List.

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[5] Washington S., and Wolf, J. Hierarchal Tree-Based versus Ordinary Least Squares Linear Regression Models: Theory and Example Applied to Trip Generation, TRR 1581, TRB, National Research Council, 1997.

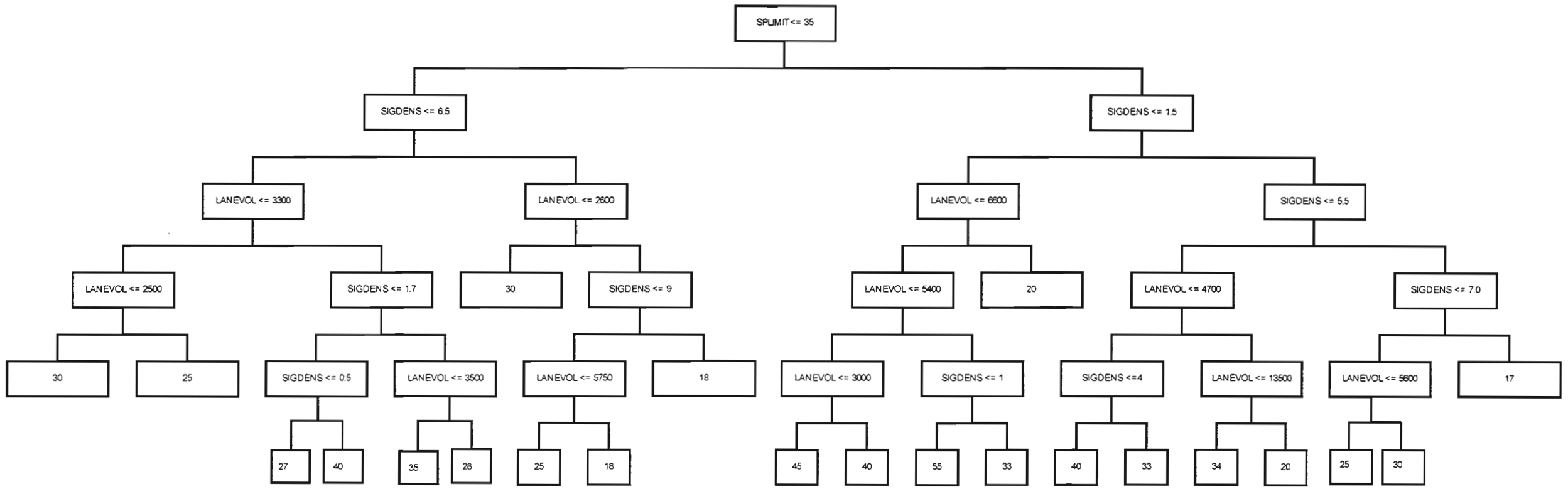

Figure 15. Arterial Speed Algorithm Tree

Further investigation of the tree structure shows no sign of the variables peak and school in any of the decision blocks. CART determined that these variables carried little to no statistical importance in the analysis. The relative importance of each variable is as follows:

Variable	Relative Importance
Signal Density	100.000
Volume Per Lane	65.566
Speed Limit	34.059
School	0.543
Peak	0.285

A validation was performed on the full GPS Speed Database to determine if the sample was representative of the full dataset. Figure 16 shows three numbers in each terminal node. The first number is the average speed that was produced from the CART model. The second number gives the number of records for the specific set of criteria in the full database; the last number is the average of speeds for the records in this case. In general, the CART model sample was quite representative of the full dataset. Differences in average speed data were typically less than 2 to 3 kph (1 to 2 mph).

A sample of 693 freeway travel speed records were analyzed to develop a freeway tree as well—variables included:

- speed limit (mean = 57.208, std.dev. = 5.318)
- lane volume (mean = 6, 078.716, std.dev. = 1,707.724)
- peak (mean = 2.036, std.dev. = 0.862)
- school (mean = 1.189, std.dev. = 0.392)
- speed (mean = 47.841, std.dev. = 13.798)

The dependent variable was again speed.

The results of the (CART) analysis are shown in the output tree illustrated in Figure 17. This analysis showed that the variables of speed limit, volume per lane, and peak were the most important.

Variable	Relative Importance
Speed Limt	100.000
Volume Per Lane	85.729
Peak	5.165

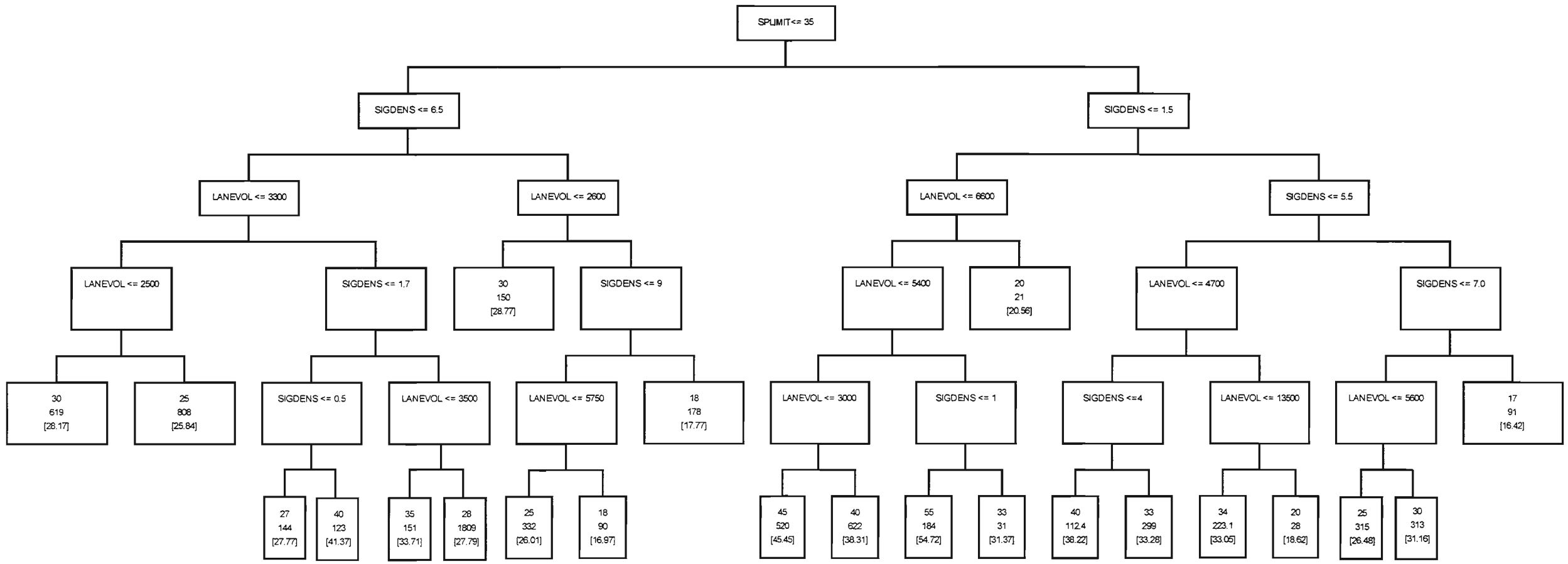

Figure 16. Arterial Speed Algorithm Tree Validation

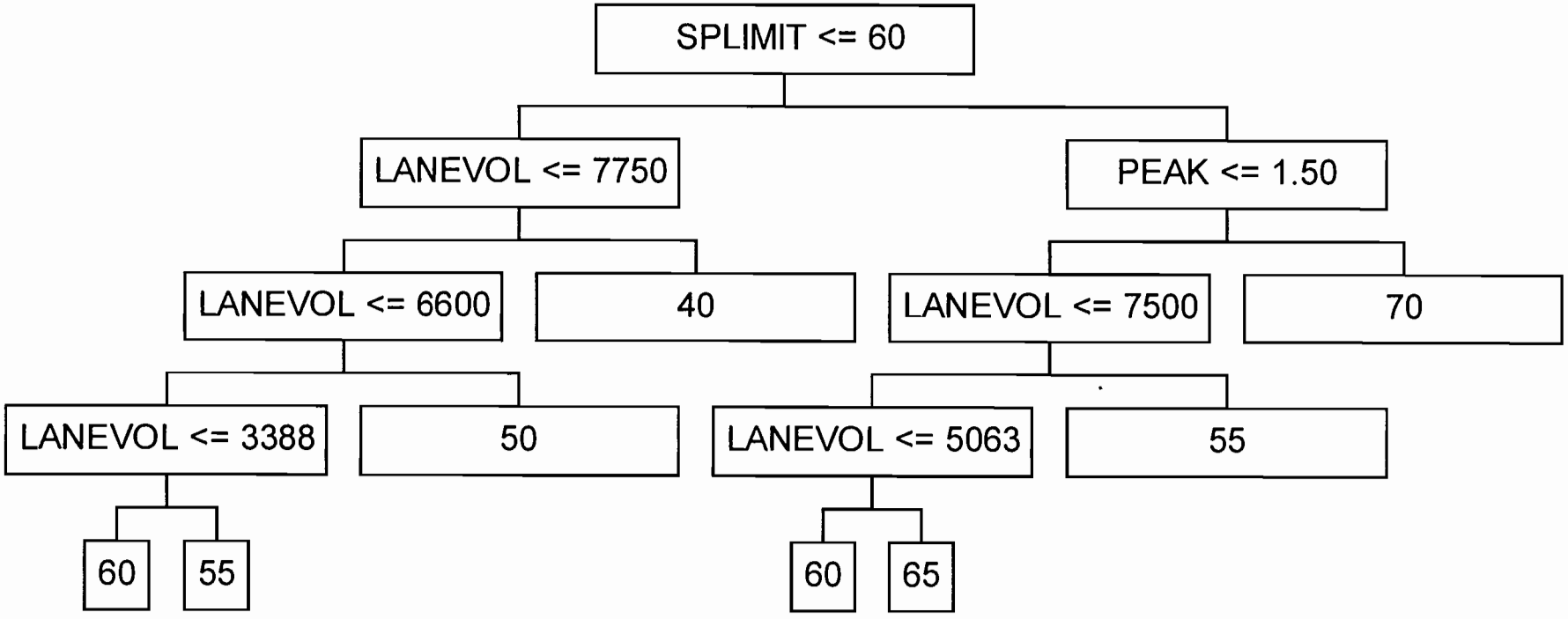

Figure 17. Freeway Speed Algorithm Tree

VIII. INCIDENT/DELAY FACTORS

WEATHER

Specific research activities were directed at assessing the effects of rainfall intensity on average travel speeds in San Antonio. Regional hourly rainfall intensity data were correlated with average spot speeds (from ATMS Phase I loop detector data) on select freeways near downtown San Antonio.

The motivation for exploring the effects of rainfall on average travel speeds was based on the need to provide accurate en-route driver information to selected motorists using route navigation devices (as part of San Antonio's Model Deployment Initiative). Based upon anecdotal data, system designers hypothesized that rainfall and several other events may increase route travel times beyond those expected for typical roadway and weather conditions.

Study Design

As mentioned previously, the research team assembled two basic data elements for this study: rainfall intensity and average freeway travel speeds. Average freeway travel speed data were readily available for 42 km (26 mi) of freeway near downtown San Antonio. The average travel speed data are collected every 20 seconds from inductance loop detectors placed at nominal spacings of 0.8 km (0.5 mi). These loop detectors are monitored and report data through the TransGuide transportation management center, which is where the data were obtained. Because of the large volume of readily-accessible speed data near downtown, the researchers attempted to get rainfall intensity data at comparable locations near downtown with little success. Most of the rainfall data available had been reported on a daily basis, which would not have been sufficient detail to perform the required analyses. Hourly rainfall intensity data were obtained for a weather monitoring station (SAT WBAN # 12921) at the San Antonio Airport, approximately 13 km (8 mi) north of downtown where the

travel speeds were collected. The rainfall data were obtained through the Office of the Texas State Climatologist, which is actually located in Texas A&M University's Department of Meteorology.

The research team obtained hourly rainfall intensity from August 1996 through September 1997. Because of its voluminous size, select days of average travel speed data were aggregated from 20-second averages to hourly averages. The following 55 days in 1997 were selected based on the occurrence of rainfall within some hour during the day:

- January 1, 2, 6, 7, 12, 20, 21, 28
- February 12, 14, 19, 25
- March 2, 10, 11, 12, 15, 17, 18
- May 21, 22, 23, 24, 27, 31
- June 1, 14, 15, 21, 22, 23, 25
- July 5, 7, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 28, 31
- August 5, 6, 19
- September 1, 7, 21

The hourly average travel speed data were obtained for 195 inductance loop detectors (one of two computer servers in the TransGuide system) for the 55 days, resulting in nearly 75,000 average travel speed observations. Data pertaining to rain conditions on arterials were also extracted from the data collected via the GPS units. A summary of these data are included in Appendix C. As can be noted in reviewing these data, the results are fairly inconclusive with no consistent impact of rain on arterial travel speeds being apparent.

Data Analysis and Findings

The research team examined linear regression models to predict relationships between rainfall intensity and average hourly freeway travel speeds. Because average travel speed and rainfall intensity were available for each hour of the 55 days, time-of-day was also included in the analysis.

The researchers hypothesized that rainfall intensity affects average travel speeds more strongly during peak traffic hours than during off-peak traffic hours with light traffic flows.

After several iterations and analyses involving different time periods, three statistically significant models were developed for different time periods during the day:

- Morning Peak Hour (7 to 8 a.m.): 3,082 observations
  average hourly travel speed, kph (mph) = 58 - 93 x (hourly rainfall intensity, cm [in.])
- Evening Peak Hour (5 to 6 p.m.): 3,137 observations
  average hourly travel speed, kph (mph) = 58 - 41 x (hourly rainfall intensity, cm [in.])
- Off-Peak Period (6 p.m. to 7 a.m., 8 a.m. to 5 p.m.): 68,534 observations
  average hourly travel speed, kph (mph) = 58 - 12 x (hourly rainfall intensity, cm [in.])

The evening peak hour and off-peak period models produced intuitively reasonable results, whereas the morning peak hour model appears drastically different. It should be noted that for both morning and evening peak hour models, there were not a large number of high intensity rainfall events. For example, the rainfall intensity did not exceed 0.2 centimeters (0.08 inches) per hour for either peak hour model, whereas the off-peak model had a significant number of rainfall events over 0.25 centimeters (0.1 inches) per hour, ranging as high as 1.8 centimeters (0.7 inches) per hour. The morning and evening peak hour models also had less than five hours each where the rainfall intensity exceeded 0.8 centimeters (0.03 inches) per hour. This result stems from the fact that it simply did not rain frequently or severely during the morning or evening peak hour during the time period in 1997 that was analyzed.

In summary, researchers developed three statistically significant regression models for predicting reductions in average hourly freeway travel speeds based upon rainfall intensity. The morning peak hour model estimates exaggerated reductions in average travel speed because of a limited number of rainfall events used to develop the model.

These regression models were developed based upon average freeway travel speeds. The actual models, therefore, apply to reductions in average travel speeds along freeways. There were, however, no possible direct comparisons which could be made between rain intensity and travel speeds for the same physical location on the freeway.

In addition, the application of these regression models to predict average travel speeds in real-time is potentially muted by the ability to obtain real-time rainfall intensity data over different geographic areas of San Antonio. As a result, it is recommended that these regression models not be incorporated into the travel time prediction and route navigation database.

Three alternatives have been identified for the possible inclusion of rainfall intensity reduction models in real-time speed prediction algorithms in the future:

- Have the National Weather Service, which provides information for the kiosks, send files indicating which quadrants of the city are experiencing rain. Rain delay factors could then be applied to all of the links in this quadrant.

- Overlay a grid onto the weather radar sent to TransGuide by the weather service. Write a software program that will go through the radar graphics file and determine which grid squares are mostly covered by colors indicating rain. Grid squares with 50+ percent (actual percentage unknown) coverage would have the rain delay factors applied.

- Query the AVI travel speeds from different quadrants of the city, and compare them to a historical AVI database. If the travel speeds throughout the quadrant are low compared with the average for that day and time, it could be due to a weather condition that is covering the entire quadrant. Weather data (specifically rain intensity) could be cross-referenced for these dates and/or time periods and be analyzed. This alternative relies on the availability of a historical AVI database.

INCIDENTS/ACCIDENTS

An additional adjustment factor which was considered in this analysis was one to account for incidents and/or accidents. The concept considered was to apply an incident adjustment factor to the "typical recurrent" travel speeds within the database which represented travel conditions on any part of the roadway network not instrumented with ATMS or AVI technologies.

Freeways

The approach considered for assessing this potential application consisted of cross-referencing data obtained from the loop detectors of the ATMS (Phase I) and incident logs (as well as accident data from police reports), as these were the only thorough data available. Several fundamentals flaws, however, exist with this approach given potential needs and applications of such adjustment factors.

Assuming appropriate adjustment factors could satisfactorily be developed, the only portions of the freeway system to which they could be applied would be limited sections of Loop 410 South (as this is the only freeway for which no real-time data are available in some form or fashion). In addition, the only thorough data upon which to (currently) base the development of an adjustment factor is that associated with the freeway ring circling the central business district (CBD) of San Antonio. This portion of the freeway system is characterized by an inordinate amount of weaving and interchanging traffic operations as well as lower normal speeds. These operating characteristics would influence the impact incidents would have on traffic operations in relation to the remainder (and much larger portion) of the San Antonio freeway system. In short, this approach would lead to drawing conclusions from a very small portion of the freeway system with unique traffic operating characteristics and applying these conclusion to the majority of the system (which would be expected to operate in a significantly different fashion). It was, therefore, determined that at this point in time, it would be unwise to develop real-time incident adjustment factors given the limitations and characteristics of the available data from which such factors could be developed.

Arterials

It was initially anticipated that arterial incident adjustment factors might be developed by review and analysis of the data (2,000+ travel time runs) collected via the GPS units. Upon review of these data (and field loop kept by data collectors), only two incidents that were not associated with inclimate weather conditions were found. Based on this very small sample of "incident" data for arterials, it was impossible to draw statistically significant conclusions and develop an arterial incident adjustment factor. As it relates to the future development of incident adjustment factors for both freeways and arterials in San Antonio, recent and near-term future changes in readily-available data will soon make this a realistic endeavor. The expansion of the TransGuide System—specifically the implementation of Phase II which is scheduled for the Fall of 1998—as well as the growing amounts of data available via the ABI system should provide adequate data by early 1999 to develop relatively accurate and reliable incident adjustment factors.

School/Non-School

As discussed in more detail previously, there was no statistically significant difference found between arterial travel speeds when school was in session as compared to when school was not in session. While a small difference can be noted in visually reviewing the data, this difference was not significant relative to the entire arterial travel speed data set which was assembled for this study. As noted for the incident adjustment factor, AVI data available for strategic arterials in San Antonio may soon be of adequate size to perform a more thorough assessment.

Peak/Off-Peak

Similar to the assessment of the impact of school on arterial street operations, no statistically significant difference was found between peak period versus off-peak travel speeds on arterials. As is the case for all of the potential adjustment factors, the peak versus off-peak analysis would benefit greatly from the significant increase in available data which will take place over the next several months.

IX. TRAVEL SPEED DATA CONSUMERS

The data consumers of the TransGuide environment that use travel speed data are the Traveler Information kiosk system, the IVN system, and the TransGuide World Wide Web (WWW) server.

In-Vehicle Navigation System

The IVN system was installed as part of the TransGuide MDI program and involves 590 navigation units that provide real-time travel speed data and route guidance to drivers in their vehicles. Data are broadcast to the navigation units every 30 seconds using the FM Subcarrier technology which was previously described in detail.

Travel Information Kiosk System

The Traveler Information kiosk system was installed as part of the TransGuide MDI program and includes 40 kiosks placed in key locations around the city of San Antonio. The kiosks provide real-time travel speed data on a graphical touch-screen map, as well as route planning, bus route information, and weather information. Data are broadcast using the same FM Subcarrier technology that is used for the IVN system.

TransGuide WWW

The TransGuide WWW server provides real-time traffic information to WWW users via a graphical map. Detailed information about each link is also available. The WWW server receives this data directly from the Data Server.

Other Potential Users

Many uses for the real-time database have been discussed by both transportation operations and planning groups. The planning group is extremely excited at the prospect of having such a comprehensive travel time database on hand. Planners will be able to access the original historical database for microscopic travel time data analysis or use a macroscopic version that has been aggregated for network analysis.

The operations group has already planned to archive all of the AVI data coming in to the Areawide Travel Time Database for use in the development of an extended historical database based on time of day analysis. This same information is also of interest to the planning groups for purposes of research and project programming decision-making/prioritization, specifically to see if this type of data can be used in origin-destination studies.

X. CONCLUSION

We have presented the considerations that were taken into account in the development of a travel speed database for the city of San Antonio. Our approach was to make the best use of available resources by targeting the placement of sensors and the definition of roadway links to the areas where they could provide the most benefit. While considerable effort went into the initial design and development of the system, the underlying data structures and concepts can be used as a foundation to easily expand the existing travel speed systems, or add new features in the future.

Additional research and developmental work is suggested to improve the statistical validity and enhanced application of the database and the "theoretical data" in particular. New components of the TransGuide System are now beginning to provide a wealth of valuable data which could be used for this enhancement.

APPENDIX A

LIST OF ABBREVIATED STREET NAMES

Table A-1. List of Abbreviated Street Names

Street Name	Abbreviation
ACME	ACME_
ADAMS HILL	ADAMS
AIRPORT	AIRPO
ALAMO	ALAMO
ALICIA	ALICI
AMITY	AMITY
ASHLEY	ASHLE
ATHENIAN	ATHEN
AUSTIN HWY.	AUSTI
BABCOCK	BABCO
BANDERA	BANDE
BASSE	BASSE
BENT OAK DR.	BENTO
BERQUIST	BERQU
BILLY MITCHELL	BILLY
BINZ-ENGLEMAN	BINZE
BITTERS	BITTE
BLANCO	BLANC
BLUE BIRD	BLUEB
BLUE CREST	BLUEC
BOWENS CROSSING	BOWEN
BOWIE	BOWIE
BRAUN RD.	BRAUN
BRAZOS	BRAZO
BRIARFIELD	BRIAR
BROADWAY	BROAD
BROKEN OAK	BROKE
BUENA VISTA	BUENA
BULVERDE	BULVE
BYNUM RD.	BYNUM
CADILLAC	CADIL
CALLAGHAN RD.	CALLA
CARYA GITTINGER	CARYA
CASSIN	CASSI
CASTROVILLE	CASTR
CENTERPIECE DR.	CENTE
CENTRAL PARKWAY N.	CENTR
CERALVO	CERAL
CHERYL	CHERY
CLARK	CLARK

CLASSEN	CLASS
COLISEUM	COLIS
COLORADO	COLOR
COMMERCE	COMME
COMMERCIAL	COMML
CONCORD.	CONCO
CORPUS CHRISTI	CORPU
CORRINE	CORRI
COTTONWOOD	COTTO
CRESENT FALLS	CRESE
CRESTWAY	CREST
CROOKED PATH	CROOK
CULBERSON AVE.	CULBE
CULEBRA	CULEB
CUNNINGHAM	CUNNI
CUPPLES	CUPPL
DAN	DAN__
DATA POINT	DATAP
DE ZAVALA	DEZAV
DEMYA	DEMYA
DIETRICH	DIETR
DIVISION	DIVIS
DOLLARHIDE	DOLLA
DONELLA	DONEL
DRESDEN	DRESD
DURANGO	DURAN
EAGLE CREST	EAGLE
ECKERT	ECKER
EISENHAUER	EISEN
EL PASO	ELPAS
EL SENDERO	ELSEN
ELLISON DR.	ELLIS
ENTRANCE AVE	ENTRA
ESMERALDA	ESMER
EVERS	EVERS
EWING HALSELL	EWING
FAIR	FAIR_
FAIRGROUNDS	FAIRG
FISCHER	FISCH
FIVE PALMS	FIVEP
FLORES	FLORE
FLOYD CURL DR.	FLOYD

FM 1346	1346F
FM 1516	1516F
FM 1976	1976F
FM 78	0078F
FOSTER RD.	FOSTE
FREDERICKSBURG	FREDE
FREMONT	FREMO
FRESNO	FRESN
FRIO CITY RD.	FRIOC
FUNSTON	FUNST
GARDENDALE	GARDE
GEN. HUDNELL RD.	GENHU
GEN. MCMULLEN	GENMC
GEORGE	GEORG
GEVERS	GEVER
GIBBS SPRAWL	GIBBS
GOLD CANYON	GOLDC
GOLIAD	GOLIA
GRAF	GRAF_
GREEN MOUNTAIN	GREEN
GRISSOM	GRISS
GROFF	GROFF
GUADALUPE	GUADA
GUILBEAU RD.	GUILB
HACKBERRY	HACKB
HAMILTON WOLFE	HAMIL
HARRY WURZBACH	HARRY
HAUSMAN	HAUSM
HENDERSON PASS	HENDE
HILDEBRAND	HILDE
HILLCREST	HILLC
HOEFGEN	HOEFG
HOLBROOK	HOLBR
HOLLYHOCK	HOLLY
HOLM	HOLM_
HOT WELLS	HOTWE
HOUSTON	HOUST
HUEBNER RD.	HUEBN
HUNT LANE	HUNT_
HUNTERS GREEN	HUNTE
HURON	HURON
HUTCHINS PL.	HUTCH

IH 10	0010I
IH 35	0035I
IH 37	0037I
IH 410	0410I
INGRAM	INGRA
INTERPARK	INTER
ISOM	ISOM_
JACKSON KELLER	JACKS
JACOB	JACOB
JENNINGS AVE.	JENNI
JONES MALTSBERGER	JONES
JUDSON	JUDSO
KING AVE.	KING_
KITTY HAWK	KITTY
KRAMERIA	KRAME
KYLE SEALE PKWY.	KYLES
LAMONT	LAMON
LANARK	LANAR
LANGTON	LANGT
LARIAT	LARIA
LARKSPUR	LARKS
LIGUSTRUM	LIGUS
LOCKHILL RD.	LOCKH
LOCKHILL SELMA	LHSEL
LOOP 1604	1604L
LOUIS PASTEUR	LOUIS
LUKE	LUKE_
MAGIC	MAGIC
MAINLAND	MAINL
MARBACH	MARBA
MARTIN L. KING	MARTI
MAYFIELD	MAYFI
MCCULLOUGH	MCCUL
MCDONALD	MCDON
MEDICAL	MEDIC
MIDCROWN	MIDCR
MIDDLEBURY DR.	MIDDL
MILITARY	MILIT
MILITARY DRIVE W.	MILIT
MILLER	MILLE
MISSION	MISSI
MISSION RIDGE	MISSR

MISTY ROCK	MISTY
MITCHELL	MITCH
MONTGOMERY	MONTG
MOURSUND	MOURS
MUIRFIELD	MUIRF
NACO PERRIN	NACOP
NACOGDOCHES	NACOG
NAKOMA	NAKOM
NAVARRO	NAVAR
NEW BRAUNFEL	NEWBR
NEW LAREDO HWY.	NEWLA
NEW NORTH LOOP	NEWNO
NEW SULPHUR SPGS RD.	NEWSU
NOGALITOS	NOGAL
NORTH RD.	NORTH
NORTHERN	NORTN
NUEVA	NUEVA
NW 19TH	NW19T
NW 24TH	NW24T
NW 39TH	NW39T
NW MILITARY HWY.	NWMIL
OAK SHADOWS	OAKSH
OAKHILL	OAKHI
OBLATE	OBLAT
O'CONNOR	OCONN
OLD HWY. 90	OLDHW
OLD PEARSALL RD.	OLDPE
OLD TEZEL	OLDTE
OLYMPIA PKWY.	OLYMP
ONSLOW	ONSLO
ORVILLE WRIGHT	ORVIL
OTTO STREET	OTTO_
PALO ALTO	PALOA
PARK AVE	PARK_
PARK CROSSING	PARKC
PARLIAMENT	PARLI
PARTRIDGE TRAIL	PARTR
PEARSALL	PEARS
PECAN VALLEY	PECAN
PITLUK	PITLU
PLEASANTON	PLEAS
PLUMNEAR	PLUMN

POINT NE PKWY	POINT
POTEET-JOURDANTON	POTEE
POTRANCO	POTRA
PRESA	PRESA
PROBANDT	PROBA
PRUE	PRUE_
QUINCY	QUINC
QUINTANA	QUINT
RALPH	RALPH
RAMPART	RAMPA
RANDOLPH BLVD.	RANDO
RAYBON	RAYBO
REED	REED_
RESEARCH	RESEA
RIDGE PATH	RIDGE
RIGSBY	RIGSB
RITTIMAN	RITTI
ROLAND	ROLAN
ROOSEVELT	ROOSE
ROYAL GATE DR	ROYAL
RUIZ	RUIZ_
SAN FELIPE	SANFE
SAN PEDRO	SANPE
SANDAU	SANDA
SCHERTZ	SCHER
SE MILITARY	MILIT
SEGUIN	SEGUI
SEVILLE	SEVIL
SH 151	0151S
SH 422	0422S
SHAENFIELD	SHAEN
SKYVIEW	SKYVI
SOMERSET	SOMER
SOUTHCROSS	SOUTH
SPACE CENTER DR.	SPACE
SPRIGGSDALE	SPRIG
SPRING RIDGE DR.	SPRIN
SPRINGFIELD	SPRIF
ST. CLOUD RD.	STCLO
ST. HEDGWIG	STHED
ST. MARY'S	STMAR
STAHL	STAHL

STARCREST	STARC
STEVES	STEVE
SUMMIT	SUMMI
SW 19TH	SW19T
SW 24TH	SW24T
SW 26TH	SW26T
SW 36TH	SW36T
SW MILITARY DR.	MILIT
TAVERN OAKS	TAVER
TEZEL	TEZEL
THOUSAND OAKS	THOUS
TIMBERCREEK	TIMBE
TITAN DR.	TITAN
TOEPPERWEIN	TOEPP
TOMAHAWK TRAIL	TOMAH
TRADESMAN	TRADE
TRINITY	TRINI
TUXEDO	TUXED
URBAN CREST	URBAN
US 281	0281U
US 87	0087U
US 90	0090U
USAA BLVD.	USAA_
UTSA BLVD.	UTSA_
VANCE JACKSON	VANCE
VANDIVER	VANDI
VERDE	VERDE
VILLAGE PKWY	VILLP
VILLAMAIN	VILLA
VIRGINIA	VIRGI
W. THOMPSON	THOMP
W. W. WHITE	WWWHI
WALTERS	WALTE
WALZEM	WALZE
WEIDNER	WEIDN
WEST	WEST_
WESTOVER HILLS	WESTO
WETMORE	WETMO
WHISPERSOUND	WHISP
WHITEWOOD	WHITE
WILSON	WILSO
WILTSHIRE	WILTS

WINDING WAY	WINDI
WISEMAN	WISEM
WOODLAKE	WOODK
WOODLAWN	WOODL
WOODSTONE	WOODS
WORCHESTER WOOD	WORCH
WURZBACH	WURZB
ZARZAMORA	ZARZA

APPENDIX B

AVI LINK ID LIST

Table B-1. AVI Link ID List

SEGMENT	STREET HIGHWAY	NORTH/EAST	SOUTH/WEST	LINK ID
½	US 281	AIRPORT	BASSE	IN0281U-AIRPO-BASSE
2/3	US 281	NORTHERN	AIRPORT	IN0281U-NORTN-AIRPO
3/4	US 281	SANDAU	NORTHERN	IN0281U-SANDA-NORTN
4/5	US 281	OAK SHADOWS	SANDAU	IN0281U-OAKSH-SANDA
4/13	SAN PEDRO	SANDAU	ISOM RD.	INSANPE-SANDA-ISOMR
5/8	US 281	DONELLA	OAK SHADOWS	IN0281U-DONEL-OAKSH
7/6	LOOP 1604	GOLD CANYON	BLANCO	IE1604L-GOLDC-BLANC
6/9	LOOP 1604	BLANCO	BITTERS	IE1604L-BLANC-BITTE
9/14	LOOP 1604	BITTERS	TRADESMAN DR.	IE1604L-BITTE-TRADE
7/53	LOOP 1604	GREEN MTN. RD.	GOLD CANYON	IE1604L-GREEN-GOLDC
53/52	LOOP 1604	POINT NE PKWY.	GREEN MTN. RD.	IE1604L-POINT-GREEN
52/VN-1	LOOP 1604	IH 35	POINT NE PKWY.	IE1604L-0035I-POINT
VN-1/51	IH 35	OLYMPIA PKWY.	LOOP 1604	IN0035I-OLYMP-1604L
VN-1/50	IH 35	LOOP 1604	TOEPPERWEIN	IN0035I-1604L-TOEPP
50/49	IH 35	TOEPPERWEIN	O'CONNOR	IN0035I-TOEPP-OCONN
49/47	IH 35	O'CONNOR	RANDOLPH	IN0035I-OCONN-RANDO
47/45	IH 35	RANDOLPH	WALZEM	IN0035I-RANDO-WALZE
45/44	IH 35	WALZEM	RITTIMAN	IN0035I-WALZE-RITTI
44/VN-2	IH 35	RITTIMAN	SPACE CTR DR.	IN0035I-RITTI-SPACE
VN-2/VN-3	IH 410	SPACE CTR DR.	SPRINGFIELD RD.	IN0410I-SPACE-SPRIF
VN-2/VN-4	IH 35	SPACE CTR DR.	BINZ ENGELMAN	IN0035I-SPACE-BINZE
VN-3/41N	IH 410	SPRINGFIELD RD.	CENTERPIECE DR.	IN0410I-SPRIF-CENTE
VN-4/43	IH 35	BINZ ENGELMAN	SEGUIN RD.	IN0035I-BINZE-SEGUI
VN-3/VN-4	IH 410	BINZ ENGELMAN	SPRINGFIELD	IN0410I-BINZE-SPRIF
43/42	IH 35	SEGUIN RD.	NEW BRAUNFELS	IN0035I-SEGUI-NEWBR
41N/VN-5	IH 410	CENTERPIECE	IH 10	IN0410I-CENTE-0010I
VN-5/40	IH 10	IH 410	HOUSTON	IE0010I-0410I-HOUST
VN-5/39	IH 10	FOSTER RD.	IH 410	IE0010I-FOSTE-0410I
VN-5/38	IH 410	IH 10	HOUSTON	IN0410I-0010I-HOUST
40/37	IH 10	HOUSTON	ROLAND	IE0010I-HOUST-ROLAN
35/36	IH 37	NEW BRAUNFELS	CORPUS CHRISTI	IN0037I-NEWBR-CORPU
34/33	IH 35	SOUTHCROSS	ZARZAMORA	IN0035I-SOUTH-ZARZA
33/VN-6	IH 35	ZARZAMORA	IH 410	IN0035I-ZARZA-0410I
VN-6/32	IH 35	IH 410	FISCHER RD.	IN0035I-0410I-FISCH
VN-6/31	IH 410	PEARSALL RD.	IH 35	IN0410I-PEARS-0035I
31/VN-7	IH 410	US 90	PEARSALL RD.	IN0410I-0090U-PEARS
VN-7/26	IH 410	DEMYA	US 90	IN0410I-DEMYA-0090U
VN-7/27	US 90	CALLAGHAN	IH 410	IE0090U-CALLA-0410I
27/29	US 90	SW 36TH.	CALLAGHAN	IE0090U-SW36T-CALLA
29/30	US 90	NOGALITOS	SW 36TH.	IE0090U-NOGAL-SW36T
26/24	IH 410	MILITARY DR. W.	DEMYA	IN0410I-MILIT-DEMYA
24/22	IH 410	FAIRGROUNDS	MILITARY DR. W.	IN0410I-FAIRG-MILIT
23/25	MILITARY DR. W.	TIMBERCREEK	IH 410	IEMILIT-TIMBE-0410I

25/28	MILITARY DR. W.	BERQUIST	TIMBERCREEK	IEMILIT-BERQU-TIMBE
19/20	BANDERA	HUEBNER	WURZBACH	INBANDE-HUEBN-WURZB
20/21	BANDERA	MAINLAND	HUEBNER	INBANDE-MAINL-HUEBN
15/16	FREDERICKSBURG	RESEARCH	DATA POINT	INFREDE-RESEA-DATAP
16/17	FREDERICKSBURG	DATA POINT	MAGIC	INFREDE-DATAP-MAGIC
17/18	FREDERICKSBURG	MAGIC	HILDEBRAND	INFREDE-MAGIC-HILDE
10/11	BLANCO	CADILLAC	PARLIAMENT	INBLANC-CADIL-PARLI
11/12	BLANCO	PARLIAMENT	LOCKHILL SELMA	INBLANC-PARLI-LHSEL
½	US 281	AIRPORT	BASSE	IS0281U-AIRPO-BASSE
2/3	US 281	NORTHERN	AIRPORT	IS0281U-NORTN-AIRPO
3/4	US 281	SANDAU	NORTHERN	IS0281U-SANDA-NORTN
4/5	US 281	OAK SHADOWS	SANDAU	IS0281U-OAKSH-SANDA
4/13	SAN PEDRO	SANDAU	ISOM RD.	ISSANPE-SANDA-ISOMR
5/8	US 281	DONELLA	OAK SHADOWS	IS0281U-DONEL-OAKSH
7/6	LOOP 1604	GOLD CANYON	BLANCO	IW1604L-GOLDC-BLANC
6/9	LOOP 1604	BLANCO	BITTERS	IW1604L-BLANC-BITTE
9/14	LOOP 1604	BITTERS	TRADESMAN DR.	IW1604L-BITTE-TRADE
7/53	LOOP 1604	GREEN MTN RD.	GOLD CANYON	IW1604L-GREEN-GOLDC
53/52	LOOP 1604	POINT NE PKWY.	GREEN MTN RD.	IW1604L-POINT-GREEN
52/VN-1	LOOP 1604	IH 35	POINT NE PKWY.	IW1604L-0035I-POINT
VN-1/51	IH 35	OLYMPIA PKWY.	LOOP 1604	IS0035I-OLYMP-1604L
VN-1/50	IH 35	LOOP 1604	TOEPPERWEIN	IS0035I-1604L-TOEPP
50/49	IH 35	TOEPPERWEIN	O'CONNOR	IS0035I-TOEPP-OCONN
49/47	IH 35	O'CONNOR	RANDOLPH	IS0035I-OCONN-RANDO
47/45	IH 35	RANDOLPH	WALZEM	IS0035I-RANDO-WALZE
45/44	IH 35	WALZEM	RITTIMAN	IS0035I-WALZE-RITTI
44/VN-2	IH 35	RITTIMAN	SPACE CTR DR.	IS0035I-RITTI-SPACE
VN-2/VN-3	IH 410	SPACE CTR DR.	SPRINGFIELD RD.	IS0410I-SPACE-SPRIF
VN-2/VN-4	IH 35	SPACE CTR DR.	BINZ ENGELMAN	IS0035I-SPACE-BINZE
VN-3/41S	IH 410	SPRINGFIELD RD.	DIETRICH	IS0410I-SPRIF-DIETR
VN-4/43	IH 35	BINZ ENGELMAN	SEGUIN RD.	IS0035I-BINZE-SEGUI
VN-3/VN-4	IH 410	BINZ ENGELMAN	SPRINGFIELD	IS0410I-BINZE-SPRIF
43/42	IH 35	SEGUIN RD.	NEW BRAUNFELS	IS0035I-SEGUI-NEWBR
41S/VN-5	IH 410	DIETRICH	IH 10	IS0410I-DIETR-0010I
VN-5/40	IH 10	IH 410	HOUSTON	IW0010I-0410I-HOUST
VN-5/39	IH 10	FOSTER RD.	IH 410	IW0010I-FOSTE-0410I
VN-5/38	IH 410	IH 10	HOUSTON	IS0410I-0010I-HOUST
40/37	IH 10	HOUSTON	ROLAND	IW0010I-HOUST-ROLAN
35/36	IH 37	NEW BRAUNFELS	CORPUS CHRISTI	IS0037I-NEWBR-CORPU
34/33	IH 35	SOUTHCROSS	ZARZAMORA	IS0035I-SOUTH-ZARZA
33/VN-6	IH 35	ZARZAMORA	IH 410	IS0035I-ZARZA-0410I
VN-6/32	IH 35	IH 410	FISCHER RD.	IS0035I-0410I-FISCH
VN-6/31	IH 410	PEARSALL RD.	IH 35	IS0410I-PEARS-0035I
31/VN-7	IH 410	US 90	PEARSALL RD.	IS0410I-0090U-PEARS
VN-7/26	IH 410	DEMYA	US 90	IS0410I-DEMYA-0090U
VN-7/27	US 90	CALLAGHAN	IH 410	IW0090U-CALLA-0410I
27/29	US 90	SW 36TH.	CALLAGHAN	IW0090U-SW36T-CALLA

29/30	US 90	NOGALITOS	SW 36TH.	IW0090U-NOGAL-SW36T
26/24	IH 410	MILITARY DR. W.	DEMYA	IS0410I-MILIT-DEMYA
24/22	IH 410	FAIRGROUNDS	MILITARY DR. W.	IS0410I-FAIRG-MILIT
23/25	MILITARY DR. W.	TIMBERCREEK	IH 410	IWMILIT-TIMBE-0410I
25/28	MILITARY DR. W.	BERQUIST	TIMBERCREEK	IWMILIT-BERQU-TIMBE
19/20	BANDERA	HUEBNER	WURZBACH	ISBANDE-HUEBN-WURZB
20/21	BANDERA	MAINLAND	HUEBNER	ISBANDE-MAINL-HUEBN
15/16	FREDERICKSBURG	RESEARCH	DATA POINT	ISFREDE-RESEA-DATAP
16/17	FREDERICKSBURG	DATA POINT	MAGIC	ISFREDE-DATAP-MAGIC
17/18	FREDERICKSBURG	MAGIC	HILDEBRAND	ISFREDE-MAGIC-HILDE
10/11	BLANCO	CADILLAC	PARLIAMENT	ISBLANC-CADIL-PARLI
11/12	BLANCO	PARLIAMENT	LOCKHILL SELMA	ISBLANC-PARLI-LHSEL

APPENDIX C

GPS LINK ID LIST

Table C-1. GPS Link ID List

ROAD NAME	NORTH OR EAST	SOUTH OR WEST	TRANSGUIDE LINK ID
IH 10	FM 1516	FOSTER RD.	GE0010I-1516F-FOSTE
IH 10	LOOP 1604	FM 1516	GE0010I-1604L-1516F
US 90	LOOP 1604	HUNT LANE	GE0090U-1604L-HUNT_
US 90	HUNT LANE	IH 410	GE0090U-HUNT_-0410I
BUENA VISTA	IH 10	COLORADO	GEBUENA-0010I-COLOR
BUENA VISTA	ALAMO	FLORES	GEBUENA-ALAMO-FLORE
BUENA VISTA	BOWIE	ALAMO	GEBUENA-BOWIE-ALAMO
BUENA VISTA	COLORADO	TRINITY	GEBUENA-COLOR-TRINI
BUENA VISTA	FLORES	IH 10	GEBUENA-FLORE-0010I
BUENA VISTA	TRINITY	ZARZAMORA	GEBUENA-TRINI-ZARZA
BUENA VISTA	ZARZAMORA	COMMERCE	GEBUENA-ZARZA-COMME
COMMERCE	ACME	CALLAGHAN	GECOMME-ACME_-CALLA
COMMERCE	BUENA VISTA	SW 24TH	GECOMME-BUENA-SW24T
COMMERCE	GEN. MCMULLEN	OLD HWY. 90	GECOMME-GENMC-OLDHW
COMMERCE	HACKBERRY	HOEFGEN	GECOMME-HACKB-HOEFG
COMMERCE	NEW BRAUNFELS	HACKBERRY	GECOMME-NEWBR-HACKB
COMMERCE	NW 39TH	ACME	GECOMME-NW39T-ACME_
COMMERCE	OLD HWY. 90	SW 36TH	GECOMME-OLDHW-SW36T
COMMERCE	SW 24TH	GEN. MCMULLEN	GECOMME-SW24T-GENMC
COMMERCE	SW 36TH	NW 39TH	GECOMME-SW36T-NW39T
CULEBRA	IH 10	ZARZAMORA	GECULEB-0010I-ZARZA
CULEBRA	NW 19TH	NW 24TH STREET	GECULEB-NW19T-NW24T
CULEBRA	ZARZAMORA	NW 19TH	GECULEB-ZARZA-NW19T
DURANGO	US 281	ALAMO	GEDURAN-0281U-ALAMO
DURANGO	ALAMO	PRESA	GEDURAN-ALAMO-PRESA
DURANGO	FLORES	IH 35	GEDURAN-FLORE-0035I
DURANGO	PRESA	FLORES	GEDURAN-PRESA-FLORE
MILITARY DRIVE	IH 35	ZARZAMORA	GEMILIT-0035I-ZARZA
MILITARY DRIVE	IH 37	NORTH RD.	GEMILIT-0037I-NORTH
MILITARY DRIVE	COMMERCIAL	IH 35	GEMILIT-COMML-0035I
MILITARY DRIVE	FIVE PALMS	ORVILLE WRIGHT	GEMILIT-FIVEP-ORVIL
MILITARY DRIVE	FLORES	PLEASANTON	GEMILIT-FLORE-PLEAS
MILITARY DRIVE	LUKE	BERQUIST	GEMILIT-LUKE_-BERQU
MILITARY DRIVE	MISSION	ROOSEVELT	GEMILIT-MISSI-ROOSE
MILITARY DRIVE	NEW BRAUNFELS	PRESA	GEMILIT-NEWBR-PRESA
MILITARY DRIVE	NEW LAREDO HWY.	QUINTANA RD.	GEMILIT-NEWLA-QUINT
MILITARY DRIVE	NORTH RD.	NEW BRAUNFELS	GEMILIT-NORTH-NEWBR
MILITARY DRIVE	OLD PEARSALL RD.	WHITEWOOD	GEMILIT-OLDPE-WHITE
MILITARY DRIVE	ORVILLE WRIGHT	LUKE	GEMILIT-ORVIL-LUKE_
MILITARY DRIVE	OTTO STREET	SOMERSET	GEMILIT-OTTO_-SOMER

MILITARY DRIVE	PLEASANTON	COMMERCIAL	GEMILIT-PLEAS-COMML
MILITARY DRIVE	PRESA	MISSION	GEMILIT-PRESA-MISSI
MILITARY DRIVE	QUINTANA RD.	OLD PEARSALL RD.	GEMILIT-QUINT-OLDPE
MILITARY DRIVE	ROOSEVELT	FLORES	GEMILIT-ROOSE-FLORE
MILITARY DRIVE	ROYAL GATE DR	FIVE PALMS	GEMILIT-ROYAL-FIVEP
MILITARY DRIVE	SOMERSET	NEW LAREDO HWY.	GEMILIT-SOMER-NEWLA
MILITARY DRIVE	WHITEWOOD	ROYAL GATE DR	GEMILIT-WHITE-ROYAL
MILITARY DRIVE	ZARZAMORA	OTTO STREET	GEMILIT-ZARZA-OTTO_
RITTIMAN	IH 410	HOLBROOK	GERITTI-0410I-HOLBR
RITTIMAN	FREMONT	HARRY WURZBACH	GERITTI-FREMO-HARRY
RITTIMAN	HOLBROOK	FREMONT	GERITTI-HOLBR-FREMO
SOUTHCROSS	IH 35	HURON	GESOUTH-0035I-HURON
SOUTHCROSS	US 281	PRESA	GESOUTH-0281U-PRESA
SOUTHCROSS	FLORES	PLEASANTON	GESOUTH-FLORE-PLEAS
SOUTHCROSS	HURON	ZARZAMORA	GESOUTH-HURON-ZARZA
SOUTHCROSS	MISSION	FLORES	GESOUTH-MISSI-FLORE
SOUTHCROSS	PLEASANTON	IH 35	GESOUTH-PLEAS-0035I
SOUTHCROSS	PRESA	MISSION	GESOUTH-PRESA-MISSI
SOUTHCROSS	SOMERSET	NEW LAREDO HWY.	GESOUTH-SOMER-NEWLA
SOUTHCROSS	ZARZAMORA	SOMERSET	GESOUTH-ZARZA-SOMER
WALZEM	IH 410	AUSTIN HWY.	GEWALZE-0410I-AUSTI
WALZEM	EAGLE CREST	MIDCROWN	GEWALZE-EAGLE-MIDCR
WALZEM	EISENHAUER	EAGLE CREST	GEWALZE-EISEN-EAGLE
WALZEM	GIBBS SPRAWL	EISENHAUER	GEWALZE-GIBBS-EISEN
WALZEM	MIDCROWN	RAYBON	GEWALZE-MIDCR-RAYBO
WALZEM	RAYBON	IH 410	GEWALZE-RAYBO-0410I
SH 151	IH 410	MILITARY DRIVE W.	GN0151S-0410I-MILIT
SH 151	LOOP 1604	WISEMAN	GN0151S-1604L-WISEM
SH 151	CALLAGHAN	OLD HWY. 90	GN0151S-CALLA-OLDHW
SH 151	HUNT LANE	POTRANCO	GN0151S-HUNT_-POTRA
SH 151	INGRAM	IH 410	GN0151S-INGRA-0410I
SH 151	MILITARY DRIVE W.	CALLAGHAN	GN0151S-MILIT-CALLA
SH 151	MILITARY DRIVE W.	HUNT LANE	GN0151S-MILIT-HUNT_
SH 151	OLD HWY. 90	US 90	GN0151S-OLDHW-0090U
SH 151	POTRANCO	INGRAM	GN0151S-POTRA-INGRA
SH 151	WESTOVER HILLS	MILITARY DR. W.	GN0151S-WESTO-MILIT
SH 151	WISEMAN	WESTOVER HILLS	GN0151S-WISEM-WESTO
LOOP 1604	LOOP 1604	ELLISON DR.	GN1604L-0151S-ELLIS
LOOP 1604	BANDERA RD.	BRAUN RD.	GN1604L-BANDE-BRAUN
LOOP 1604	BOWENS CROSSING	SHAENFIELD	GN1604L-BOWEN-SHAEN
LOOP 1604	BRAUN RD.	BOWENS CROSSING	GN1604L-BRAUN-BOWEN
LOOP 1604	ELLISON DRI.	WISEMAN BLVD.	GN1604L-ELLIS-WISEM

LOOP 1604	GRISSOM RD..	SH 151	GN1604L-GRISS-0151S
LOOP 1604	KYLE SEALE PKWY.	BANDERA RD.	GN1604L-KYLES-BANDE
LOOP 1604	MARBACH RD..	US 90	GN1604L-MARBA-0090U
LOOP 1604	MILITARY DR. W.	POTRANCO	GN1604L-MILIT-POTRA
LOOP 1604	POTRANCO	MARBACH RD.	GN1604L-POTRA-MARBA
LOOP 1604	SHAENFIELD	GRISSOM RD.	GN1604L-SHAEN-GRISS
LOOP 1604	WISEMAN BLVD.	MILITARY DR. W.	GN1604L-WISEM-MILIT
AUSTIN HWY.	IH 410	WALZEM	GNAUSTI-0410I-WALZE
AUSTIN HWY.	CORRINE	EISENHAUER	GNAUSTI-CORRI-EISEN
AUSTIN HWY.	EISENHAUER	HARRY WURZBACH	GNAUSTI-EISEN-HARRY
AUSTIN HWY.	HARRY WURZBACH	VANDIVER	GNAUSTI-HARRY-VANDI
AUSTIN HWY.	LANARK	CORRINE	GNAUSTI-LANAR-CORRI
AUSTIN HWY.	RITTMAN	BROADWAY	GNAUSTI-RITTI-BROAD
AUSTIN HWY.	VANDIVER	RITTIMAN	GNAUSTI-VANDI-RITTI
AUSTIN HWY.	WALZEM	LANARK	GNAUSTI-WALZE-LANAR
BABCOCK	IH 410	HILLCREST	GNBABCO-0410I-HILLC
BABCOCK	CALLAGHAN	IH 410	GNBABCO-CALLA-0410I
BABCOCK	CONCORD.	ST. CLOUD RD.	GNBABCO-CONCO-STCLO
BABCOCK	HAMILTON WOLFE	MEDICAL DR.	GNBABCO-HAMIL-MEDIC
BABCOCK	HILLCREST	CONCORD.	GNBABCO-HILLC-CONCO
BABCOCK	HOLLYHOCK	HUEBNER	GNBABCO-HOLLY-HUEBN
BABCOCK	HUEBNER	HAMILTON WOLFE	GNBABCO-HUEBN-HAMIL
BABCOCK	LOCKHILL RD.	HOLLYHOCK	GNBABCO-LOCKH-HOLLY
BABCOCK	LOUIS PASTEUR	CALLAGHAN	GNBABCO-LOUIS-CALLA
BABCOCK	MEDICAL	WURZBACH	GNBABCO-MEDIC-WURZB
BABCOCK	PRUE	LOCKHILL RD.	GNBABCO-PRUE_-LOCKH
BABCOCK	ST CLOUD RD..	WILSON	GNBABCO-STCLO-WILSO
BABCOCK	WILSON	FREDERICKSBURG	GNBABCO-WILSO-FREDE
BABCOCK	WURZBACH	LOUIS PASTEUR	GNBABCO-WURZB-LOUIS
BANDERA	IH 410	CALLAGHAN	GNBANDE-0410I-CALLA
BANDERA	CALLAGHAN	SKYVIEW	GNBANDE-CALLA-SKYVI
BANDERA	CHERYL	GEN. MCMULLEN	GNBANDE-CHERY-GENMC
BANDERA	GEN. MCMULLEN	NW 24TH STREET	GNBANDE-GENMC-NW24T
BANDERA	HILLCREST	LIGUSTRUM	GNBANDE-HILLC-LIGUS
BANDERA	LIGUSTRUM	CHERYL	GNBANDE-LIGUS-CHERY
BANDERA	SKYVIEW	HILLCREST	GNBANDE-SKYVI-HILLC
BITTERS	US 281	BLUE CREST	GNBITTE-0281U-BLUEC
BITTERS	BLANCO	PARTRIDGE TRAIL	GNBITTE-BLANC-PARTR
BITTERS	BLUE CREST	JONES MALTSBERGER	GNBITTE-BLUEC-JONES
BITTERS	PARTRIDGE TRAIL	TOMAHAWK TRAIL	GNBITTE-PARTR-TOMAH
BITTERS	TOMAHAWK TRAIL	WINDING WAY	GNBITTE-TOMAH-WINDI
BITTERS	WINDING WAY	US 281	GNBITTE-WINDI-0281U

BLANCO	IH 410	LANGTON	GNBLANC-0410I-LANGT
BLANCO	LOOP 1604	LARIAT	GNBLANC-1604L-LARIA
BLANCO	BASSE	FRESNO	GNBLANC-BASSE-FRESN
BLANCO	DRESDEN	BASSE	GNBLANC-DRESD-BASSE
BLANCO	FRESNO	HILDEBRAND	GNBLANC-FRESN-HILDE
BLANCO	HILDEBRAND	SUMMIT	GNBLANC-HILDE-SUMMI
BLANCO	LANGTON	OBLATE	GNBLANC-LANGT-OBLAT
BLANCO	LARIAT	MISSION RIDGE	GNBLANC-LARIA-MISSR
BLANCO	MISSION RIDGE	BITTERS	GNBLANC-MISSR-BITTE
BLANCO	OBLATE	DRESDEN	GNBLANC-OBLAT-DRESD
BLANCO	SUMMIT	WOODLAWN	GNBLANC-SUMMI-WOODL
BLANCO	WOODLAWN	FREDERICKSBURG	GNBLANC-WOODL-FREDE
BROADWAY	IH 410	SUNSET	GNBROAD-0410I-SUNSE
BROADWAY	AUSTIN HWY..	HILDEBRAND	GNBROAD-AUSTI-HILDE
BROADWAY	CUNNINGHAM	IH 35	GNBROAD-CUNNI-0035I
BROADWAY	FUNSTON	CUNNINGHAM	GNBROAD-FUNST-CUNNI
BROADWAY	HILDEBRAND	FUNSTON	GNBROAD-HILDE-FUNST
BROADWAY	LAMONT	AUSTIN HWY.	GNBROAD-LAMON-AUSTI
BROADWAY	NACOGDOCHES	LAMONT	GNBROAD-NACOG-LAMON
BROADWAY	SUNSET	NACOGDOCHES	GNBROAD-SUNSE-NACOG
CALLAGHAN	IH010	FREDERICKSBURG	GNCALLA-0010I-FREDE
CALLAGHAN	BRIARFIELD	IH010	GNCALLA-BRIAR-0010I
CALLAGHAN	FREDERICKSBURG	MUIRFIELD	GNCALLA-FREDE-MUIRF
CALLAGHAN	MUIRFIELD	BABCOCK	GNCALLA-MUIRF-BABCO
CALLAGHAN	VANCE JACKSON	BRIARFIELD	GNCALLA-VANCE-BRIAR
FREDERICKSBURG	IH 10	BLANCO	GNFREDE-0010I-BLANC
FREDERICKSBURG	HILDEBRAND	ZARZAMORA	GNFREDE-HILDE-ZARZA
FREDERICKSBURG	ZARZAMORA	IH 35	GNFREDE-ZARZA-0010I
GEN. MCMULLEN	US 90	W. THOMPSON	GNGENMC-0090U-THOMP
GEN. MCMULLEN	BANDERA	CULEBRA	GNGENMC-BANDE-CULEB
GEN. MCMULLEN	CASTROVILLE	CERALVO	GNGENMC-CASTR-CERAL
GEN. MCMULLEN	CERALVO	US 90	GNGENMC-CERAL-0090U
GEN. MCMULLEN	COMMERCE	EL PASO	GNGENMC-COMME-ELPAS
GEN. MCMULLEN	CULEBRA	RUIZ	GNGENMC-CULEB-RUIZ_
GEN. MCMULLEN	EL PASO	CASTROVILLE	GNGENMC-ELPAS-CASTR
GEN. MCMULLEN	RUIZ	COMMERCE	GNGENMC-RUIZ_-COMME
GEN. MCMULLEN	W. THOMPSON	BILLY MITCHELL	GNGENMC-THOMP-BILLY
HARRY WURZBACH	IH 410	URBAN CREST	GNHARRY-0410I-URBAN
HARRY WURZBACH	EISENHAUER	RITTIMAN	GNHARRY-EISEN-RITTI
HARRY WURZBACH	URBAN CREST	EISENHAUER	GNHARRY-URBAN-EISEN
HUEBNER	IH 10	FREDERICKSBURG	GNHUEBN-0010I-FREDE
HUEBNER	FLOYD CURL DR.	BABCOCK	GNHUEBN-FLOYD-BABCO

HUEBNER	FREDERICKSBURG	USAA BLVD	GNHUEBN-FREDE-USAA_
HUEBNER	LOCKHILL SELMA	VANCE JACKSON	GNHUEBN-LHSEL-VANCE
HUEBNER	NW MILITARY HWY.	LOCKHILL SELMA	GNHUEBN-MILIT-LHSEL
HUEBNER	USAA BLVD.	FLOYD CURL DR.	GNHUEBN-USAA_-FLOYD
HUEBNER	VANCE JACKSON	IH 10	GNHUEBN-VANCE-0010I
NACOGDOCHES	BITTERS	MIDDLEBURY DR.	GNNACOG-BITTE-MIDDL
NACOGDOCHES	MIDDLEBURY DR.	IH 410	GNNACOG-MIDDL-0410I
NACOGDOCHES	NACO PERRIN	STARCREST	GNNACOG-NACOP-STARC
NACOGDOCHES	STARCREST	TITAN DR.	GNNACOG-STARC-TITAN
NACOGDOCHES	THOUSAND OAKS	NACO PERRIN	GNNACOG-THOUS-NACOP
NACOGDOCHES	TITAN DR.	BITTERS	GNNACOG-TITAN-BITTE
NEW BRAUNFELS	AUSTIN HWY.	WILTSHIRE	GNNEWBR-AUSTI-WILTS
NEW BRAUNFELS	FUNSTON	WILSON	GNNEWBR-FUNST-WILSO
NEW BRAUNFELS	HILDEBRAND	FUNSTON	GNNEWBR-HILDE-FUNST
NEW BRAUNFELS	WILSON	IH 35	GNNEWBR-WILSO-0035I
NEW BRAUNFELS	WILTSHIRE	HILDEBRAND	GNNEWBR-WILTS-HILDE
NEW LAREDO HWY.	KING AVE.	MILITARY DRIVE	GNNEWLA-KING_-MILIT
NEW LAREDO HWY.	SOUTHCROSS	KING AVE.	GNNEWLA-SOUTH-KING_
NEW LAREDO HWY.	ZARZAMORA	SOUTHCROSS	GNNEWLA-ZARZA-SOUTH
NOGALITOS	US 90	JENNINGS AVE.	GNNOGAL-0090U-JENNI
NOGALITOS	COTTONWOOD	DIVISION	GNNOGAL-COTTO-DIVIS
NOGALITOS	DIVISION	ZARZAMORA	GNNOGAL-DIVIS-ZARZA
NOGALITOS	FLORES	RALPH	GNNOGAL-FLORE-RALPH
NOGALITOS	JENNINGS AVE.	COTTONWOOD	GNNOGAL-JENNI-COTTO
NOGALITOS	RALPH	US 90	GNNOGAL-RALPH-0090U
NW MILITARY HWY.	LOOP 1604	DEZAVALA	GNNWMIL-1604L-DEZAV
NW MILITARY HWY.	BENT OAK DR.	HUEBNER	GNNWMIL-BENTO-HUEBN
NW MILITARY HWY.	DEZAVALA	BENT OAK DR.	GNNWMIL-DEZAV-BENTO
NW MILITARY HWY.	GEORGE	LOCKHILL SELMA	GNNWMIL-GEORG-LHSEL
NW MILITARY HWY.	HUEBNER	HUNTERS GREEN	GNNWMIL-HUEBN-HUNTE
NW MILITARY HWY.	HUNTERS GREEN	GEORGE	GNNWMIL-HUNTE-GEORG
NW MILITARY HWY.	LOCKHILL SELMA	WEST AVE.	GNNWMIL-LHSEL-WEST_
NW MILITARY HWY.	WEST AVE.	IH 410	GNNWMIL-WEST_-0410I
SAN PEDRO AVE.	IH 410	RAMPART	GNSANPE-0410I-RAMPA
SAN PEDRO AVE.	BASSE	FRESNO	GNSANPE-BASSE-FRESN
SAN PEDRO AVE.	FRESNO	HILDEBRAND	GNSANPE-FRESN-HILDE
SAN PEDRO AVE.	HILDEBRAND	SUMMIT	GNSANPE-HILDE-SUMMI
SAN PEDRO AVE.	JACKSON KELLER	BASSE	GNSANPE-JACKS-BASSE
SAN PEDRO AVE.	OBLATE	JACKSON KELLER	GNSANPE-OBLAT-JACKS
SAN PEDRO AVE.	PARK AVE	IH 35	GNSANPE-PARK_-0035I
SAN PEDRO AVE.	RAMPART	OBLATE	GNSANPE-RAMPA-OBLAT
SAN PEDRO AVE.	SUMMIT	WOODLAWN	GNSANPE-SUMMI-WOODL

SAN PEDRO AVE.	WOODLAWN	PARK AVE	GNSANPE-WOODL-PARK_
STARCREST	ENTRANCE AVE.	WETMORE RD.	GNSTARC-ENTRA-WETMO
STARCREST	JONES MALTSBERGER	ENTRANCE AVE	GNSTARC-JONES-ENTRA
THOUSAND OAKS	US 281	BROKEN OAK	GNTHOUS-0281U-BROKE
THOUSAND OAKS	BROKEN OAK	HENDERSON PASS	GNTHOUS-BROKE-HENDE
THOUSAND OAKS	EL SENDERO	SHERTZ	GNTHOUS-ELSEN-SHERT
THOUSAND OAKS	HENDERSON PASS	JONES MALTSBERGER	GNTHOUS-HENDE-JONES
THOUSAND OAKS	JONES MALTSBERGER	TAVERN OAKS	GNTHOUS-JONES-TAVER
THOUSAND OAKS	NACOGDOCHES	EL SENDERO	GNTHOUS-NACOG-ELSEN
THOUSAND OAKS	PARK CROSSING	NACOGDOCHES	GNTHOUS-PARKC-NACOG
THOUSAND OAKS	TAVERN OAKS	WETMORE RD.	GNTHOUS-TAVER-WETMO
THOUSAND OAKS	WETMORE RD..	PARK CROSSING	GNTHOUS-WETMO-PARKC
WEST AVE.	BITTERS	INTERPARK	GNWEST_-BITTE-INTER
WEST AVE.	BLANCO	LARKSPUR	GNWEST_-BLANC-LARKS
WEST AVE.	INTERPARK	NAKOMA	GNWEST_-INTER-NAKOM
WEST AVE.	KRAMERIA	IH 410	GNWEST_-KRAME-0410I
WEST AVE.	LARKSPUR	NW MILITARY HWY.	GNWEST_-LARKS-NWMIL
WEST AVE.	NAKOMA	BLANCO	GNWEST_-NAKOM-BLANC
WEST AVE.	NW MILITARY HWY.	KRAMERIA	GNWEST_-NWMIL-KRAME
WURZBACH	IH 10	GARDENDALE	GNWURZB-0010I-GARDE
WURZBACH	FREDERICKSBURG	MEDICAL DR.	GNWURZB-FREDE-MEDIC
WURZBACH	GARDENDALE	FREDERICKSBURG	GNWURZB-GARDE-FREDE
WURZBACH	LOCKHILL SELMA	WHISPERSOUND	GNWURZB-LHSEL-WHISP
WURZBACH	MEDICAL DR.	BABCOCK	GNWURZB-MEDIC-BABCO
WURZBACH	VANCE JACKSON	IH 10	GNWURZB-VANCE-0010I
WURZBACH	WHISPERSOUND	VANCE JACKSON	GNWURZB-WHISP-VANCE
ZARZAMORA	US 90	JENNINGS AVE.	GNZARZA-0090U-JENNI
ZARZAMORA	COTTONWOOD	CULBERSON AVE.	GNZARZA-COTTO-CULBE
ZARZAMORA	CULBERSON AVE.	NEW LAREDO HWY.	GNZARZA-CULBE-NEWLA
ZARZAMORA	JENNINGS AVE.	COTTONWOOD	GNZARZA-JENNI-COTTO
ZARZAMORA	MAYFIELD	MILITARY DRIVE	GNZARZA-MAYFI-MILIT
ZARZAMORA	NEW LAREDO HWY.	SOUTHCROSS	GNZARZA-NEWLA-SOUTH
ZARZAMORA	SOUTHCROSS	MAYFIELD	GNZARZA-SOUTH-MAYFI
SH 151	IH 410	MILITARY DRIVE W.	GS0151S-0410I-MILIT
SH 151	LOOP 1604	WISEMAN	GS0151S-1604L-WISEM
SH 151	CALLAGHAN	OLD HWY. 90	GS0151S-CALLA-OLDHW
SH 151	HUNT LANE	POTRANCO	GS0151S-HUNT_-POTRA
SH 151	INGRAM	IH 410	GS0151S-INGRA-0410I
SH 151	MILITARY DRIVE W.	CALLAGHAN	GS0151S-MILIT-CALLA
SH 151	MILITARY DRIVE W.	HUNT LANE	GS0151S-MILIT-HUNT_
SH 151	OLD HWY. 90	US 90	GS0151S-OLDHW-0090U
SH 151	POTRANCO	INGRAM	GS0151S-POTRA-INGRA

SH 151	WESTOVER HILLS	MILITARY DR. W.	GS0151S-WESTO-MILIT
SH 151	WISEMAN	WESTOVER HILLS	GS0151S-WISEM-WESTO
LOOP 1604	LOOP 1604	ELLISON DR.	GS1604L-0151S-ELLIS
LOOP 1604	BANDERA RD.	BRAUN RD.	GS1604L-BANDE-BRAUN
LOOP 1604	BOWENS CROSSING	SHAENFIELD	GS1604L-BOWEN-SHAEN
LOOP 1604	BRAUN RD.	BOWENS CROSSING	GS1604L-BRAUN-BOWEN
LOOP 1604	ELLISON DRI.	WISEMAN BLVD.	GS1604L-ELLIS-WISEM
LOOP 1604	GRISSOM RD..	SH 151	GS1604L-GRISS-0151S
LOOP 1604	KYLE SEALE PKWY.	BANDERA RD.	GS1604L-KYLES-BANDE
LOOP 1604	MARBACH RD..	US 90	GS1604L-MARBA-0090U
LOOP 1604	MILITARY DR. W.	POTRANCO	GS1604L-MILIT-POTRA
LOOP 1604	POTRANCO	MARBACH RD.	GS1604L-POTRA-MARBA
LOOP 1604	SHAENFIELD	GRISSOM RD.	GS1604L-SHAEN-GRISS
LOOP 1604	WISEMAN BLVD.	MILITARY DR. W.	GS1604L-WISEM-MILIT
AUSTIN HWY.	IH 410	WALZEM	GSAUSTI-0410I-WALZE
AUSTIN HWY.	CORRINE	EISENHAUER	GSAUSTI-CORRI-EISEN
AUSTIN HWY.	EISENHAUER	HARRY WURZBACH	GSAUSTI-EISEN-HARRY
AUSTIN HWY.	HARRY WURZBACH	VANDIVER	GSAUSTI-HARRY-VANDI
AUSTIN HWY.	LANARK	CORRINE	GSAUSTI-LANAR-CORRI
AUSTIN HWY.	RITTMAN	BROADWAY	GSAUSTI-RITTI-BROAD
AUSTIN HWY.	VANDIVER	RITTIMAN	GSAUSTI-VANDI-RITTI
AUSTIN HWY.	WALZEM	LANARK	GSAUSTI-WALZE-LANAR
BABCOCK	IH 410	HILLCREST	GSBABCO-0410I-HILLC
BABCOCK	CALLAGHAN	IH 410	GSBABCO-CALLA-0410I
BABCOCK	CONCORD.	ST. CLOUD RD.	GSBABCO-CONCO-STCLO
BABCOCK	HAMILTON WOLFE	MEDICAL DR.	GSBABCO-HAMIL-MEDIC
BABCOCK	HILLCREST	CONCORD.	GSBABCO-HILLC-CONCO
BABCOCK	HOLLYHOCK	HUEBNER	GSBABCO-HOLLY-HUEBN
BABCOCK	HUEBNER	HAMILTON WOLFE	GSBABCO-HUEBN-HAMIL
BABCOCK	LOCKHILL RD.	HOLLYHOCK	GSBABCO-LOCKH-HOLLY
BABCOCK	LOUIS PASTEUR	CALLAGHAN	GSBABCO-LOUIS-CALLA
BABCOCK	MEDICAL	WURZBACH	GSBABCO-MEDIC-WURZB
BABCOCK	PRUE	LOCKHILL RD.	GSBABCO-PRUE_-LOCKH
BABCOCK	ST CLOUD RD..	WILSON	GSBABCO-STCLO-WILSO
BABCOCK	WILSON	FREDERICKSBURG	GSBABCO-WILSO-FREDE
BABCOCK	WURZBACH	LOUIS PASTEUR	GSBABCO-WURZB-LOUIS
BANDERA	IH 410	CALLAGHAN	GSBANDE-0410I-CALLA
BANDERA	CALLAGHAN	SKYVIEW	GSBANDE-CALLA-SKYVI
BANDERA	CHERYL	GEN. MCMULLEN	GSBANDE-CHERY-GENMC
BANDERA	GEN. MCMULLEN	NW 24TH STREET	GSBANDE-GENMC-NW24T
BANDERA	HILLCREST	LIGUSTRUM	GSBANDE-HILLC-LIGUS
BANDERA	LIGUSTRUM	CHERYL	GSBANDE-LIGUS-CHERY

BANDERA	SKYVIEW	HILLCREST	GSBANDE-SKYVI-HILLC
BITTERS	US 281	BLUE CREST	GSBITTE-0281U-BLUEC
BITTERS	BLANCO	PARTRIDGE TRAIL	GSBITTE-BLANC-PARTR
BITTERS	BLUE CREST	JONES MALTSBERGER	GSBITTE-BLUEC-JONES
BITTERS	PARTRIDGE TRAIL	TOMAHAWK TRAIL	GSBITTE-PARTR-TOMAH
BITTERS	TOMAHAWK TRAIL	WINDING WAY	GSBITTE-TOMAH-WINDI
BITTERS	WINDING WAY	US 281	GSBITTE-WINDI-0281U
BLANCO	IH 410	LANGTON	GSBLANC-0410I-LANGT
BLANCO	LOOP 1604	LARIAT	GSBLANC-1604L-LARIA
BLANCO	BASSE	FRESNO	GSBLANC-BASSE-FRESN
BLANCO	DRESDEN	BASSE	GSBLANC-DRESD-BASSE
BLANCO	FRESNO	HILDEBRAND	GSBLANC-FRESN-HILDE
BLANCO	HILDEBRAND	SUMMIT	GSBLANC-HILDE-SUMMI
BLANCO	LANGTON	OBLATE	GSBLANC-LANGT-OBLAT
BLANCO	LARIAT	MISSION RIDGE	GSBLANC-LARIA-MISSR
BLANCO	MISSION RIDGE	BITTERS	GSBLANC-MISSR-BITTE
BLANCO	OBLATE	DRESDEN	GSBLANC-OBLAT-DRESD
BLANCO	SUMMIT	WOODLAWN	GSBLANC-SUMMI-WOODL
BLANCO	WOODLAWN	FREDERICKSBURG	GSBLANC-WOODL-FREDE
BROADWAY	IH 410	SUNSET	GSBROAD-0410I-SUNSE
BROADWAY	AUSTIN HWY..	HILDEBRAND	GSBROAD-AUSTI-HILDE
BROADWAY	CUNNINGHAM	IH 35	GSBROAD-CUNNI-0035I
BROADWAY	FUNSTON	CUNNINGHAM	GSBROAD-FUNST-CUNNI
BROADWAY	HILDEBRAND	FUNSTON	GSBROAD-HILDE-FUNST
BROADWAY	LAMONT	AUSTIN HWY.	GSBROAD-LAMON-AUSTI
BROADWAY	NACOGDOCHES	LAMONT	GSBROAD-NACOG-LAMON
BROADWAY	SUNSET	NACOGDOCHES	GSBROAD-SUNSE-NACOG
CALLAGHAN	IH010	FREDERICKSBURG	GSCALLA-0010I-FREDE
CALLAGHAN	BRIARFIELD	IH010	GSCALLA-BRIAR-0010I
CALLAGHAN	FREDERICKSBURG	MUIRFIELD	GSCALLA-FREDE-MUIRF
CALLAGHAN	MUIRFIELD	BABCOCK	GSCALLA-MUIRF-BABCO
CALLAGHAN	VANCE JACKSON	BRIARFIELD	GSCALLA-VANCE-BRIAR
FREDERICKSBURG	IH 10	BLANCO	GSFREDE-0010I-BLANC
FREDERICKSBURG	HILDEBRAND	ZARZAMORA	GSFREDE-HILDE-ZARZA
FREDERICKSBURG	ZARZAMORA	IH 35	GSFREDE-ZARZA-0010I
GEN. MCMULLEN	US 90	W. THOMPSON	GSGENMC-0090U-THOMP
GEN. MCMULLEN	BANDERA	CULEBRA	GSGENMC-BANDE-CULEB
GEN. MCMULLEN	CASTROVILLE	CERALVO	GSGENMC-CASTR-CERAL
GEN. MCMULLEN	CERALVO	US 90	GSGENMC-CERAL-0090U
GEN. MCMULLEN	COMMERCE	EL PASO	GSGENMC-COMME-ELPAS
GEN. MCMULLEN	CULEBRA	RUIZ	GSGENMC-CULEB-RUIZ_
GEN. MCMULLEN	EL PASO	CASTROVILLE	GSGENMC-ELPAS-CASTR

GEN. MCMULLEN	RUIZ	COMMERCE	GSGENMC-RUIZ_-COMME
GEN. MCMULLEN	W. THOMPSON	BILLY MITCHELL	GSGENMC-THOMP-BILLY
HARRY WURZBACH	IH 410	URBAN CREST	GSHARRY-0410I-URBAN
HARRY WURZBACH	EISENHAUER	RITTIMAN	GSHARRY-EISEN-RITTI
HARRY WURZBACH	URBAN CREST	EISENHAUER	GSHARRY-URBAN-EISEN
HUEBNER	IH 10	FREDERICKSBURG	GSHUEBN-0010I-FREDE
HUEBNER	FLOYD CURL DR.	BABCOCK	GSHUEBN-FLOYD-BABCO
HUEBNER	FREDERICKSBURG	USAA BLVD	GSHUEBN-FREDE-USAA_
HUEBNER	LOCKHILL SELMA	VANCE JACKSON	GSHUEBN-LHSEL-VANCE
HUEBNER	NW MILITARY HWY.	LOCKHILL SELMA	GSHUEBN-MILIT-LHSEL
HUEBNER	USAA BLVD.	FLOYD CURL DR.	GSHUEBN-USAA_-FLOYD
HUEBNER	VANCE JACKSON	IH 10	GSHUEBN-VANCE-0010I
NACOGDOCHES	BITTERS	MIDDLEBURY DR.	GSNACOG-BITTE-MIDDL
NACOGDOCHES	MIDDLEBURY DR.	IH 410	GSNACOG-MIDDL-0410I
NACOGDOCHES	NACO PERRIN	STARCREST	GSNACOG-NACOP-STARC
NACOGDOCHES	STARCREST	TITAN DR.	GSNACOG-STARC-TITAN
NACOGDOCHES	THOUSAND OAKS	NACO PERRIN	GSNACOG-THOUS-NACOP
NACOGDOCHES	TITAN DR.	BITTERS	GSNACOG-TITAN-BITTE
NEW BRAUNFELS	AUSTIN HWY.	WILTSHIRE	GSNEWBR-AUSTI-WILTS
NEW BRAUNFELS	FUNSTON	WILSON	GSNEWBR-FUNST-WILSO
NEW BRAUNFELS	HILDEBRAND	FUNSTON	GSNEWBR-HILDE-FUNST
NEW BRAUNFELS	WILSON	IH 35	GSNEWBR-WILSO-0035I
NEW BRAUNFELS	WILTSHIRE	HILDEBRAND	GSNEWBR-WILTS-HILDE
NEW LAREDO HWY.	KING AVE.	MILITARY DRIVE	GSNEWLA-KING_-MILIT
NEW LAREDO HWY.	SOUTHCROSS	KING AVE.	GSNEWLA-SOUTH-KING_
NEW LAREDO HWY.	ZARZAMORA	SOUTHCROSS	GSNEWLA-ZARZA-SOUTH
NOGALITOS	US 90	JENNINGS AVE.	GSNOGAL-0090U-JENNI
NOGALITOS	COTTONWOOD	DIVISION	GSNOGAL-COTTO-DIVIS
NOGALITOS	DIVISION	ZARZAMORA	GSNOGAL-DIVIS-ZARZA
NOGALITOS	FLORES	RALPH	GSNOGAL-FLORE-RALPH
NOGALITOS	JENNINGS AVE.	COTTONWOOD	GSNOGAL-JENNI-COTTO
NOGALITOS	RALPH	US 90	GSNOGAL-RALPH-0090U
NW MILITARY HWY.	LOOP 1604	DEZAVALA	GSNWMIL-1604L-DEZAV
NW MILITARY HWY.	BENT OAK DR.	HUEBNER	GSNWMIL-BENTO-HUEBN
NW MILITARY HWY.	DEZAVALA	BENT OAK DR.	GSNWMIL-DEZAV-BENTO
NW MILITARY HWY.	GEORGE	LOCKHILL SELMA	GSNWMIL-GEORG-LHSEL
NW MILITARY HWY.	HUEBNER	HUNTERS GREEN	GSNWMIL-HUEBN-HUNTE
NW MILITARY HWY.	HUNTERS GREEN	GEORGE	GSNWMIL-HUNTE-GEORG
NW MILITARY HWY.	LOCKHILL SELMA	WEST AVE.	GSNWMIL-LHSEL-WEST_
NW MILITARY HWY.	WEST AVE.	IH 410	GSNWMIL-WEST_-0410I
SAN PEDRO AVE.	IH 410	RAMPART	GSSANPE-0410I-RAMPA
SAN PEDRO AVE.	BASSE	FRESNO	GSSANPE-BASSE-FRESN

SAN PEDRO AVE.	FRESNO	HILDEBRAND	GSSANPE-FRESN-HILDE
SAN PEDRO AVE.	HILDEBRAND	SUMMIT	GSSANPE-HILDE-SUMMI
SAN PEDRO AVE.	JACKSON KELLER	BASSE	GSSANPE-JACKS-BASSE
SAN PEDRO AVE.	OBLATE	JACKSON KELLER	GSSANPE-OBLAT-JACKS
SAN PEDRO AVE.	PARK AVE	IH 35	GSSANPE-PARK_-0035I
SAN PEDRO AVE.	RAMPART	OBLATE	GSSANPE-RAMPA-OBLAT
SAN PEDRO AVE.	SUMMIT	WOODLAWN	GSSANPE-SUMMI-WOODL
SAN PEDRO AVE.	WOODLAWN	PARK AVE	GSSANPE-WOODL-PARK_
STARCREST	ENTRANCE AVE.	WETMORE RD.	GSSTARC-ENTRA-WETMO
STARCREST	JONES MALTSBERGER	ENTRANCE AVE	GSSTARC-JONES-ENTRA
THOUSAND OAKS	US 281	BROKEN OAK	GSTHOUS-0281U-BROKE
THOUSAND OAKS	BROKEN OAK	HENDERSON PASS	GSTHOUS-BROKE-HENDE
THOUSAND OAKS	EL SENDERO	SHERTZ	GSTHOUS-ELSEN-SHERT
THOUSAND OAKS	HENDERSON PASS	JONES MALTSBERGER	GSTHOUS-HENDE-JONES
THOUSAND OAKS	JONES MALTSBERGER	TAVERN OAKS	GSTHOUS-JONES-TAVER
THOUSAND OAKS	NACOGDOCHES	EL SENDERO	GSTHOUS-NACOG-ELSEN
THOUSAND OAKS	PARK CROSSING	NACOGDOCHES	GSTHOUS-PARKC-NACOG
THOUSAND OAKS	TAVERN OAKS	WETMORE RD.	GSTHOUS-TAVER-WETMO
THOUSAND OAKS	WETMORE RD..	PARK CROSSING	GSTHOUS-WETMO-PARKC
WEST AVE.	BITTERS	INTERPARK	GSWEST_-BITTE-INTER
WEST AVE.	BLANCO	LARKSPUR	GSWEST_-BLANC-LARKS
WEST AVE.	INTERPARK	NAKOMA	GSWEST_-INTER-NAKOM
WEST AVE.	KRAMERIA	IH 410	GSWEST_-KRAME-0410I
WEST AVE.	LARKSPUR	NW MILITARY HWY.	GSWEST_-LARKS-NWMIL
WEST AVE.	NAKOMA	BLANCO	GSWEST_-NAKOM-BLANC
WEST AVE.	NW MILITARY HWY.	KRAMERIA	GSWEST_-NWMIL-KRAME
WURZBACH	IH 10	GARDENDALE	GSWURZB-0010I-GARDE
WURZBACH	FREDERICKSBURG	MEDICAL DR.	GSWURZB-FREDE-MEDIC
WURZBACH	GARDENDALE	FREDERICKSBURG	GSWURZB-GARDE-FREDE
WURZBACH	LOCKHILL SELMA	WHISPERSOUND	GSWURZB-LHSEL-WHISP
WURZBACH	MEDICAL DR.	BABCOCK	GSWURZB-MEDIC-BABCO
WURZBACH	VANCE JACKSON	IH 10	GSWURZB-VANCE-0010I
WURZBACH	WHISPERSOUND	VANCE JACKSON	GSWURZB-WHISP-VANCE
ZARZAMORA	US 90	JENNINGS AVE.	GSZARZA-0090U-JENNI
ZARZAMORA	COTTONWOOD	CULBERSON AVE.	GSZARZA-COTTO-CULBE
ZARZAMORA	CULBERSON AVE.	NEW LAREDO HWY.	GSZARZA-CULBE-NEWLA
ZARZAMORA	JENNINGS AVE.	COTTONWOOD	GSZARZA-JENNI-COTTO
ZARZAMORA	MAYFIELD	MILITARY DRIVE	GSZARZA-MAYFI-MILIT
ZARZAMORA	NEW LAREDO HWY.	SOUTHCROSS	GSZARZA-NEWLA-SOUTH
ZARZAMORA	SOUTHCROSS	MAYFIELD	GSZARZA-SOUTH-MAYFI
IH 10	FM 1516	FOSTER RD.	GW0010I-1516F-FOSTE
IH 10	LOOP 1604	FM 1516 .	GW0010I-1604L-1516F

US 90	LOOP 1604	HUNT LANE	GW0090U-1604L-HUNT_
US 90	HUNT LANE	IH 410	GW0090U-HUNT_-0410I
COMMERCE	IH 010	COLORADO	GWCOMME-0010I-COLOR
COMMERCE	ACME	CALLAGHAN	GWCOMME-ACME_-CALLA
COMMERCE	ALAMO	FLORES	GWCOMME-ALAMO-FLORE
COMMERCE	BOWIE	ALAMO	GWCOMME-BOWIE-ALAMO
COMMERCE	BUENA VISTA	SW 24TH	GWCOMME-BUENA-SW24T
COMMERCE	COLORADO	TRINITY	GWCOMME-COLOR-TRINI
COMMERCE	FLORES	IH 10	GWCOMME-FLORE-0010I
COMMERCE	GEN. MCMULLEN	OLD HWY. 90	GWCOMME-GENMC-OLDHW
COMMERCE	HACKBERRY	HOEFGEN	GWCOMME-HACKB-HOEFG
COMMERCE	HOEFGEN	BOWIE	GWCOMME-HOEFG-BOWIE
COMMERCE	NEW BRAUNFELS	HACKBERRY	GWCOMME-NEWBR-HACKB
COMMERCE	NW 39TH	ACME	GWCOMME-NW39T-ACME_
COMMERCE	OLD HWY. 90	SW 36TH	GWCOMME-OLDHW-SW36T
COMMERCE	SW 24TH	GEN. MCMULLEN	GWCOMME-SW24T-GENMC
COMMERCE	SW 36TH	NW 39TH	GWCOMME-SW36T-NW39T
COMMERCE	TRINITY	ZARZAMORA	GWCOMME-TRINI-ZARZA
COMMERCE	ZARZAMORA	BUENA VISTA	GWCOMME-ZARZA-BUENA
CULEBRA	IH 10	ZARZAMORA	GWCULEB-0010I-ZARZA
CULEBRA	NW 19TH	NW 24TH STREET	GWCULEB-NW19T-NW24T
CULEBRA	ZARZAMORA	NW 19TH	GWCULEB-ZARZA-NW19T
DURANGO	US 281	ALAMO	GWDURAN-0281U-ALAMO
DURANGO	ALAMO	PRESA	GWDURAN-ALAMO-PRESA
DURANGO	FLORES	IH 35	GWDURAN-FLORE-0035I
DURANGO	PRESA	FLORES	GWDURAN-PRESA-FLORE
MILITARY DRIVE	IH 35	ZARZAMORA	GWMILIT-0035I-ZARZA
MILITARY DRIVE	IH 37	NORTH RD.	GWMILIT-0037I-NORTH
MILITARY DRIVE	COMMERCIAL	IH 35	GWMILIT-COMML-0035I
MILITARY DRIVE	FIVE PALMS	ORVILLE WRIGHT	GWMILIT-FIVEP-ORVIL
MILITARY DRIVE	FLORES	PLEASANTON	GWMILIT-FLORE-PLEAS
MILITARY DRIVE	LUKE	BERQUIST	GWMILIT-LUKE_-BERQU
MILITARY DRIVE	MISSION	ROOSEVELT	GWMILIT-MISSI-ROOSE
MILITARY DRIVE	NEW BRAUNFELS	PRESA	GWMILIT-NEWBR-PRESA
MILITARY DRIVE	NEW LAREDO HWY.	QUINTANA RD.	GWMILIT-NEWLA-QUINT
MILITARY DRIVE	NORTH RD.	NEW BRAUNFELS	GWMILIT-NORTH-NEWBR
MILITARY DRIVE	OLD PEARSALL RD.	WHITEWOOD	GWMILIT-OLDPE-WHITE
MILITARY DRIVE	ORVILLE WRIGHT	LUKE	GWMILIT-ORVIL-LUKE_
MILITARY DRIVE	OTTO STREET	SOMERSET	GWMILIT-OTTO_-SOMER
MILITARY DRIVE	PLEASANTON	COMMERCIAL	GWMILIT-PLEAS-COMML
MILITARY DRIVE	PRESA	MISSION	GWMILIT-PRESA-MISSI
MILITARY DRIVE	QUINTANA RD.	OLD PEARSALL RD.	GWMILIT-QUINT-OLDPE

MILITARY DRIVE	ROOSEVELT	FLORES	GWMILIT-ROOSE-FLORE
MILITARY DRIVE	ROYAL GATE DR	FIVE PALMS	GWMILIT-ROYAL-FIVEP
MILITARY DRIVE	SOMERSET	NEW LAREDO HWY.	GWMILIT-SOMER-NEWLA
MILITARY DRIVE	WHITEWOOD	ROYAL GATE DR	GWMILIT-WHITE-ROYAL
MILITARY DRIVE	ZARZAMORA	OTTO STREET	GWMILIT-ZARZA-OTTO_
RITTIMAN	IH 410	HOLBROOK	GWRITTI-0410I-HOLBR
RITTIMAN	FREMONT	HARRY WURZBACH	GWRITTI-FREMO-HARRY
RITTIMAN	HOLBROOK	FREMONT	GWRITTI-HOLBR-FREMO
SOUTHCROSS	IH 35	HURON	GWSOUTH-0035I-HURON
SOUTHCROSS	US 281	PRESA	GWSOUTH-0281U-PRESA
SOUTHCROSS	FLORES	PLEASANTON	GWSOUTH-FLORE-PLEAS
SOUTHCROSS	HURON	ZARZAMORA	GWSOUTH-HURON-ZARZA
SOUTHCROSS	MISSION	FLORES	GWSOUTH-MISSI-FLORE
SOUTHCROSS	PLEASANTON	IH 35	GWSOUTH-PLEAS-0035I
SOUTHCROSS	PRESA	MISSION	GWSOUTH-PRESA-MISSI
SOUTHCROSS	SOMERSET	NEW LAREDO HWY.	GWSOUTH-SOMER-NEWLA
SOUTHCROSS	ZARZAMORA	SOMERSET	GWSOUTH-ZARZA-SOMER
WALZEM	IH 410	AUSTIN HWY.	GWWALZE-0410I-AUSTI
WALZEM	EAGLE CREST	MIDCROWN	GWWALZE-EAGLE-MIDCR
WALZEM	EISENHAUER	EAGLE CREST	GWWALZE-EISEN-EAGLE
WALZEM	GIBBS SPRAWL	EISENHAUER	GWWALZE-GIBBS-EISEN
WALZEM	MIDCROWN	RAYBON	GWWALZE-MIDCR-RAYBO
WALZEM	RAYBON	IH 410	GWWALZE-RAYBO-0410I

APPENDIX D

GPS DATA COLLECTION SYSTEM

GPS DATA COLLECTION SYSTEM

As a portion of the assessment of travel characteristics in San Antonio, TTI developed a travel time database with 242 center-line kilometers (150 miles) of coverage using advanced technologies. The database was used to supplement two real-time speed data collection systems, the ATMS and AVI systems. The envisioned concept was to provide motorists with the best possible speed information, while also trying to achieve maximum coverage. The data from the various collection systems are transmitted to in-vehicle navigation systems and other traveler information systems.

Technology

TTI used a newly emerging Geographic Positioning System (GPS) approach to collect the travel time data. The basic principle of GPS is triangulation. The Department of Defense operates a system of 24 satellites which can be used to determine location coordinates anywhere on earth by using a GPS receiver. The GPS receives signals from 3 or more satellites and calculates a location based on the time that it takes to receive the signals (See Figure D-1).

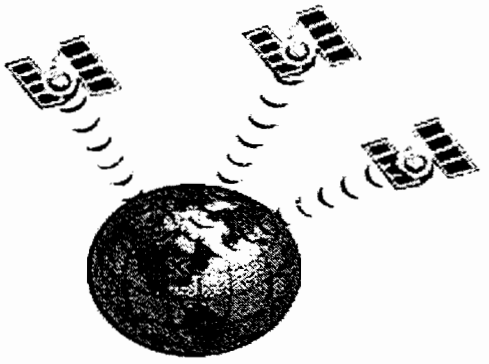

Figure D-1. GPS Triangulation

As a safety precaution, the Department of Defense degrades the accuracy of the signals for civilian use. However, by using a technique referred to as differential correction, the accuracy of the system can be greatly improved. Differential correction works by means of a base station. The base station location is calibrated to a high degree of accuracy. Using the known location of satellites, correction factors can be determined for each satellite by figuring error from the base station. This application was used in this study to obtain 2- to 5-meter accuracy.

GPS Equipment

The data collection equipment consists of a GPS receiver, GPS antenna, differential corrections receiver, differential corrections antenna, power source, and a memory device for data logging (see Figure D-2).

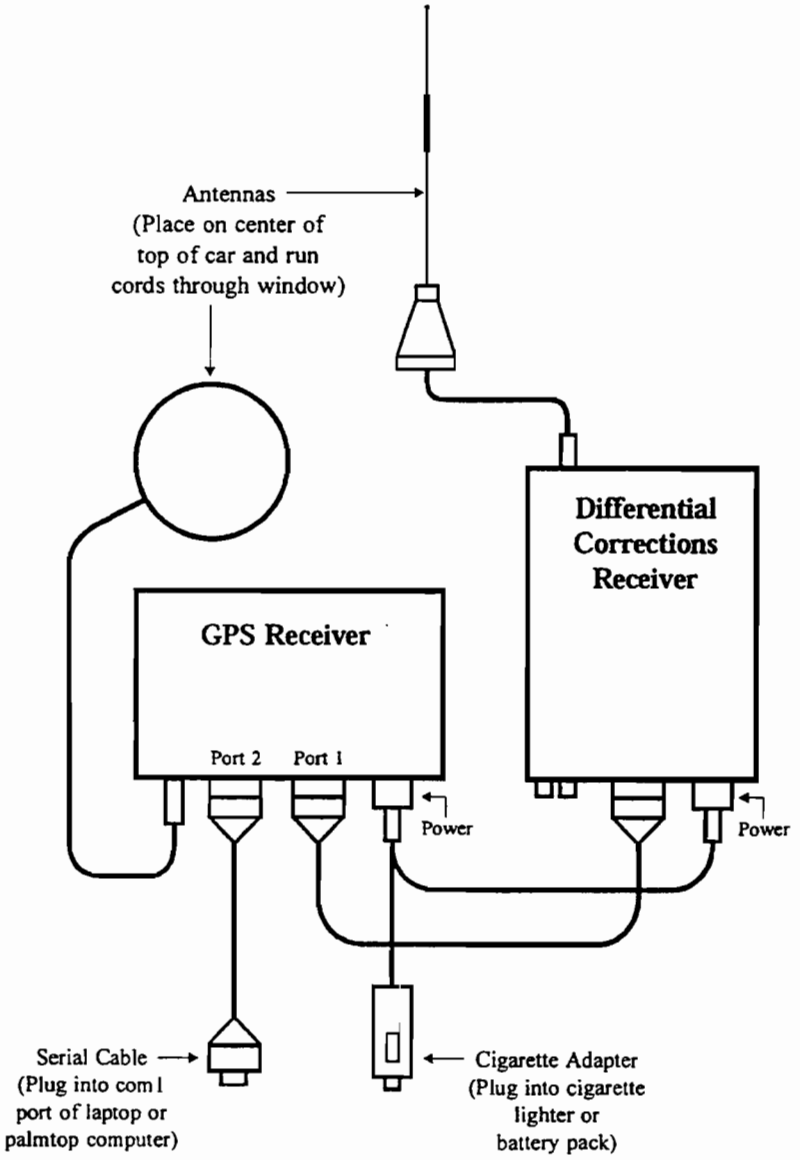

Figure D-2. Equipment Diagram

GPS receivers vary greatly in quality and features. The following is a specification that was used when ordering these specific units.

The data collection equipment were contained with a small plastic briefcase for portability. To set up the equipment in the vehicle, the two antennas are placed on the roof, and the cigarette adapter is plugged into the vehicle's cigarette lighter or portable battery pack. A serial cable is connected to a laptop or palmtop computer, and a data logging software is executed. The GPS receives degraded location data from the satellites, as well as receiving differential corrections data thru a serial port. The location data are corrected, known as DGPS data, and sent to the laptop computer upon query. Data are downloaded to a permanent storage area once brought into the office (see Figure D-3).

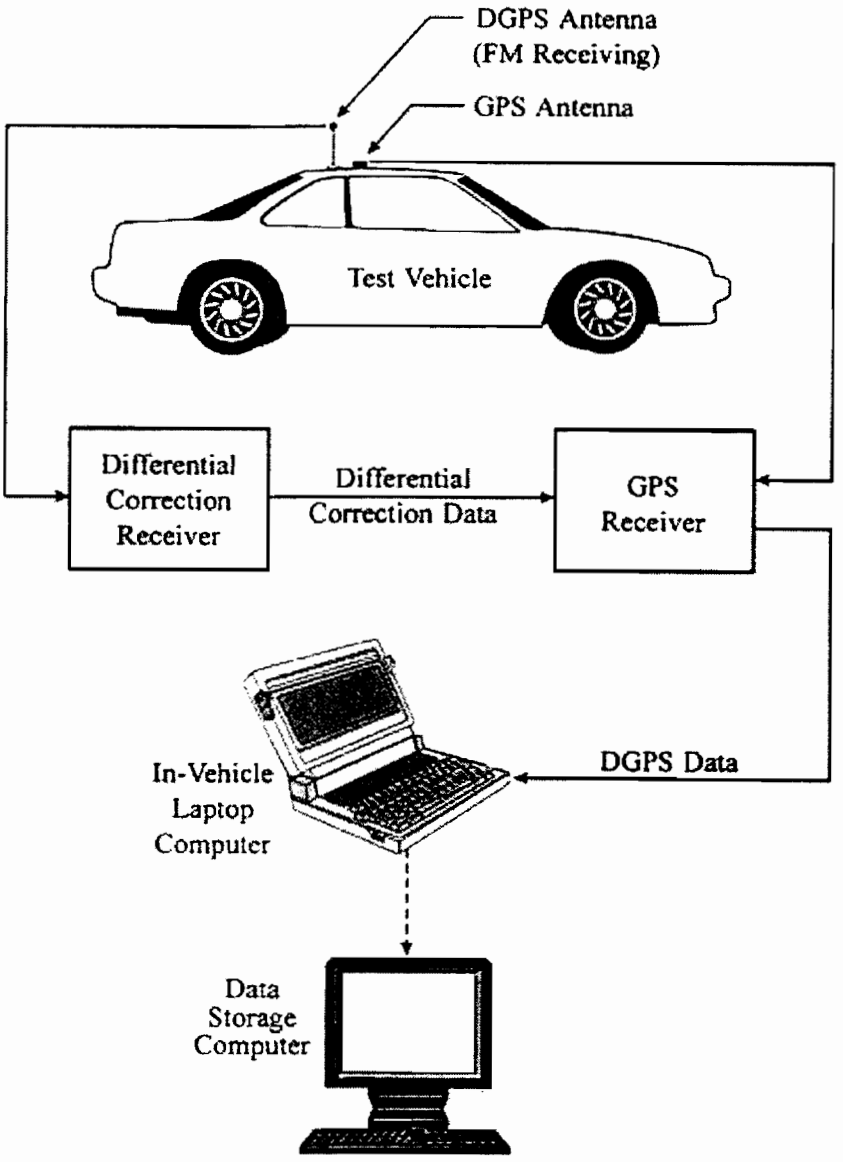

Figure D-3. Data Collection Process

Minimum GPS Receiver Equipment Specifications

Channels/tracking mode:

Six parallel multichannel, continuous tracking

Signal tracked:

L1 frequency and C/A-code (SPS)

User environment and application:

Vehicle locating at speeds in excess of 100 kph (60 mph)

Position accuracy:

<5 meters spherical error probability (SEP) using differential correction

25 meters SEP, with selective availability (SA) disabled

100 meters SEP, with SA enabled

Position fix update rate:

one second or less

Cold start time to first fix:

less than five minutes

Warm start:

less than one minute

Reacquisition time:

less than 10 seconds

Velocity accuracy:

0.1 m/s (0.2 mph), with SA disabled

0.5 m/s (1.0 mph), with SA enabled

Velocity range:

0-113 km/h (0-70 mph)

Velocity computation:

Velocity computation must be based on both pseudorange (distance from satellite to receiver) and pseudorange rate data. Velocity computation based on coordinates of adjacent position fixes is not acceptable.

Altitude:

-400 to +5,000 meters

Temperature (operating):

-40 to +85 degrees Celsius

Input Voltage range:

nine to 32 volts DC

Weight:

< 2 lbs.

Antenna:

low profile micro-strip patch

Number of ports/type:

2/RS-232

Data input:

Mode settings, I/O configuration, differential corrections

Data output:

Latitude, longitude, altitude, speed, heading, time, vertical velocity, satellite information and diagnostic information

Output data reporting interval:

one second or less

Output data recording interval:

one second or less

Baud rate:

300; 600; 1,200; 2,400; 4,800; 9,600; selectable

Time:

Universal Coordinated Time (UTC) to the nearest microsecond with one PPS available at interface cable

Protocols/formats:

NMEA (output), Proprietary Protocol with documentation, RTCM (differential input)

Warranty:

12 months (must also have a 1-800 tech support number directly to factory)

Price:

in the range of $500-$700

Miscellaneous:

collects data at all timed

tracks four or more satellites at all times

needs to be small, lightweight and portable

must come with software to log speed and position on notebook computer every one second

Advantages

There are many advantages to collecting travel time data with GPS as opposed to collecting data using license plate matching, manual timing, or even using distance measuring instruments:

- reduction in staff requirements;
- reduction in human error;
- no vehicle or equipment calibration necessary;
- returns a robust data set;
- relatively portable and accurate; and
- low capital investment of $2,000

GPS Data

Data for this study were collected on a fixed interval of one second. Each point shown in Figure D-4 represents one calculated location along a traveled site. As seen in Figure D-4, GPS data is very intuitive in the visual format. The further apart the points, the more distance that is covered in one second. This situation relates increased speed, whereas, the closer together the points, the slower the speed.

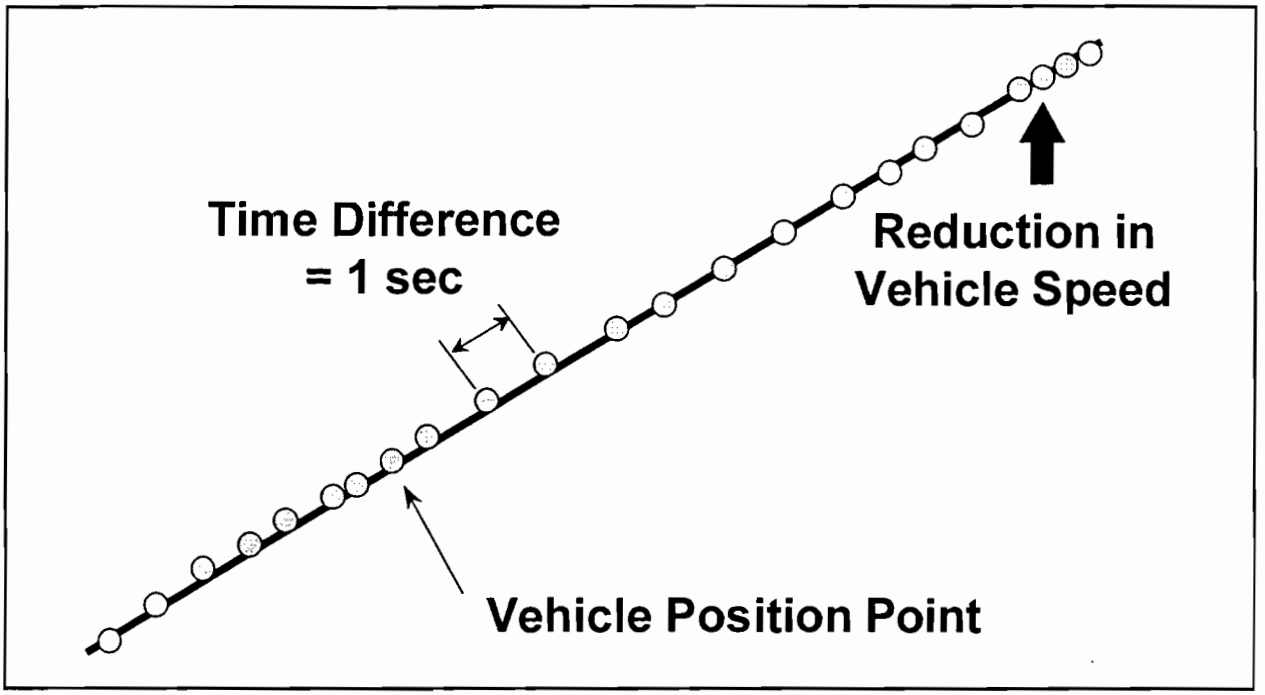

Figure D-4. Visualization of GPS Data

GPS data in tabular format are less intuitive. Table D-1 shows a sample of GPS data. The data types are date, latitude and longitude in decimal degrees. Time (usually in Greenwich time which is five hours off from CST) and GPS speed. GPS speed is synonymous to spot speed collected by means of doppler radar effects.

Table D-1. Raw GPS Data

DATE	LATITUDE	LONGITUDE	TIME	SPEED (MPH)
1/14/1998	29.492620	-98.570849	07:11:12	42 (26)
1/14/1998	29.493720	-98.569689	07:12:02	39 (24)
1/14/1998	29.498260	-98.565089	07:12:47	63 (39)
1/14/1998	29.501470	-98.561939	07:13:14	64 (40)
1/14/1998	29.505640	-98.557789	07:13:55	66 (41)
1/14/1998	29.507010	-98.556439	07:14:06	56 (35)

The robustness of the GPS data is best shown in a speed vs. time plot (Figure D-5). The data for this section shows speed on the y-axis up to about 75 kph (45 mph). The time span covers approximately six minutes with each tick mark representing 30 seconds. Where the speeds drop significantly are intuitively where the signalized intersections are located. These plots are great for delay study applications. The variability in stopped time is very obvious in this run which denotes the need for multiple runs to determine an average travel time.

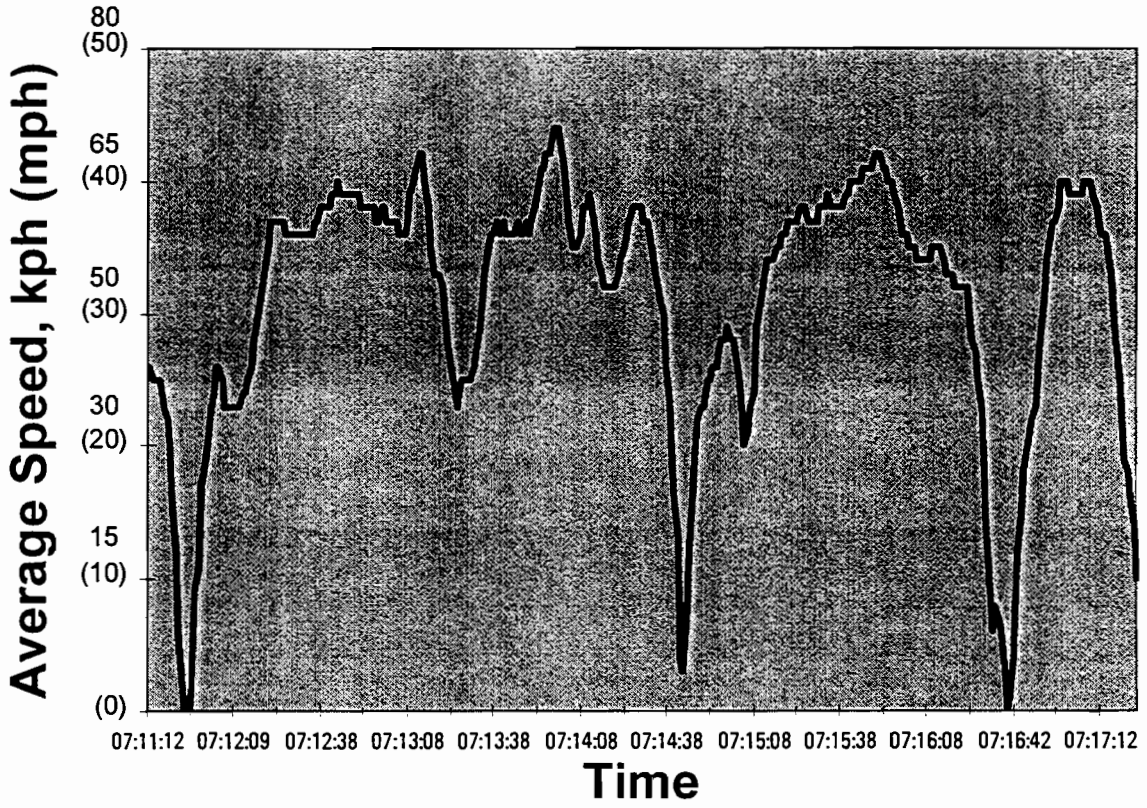

Figure D-5. Speed Profile Along Route

Giving rise to the variability issue, it was necessary to determine how many runs were necessary to develop an accurate picture of travel time. Many equations have been developed over the years. The particular equation (1) that was used for this study came from the new *Travel Time Data Collection Handbook* that was developed by TTI for the Federal Highway Administration (1998). A

practitioner's equation is developed through the relationships of relative error and the coefficient of variation with mean travel time. Coefficients of variation are dependent upon traffic central and other roadway characteristics, and have been shown to vary between 9 percent and 17 percent.

$$n = \left(\frac{t \times s}{\varepsilon}\right)^2 = \left(\frac{t \times (c.v. \times \bar{x})}{(e \times \bar{x})}\right)^2 = \left(\frac{t \times c.v.}{e}\right)^2 \qquad (1)$$

n = Sample Size
t = t-statistic for specified confidence level
s = standard deviation of travel time
ε = maximum specified allowable error
$\bar{x}$ = mean travel time

c.v = coefficient of variation = $\frac{s}{\bar{x}}$

e = relative error = $\frac{\varepsilon}{\bar{x}}$

Table D-2 shows a few examples of sample sizes for arterial roadways (note the dependency on signal density). With the primary GPS data collection coverage on arterials with heavy volumes and numerous signals, a sample size of 12 was used.

Table D-2. Arterial Street Sample Sizes

Traffic Signal Density (signals per kilometer)	Average Coefficient of Variation, (%)	Sample Sizes		
		90 % Confidence +/- 10 % Error	95 % Confidence +/- 10 % Error	95 % Confidence +/- 5 % Error
Less than 2	9	5	6	15
2 to 4	12	6	8	25
Greater than 4	15	9	12	37

Data were collected over three different periods (AM Peak, PM Peak, and Off-Peak). The estimated sample size for each peak period was 12 runs for the off-peak period. Because the database is supposed to show typical travel speeds, incident/accident conditions and rain conditions were not included in speed analysis.

Implementation Issues

The application of second-by-second analysis, such as the graph shown in Figure D-5, is fine for microscopic analysis on only a few corridors. However, for this study, TTI was more interested in macroscopic view of travel times by time of day over numerous corridors. Issues of size manageability and segmentation were key to the successful macroscopic implementation of the project.

GPS receivers will typically output 15 to 400 KB of data for each 15-minute time period. This file size depends on the logging software used and data formats. During a typical day of data collection for one vehicle (approximately five hours), up to 2 MB of data can be logged. This file size can be dramatically reduced by aggregating the data by link. To achieve a link travel time, only two point records are needed out of thousands of points.

A second implementation issue allows for comparison over time. If the segments are chosen properly, and there is a fixed point segmentation scheme, runs over time can be compared to show deterioration/improvement in congestion conditions. Typical segment lengths of 1 to 1.5 kilometers (0.5 to 1 mile) produced 485 segments over 32 routes. The segments were broken at major intersections because the data were to be used for navigational purposes. This segmentation scheme is somewhat different than most previous GPS travel time studies. Previous studies have typically concentrated data collection efforts on freeways, whereas this study focused primarily on arterial roads.

The GPS link segments were primarily determined by the changes in characteristics of the various roadway sections. Characteristics of concern included number of lanes, number of signals, speed limit boundaries, volume, roadway type, and the location of major intersections (see Figure D-6). The links are defined to encompass sections with homogeneous characteristics. GPS links are typically defined at the first discontinuity in frequency of signal spacing and some major intersection locations.

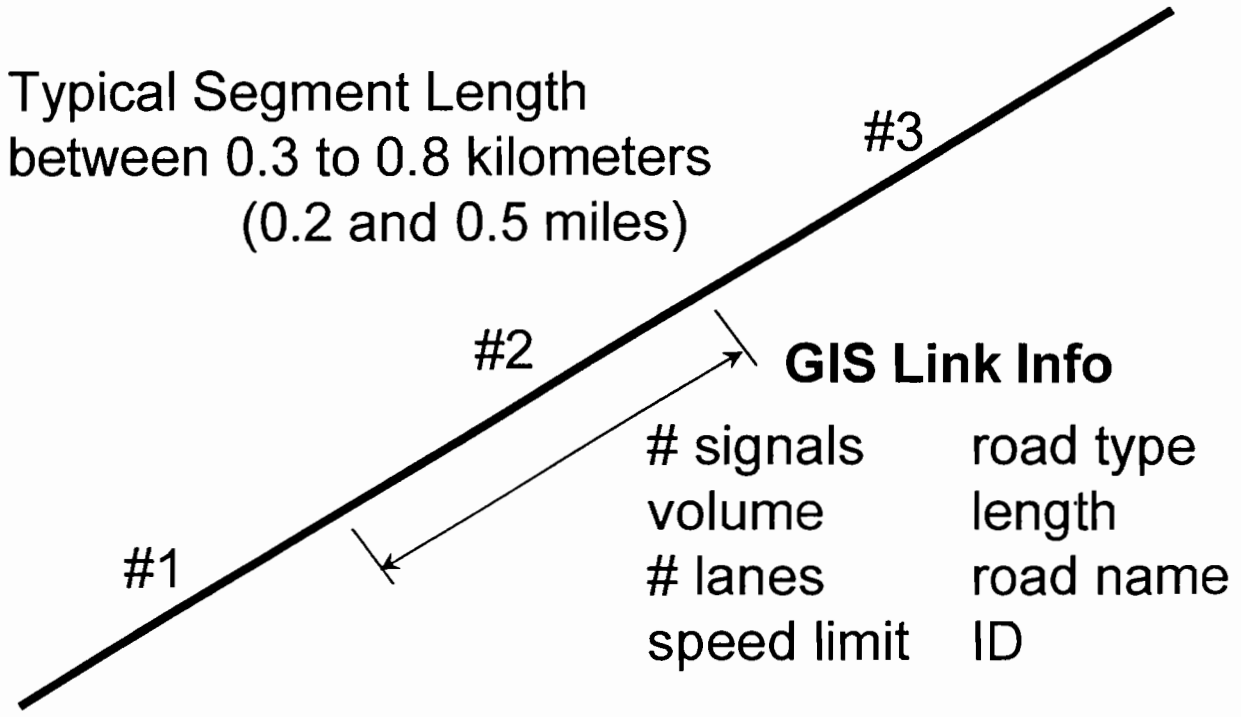

Figure D-6. GIS Link Information

Data Aggregation

Once the segments have been determined within the geographic information system, the data fields may then be aggregated. Points from one directional trip are overlayed onto the base map. (Figure D-7). The points are then associated with the nearest link, and endpoints are determined. The ending point for one link is synonymous with the starting point of the consecutive link. Thus, link travel time can be determined by subtracting the start point time from the end point time.

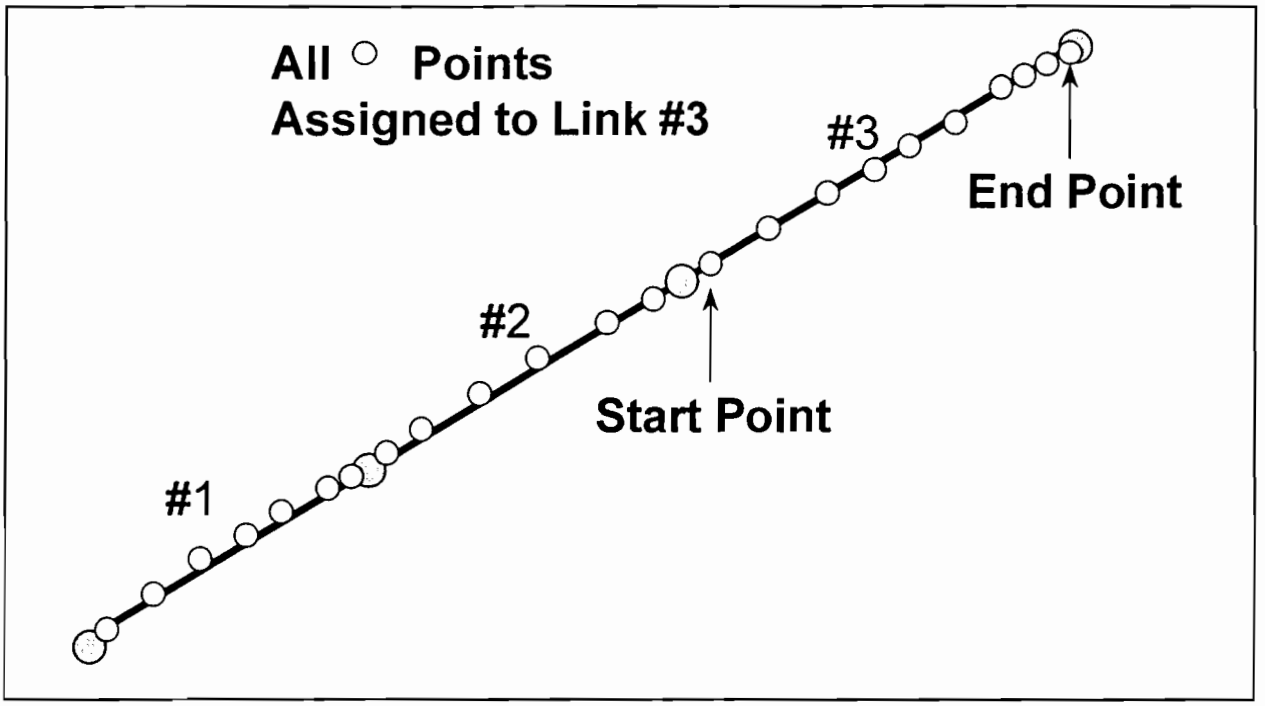

Figure D-7. GPS Point to Link Association

Using this type of aggregation procedure, an inherent error occurred. The closest point to the end of the segment will be defined as the endpoint. However, this point is not always directly on the link node (Figure D-8). This may cause an error of <0.5 sec. Cumulative error over any given link or corridor will then be <1 segment.

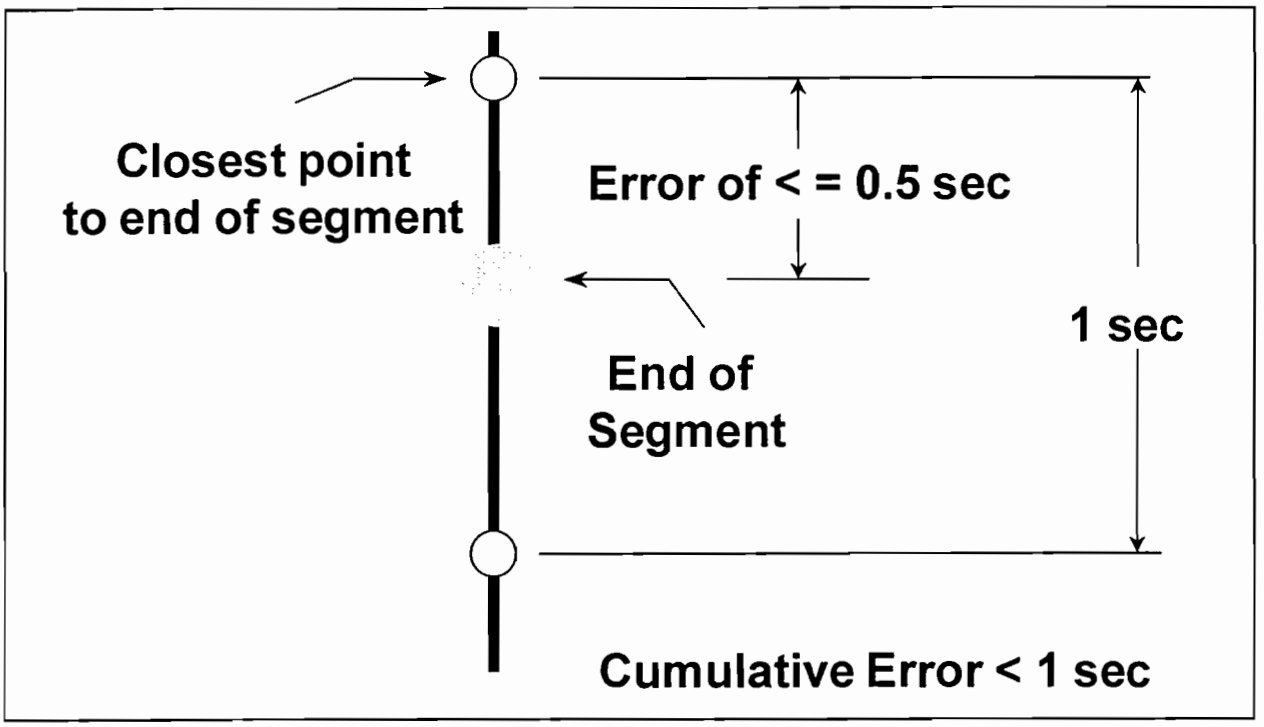

Figure D-8. Data Aggregation Error

After aggregating all of the travel time runs, the summary information is stored in a final database. An example is shown in Appendix F. The database can then be queried to determine:

- average speeds by time of day;
- average speeds along certain routes;
- average speeds on certain types of roadways;
- variability of travel times on arterials vs. freeways; and
- etc.

File Management

Each directional trip along a route corridor produces one data file. As previously mentioned, there were more than 2,000 trip files collected during the study period. Managing those files became a

large part of daily routine. In order to avoid overwriting the files, a unique file naming system was developed. Each filename is eight characters long and contains information about:

- route name;
- direction of travel along the route;
- date; and
- time

within the eight characters. Figure D-9 depicts the file naming convention for all files.

Pos. 1	Route Name
1	151
2	Austin Highway
3	Babcock (N. Section)
4	Babcock (S. Section)
5	Bandera/Culebra
6	Bitters/Blanco
7	Blanco
8	Broadway
9	Buena Vista
A	Callaghan
B	Commerce (E. Section)
C	Commerce (W. Section)
D	Durango
E	Gen. McMullen
F	Huebner
G	IH 10
H	Laredo Hwy
I	Loop 1604 (N. Section)
J	Loop 1604/US 90 (S. Section)
K	Military Drive (E. Section)
L	Military Drive (W. Section)
M	Nacogdoches
N	New Braunfels
O	NW Military Highway
P	Rittiman/Harry Wurzbach
Q	San Pedro
R	Southcross
S	Thousand Oaks
T	Walzem
U	West Ave.
V	Wurzbach
W	Zarzamora

Pos. 2	Direction
N	NE, NW
S	SE, SW
W	WB
E	EB
(First letter of Direction on Log Form)	

Pos. 3	Month
A	January
B	February
C	March
D	April
E	May
F	June
G	July
H	August
I	September
J	October
K	November
L	December

Pos. 4-5	Day
01-31	Self Explanatory

Pos. 6-7	Start Time Hour
01-24	Military Time

Pos. 8	Start Time Minutes
A	:00
B	:05
C	:10
D	:15
E	:20
F	:25
G	:30
H	:35
I	:40
J	:45
K	:50
L	:55

Figure D-9. GPS File Naming Convention

One final piece of data should be mentioned. For each trip made, there is a record of weather, pavement, and other environmental conditions. These records were kept via paper copies of trip logs (Figure D-10). The log has a place for driver and date information at the top with a pre-printed route and direction. Route section limits are also pre-printed, and there is space to record six trips in one direction within one time period. Each trip column has a place for time, filenumber, weather, lighting conditions, and pavement conditions. Those records accompany the download files, and using the recorded information, the files are given the unique eight character filenames for permanent storage.

Driver: ______________________

Date: ______________________

Route: ZARZAMORA

MID Direction: SB (US 90 to Military Dr.)

	Start Time:	Start Time:	Start Time:	Start Time:	Start Time:	Start Time:
	File: Trip___.gps	File: Trip___.gps	File: Trip___.gps	File: Trip___.gps	File: Trip___.gps	File: Trip___.gps
Route Section Limits	**Incident Type (if any)**					
US 90 to Jennings						
Jennings to Cottonwood						
Cottonwood to Culberson						
Culberson to Laredo Hwy						
Laredo Hwy to Southcross						
Southcross to Mayfield						
Mayfield to Military Dr.						
Incident Types 1 - Accident Lane 1 (inside lane) 2 - Accident Lane 2 (middle lane) 3 - Accident Lane 3 (outside lane) O - Accident in Opposite Direction	**Weather** ☐ Clear ☐ Overcast ☐ Lt. Rain/Drizzle ☐ Heavy Rain	**Weather** ☐ Clear ☐ Overcast ☐ Lt. Rain/Drizzle ☐ Heavy Rain	**Weather** ☐ Clear ☐ Overcast ☐ Lt. Rain/Drizzle ☐ Heavy Rain	**Weather** ☐ Clear ☐ Overcast ☐ Lt. Rain/Drizzle ☐ Heavy Rain	**Weather** ☐ Clear ☐ Overcast ☐ Lt. Rain/Drizzle ☐ Heavy Rain	**Weather** ☐ Clear ☐ Overcast ☐ Lt. Rain/Drizzle ☐ Heavy Rain
L - Stall on Left Shoulder R - Stall on Right Shoulder M - Multiple Lanes Blocked CS - Construction Start	**Light** ☐ Normal Daylight ☐ Dark or Twilight ☐ Sun Glare ☐ Fog	**Light** ☐ Normal Daylight ☐ Dark or Twilight ☐ Sun Glare ☐ Fog	**Light** ☐ Normal Daylight ☐ Dark or Twilight ☐ Sun Glare ☐ Fog	**Light** ☐ Normal Daylight ☐ Dark or Twilight ☐ Sun Glare ☐ Fog	**Light** ☐ Normal Daylight ☐ Dark or Twilight ☐ Sun Glare ☐ Fog	**Light** ☐ Normal Daylight ☐ Dark or Twilight ☐ Sun Glare ☐ Fog
CE - Construction End D - Debris in Road Q - Queue SQ - Signal Queue	**Pavement** ☐ Dry ☐ Wet ☐ Ice/Slickness	**Pavement** ☐ Dry ☐ Wet ☐ Ice/Slickness	**Pavement** ☐ Dry ☐ Wet ☐ Ice/Slickness	**Pavement** ☐ Dry ☐ Wet ☐ Ice/Slickness	**Pavement** ☐ Dry ☐ Wet ☐ Ice/Slickness	**Pavement** ☐ Dry ☐ Wet ☐ Ice/Slickness
	Any Incidents? ☐ Yes ☐ No	**Any Incidents?** ☐ Yes ☐ No	**Any Incidents?** ☐ Yes ☐ No	**Any Incidents?** ☐ Yes ☐ No	**Any Incidents?** ☐ Yes ☐ No	**Any Incidents?** ☐ Yes ☐ No

OFFICE USE ONLY					
File Downloaded? ☐ Yes, Init.____ ☐ No File Name: ________	File Downloaded? ☐ Yes, Init.____ ☐ No File Name: ________	File Downloaded? ☐ Yes, Init.____ ☐ No File Name: ________	File Downloaded? ☐ Yes, Init.____ ☐ No File Name: ________	File Downloaded? ☐ Yes, Init.____ ☐ No File Name: ________	File Downloaded? ☐ Yes, Init.____ ☐ No File Name: ________

Figure D-10. Example of Trip Log

APPENDIX E

THEORETICAL LINK ID LIST

Table E-1. Theoretical Link ID List

ROUTE NAME	nore	sorw	TRANSGUIDE
FM 78	FM 1516	WALZEM	TE0078F-1516F-WALZE
FM 78	LOOP 1604	FM 1516	TE0078F-1604L-1516F
FM 78	FOSTER	GIBBS SPRAWL	TE0078F-FOSTE-GIBBS
FM 78	GIBBS SPRAWL	IH 410	TE0078F-GIBBS-0410I
FM 78	WALZEM	WOODLAKE	TE0078F-WALZE-WOODL
FM 78	WOODLAKE	FOSTER	TE0078F-WOODL-FOSTE
IH 410	US 87	SOUTHCROSS	TE0410I-0087U-SOUTH
IH 410	SH 422	SOMERSET	TE0410I-0422S-SOMER
IH 410	GOLIAD	ROOSEVELT	TE0410I-GOLIA-ROOSE
IH 410	MOURSUND	ZARZAMORA	TE0410I-MOURS-ZARZA
IH 410	ROOSEVELT	MOURSUND	TE0410I-ROOSE-MOURS
IH 410	SOMERSET	IH 35	TE0410I-SOMER-0035I
IH 410	SOUTHCROSS	W. W. WHITE	TE0410I-SOUTH-WWWHI
IH 410	ST. HEDGWIG	US 87	TE0410I-STHED-0087U
IH 410	W. W. WHITE	GOLIAD	TE0410I-WWWHI-GOLIA
IH 410	ZARZAMORA	SH 422	TE0410I-ZARZA-0422S
BASSE RD.	NACOGDOCHES	TUXEDO	TEBASSE-NACOG-TUXED
BASSE RD.	SAN PEDRO	BLANCO	TEBASSE-SANPE-BLANC
BASSE RD.	TUXEDO	SAN PEDRO	TEBASSE-TUXED-SANPE
BINZ-ENGLEMAN	FM 1516	FOSTER	TEBINZE-1516F-FOSTE
BINZ-ENGLEMAN	FOSTER	IH 410	TEBINZE-FOSTE-0410I
BRAUN RD.	BANDERA	TEZEL	TEBRAUN-BANDE-TEZEL
BRAUN RD.	TEZEL	LOOP 1604	TEBRAUN-TEZEL-1604L
CASSIN	NEW LAREDO HWY.	QUINTANA	TECASSI-NEWLA-QUINT
CASSIN	SOMERSET	NEW LAREDO HWY.	TECASSI-SOMER-NEWLA
CASTROVILLE	GEN. MCMULLEN	SW 36TH	TECASTR-GENMC-SW36T
CASTROVILLE	SW19TH	GEN. MCMULLEN	TECASTR-SW19T-GENMC
CASTROVILLE	SW36TH	US 90	TECASTR-SW36T-0090U
COMMERCE	IH 10	SPRIGGSDALE	TECOMME-0010I-SPRIG
COMMERCE	SPRIGGSDALE	NEW BRAUNFELS	TECOMME-SPRIG-NEWBR
CRESTWAY	RANDOLPH	WEIDNER	TECREST-RANDO-WEIDN
CRESTWAY	WEIDNER	KITTY HAWK	TECREST-WEIDN-KITTY
CULEBRA RD.	IH 410	INGRAM	TECULEB-0410I-INGRA
CULEBRA RD.	ALICIA	CALLAGHAN	TECULEB-ALICI-CALLA
CULEBRA RD.	CALLAGHAN	OAKHILL	TECULEB-CALLA-OAKHI
CULEBRA RD.	INGRAM	REED	TECULEB-INGRA-REED_
CULEBRA RD.	NW 24TH	SAN FELIPE	TECULEB-NW24T-SANFE
CULEBRA RD.	OAKHILL	IH 410	TECULEB-OAKHI-0410I
CULEBRA RD.	REED	VILLAGE PKWY	TECULEB-REED_-VILLP
CULEBRA RD.	SAN FELIPE	ALICIA	TECULEB-SANFE-ALICI
CULEBRA RD.	TEZEL	LOOP 1604	TECULEB-TEZEL-1604L
CULEBRA RD.	VILLAGE PKWY	WESTOVER HILLS	TECULEB-VILLP-WESTO
CULEBRA RD.	WESTOVER HILLS	GRISSOM	TECULEB-WESTO-GRISS
DE ZAVALA	LOCKHILL SELMA	VANCE JACKSON	TEDEZAV-LHSEL-VANCE

DE ZAVALA	NW MILITARY	LOCKHILL SELMA	TEDEZAV-NWMIL-LHSEL
DE ZAVALA	VANCE JACKSON	BABCOCK	TEDEZAV-VANCE-BABCO
ECKERT	BLUE BIRD	BANDERA	TEECKER-BLUEB-BANDE
ECKERT	HUEBNER	BLUE BIRD	TEECKER-HUEBN-BLUEB
GIBBS SPRAWL	LOOP 1604	TOPPERWEIN	TEGIBBS-1604L-TOEPP
GIBBS SPRAWL	MONTGOMERY	WALZEM	TEGIBBS-MONTG-WALZE
GIBBS SPRAWL	RITTIMAN	SEGUIN	TEGIBBS-RITTI-SEGUI
GIBBS SPRAWL	TOPPERWEIN	MONTGOMERY	TEGIBBS-TOEPP-MONTG
GIBBS SPRAWL	WALZEM	RITTIMAN	TEGIBBS-WALZE-RITTI
GRISSOM RD.	BANDERA	TEZEL	TEGRISS-BANDE-TEZEL
GUADALUPE	BRAZOS	SW 19TH	TEGUADA-BRAZO-SW19T
GUADALUPE	FLORES	BRAZOS	TEGUADA-FLORE-BRAZO
GUILBEAU RD.	BANDERA	CROOKED PATH	TEGUILB-BANDE-CROOK
GUILBEAU RD.	CROOKED PATH	OLD TEZEL	TEGUILB-CROOK-OLDTE
GUILBEAU RD.	OLD TEZEL	LOOP 1604	TEGUILB-OLDTE-1604L
HAUSMAN RD.	IH 10	BABCOCK	TEHAUSM-0010I-BABCO
HAUSMAN RD.	BABCOCK	LOOP 1604	TEHAUSM-BABCO-1604L
HILDEBRAND	US 281	MCCULLOUGH	TEHILDE-0281U-MCCUL
HILDEBRAND	BLANCO	WEST	TEHILDE-BLANC-WEST_
HILDEBRAND	MCCULLOUGH	BLANCO	TEHILDE-MCCUL-BLANC
HILDEBRAND	NEW BRAUNFELS	US 281	TEHILDE-NEWBR-0281U
HOUSTON	IH 10	ONSLOW	TEHOUST-0010I-ONSLO
HOUSTON	IH 410	IH 10	TEHOUST-0410I-0010I
HOUSTON	NEW BRAUNFEL	IH 37	TEHOUST-NEWBR-0037I
HOUSTON	ONSLOW	NEW BRAUNFELS	TEHOUST-ONSLO-NEWBR
INGRAM RD.	CALLAGHAN	WURZBACH	TEINGRA-CALLA-WURZB
INGRAM RD.	WURZBACH	CULEBRA	TEINGRA-WURZB-CULEB
JACKSON KELLER	BLANCO	WEST AVE.	TEJACKS-BLANC-WEST_
JACKSON KELLER	MCCULLOUGH	SAN PEDRO	TEJACKS-MCCUL-SANPE
JACKSON KELLER	SAN PEDRO	BLANCO	TEJACKS-SANPE-BLANC
JACKSON KELLER	WEST AVE.	VANCE JACKSON	TEJACKS-WEST_-VANCE
KITTY HAWK	LOOP 1604	TOEPPERWEIN	TEKITTY-1604L-TOEPP
KITTY HAWK	TOPPERWEIN	MILLER	TEKITTY-TOEPP-MILLE
MAINLAND	BANDERA	TEZEL	TEMAINL-BANDE-TEZEL
MEDICAL	EWING HALSELL	WURZBACH	TEMEDIC-EWING-WURZB
MEDICAL	FREDERICKSBURG	EWING HALSELL	TEMEDIC-FREDE-EWING
MEDICAL	WURZBACH	BABCOCK	TEMEDIC-WURZB-BABCO
MILITARY DR. W.	SH151	ELLISON	TEMILIT-0151S-ELLIS
MILITARY DR. W.	ELLISON	LOOP 1604	TEMILIT-ELLIS-1604L
MILITARY DR. W.	HUNT	SH151	TEMILIT-HUNT_-0151S
MILITARY DR. SE	W. W. WHITE	IH 37	TEMILIT-WWWHI-0037I
NACOGDOCHES	LOOP 1604	JUDSON	TENACOG-1604L-JUDSO
NACOGDOCHES	JUDSON	O'CONNOR	TENACOG-JUDSO-OCONN
NACOGDOCHES	O'CONNOR	THOUSAND OAKS	TENACOG-OCONN-THOUS
NAKOMA DR.	US 281	WEST AVE.	TENAKOM-0281U-WEST_
NAKOMA DR.	JONES MALTSBERGER	US 281	TENAKOM-JONES-0281U
NEW SULPHUR SPGS RD.	FOSTER	IH 410	TENEWSU-FOSTE-0410I

OLD HWY. 90	ACME	US 90	TEOLDHW-ACME_-0090U
OLD HWY. 90	COMMERCE	ACME	TEOLDHW-COMME-ACME_
POTRANCO	CULEBRA	MILITARY DR. W.	TEPOTRA-CULEB-MILIT
POTRANCO	ELLISON	LOOP 1604	TEPOTRA-ELLIS-1604L
POTRANCO	INGRAM	CULEBRA	TEPOTRA-INGRA-CULEB
POTRANCO	MILITARY DR. W.	ELLISON DR.	TEPOTRA-MILIT-ELLIS
RIGSBY AVE.	IH 410	W. W. WHITE	TERIGSB-0410I-WWWHI
RIGSBY AVE.	FM 1516	IH 410	TERIGSB-1516F-0410I
RIGSBY AVE.	AMITY	ROLAND	TERIGSB-AMITY-ROLAN
RIGSBY AVE.	CLARK	IH 410	TERIGSB-CLARK-0010I
RIGSBY AVE.	ROLAND	CLARK	TERIGSB-ROLAN-CLARK
RIGSBY AVE.	W. W. WHITE	AMITY	TERIGSB-WWWHI-AMITY
RITTIMAN	GIBBS SPRAWL	IH 410	TERITTI-GIBBS-0410I
SCHERTZ	WEIDNER	THOUSAND OAKS	TESCHER-WEIDN-THOUS
SOUTHCROSS	IH 410	CARYA GITTINGER	TESOUTH-0410I-CARYA
SOUTHCROSS	CARYA GITTINGER	PECAN VALLEY	TESOUTH-CARYA-PECAN
SOUTHCROSS BLVD.	NEW LAREDO HWY.	QUINTANA	TESOUTH-NEWLA-QUINT
SOUTHCROSS	PECAN VALLEY	IH 37	TESOUTH-PECAN-0037I
STAHL	JUDSON	O'CONNOR	TESTAHL-JUDSO-OCONN
STAHL	NACOGDOCHES	JUDSON	TESTAHL-NACOG-JUDSO
STEVES	GEVERS	NEW BRAUNFELS	TESTEVE-GEVER-NEWBR
STEVES	NEW BRAUNFELS	PRESA	TESTEVE-NEWBR-PRESA
STEVES	PRESA	PROBANDT	TESTEVE-PRESA-PROBA
ST. HEDWIG	FM 1516	FOSTER	TESTHED-1516F-FOSTE
ST. HEDWIG	FOSTER	IH 410	TESTHED-FOSTE-0410I
TUXEDO AVE.	BROADWAY	US 281	TETUXED-BROAD-0281U
UTSA BLVD.	IH 10	BABCOCK	TEUTSA_-0010I-BABCO
WESTOVER HILLS	CULEBRA	MISTY ROCK	TEWESTO-CULEB-MISTY
WESTOVER HILLS	MISTY ROCK	WISEMAN	TEWESTO-MISTY-WISEM
WESTOVER HILLS	WISEMAN	ELLISON	TEWESTO-WISEM-ELLIS
WISEMAN BLVD.	SH151	LOOP 1606	TEWISEM-0151S-1604L
WISEMAN BLVD.	WESTOVER HILLS	SH151	TEWISEM-WESTO-0151S
WOODLAWN	US 281	MCCULLOUGH	TEWOODL-0281U-MCCUL
WOODLAWN	BLANCO	ZARZAMORA	TEWOODL-BLANC-ZARZA
WOODLAWN	MCCULLOUGH	BLANCO	TEWOODL-MCCUL-BLANC
WOODLAWN	ZARZAMORA	BANDERA	TEWOODL-ZARZA-BANDE
WOODSTONE	VANCE JACKSON	IH 10	TEWOODS-VANCE-0010I
FM 1516	IH 10	FM 1346	TN1516F-0010I-1346F
FM 1516	FM 1346	US 87	TN1516F-1346F-0087U
FM 1516	BINZ ENGLEMAN	IH 10	TN1516F-BINZE-0010I
FM 1516	SEGUIN	BINZ ENGLEMAN	TN1516F-SEGUI-BINZE
LOOP 1604	IH 35	ATHENIAN	TN1604L-0035I-ATHEN
LOOP 1604	FM 1976	IH 10	TN1604L-1976F-0010I
LOOP 1604	ATHENIAN	KITTY HAWK	TN1604L-ATHEN-KITTY
LOOP 1604	KITTY HAWK	FM 1976	TN1604L-KITTY-1976F
ACKERMAN	BINZ ENGLEMAN	IH 10	TNACKER-BINZE-0010I
ACKERMAN	GIBBS SPRAWL	BINZ ENGLEMAN	TNACKER-GIBBS-BINZE

ALAMO	COMMERCE	DURANGO	TNALAMO-COMME-DURAN
ALAMO	DURANGO	PROBANDT	TNALAMO-DURAN-PROBA
ALAMO	PROBANDT	IH 35	TNALAMO-PROBA-0035I
BABCOCK	LOOP1604	HAUSMAN	TNBABCO-1604L-HAUSM
BABCOCK	HAUSMAN	SPRING RIDGE DR.	TNBABCO-HAUSM-SPRIN
BABCOCK	SPRING RIDGE DR.	DE ZAVALA	TNBABCO-SPRIN-DEZAV
BANDERA	LOOP 1604	VERDE	TNBANDE-1604L-VERDE
BANDERA	VERDE	MAINLAND	TNBANDE-VERDE-MAINL
BITTERS RD.	LOOP 1604	HUEBNER	TNBITTE-1604L-HUEBN
BITTERS RD.	HUEBNER	BLANCO	TNBITTE-HUEBN-BLANC
BRAZOS	BUENA VISTA	FRIO CITY RD.	TNBRAZO-BUENA-FRIOC
BROADWAY	IH 35	COMMERCE	TNBROAD-0035I-COMME
BULVERDE	LOOP 1604	STAHL	TNBULVE-1604L-STAHL
BYNUM RD.	QUINTANA	NEW LAREDO HWY.	TNBYNUM-QUINT-NEWLA
CALLAGHAN RD.	BABCOCK	BANDERA	TNCALLA-BABCO-BANDE
CALLAGHAN RD.	BANDERA	INGRAM	TNCALLA-BANDE-INGRA
CALLAGHAN	COMMERCE	OLD HWY. 90	TNCALLA-COMME-OLDHW
CALLAGHAN RD.	CULEBRA	COMMERCE	TNCALLA-CULEB-COMME
CALLAGHAN RD.	INGRAM	CULEBRA	TNCALLA-INGRA-CULEB
CALLAGHAN	OLD HWY. 90	US 90	TNCALLA-OLDHW-0090U
CLASSEN	BULVERDE	STAHL	TNCLASS-BULVE-STAHL
COLISEUM	IH 35	HOUSTON	TNCOLIS-0035I-HOUST
COLORADO	IH 10	BRAZOS	TNCOLOR-0010I-BRAZO
COLORADO	FREDERICKSBURG	IH 10	TNCOLOR-FREDE-0010I
CUPPLES	US 90	FRIO CITY	TNCUPPL-0090U-FRIOC
CUPPLES	CASTROVILLE	US 90	TNCUPPL-CASTR-0090U
EAGLE CREST	CRESENT FALLS	WALZEM	TNEAGLE-CRESE-WALZE
EAGLE CREST	WEIDNER	CRESENT FALLS	TNEAGLE-WEIDN-CRESE
ELLISON DR.	LOOP 1604	WESTOVER HILLS	TNELLIS-1604L-WESTO
ELLISON DR.	MILITARY	POTRANCO	TNELLIS-MILIT-POTRA
ELLISON DR.	WESTOVER HILLS	MILITARY	TNELLIS-WESTO-MILIT
ESMERALDA	CULEBRA	GROFF	TNESMER-CULEB-GROFF
FLORES	IH 10	SOUTHCROSS	TNFLORE-0010I-SOUTH
FLORES	IH 35	DURANGO	TNFLORE-0035I-DURAN
FLORES	DURANGO	PROBANDT	TNFLORE-DURAN-PROBA
FLORES	FREDERICKSBURG	IH 35	TNFLORE-FREDE-0035I
FLORES	SE MILITARY	ROOSEVELT	TNFLORE-MILIT-ROOSE
FLORES	PROBANDT	IH 10	TNFLORE-PROBA-0010I
FLORES	SOUTHCROSS	SE MILITARY	TNFLORE-SOUTH-MILIT
FLOYD CURL DR.	HUEBNER	WURZBACH	TNFLOYD-HUEBN-WURZB
FLOYD CURL DR.	WURZBACH	LOUIS PASTEUR	TNFLOYD-WURZB-LOUIS
FOSTER	IH 10	FM 1346	TNFOSTE-0010I-1346F
FOSTER	FM 78	BINZ ENGLEMAN	TNFOSTE-0078F-BINZE
FOSTER	US 87	NEW SULPHUR SPRINGS	TNFOSTE-0087U-NEWSU
FOSTER	FM 1346	US 87	TNFOSTE-1346F-0087U
FOSTER	BINZ ENGLEMAN	IH 10	TNFOSTE-BINZE-0010I
FOSTER	GIBBS SPRAWL	FM 78	TNFOSTE-GIBBS-0078F

FRIO CITY DR	BRAZOS	ZARZAMORA	TNFRIOC-BRAZO-ZARZA
FRIO CITY DR	ZARZAMORA	GEN HUDNELL	TNFRIOC-ZARZA-GENHU
GEN. HUDNELL RD.	US 90	FRIO CITY RD.	TNGENHU-0090U-FRIOC
GEVERS	COMMERCE	VIRGINIA	TNGEVER-COMME-VIRGI
GEVERS	RIGSBY	SOUTHCROSS	TNGEVER-RIGSB-SOUTH
GEVERS	VIRGINIA	RIGSBY	TNGEVER-VIRGI-RIGSB
GOLIAD RD.	GEVERS	MILITARY	TNGOLIA-GEVER-MILIT
GOLIAD RD.	MILITARY	IH 410	TNGOLIA-MILIT-0410I
GREEN MOUNTAIN	LOOP 1604	STAHL	TNGREEN-1604L-STAHL
HACKBERRY	COMMERCE	STEVES	TNHACKB-COMME-STEVE
HACKBERRY	FAIR	SOUTHCROSS	TNHACKB-FAIR_-SOUTH
HACKBERRY	STEVES	FAIR	TNHACKB-STEVE-FAIR_
HUEBNER RD.	LOOP 1604	BITTERS	TNHUEBN-1604L-BITTE
HUEBNER	BABCOCK	BANDERA	TNHUEBN-BABCO-BANDE
HUEBNER RD.	BITTERS	NW MILITARY DR.	TNHUEBN-BITTE-NWMIL
HUNT	ADAMS HILL	US 90	TNHUNT_-ADAMS-0090U
HUNT	MARBACH	ADAMS HILL	TNHUNT_-MARBA-ADAMS
HUNT	POTRANCO	MARBACH	TNHUNT_-POTRA-MARBA
HUNT	WESTOVER HILLS	SH 151	TNHUNT_-WESTO-0151S
JONES MALTSBERGER	BULVERDE	THOUSAND OAKS	TNJONES-BULVE-THOUS
JONES MALTSBERGER	STARCREST	NEW NORTH LOOP	TNJONES-STARC-NEWNO
JONES MALTSBERGER	THOUSAND OAKS	STARCREST	TNJONES-THOUS-STARC
JUDSON	LOOP 1604	STAHL	TNJUDSO-1604L-STAHL
JUDSON	NACOGDOCHES	WORCHESTER WOOD	TNJUDSO-NACOG-WORCH
JUDSON	STAHL	NACOGDOCHES	TNJUDSO-STAHL-NACOG
JUDSON	WORCHESTER WOOD	IH 35	TNJUDSO-WORCH-0035I
LOCKHILL SELMA RD.	DE ZAVALA	HUEBNER	TNLHSEL-DEZAV-HUEBN
LOCKHILL SELMA RD.	HUEBNER	WURZBACH	TNLHSEL-HUEBN-WURZB
LOCKHILL SELMA RD.	WURZBACH	NW MLITARY DR.	TNLHSEL-WURZB-NWMIL
LOUIS PASTEUR	FREDERICKSBURG	BABCOCK	TNLOUIS-FREDE-BABCO
MCCULLOUGH	IH 410	BASSE	TNMCCUL-0410I-BASSE
MCCULLOUGH	BASSE	HILDEBRAND	TNMCCUL-BASSE-HILDE
MCCULLOUGH	HILDEBRAND	ST. MARY'S	TNMCCUL-HILDE-STMAR
MILITARY DR. W.	POTRANCO	IH 410	TNMILIT-POTRA-0410I
MILLER RD.	KITTY HAWK	O'CONNOR	TNMILLE-KITTY-OCONN
MISSION RD.	ASHLEY	VILLAMAIN	TNMISSI-ASHLE-VILLA
MISSION RD.	MILITARY	ASHLEY	TNMISSI-MILIT-ASHLE
MISSION RD.	ROOSEVELT	MILITARY	TNMISSI-ROOSE-MILIT
MISSION RD.	VILLAMAIN	IH 410	TNMISSI-VILLA-0410I
MOURSUND	PLEASANTON	IH 410	TNMOURS-PLEAS-0410I
NACOGDOCHES	IH 410	NEW BRAUNFELS	TNNACOG-0410I-NEWBR
NACOGDOCHES	BASSE	TUXEDO	TNNACOG-BASSE-TUXED
NACOGDOCHES	NEW BRAUNFELS	BASSE	TNNACOG-NEWBR-BASSE
NAVARRO	QUINCY	ST. MARY'S	TNNAVAR-QUINC-STMAR
NAVARRO	ST. MARY'S	NUEVA	TNNAVAR-STMAR-NUEVA
NEW BRAUNFELS	IH 410	NACOGDOCHES	TNNEWBR-0410I-NACOG
NEW BRAUNFELS	NACOGDOCHES	AUSTIN HWY.	TNNEWBR-NACOG-AUSTI

NEW LAREDO HWY.	CASSIN	IH 35	TNNEWLA-CASSI-0035I
NEW LAREDO HWY.	SW MILITARY DR.	PITLUK	TNNEWLA-MILIT-PITLU
NEW LAREDO HWY.	PITLUK	CASSIN	TNNEWLA-PITLU-CASSI
O'CONNOR	NACOGDOCHES	RANDOLPH BLVD.	TNOCONN-NACOG-RANDO
O'CONNOR	RANDOLPH BLVD.	MILLER	TNOCONN-RANDO-MILLE
O'CONNOR	STAHL	NACOGDOCHES	TNOCONN-STAHL-NACOG
PALO ALTO	SOMERSET	IH 35	TNPALOA-SOMER-0035I
PEARSALL	HOLM	IH 410	TNPEARS-HOLM_-0410I
PEARSALL	MILITARY DR.	HOLM	TNPEARS-MILIT-HOLM_
PECAN VALLEY DR.	DOLLARHIDE	NEW BRAUNFELS	TNPECAN-DOLLA-NEWBR
PECAN VALLEY DR.	MARTIN L. KING	SOUTHCROSS	TNPECAN-MARTI-SOUTH
PECAN VALLEY DR.	SOUTHCROSS	DOLLARHIDE	TNPECAN-SOUTH-DOLLA
PLEASANTON	FLORES	SOUTHCROSS	TNPLEAS-FLORE-SOUTH
PLEASANTON	MILITARY	MOURSUND	TNPLEAS-MILIT-MOURS
PLEASANTON	SOUTHCROSS	MILITARY	TNPLEAS-SOUTH-MILIT
POTEET-JOURDANTON	IH 35	IH 410	TNPOTEE-0035I-0410I
PRESA	IH 10	HOT WELLS	TNPRESA-0010I-HOTWE
PRESA	ALAMO	IH 10	TNPRESA-ALAMO-0010I
PRESA	DAN	GRAF	TNPRESA-DAN__-GRAF_
PRESA	GRAF	IH 410	TNPRESA-GRAF_-0410I
PRESA	HOT WELLS	MILITARY	TNPRESA-HOTWE-MILIT
PRESA	MILITARY	DAN	TNPRESA-MILIT-DAN__
PROBANDT	ALAMO	MITCHELL	TNPROBA-ALAMO-MITCH
PROBANDT	MITCHELL	FLORES	TNPROBA-MITCH-FLORE
QUINTANA	BYNUM	PLUMNEAR	TNQUINT-BYNUM-PLUMN
QUINTANA	FRIO CITY	BYNUM	TNQUINT-FRIOC-BYNUM
QUINTANA	PLUMNEAR	IH 410	TNQUINT-PLUMN-0410I
ROOSEVELT	MCDONALD	MILITARY	TNROOSE-MCDON-MILIT
ROOSEVELT	MILITARY	IH 410	TNROOSE-MILIT-0410I
ROOSEVELT	STEVES	MCDONALD	TNROOSE-STEVE-MCDON
SOMERSET RD.	IH 35	CASSIN	TNSOMER-0035I-CASSI
SOMERSET RD.	CASSIN	IH 410	TNSOMER-CASSI-0410I
SOMERSET RD.	MILITARY	IH 35	TNSOMER-MILIT-0035I
SOMERSET RD.	ZARZAMORA	MILITARY	TNSOMER-ZARZA-MILIT
ST. CLOUD RD.	BABCOCK	BANDERA	TNSTCLO-BABCO-BANDE
ST. MARY'S	IH 35	NAVARRO	TNSTMAR-0035I-NAVAR
ST. MARY'S	US281	IH 35	TNSTMAR-0281U-0035I
ST. MARY'S	DURANGO	JACOB	TNSTMAR-DURAN-JACOB
ST. MARY'S	JACOB	STEVES	TNSTMAR-JACOB-STEVE
ST. MARY'S	NAVARRO	DURANGO	TNSTMAR-NAVAR-DURAN
SW 24TH	CULEBRA	SW 26TH	TNSW24T-CULEB-SW26T
SW 26TH	SW 24TH	CASTROVILLE	TNSW26T-SW24T-CASTR
SW 36TH	GROFF	OLD HWY. 90	TNSW36T-GROFF-OLDHW
SW 36TH	OLD HWY. 90	US 90	TNSW36T-OLDHW-0090U
TEZEL RD.	BRAUN	GUILBEAU	TNTEZEL-BRAUN-GUILB
TEZEL RD.	GUILBEAU	RIDGE PATH	TNTEZEL-GUILB-RIDGE
TEZEL RD.	RIDGE PATH	GRISSOM	TNTEZEL-RIDGE-GRISS

TOEPPERWEIN	IH 35	JUDSON	TNTOEPP-0035I-JUDSO
TOEPPERWEIN	JUDSON	KITTY HAWK	TNTOEPP-JUDSO-KITTY
TOEPPERWEIN	KITTY HAWK	GIBBS SPRAWL	TNTOEPP-KITTY-GIBBS
VANCE JACKSON RD.	IH 10	FREDERICKSBURG	TNVANCE-0010I-FREDE
VANCE JACKSON RD.	IH 410	IH 10	TNVANCE-0410I-0010I
VANCE JACKSON RD.	CALLAGHAN	IH 410	TNVANCE-CALLA-0410I
VANCE JACKSON RD.	HUEBNER	WURZBACH	TNVANCE-HUEBN-WURZB
VANCE JACKSON RD.	WURZBACH	CALLAGHAN	TNVANCE-WURZB-CALLA
WALTERS	IH 35	HOUSTON	TNWALTE-0035I-HOUST
WALTERS	HOUSTON	RIGSBY	TNWALTE-HOUST-RIGSB
WEIDNER	RANDOLPH BLVD.	EAGLE CREST	TNWEIDN-RANDO-EAGLE
WEIDNER	SCHERTZ	RANDOLPH BLVD.	TNWEIDN-SCHER-RANDO
WEST AVE.	DRESDEN	IH 10	TNWEST_-DRESD-0010I
WEST AVE.	JACKSON KELLER	DRESDEN	TNWEST_-JACKS-DRESD
WETMORE	BROADWAY	IH 410	TNWETMO-BROAD-0410I
WETMORE	STARCREST	BROADWAY	TNWETMO-STARC-BROAD
WETMORE	THOUSAND OAKS	STARCREST	TNWETMO-THOUS-STARC
WOODLAKE	SEGUIN	BINZ-ENGLEMAN	TNWOODK-SEGUI-BINZE
WURZBACH	BABCOCK	EVERS	TNWURZB-BABCO-EVERS
WURZBACH	EVERS	SEVILLE	TNWURZB-EVERS-SEVIL
WURZBACH	SEVILLE	INGRAM	TNWURZB-SEVIL-INGRA
W. W. WHITE PKWY.	IH 10	RIGSBY	TNWWWHI-0010I-RIGSB
W. W. WHITE PKWY.	IH 410	IH 10	TNWWWHI-0410I-0010I
W. W. WHITE PKWY.	RIGSBY	SOUTHCROSS	TNWWWHI-RIGSB-SOUTH
W. W. WHITE PKWY.	SOUTHCROSS	IH 410	TNWWWHI-SOUTH-0410I
ZARZAMORA	COMMERCE	US 90	TNZARZA-COMME-0090U
ZARZAMORA	CULEBRA	COMMERCE	TNZARZA-CULEB-COMME
ZARZAMORA	FREDERICKSBURG	CULEBRA	TNZARZA-FREDE-CULEB
ZARZAMORA	HUTCHINS PL.	IH 410	TNZARZA-HUTCH-0410I
ZARZAMORA	MILITARY DR.	HUTCHINS PL.	TNZARZA-MILIT-HUTCH
FM 1516	IH 10	FM 1346	TS1516F-0010I-1346F
FM 1516	FM 1346	US 87	TS1516F-1346F-0087U
FM 1516	BINZ ENGLEMAN	IH 10	TS1516F-BINZE-0010I
FM 1516	SEGUIN	BINZ ENGLEMAN	TS1516F-SEGUI-BINZE
LOOP 1604	IH 35	ATHENIAN	TS1604L-0035I-ATHEN
LOOP 1604	FM 1976	IH 10	TS1604L-1976F-0010I
LOOP 1604	ATHENIAN	KITTY HAWK	TS1604L-ATHEN-KITTY
LOOP 1604	KITTY HAWK	FM 1976	TS1604L-KITTY-1976F
ACKERMAN	BINZ ENGLEMAN	IH 10	TSACKER-BINZE-0010I
ACKERMAN	GIBBS SPRAWL	BINZ ENGLEMAN	TSACKER-GIBBS-BINZE
ALAMO	COMMERCE	DURANGO	TSALAMO-COMME-DURAN
ALAMO	DURANGO	PROBANDT	TSALAMO-DURAN-PROBA
ALAMO	PROBANDT	IH 35	TSALAMO-PROBA-0035I
BABCOCK	LOOP1604	HAUSMAN	TSBABCO-1604L-HAUSM
BABCOCK	HAUSMAN	SPRING RIDGE DR.	TSBABCO-HAUSM-SPRIN
BABCOCK	SPRING RIDGE DR.	DE ZAVALA	TSBABCO-SPRIN-DEZAV
BANDERA	LOOP 1604	VERDE	TSBANDE-1604L-VERDE

BANDERA	VERDE	MAINLAND	TSBANDE-VERDE-MAINL
BITTERS RD.	LOOP 1604	HUEBNER	TSBITTE-1604L-HUEBN
BITTERS RD.	HUEBNER	BLANCO	TSBITTE-HUEBN-BLANC
BRAZOS	BUENA VISTA	FRIO CITY RD.	TSBRAZO-BUENA-FRIOC
BROADWAY	IH 35	COMMERCE	TSBROAD-0035I-COMME
BULVERDE	LOOP 1604	STAHL	TSBULVE-1604L-STAHL
BYNUM RD.	QUINTANA	NEW LAREDO HWY.	TSBYNUM-QUINT-NEWLA
CALLAGHAN RD.	BABCOCK	BANDERA	TSCALLA-BABCO-BANDE
CALLAGHAN RD.	BANDERA	INGRAM	TSCALLA-BANDE-INGRA
CALLAGHAN	COMMERCE	OLD HWY. 90	TSCALLA-COMME-OLDHW
CALLAGHAN RD.	CULEBRA	COMMERCE	TSCALLA-CULEB-COMME
CALLAGHAN RD.	INGRAM	CULEBRA	TSCALLA-INGRA-CULEB
CALLAGHAN	OLD HWY. 90	US 90	TSCALLA-OLDHW-0090U
CLASSEN	BULVERDE	STAHL	TSCLASS-BULVE-STAHL
COLISEUM	IH 35	HOUSTON	TSCOLIS-0035I-HOUST
COLORADO	IH 10	BRAZOS	TSCOLOR-0010I-BRAZO
COLORADO	FREDERICKSBURG	IH 10	TSCOLOR-FREDE-0010I
CUPPLES	US 90	FRIO CITY	TSCUPPL-0090U-FRIOC
CUPPLES	CASTROVILLE	US 90	TSCUPPL-CASTR-0090U
EAGLE CREST	CRESENT FALLS	WALZEM	TSEAGLE-CRESE-WALZE
EAGLE CREST	WEIDNER	CRESENT FALLS	TSEAGLE-WEIDN-CRESE
ELLISON DR.	LOOP 1604	WESTOVER HILLS	TSELLIS-1604L-WESTO
ELLISON DR.	MILITARY	POTRANCO	TSELLIS-MILIT-POTRA
ELLISON DR.	WESTOVER HILLS	MILITARY	TSELLIS-WESTO-MILIT
ESMERALDA	CULEBRA	GROFF	TSESMER-CULEB-GROFF
FLORES	IH 10	SOUTHCROSS	TSFLORE-0010I-SOUTH
FLORES	IH 35	DURANGO	TSFLORE-0035I-DURAN
FLORES	DURANGO	PROBANDT	TSFLORE-DURAN-PROBA
FLORES	FREDERICKSBURG	IH 35	TSFLORE-FREDE-0035I
FLORES	SE MILITARY	ROOSEVELT	TSFLORE-MILIT-ROOSE
FLORES	PROBANDT	IH 10	TSFLORE-PROBA-0010I
FLORES	SOUTHCROSS	SE MILITARY	TSFLORE-SOUTH-MILIT
FLOYD CURL DR.	HUEBNER	WURZBACH	TSFLOYD-HUEBN-WURZB
FLOYD CURL DR.	WURZBACH	LOUIS PASTEUR	TSFLOYD-WURZB-LOUIS
FOSTER	IH 10	FM 1346	TSFOSTE-0010I-1346F
FOSTER	FM 78	BINZ ENGLEMAN	TSFOSTE-0078F-BINZE
FOSTER	US 87	NEW SULPHUR SPRINGS	TSFOSTE-0087U-NEWSU
FOSTER	FM 1346	US 87	TSFOSTE-1346F-0087U
FOSTER	BINZ ENGLEMAN	IH 10	TSFOSTE-BINZE-0010I
FOSTER	GIBBS SPRAWL	FM 78	TSFOSTE-GIBBS-0078F
FRIO CITY DR	BRAZOS	ZARZAMORA	TSFRIOC-BRAZO-ZARZA
FRIO CITY DR	ZARZAMORA	GEN HUDNELL	TSFRIOC-ZARZA-GENHU
GEN. HUDNELL RD.	US 90	FRIO CITY RD.	TSGENHU-0090U-FRIOC
GEVERS	COMMERCE	VIRGINIA	TSGEVER-COMME-VIRGI
GEVERS	RIGSBY	SOUTHCROSS	TSGEVER-RIGSB-SOUTH
GEVERS	VIRGINIA	RIGSBY	TSGEVER-VIRGI-RIGSB
GOLIAD RD.	GEVERS	MILITARY	TSGOLIA-GEVER-MILIT

GOLIAD RD.	MILITARY	IH 410	TSGOLIA-MILIT-0410I
GREEN MOUNTAIN	LOOP 1604	STAHL	TSGREEN-1604L-STAHL
HACKBERRY	COMMERCE	STEVES	TSHACKB-COMME-STEVE
HACKBERRY	FAIR	SOUTHCROSS	TSHACKB-FAIR_-SOUTH
HACKBERRY	STEVES	FAIR	TSHACKB-STEVE-FAIR_
HUEBNER RD.	LOOP 1604	BITTERS	TSHUEBN-1604L-BITTE
HUEBNER	BABCOCK	BANDERA	TSHUEBN-BABCO-BANDE
HUEBNER RD.	BITTERS	NW MILITARY DR.	TSHUEBN-BITTE-NWMIL
HUNT	ADAMS HILL	US 90	TSHUNT_-ADAMS-0090U
HUNT	MARBACH	ADAMS HILL	TSHUNT_-MARBA-ADAMS
HUNT	POTRANCO	MARBACH	TSHUNT_-POTRA-MARBA
HUNT	WESTOVER HILLS	SH 151	TSHUNT_-WESTO-0151S
JONES MALTSBERGER	BULVERDE	THOUSAND OAKS	TSJONES-BULVE-THOUS
JONES MALTSBERGER	STARCREST	NEW NORTH LOOP	TSJONES-STARC-NEWNO
JONES MALTSBERGER	THOUSAND OAKS	STARCREST	TSJONES-THOUS-STARC
JUDSON	LOOP 1604	STAHL	TSJUDSO-1604L-STAHL
JUDSON	NACOGDOCHES	WORCHESTER WOOD	TSJUDSO-NACOG-WORCH
JUDSON	STAHL	NACOGDOCHES	TSJUDSO-STAHL-NACOG
JUDSON	WORCHESTER WOOD	IH 35	TSJUDSO-WORCH-0035I
LOCKHILL SELMA RD.	DE ZAVALA	HUEBNER	TSLHSEL-DEZAV-HUEBN
LOCKHILL SELMA RD.	HUEBNER	WURZBACH	TSLHSEL-HUEBN-WURZB
LOCKHILL SELMA RD.	WURZBACH	NW MLITARY DR.	TSLHSEL-WURZB-NWMIL
LOUIS PASTEUR	FREDERICKSBURG	BABCOCK	TSLOUIS-FREDE-BABCO
MCCULLOUGH	IH 410	BASSE	TSMCCUL-0410I-BASSE
MCCULLOUGH	BASSE	HILDEBRAND	TSMCCUL-BASSE-HILDE
MCCULLOUGH	HILDEBRAND	ST. MARY'S	TSMCCUL-HILDE-STMAR
MILITARY DR. W.	POTRANCO	IH 410	TSMILIT-POTRA-0410I
MILLER RD.	KITTY HAWK	O'CONNOR	TSMILLE-KITTY-OCONN
MISSION RD.	ASHLEY	VILLAMAIN	TSMISSI-ASHLE-VILLA
MISSION RD.	MILITARY	ASHLEY	TSMISSI-MILIT-ASHLE
MISSION RD.	ROOSEVELT	MILITARY	TSMISSI-ROOSE-MILIT
MISSION RD.	VILLAMAIN	IH 410	TSMISSI-VILLA-0410I
MOURSUND	PLEASANTON	IH 410	TSMOURS-PLEAS-0410I
NACOGDOCHES	IH 410	NEW BRAUNFELS	TSNACOG-0410I-NEWBR
NACOGDOCHES	BASSE	TUXEDO	TSNACOG-BASSE-TUXED
NACOGDOCHES	NEW BRAUNFELS	BASSE	TSNACOG-NEWBR-BASSE
NAVARRO	QUINCY	ST. MARY'S	TSNAVAR-QUINC-STMAR
NAVARRO	ST. MARY'S	NUEVA	TSNAVAR-STMAR-NUEVA
NEW BRAUNFELS	IH 410	NACOGDOCHES	TSNEWBR-0410I-NACOG
NEW BRAUNFELS	NACOGDOCHES	AUSTIN HWY.	TSNEWBR-NACOG-AUSTI
NEW LAREDO HWY.	CASSIN	IH 35	TSNEWLA-CASSI-0035I
NEW LAREDO HWY.	SW MILITARY DR.	PITLUK	TSNEWLA-MILIT-PITLU
NEW LAREDO HWY.	PITLUK	CASSIN	TSNEWLA-PITLU-CASSI
O'CONNOR	NACOGDOCHES	RANDOLPH BLVD.	TSOCONN-NACOG-RANDO
O'CONNOR	RANDOLPH BLVD.	MILLER	TSOCONN-RANDO-MILLE
O'CONNOR	STAHL	NACOGDOCHES	TSOCONN-STAHL-NACOG
PALO ALTO	SOMERSET	IH 35	TSPALOA-SOMER-0035I

PEARSALL	HOLM	IH 410	TSPEARS-HOLM_-0410I
PEARSALL	MILITARY DR.	HOLM	TSPEARS-MILIT-HOLM_
PECAN VALLEY DR.	DOLLARHIDE	NEW BRAUNFELS	TSPECAN-DOLLA-NEWBR
PECAN VALLEY DR.	MARTIN L. KING	SOUTHCROSS	TSPECAN-MARTI-SOUTH
PECAN VALLEY DR.	SOUTHCROSS	DOLLARHIDE	TSPECAN-SOUTH-DOLLA
PLEASANTON	FLORES	SOUTHCROSS	TSPLEAS-FLORE-SOUTH
PLEASANTON	MILITARY	MOURSUND	TSPLEAS-MILIT-MOURS
PLEASANTON	SOUTHCROSS	MILITARY	TSPLEAS-SOUTH-MILIT
POTEET-JOURDANTON	IH 35	IH 410	TSPOTEE-0035I-0410I
PRESA	IH 10	HOT WELLS	TSPRESA-0010I-HOTWE
PRESA	ALAMO	IH 10	TSPRESA-ALAMO-0010I
PRESA	DAN	GRAF	TSPRESA-DAN__-GRAF_
PRESA	GRAF	IH 410	TSPRESA-GRAF_-0410I
PRESA	HOT WELLS	MILITARY	TSPRESA-HOTWE-MILIT
PRESA	MILITARY	DAN	TSPRESA-MILIT-DAN__
PROBANDT	ALAMO	MITCHELL	TSPROBA-ALAMO-MITCH
PROBANDT	MITCHELL	FLORES	TSPROBA-MITCH-FLORE
QUINTANA	BYNUM	PLUMNEAR	TSQUINT-BYNUM-PLUMN
QUINTANA	FRIO CITY	BYNUM	TSQUINT-FRIOC-BYNUM
QUINTANA	PLUMNEAR	IH 410	TSQUINT-PLUMN-0410I
ROOSEVELT	MCDONALD	MILITARY	TSROOSE-MCDON-MILIT
ROOSEVELT	MILITARY	IH 410	TSROOSE-MILIT-0410I
ROOSEVELT	STEVES	MCDONALD	TSROOSE-STEVE-MCDON
SOMERSET RD.	IH 35	CASSIN	TSSOMER-0035I-CASSI
SOMERSET RD.	CASSIN	IH 410	TSSOMER-CASSI-0410I
SOMERSET RD.	MILITARY	IH 35	TSSOMER-MILIT-0035I
SOMERSET RD.	ZARZAMORA	MILITARY	TSSOMER-ZARZA-MILIT
ST. CLOUD RD.	BABCOCK	BANDERA	TSSTCLO-BABCO-BANDE
ST. MARY'S	IH 35	NAVARRO	TSSTMAR-0035I-NAVAR
ST. MARY'S	US 281	IH 35	TSSTMAR-0281U-0035I
ST. MARY'S	DURANGO	JACOB	TSSTMAR-DURAN-JACOB
ST. MARY'S	JACOB	STEVES	TSSTMAR-JACOB-STEVE
ST. MARY'S	NAVARRO	DURANGO	TSSTMAR-NAVAR-DURAN
SW 24TH	CULEBRA	SW 26TH	TSSW24T-CULEB-SW26T
SW 26TH	SW 24TH	CASTROVILLE	TSSW26T-SW24T-CASTR
SW 36TH	GROFF	OLD HWY. 90	TSSW36T-GROFF-OLDHW
SW 36TH	OLD HWY. 90	US 90	TSSW36T-OLDHW-0090U
TEZEL RD.	BRAUN	GUILBEAU	TSTEZEL-BRAUN-GUILB
TEZEL RD.	GUILBEAU	RIDGE PATH	TSTEZEL-GUILB-RIDGE
TEZEL RD.	RIDGE PATH	GRISSOM	TSTEZEL-RIDGE-GRISS
TOEPPERWEIN	IH 35	JUDSON	TSTOEPP-0035I-JUDSO
TOEPPERWEIN	JUDSON	KITTY HAWK	TSTOEPP-JUDSO-KITTY
TOEPPERWEIN	KITTY HAWK	GIBBS SPRAWL	TSTOEPP-KITTY-GIBBS
VANCE JACKSON RD.	IH F74210	FREDERICKSBURG	TSVANCE-0010I-FREDE
VANCE JACKSON RD.	IH 410	IH 10	TSVANCE-0410I-0010I
VANCE JACKSON RD.	CALLAGHAN	IH 410	TSVANCE-CALLA-0410I
VANCE JACKSON RD.	HUEBNER	WURZBACH	TSVANCE-HUEBN-WURZB

VANCE JACKSON RD.	WURZBACH	CALLAGHAN	TSVANCE-WURZB-CALLA
WALTERS	IH 35	HOUSTON	TSWALTE-0035I-HOUST
WALTERS	HOUSTON	RIGSBY	TSWALTE-HOUST-RIGSB
WEIDNER	RANDOLPH BLVD.	EAGLE CREST	TSWEIDN-RANDO-EAGLE
WEIDNER	SCHERTZ	RANDOLPH BLVD.	TSWEIDN-SCHER-RANDO
WEST AVE.	DRESDEN	IH 10	TSWEST_-DRESD-0010I
WEST AVE.	JACKSON KELLER	DRESDEN	TSWEST_-JACKS-DRESD
WETMORE	BROADWAY	IH 410	TSWETMO-BROAD-0410I
WETMORE	STARCREST	BROADWAY	TSWETMO-STARC-BROAD
WETMORE	THOUSAND OAKS	STARCREST	TSWETMO-THOUS-STARC
WOODLAKE	SEGUIN	BINZ-ENGLEMAN	TSWOODK-SEGUI-BINZE
WURZBACH	BABCOCK	EVERS	TSWURZB-BABCO-EVERS
WURZBACH	EVERS	SEVILLE	TSWURZB-EVERS-SEVIL
WURZBACH	SEVILLE	INGRAM	TSWURZB-SEVIL-INGRA
W. W. WHITE PKWY.	IH 10	RIGSBY	TSWWWHI-0010I-RIGSB
W. W. WHITE PKWY.	IH 410	IH 10	TSWWWHI-0410I-0010I
W. W. WHITE PKWY.	RIGSBY	SOUTHCROSS	TSWWWHI-RIGSB-SOUTH
W. W. WHITE PKWY.	SOUTHCROSS	IH 10	TSWWWHI-SOUTH-0410I
ZARZAMORA	COMMERCE	US 90	TSZARZA-COMME-0090U
ZARZAMORA	CULEBRA	COMMERCE	TSZARZA-CULEB-COMME
ZARZAMORA	FREDERICKSBURG	CULEBRA	TSZARZA-FREDE-CULEB
ZARZAMORA	HUTCHINS PL.	IH 410	TSZARZA-HUTCH-0410I
ZARZAMORA	MILITARY DR.	HUTCHINS PL.	TSZARZA-MILIT-HUTCH
FM 78	FM 1516	WALZEM	TW0078F-1516F-WALZE
FM 78	LOOP 1604	FM 1516	TW0078F-1604L-1516F
FM 78	FOSTER	GIBBS SPRAWL	TW0078F-FOSTE-GIBBS
FM 78	GIBBS SPRAWL	IH 410	TW0078F-GIBBS-0410I
FM 78	WALZEM	WOODLAKE	TW0078F-WALZE-WOODL
FM 78	WOODLAKE	FOSTER	TW0078F-WOODL-FOSTE
IH 410	US 87	SOUTHCROSS	TW0410I-0087U-SOUTH
IH 410	SH 422	SOMERSET	TW0410I-0422S-SOMER
IH 410	GOLIAD	ROOSEVELT	TW0410I-GOLIA-ROOSE
IH 410	MOURSUND	ZARZAMORA	TW0410I-MOURS-ZARZA
IH 410	ROOSEVELT	MOURSUND	TW0410I-ROOSE-MOURS
IH 410	SOMERSET	IH 35	TW0410I-SOMER-0035I
IH 410	SOUTHCROSS	W. W. WHITE	TW0410I-SOUTH-WWWHI
IH 410	ST. HEDGWIG	US 87	TW0410I-STHED-0087U
IH 410	W. W. WHITE	GOLIAD	TW0410I-WWWHI-GOLIA
IH 410	ZARZAMORA	SH 422	TW0410I-ZARZA-0422S
BASSE RD.	NACOGDOCHES	TUXEDO	TWBASSE-NACOG-TUXED
BASSE RD.	SAN PEDRO	BLANCO	TWBASSE-SANPE-BLANC
BASSE RD.	TUXEDO	SAN PEDRO	TWBASSE-TUXED-SANPE
BINZ-ENGLEMAN	FM 1516	FOSTER	TWBINZE-1516F-FOSTE
BINZ-ENGLEMAN	FOSTER	IH 410	TWBINZE-FOSTE-0410I
BRAUN RD.	BANDERA	TEZEL	TWBRAUN-BANDE-TEZEL
BRAUN RD.	TEZEL	LOOP 1604	TWBRAUN-TEZEL-1604L
CASSIN	NEW LAREDO HWY.	QUINTANA	TWCASSI-NEWLA-QUINT

CASSIN	SOMERSET	NEW LAREDO HWY.	TWCASSI-SOMER-NEWLA
CASTROVILLE	GEN. MCMULLEN	SW 36TH	TWCASTR-GENMC-SW36T
CASTROVILLE	SW19TH	GEN. MCMULLEN	TWCASTR-SW19T-GENMC
CASTROVILLE	SW36TH	US 90	TWCASTR-SW36T-0090U
COMMERCE	IH 10	SPRIGGSDALE	TWCOMME-0010I-SPRIG
COMMERCE	SPRIGGSDALE	NEW BRAUNFELS	TWCOMME-SPRIG-NEWBR
CRESTWAY	RANDOLPH	WEIDNER	TWCREST-RANDO-WEIDN
CRESTWAY	WEIDNER	KITTY HAWK	TWCREST-WEIDN-KITTY
CULEBRA RD.	IH 410	INGRAM	TWCULEB-0410I-INGRA
CULEBRA RD.	ALICIA	CALLAGHAN	TWCULEB-ALICI-CALLA
CULEBRA RD.	CALLAGHAN	OAKHILL	TWCULEB-CALLA-OAKHI
CULEBRA RD.	INGRAM	REED	TWCULEB-INGRA-REED_
CULEBRA RD.	NW 24TH	SAN FELIPE	TWCULEB-NW24T-SANFE
CULEBRA RD.	OAKHILL	IH 410	TWCULEB-OAKHI-0410I
CULEBRA RD.	REED	VILLAGE PKWY	TWCULEB-REED_-VILLP
CULEBRA RD.	SAN FELIPE	ALICIA	TWCULEB-SANFE-ALICI
CULEBRA RD.	TEZEL	LOOP 1604	TWCULEB-TEZEL-1604L
CULEBRA RD.	VILLAGE PKWY	WESTOVER HILLS	TWCULEB-VILLP-WESTO
CULEBRA RD.	WESTOVER HILLS	GRISSOM	TWCULEB-WESTO-GRISS
DE ZAVALA	LOCKHILL SELMA	VANCE JACKSON	TWDEZAV-LHSEL-VANCE
DE ZAVALA	NW MILITARY	LOCKHILL SELMA	TWDEZAV-NWMIL-LHSEL
DE ZAVALA	VANCE JACKSON	BABCOCK	TWDEZAV-VANCE-BABCO
ECKERT	BLUE BIRD	BANDERA	TWECKER-BLUEB-BANDE
ECKERT	HUEBNER	BLUE BIRD	TWECKER-HUEBN-BLUEB
GIBBS SPRAWL	LOOP 1604	TOPPERWEIN	TWGIBBS-1604L-TOEPP
GIBBS SPRAWL	MONTGOMERY	WALZEM	TWGIBBS-MONTG-WALZE
GIBBS SPRAWL	RITTIMAN	SEGUIN	TWGIBBS-RITTI-SEGUI
GIBBS SPRAWL	TOPPERWEIN	MONTGOMERY	TWGIBBS-TOEPP-MONTG
GIBBS SPRAWL	WALZEM	RITTIMAN	TWGIBBS-WALZE-RITTI
GRISSOM RD.	BANDERA	TEZEL	TWGRISS-BANDE-TEZEL
GUADALUPE	BRAZOS	SW 19TH	TWGUADA-BRAZO-SW19T
GUADALUPE	FLORES	BRAZOS	TWGUADA-FLORE-BRAZO
GUILBEAU RD.	BANDERA	CROOKED PATH	TWGUILB-BANDE-CROOK
GUILBEAU RD.	CROOKED PATH	OLD TEZEL	TWGUILB-CROOK-OLDTE
GUILBEAU RD.	OLD TEZEL	LOOP 1604	TWGUILB-OLDTE-1604L
HAUSMAN RD.	IH 10	BABCOCK	TWHAUSM-0010I-BABCO
HAUSMAN RD.	BABCOCK	LOOP 1604	TWHAUSM-BABCO-1604L
HILDEBRAND	US 281	MCCULLOUGH	TWHILDE-0281U-MCCUL
HILDEBRAND	BLANCO	WEST	TWHILDE-BLANC-WEST_
HILDEBRAND	MCCULLOUGH	BLANCO	TWHILDE-MCCUL-BLANC
HILDEBRAND	NEW BRAUNFELS	US 281	TWHILDE-NEWBR-0281U
HOUSTON	IH 10	ONSLOW	TWHOUST-0010I-ONSLO
HOUSTON	IH 410	IH 10	TWHOUST-0410I-0010I
HOUSTON	NEW BRAUNFEL	IH 37	TWHOUST-NEWBR-0037I
HOUSTON	ONSLOW	NEW BRAUNFELS	TWHOUST-ONSLO-NEWBR
INGRAM RD.	CALLAGHAN	WURZBACH	TWINGRA-CALLA-WURZB
INGRAM RD.	WURZBACH	CULEBRA	TWINGRA-WURZB-CULEB

JACKSON KELLER	BLANCO	WEST AVE.	TWJACKS-BLANC-WEST_
JACKSON KELLER	MCCULLOUGH	SAN PEDRO	TWJACKS-MCCUL-SANPE
JACKSON KELLER	SAN PEDRO	BLANCO	TWJACKS-SANPE-BLANC
JACKSON KELLER	WEST AVE.	VANCE JACKSON	TWJACKS-WEST_-VANCE
KITTY HAWK	LOOP 1604	TOEPPERWEIN	TWKITTY-1604L-TOEPP
KITTY HAWK	TOPPERWEIN	MILLER	TWKITTY-TOEPP-MILLE
MAINLAND	BANDERA	TEZEL	TWMAINL-BANDE-TEZEL
MEDICAL	EWING HALSELL	WURZBACH	TWMEDIC-EWING-WURZB
MEDICAL	FREDERICKSBURG	EWING HALSELL	TWMEDIC-FREDE-EWING
MEDICAL	WURZBACH	BABCOCK	TWMEDIC-WURZB-BABCO
MILITARY DR. W.	SH 151	ELLISON	TWMILIT-0151S-ELLIS
MILITARY DR. W.	ELLISON	LOOP 1604	TWMILIT-ELLIS-1604L
MILITARY DR. W.	HUNT	SH151	TWMILIT-HUNT_-0151S
MILITARY DR. SE	W. W. WHITE	IH 37	TWMILIT-WWWHI-0037I
NACOGDOCHES	LOOP 1604	JUDSON	TWNACOG-1604L-JUDSO
NACOGDOCHES	JUDSON	O'CONNOR	TWNACOG-JUDSO-OCONN
NACOGDOCHES	O'CONNOR	THOUSAND OAKS	TWNACOG-OCONN-THOUS
NAKOMA DR.	US 281	WEST AVE.	TWNAKOM-0281U-WEST_
NAKOMA DR.	JONES MALTSBERGER	US 281	TWNAKOM-JONES-0281U
NEW SULPHUR SPGS RD.	FOSTER	IH 410	TWNEWSU-FOSTE-0410I
OLD HWY. 90	ACME	US 90	TWOLDHW-ACME_-0090U
OLD HWY. 90	COMMERCE	ACME	TWOLDHW-COMME-ACME_
POTRANCO	CULEBRA	MILITARY DR. W.	TWPOTRA-CULEB-MILIT
POTRANCO	ELLISON	LOOP 1604	TWPOTRA-ELLIS-1604L
POTRANCO	INGRAM	CULEBRA	TWPOTRA-INGRA-CULEB
POTRANCO	MILITARY DR. W.	ELLISON DR.	TWPOTRA-MILIT-ELLIS
RIGSBY AVE.	IH 410	W. W. WHITE	TWRIGSB-0410I-WWWHI
RIGSBY AVE.	FM 1516	IH 410	TWRIGSB-1516F-0410I
RIGSBY AVE.	AMITY	ROLAND	TWRIGSB-AMITY-ROLAN
RIGSBY AVE.	CLARK	IH 410	TWRIGSB-CLARK-0010I
RIGSBY AVE.	ROLAND	CLARK	TWRIGSB-ROLAN-CLARK
RIGSBY AVE.	W. W. WHITE	AMITY	TWRIGSB-WWWHI-AMITY
RITTIMAN	GIBBS SPRAWL	IH 410	TWRITTI-GIBBS-0410I
SCHERTZ	WEIDNER	THOUSAND OAKS	TWSCHER-WEIDN-THOUS
SOUTHCROSS	IH 410	CARYA GITTINGER	TWSOUTH-0410I-CARYA
SOUTHCROSS	CARYA GITTINGER	PECAN VALLEY	TWSOUTH-CARYA-PECAN
SOUTHCROSS BLVD.	NEW LAREDO HWY.	QUINTANA	TWSOUTH-NEWLA-QUINT
SOUTHCROSS	PECAN VALLEY	IH 37	TWSOUTH-PECAN-0037I
STAHL	JUDSON	O'CONNOR	TWSTAHL-JUDSO-OCONN
STAHL	NACOGDOCHES	JUDSON	TWSTAHL-NACOG-JUDSO
STEVES	GEVERS	NEW BRAUNFELS	TWSTEVE-GEVER-NEWBR
STEVES	NEW BRAUNFELS	PRESA	TWSTEVE-NEWBR-PRESA
STEVES	PRESA	PROBANDT	TWSTEVE-PRESA-PROBA
ST. HEDWIG	FM 1516	FOSTER	TWSTHED-1516F-FOSTE
ST. HEDWIG	FOSTER	IH 410	TWSTHED-FOSTE-0410I
TUXEDO AVE.	BROADWAY	US 281	TWTUXED-BROAD-0281U
UTSA BLVD.	IH 10	BABCOCK	TWUTSA_-0010I-BABCO

WESTOVER HILLS	CULEBRA	MISTY ROCK	TWWESTO-CULEB-MISTY
WESTOVER HILLS	MISTY ROCK	WISEMAN	TWWESTO-MISTY-WISEM
WESTOVER HILLS	WISEMAN	ELLISON	TWWESTO-WISEM-ELLIS
WISEMAN BLVD.	SH151	LOOP 1606	TWWISEM-0151S-1604L
WISEMAN BLVD.	WESTOVER HILLS	SH151	TWWISEM-WESTO-0151S
WOODLAWN	US 281	MCCULLOUGH	TWWOODL-0281U-MCCUL
WOODLAWN	BLANCO	ZARZAMORA	TWWOODL-BLANC-ZARZA
WOODLAWN	MCCULLOUGH	BLANCO	TWWOODL-MCCUL-BLANC
WOODLAWN	ZARZAMORA	BANDERA	TWWOODL-ZARZA-BANDE
WOODSTONE	VANCE JACKSON	IH 10	TWWOODS-VANCE-0010I

APPENDIX F

EXAMPLE OF AGGREGATED GPS TRAVEL TIME DATABASE

Table F-1. Example of Aggregated GPS Travel Time Database

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GE0010I-1516F-FOSTE	geh2113g	0:02:21	8/21/97	13:30	2.82	116	72
GE0010I-1516F-FOSTE	geh2113k	0:02:29	8/21/97	13:50	2.82	110	68
GE0010I-1516F-FOSTE	geh2114c	0:02:24	8/21/97	14:10	2.82	114	71
GE0010I-1516F-FOSTE	geh2114g	0:02:32	8/21/97	14:30	2.82	108	67
GE0010I-1516F-FOSTE	geh2114k	0:02:30	8/21/97	14:50	2.82	109	68
GE0010I-1516F-FOSTE	geh2115d	0:02:30	8/21/97	15:15	2.82	109	68
GE0010I-1516F-FOSTE	gei0316a	0:02:55	9/3/97	16:00	2.82	93	58
GE0010I-1516F-FOSTE	gei0316d	0:02:37	9/3/97	16:15	2.82	104	65
GE0010I-1516F-FOSTE	gei0316i	0:02:30	9/3/97	16:40	2.82	109	68
GE0010I-1516F-FOSTE	gei0316k	0:02:33	9/3/97	16:50	2.82	107	66
GE0010I-1516F-FOSTE	gei0317d	0:03:02	9/3/97	17:15	2.82	90	56
GE0010I-1516F-FOSTE	gei0317h	0:02:28	9/3/97	17:35	2.82	110	69
GE0010I-1516F-FOSTE	gel1516i	0:02:20	12/15/97	16:40	2.82	117	73
GE0010I-1516F-FOSTE	gel1516l	0:02:21	12/15/97	16:55	2.82	116	72
GE0010I-1516F-FOSTE	gel1517c	0:02:15	12/15/97	17:10	2.82	121	75
GE0010I-1516F-FOSTE	gel1517g	0:02:16	12/15/97	17:30	2.82	120	75
GE0010I-1516F-FOSTE	gel1608c	0:02:33	12/16/97	8:10	2.82	107	66
GE0010I-1516F-FOSTE	gel1608j	0:02:15	12/16/97	8:45	2.82	121	75
GE0010I-1516F-FOSTE	gel1807d	0:02:22	12/18/97	7:15	2.82	115	72
GE0010I-1516F-FOSTE	gel1807g	0:02:18	12/18/97	7:30	2.82	118	74
GE0010I-1516F-FOSTE	gel1808a	0:02:15	12/18/97	8:00	2.82	121	75
GE0010I-1516F-FOSTE	gel1808c	0:02:18	12/18/97	8:10	2.82	118	74
GE0010I-1516F-FOSTE	gel1808g	0:02:17	12/18/97	8:30	2.82	119	74
GE0010I-1516F-FOSTE	gel1907e	0:02:24	12/19/97	7:20	2.82	114	71
GE0010I-1516F-FOSTE	gel1907i	0:02:21	12/19/97	7:40	2.82	116	72
GE0010I-1516F-FOSTE	gel1907l	0:02:19	12/19/97	7:55	2.82	118	73
GE0010I-1516F-FOSTE	gel1908h	0:02:18	12/19/97	8:35	2.82	118	74
GE0010I-1516F-FOSTE	gea1216c	0:02:17	1/12/98	16:10	2.82	119	74
GE0010I-1516F-FOSTE	gea1216f	0:02:15	1/12/98	16:25	2.82	121	75
GE0010I-1516F-FOSTE	gea1216j	0:02:24	1/12/98	16:45	2.82	114	71
GE0010I-1516F-FOSTE	gea1217a	0:02:25	1/12/98	17:00	2.82	113	70
GE0010I-1516F-FOSTE	gea1217e	0:02:31	1/12/98	17:20	2.82	108	67
GE0010I-1516F-FOSTE	gea1217h	0:02:22	1/12/98	17:35	2.82	115	72
GE0010I-1604L-1516F	geh2113g	0:01:28	8/21/97	13:30	1.58	104	65
GE0010I-1604L-1516F	geh2113k	0:01:26	8/21/97	13:50	1.58	106	66
GE0010I-1604L-1516F	geh2114c	0:01:38	8/21/97	14:10	1.58	93	58
GE0010I-1604L-1516F	geh2114g	0:01:40	8/21/97	14:30	1.58	92	57

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GE0010I-1604L-1516F	geh2114k	0:01:37	8/21/97	14:50	1.58	94	59
GE0010I-1604L-1516F	geh2115d	0:02:03	8/21/97	15:15	1.58	74	46
GE0010I-1604L-1516F	gei0316a	0:02:01	9/3/97	16:00	1.58	76	47
GE0010I-1604L-1516F	gei0316d	0:02:27	9/3/97	16:15	1.58	62	39
GE0010I-1604L-1516F	gei0316i	0:02:17	9/3/97	16:40	1.58	67	42
GE0010I-1604L-1516F	gei0316k	0:01:51	9/3/97	16:50	1.58	82	51
GE0010I-1604L-1516F	gei0317d	0:01:54	9/3/97	17:15	1.58	80	50
GE0010I-1604L-1516F	gei0317h	0:01:40	9/3/97	17:35	1.58	92	57
GE0010I-1604L-1516F	gel1608c	0:01:15	12/16/97	8:10	1.58	122	76
GE0010I-1604L-1516F	gel1807j	0:01:17	12/18/97	7:45	1.58	119	74
GE0010I-1604L-1516F	gel1808g	0:01:18	12/18/97	8:30	1.58	117	73
GE0010I-1604L-1516F	gel1908h	0:01:21	12/19/97	8:35	1.58	113	70
GEBUENA-0010I-COLOR	9ei0216a	0:01:46	9/2/97	16:00	0.59	32	20
GEBUENA-0010I-COLOR	9ei0216f	0:01:37	9/2/97	16:25	0.59	35	22
GEBUENA-0010I-COLOR	9ei0216l	0:01:19	9/2/97	16:55	0.59	43	27
GEBUENA-0010I-COLOR	9ei0217h	0:00:52	9/2/97	17:35	0.59	66	41
GEBUENA-0010I-COLOR	9ei1615g	0:00:49	9/16/97	15:30	0.59	70	43
GEBUENA-0010I-COLOR	9ek1907a	0:01:42	11/19/97	7:00	0.59	33	21
GEBUENA-0010I-COLOR	9ek1907h	0:01:58	11/19/97	7:35	0.59	29	18
GEBUENA-0010I-COLOR	9ek1907l	0:01:38	11/19/97	7:55	0.59	35	22
GEBUENA-0010I-COLOR	9ek1908e	0:01:27	11/19/97	8:20	0.59	39	24
GEBUENA-0010I-COLOR	9ek2009k	0:01:20	11/20/97	9:50	0.59	43	27
GEBUENA-0010I-COLOR	9ek2010c	0:01:01	11/20/97	10:10	0.59	56	35
GEBUENA-0010I-COLOR	9ek2010f	0:01:19	11/20/97	10:25	0.59	43	27
GEBUENA-0010I-COLOR	9ek2107b	0:01:13	11/21/97	7:05	0.59	47	29
GEBUENA-0010I-COLOR	9ek2107g	0:02:08	11/21/97	7:30	0.59	27	17
GEBUENA-0010I-COLOR	9ek2108a	0:01:01	11/21/97	8:00	0.59	56	35
GEBUENA-0010I-COLOR	9ek2108g	0:01:42	11/21/97	8:30	0.59	33	21
GEBUENA-0010I-COLOR	9ek2407a	0:01:22	11/24/97	7:00	0.59	42	26
GEBUENA-0010I-COLOR	9ek2407f	0:01:02	11/24/97	7:25	0.59	55	34
GEBUENA-0010I-COLOR	9ek2407k	0:01:08	11/24/97	7:50	0.59	50	31
GEBUENA-0010I-COLOR	9ek2408e	0:01:24	11/24/97	8:20	0.59	41	25
GEBUENA-0010I-COLOR	9el0413i	0:01:42	12/4/97	13:40	0.59	33	21
GEBUENA-0010I-COLOR	9el0414c	0:01:10	12/4/97	14:10	0.59	49	30
GEBUENA-0010I-COLOR	9el0907a	0:01:41	12/9/97	7:00	0.59	34	21
GEBUENA-0010I-COLOR	9el0907e	0:01:09	12/9/97	7:20	0.59	50	31
GEBUENA-0010I-COLOR	9el0907h	0:01:36	12/9/97	7:35	0.59	36	22
GEBUENA-0010I-COLOR	9el0907l	0:01:51	12/9/97	7:55	0.59	31	19
GEBUENA-0010I-COLOR	9el0908c	0:01:25	12/9/97	8:10	0.59	40	25
GEBUENA-0010I-COLOR	9el0908g	0:01:10	12/9/97	8:30	0.59	49	30

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GEBUENA-0010I-COLOR	9el1516d	0:01:49	12/15/97	16:15	0.59	31	20
GEBUENA-0010I-COLOR	9el1516j	0:01:24	12/15/97	16:45	0.59	41	25
GEBUENA-0010I-COLOR	9el1517d	0:02:03	12/15/97	17:15	0.59	28	17
GEBUENA-0010I-COLOR	9el1517f	0:01:03	12/15/97	17:25	0.59	54	34
GEBUENA-0010I-COLOR	9el1707g	0:01:21	12/17/97	7:30	0.59	42	26
GEBUENA-0010I-COLOR	9el1707j	0:01:40	12/17/97	7:45	0.59	34	21
GEBUENA-0010I-COLOR	9el1907a	0:01:31	12/19/97	7:00	0.59	38	23
GEBUENA-0010I-COLOR	9el1907d	0:01:31	12/19/97	7:15	0.59	38	23
GEBUENA-0010I-COLOR	9el1907h	0:01:06	12/19/97	7:35	0.59	52	32
GEBUENA-0010I-COLOR	9el1908c	0:01:34	12/19/97	8:10	0.59	36	23
GEBUENA-0010I-COLOR	9el1908g	0:01:23	12/19/97	8:30	0,59	41	26
GEBUENA-0010I-COLOR	9ea0816f	0:02:03	1/8/98	16:25	0.59	28	17
GEBUENA-0010I-COLOR	9ea0816l	0:01:02	1/8/98	16:55	0.59	55	34
GEBUENA-0010I-COLOR	9ea0817g	0:01:02	1/8/98	17:30	0.59	55	34
GEBUENA-ALAMO-FLORE	9ei0216a	0:02:10	9/2/97	16:00	0.46	20	13
GEBUENA-ALAMO-FLORE	9ei0216f	0:01:10	9/2/97	16:25	0.46	38	24
GEBUENA-ALAMO-FLORE	9ei0216l	0:02:05	9/2/97	16:55	0.46	21	13
GEBUENA-ALAMO-FLORE	9ei0217h	0:02:53	9/2/97	17:35	0.46	15	10
GEBUENA-ALAMO-FLORE	9ei1615g	0:01:14	9/16/97	15:30	0.46	36	22
GEBUENA-ALAMO-FLORE	9ek1907a	0:01:13	11/19/97	7:00	0.46	37	23
GEBUENA-ALAMO-FLORE	9ek1907h	0:02:01	11/19/97	7:35	0.46	22	14
GEBUENA-ALAMO-FLORE	9ek1907l	0:01:16	11/19/97	7:55	0.46	35	22
GEBUENA-ALAMO-FLORE	9ek1908e	0:01:11	11/19/97	8:20	0.46	38	23
GEBUENA-ALAMO-FLORE	9ek2009k	0:01:22	11/20/97	9:50	0.46	33	20
GEBUENA-ALAMO-FLORE	9ek2010c	0:01:19	11/20/97	10:10	0.46	34	21
GEBUENA-ALAMO-FLORE	9ek2010f	0:02:59	11/20/97	10:25	0.46	15	9
GEBUENA-ALAMO-FLORE	9ek2107b	0:02:04	11/21/97	7:05	0.46	22	13
GEBUENA-ALAMO-FLORE	9ek2107g	0:01:10	11/21/97	7:30	0.46	38	24
GEBUENA-ALAMO-FLORE	9ek2108a	0:01:12	11/21/97	8:00	0.46	37	23
GEBUENA-ALAMO-FLORE	9ek2108g	0:02:13	11/21/97	8:30	0.46	20	13
GEBUENA-ALAMO-FLORE	9ek2407a	0:01:13	11/24/97	7:00	0.46	37	23
GEBUENA-ALAMO-FLORE	9ek2407f	0:01:09	11/24/97	7:25	0.46	39	24
GEBUENA-ALAMO-FLORE	9ek2407k	0:01:22	11/24/97	7:50	0.46	33	20
GEBUENA-ALAMO-FLORE	9ek2408e	0:01:15	11/24/97	8:20	0.46	36	22
GEBUENA-ALAMO-FLORE	9el0413i	0:01:19	12/4/97	13:40	0.46	34	21
GEBUENA-ALAMO-FLORE	9el0414c	0:01:14	12/4/97	14:10	0.46	36	22
GEBUENA-ALAMO-FLORE	9el0907a	0:01:12	12/9/97	7:00	0.46	37	23
GEBUENA-ALAMO-FLORE	9el0907e	0:01:22	12/9/97	7:20	0.46	33	20
GEBUENA-ALAMO-FLORE	9el0907h	0:01:17	12/9/97	7:35	0.46	35	22
GEBUENA-ALAMO-FLORE	9el0907l	0:01:08	12/9/97	7:55	0.46	39	24

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GEBUENA-ALAMO-FLORE	9el0908c	0:02:15	12/9/97	8:10	0.46	20	12
GEBUENA-ALAMO-FLORE	9el0908g	0:03:12	12/9/97	8:30	0.46	14	9
GEBUENA-ALAMO-FLORE	9el1516d	0:01:55	12/15/97	16:15	0.46	23	14
GEBUENA-ALAMO-FLORE	9el1516j	0:02:06	12/15/97	16:45	0.46	21	13
GEBUENA-ALAMO-FLORE	9el1517d	0:02:10	12/15/97	17:15	0.46	20	13
GEBUENA-ALAMO-FLORE	9el1517f	0:02:04	12/15/97	17:25	0.46	22	13
GEBUENA-ALAMO-FLORE	9el1707g	0:01:09	12/17/97	7:30	0.46	39	24
GEBUENA-ALAMO-FLORE	9el1707j	0:01:08	12/17/97	7:45	0.46	39	24
GEBUENA-ALAMO-FLORE	9el1907a	0:01:10	12/19/97	7:00	0.46	38	24
GEBUENA-ALAMO-FLORE	9el1907d	0:01:10	12/19/97	7:15	0.46	38	24
GEBUENA-ALAMO-FLORE	9el1907h	0:01:16	12/19/97	7:35	0.46	35	22
GEBUENA-ALAMO-FLORE	9el1908c	0:01:03	12/19/97	8:10	0.46	42	26
GEBUENA-ALAMO-FLORE	9el1908g	0:01:18	12/19/97	8:30	0.46	34	21
GEBUENA-ALAMO-FLORE	9ea0816f	0:02:06	1/8/98	16:25	0.46	21	13
GEBUENA-ALAMO-FLORE	9ea0816l	0:02:07	1/8/98	16:55	0.46	21	13
GEBUENA-ALAMO-FLORE	9ea0817g	0:01:11	1/8/98	17:30	0.46	38	23
GEBUENA-BOWIE-ALAMO	9ei0216a	0:00:27	9/2/97	16:00	0.24	52	32
GEBUENA-BOWIE-ALAMO	9ei0216f	0:00:28	9/2/97	16:25	0.24	50	31
GEBUENA-BOWIE-ALAMO	9ei0216l	0:00:26	9/2/97	16:55	0.24	53	33
GEBUENA-BOWIE-ALAMO	9ei0217h	0:00:37	9/2/97	17:35	0.24	38	23
GEBUENA-BOWIE-ALAMO	9ei1615g	0:00:30	9/16/97	15:30	0.24	46	29
GEBUENA-BOWIE-ALAMO	9ek1907a	0:00:30	11/19/97	7:00	0.24	46	29
GEBUENA-BOWIE-ALAMO	9ek1907h	0:00:35	11/19/97	7:35	0.24	40	25
GEBUENA-BOWIE-ALAMO	9ek1907l	0:00:29	11/19/97	7:55	0.24	48	30
GEBUENA-BOWIE-ALAMO	9ek1908e	0:00:33	11/19/97	8:20	0.24	42	26
GEBUENA-BOWIE-ALAMO	9ek2107b	0:00:31	11/21/97	7:05	0.24	45	28
GEBUENA-BOWIE-ALAMO	9ek2107g	0:00:33	11/21/97	7:30	0.24	42	26
GEBUENA-BOWIE-ALAMO	9ek2108a	0:00:32	11/21/97	8:00	0.24	43	27
GEBUENA-BOWIE-ALAMO	9ek2108g	0:00:29	11/21/97	8:30	0.24	48	30
GEBUENA-BOWIE-ALAMO	9ek2407a	0:00:29	11/24/97	7:00	0.24	48	30
GEBUENA-BOWIE-ALAMO	9ek2407f	0:00:31	11/24/97	7:25	0.24	45	28
GEBUENA-BOWIE-ALAMO	9ek2408e	0:00:30	11/24/97	8:20	0.24	46	29
GEBUENA-BOWIE-ALAMO	9el0413i	0:00:33	12/4/97	13:40	0.24	42	26
GEBUENA-BOWIE-ALAMO	9el0414c	0:00:37	12/4/97	14:10	0.24	38	23
GEBUENA-BOWIE-ALAMO	9el1516d	0:01:28	12/15/97	16:15	0.24	16	10
GEBUENA-BOWIE-ALAMO	9el1516j	0:00:51	12/15/97	16:45	0.24	27	17
GEBUENA-BOWIE-ALAMO	9el1517d	0:00:50	12/15/97	17:15	0.24	28	17
GEBUENA-BOWIE-ALAMO	9el1517f	0:00:35	12/15/97	17:25	0.24	40	25
GEBUENA-BOWIE-ALAMO	9ea0816f	0:01:06	1/8/98	16:25	0.24	21	13
GEBUENA-BOWIE-ALAMO	9ea0816l	0:00:44	1/8/98	16:55	0.24	32	20

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GEBUENA-BOWIE-ALAMO	9ea0817g	0:00:41	1/8/98	17:30	0.24	34	21
GEBUENA-COLOR-TRINI	9ei0216a	0:00:42	9/2/97	16:00	0.41	57	35
GEBUENA-COLOR-TRINI	9ei0216f	0:00:39	9/2/97	16:25	0.41	61	38
GEBUENA-COLOR-TRINI	9ei0216l	0:00:45	9/2/97	16:55	0.41	53	33
GEBUENA-COLOR-TRINI	9ei0217h	0:00:42	9/2/97	17:35	0.41	57	35
GEBUENA-COLOR-TRINI	9ei1615g	0:00:41	9/16/97	15:30	0.41	58	36
GEBUENA-COLOR-TRINI	9ek1907a	0:00:44	11/19/97	7:00	0.41	54	34
GEBUENA-COLOR-TRINI	9ek1907h	0:00:42	11/19/97	7:35	0.41	57	35
GEBUENA-COLOR-TRINI	9ek1907l	0:00:46	11/19/97	7:55	0.41	52	32
GEBUENA-COLOR-TRINI	9ek1908e	0:00:44	11/19/97	8:20	0.41	54	34
GEBUENA-COLOR-TRINI	9ek2009k	0:00:46	11/20/97	9:50	0.41	52	32
GEBUENA-COLOR-TRINI	9ek2010c	0:00:45	11/20/97	10:10	0.41	53	33
GEBUENA-COLOR-TRINI	9ek2010f	0:00:43	11/20/97	10:25	0.41	55	34
GEBUENA-COLOR-TRINI	9ek2107b	0:00:43	11/21/97	7:05	0.41	55	34
GEBUENA-COLOR-TRINI	9ek2107g	0:00:57	11/21/97	7:30	0.41	42	26
GEBUENA-COLOR-TRINI	9ek2108a	0:00:47	11/21/97	8:00	0.41	51	31
GEBUENA-COLOR-TRINI	9ek2108g	0:00:48	11/21/97	8:30	0.41	50	31
GEBUENA-COLOR-TRINI	9ek2407a	0:00:44	11/24/97	7:00	0.41	54	34
GEBUENA-COLOR-TRINI	9ek2407f	0:00:40	11/24/97	7:25	0.41	59	37
GEBUENA-COLOR-TRINI	9ek2407k	0:00:42	11/24/97	7:50	0.41	57	35
GEBUENA-COLOR-TRINI	9ek2408e	0:00:40	11/24/97	8:20	0.41	59	37
GEBUENA-COLOR-TRINI	9el0413i	0:00:43	12/4/97	13:40	0.41	55	34
GEBUENA-COLOR-TRINI	9el0414c	0:00:44	12/4/97	14:10	0.41	54	34
GEBUENA-COLOR-TRINI	9el0907a	0:00:42	12/9/97	7:00	0.41	57	35
GEBUENA-COLOR-TRINI	9el0907e	0:00:44	12/9/97	7:20	0.41	54	34
GEBUENA-COLOR-TRINI	9el0907h	0:01:18	12/9/97	7:35	0.41	30	19
GEBUENA-COLOR-TRINI	9el0907l	0:00:45	12/9/97	7:55	0.41	53	33
GEBUENA-COLOR-TRINI	9el0908c	0:00:48	12/9/97	8:10	0.41	50	31
GEBUENA-COLOR-TRINI	9el0908g	0:01:11	12/9/97	8:30	0.41	33	21
GEBUENA-COLOR-TRINI	9el1516d	0:00:45	12/15/97	16:15	0.41	53	33
GEBUENA-COLOR-TRINI	9el1516j	0:00:45	12/15/97	16:45	0.41	53	33
GEBUENA-COLOR-TRINI	9el1517d	0:00:46	12/15/97	17:15	0.41	52	32
GEBUENA-COLOR-TRINI	9el1517f	0:00:48	12/15/97	17:25	0.41	50	31
GEBUENA-COLOR-TRINI	9el1707g	0:00:52	12/17/97	7:30	0.41	46	28
GEBUENA-COLOR-TRINI	9el1707j	0:00:39	12/17/97	7:45	0.41	61	38
GEBUENA-COLOR-TRINI	9el1907a	0:00:45	12/19/97	7:00	0.41	53	33
GEBUENA-COLOR-TRINI	9el1907d	0:00:45	12/19/97	7:15	0.41	53	33
GEBUENA-COLOR-TRINI	9el1907h	0:00:45	12/19/97	7:35	0.41	53	33
GEBUENA-COLOR-TRINI	9el1908c	0:00:48	12/19/97	8:10	0.41	50	31
GEBUENA-COLOR-TRINI	9el1908g	0:01:08	12/19/97	8:30	0.41	35	22

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GEBUENA-COLOR-TRINI	9ea0816f	0:00:57	1/8/98	16:25	0.41	42	26
GEBUENA-COLOR-TRINI	9ea0816l	0:00:52	1/8/98	16:55	0.41	46	28
GEBUENA-COLOR-TRINI	9ea0817g	0:00:47	1/8/98	17:30	0.41	51	31
GEBUENA-FLORE-0010I	9ei0216a	0:01:36	9/2/97	16:00	0.41	25	15
GEBUENA-FLORE-0010I	9ei0216f	0:01:26	9/2/97	16:25	0.41	28	17
GEBUENA-FLORE-0010I	9ei0216l	0:01:53	9/2/97	16:55	0.41	21	13
GEBUENA-FLORE-0010I	9ei0217h	0:01:19	9/2/97	17:35	0.41	30	19
GEBUENA-FLORE-0010I	9ei1615g	0:01:41	9/16/97	15:30	0.41	24	15
GEBUENA-FLORE-0010I	9ek1907a	0:01:56	11/19/97	7:00	0.41	20	13
GEBUENA-FLORE-0010I	9ek1907h	0:01:41	11/19/97	7:35	0.41	24	15
GEBUENA-FLORE-0010I	9ek1907l	0:02:03	11/19/97	7:55	0.41	19	12
GEBUENA-FLORE-0010I	9ek1908e	0:01:27	11/19/97	8:20	0.41	27	17
GEBUENA-FLORE-0010I	9ek2009k	0:01:53	11/20/97	9:50	0.41	21	13
GEBUENA-FLORE-0010I	9ek2010c	0:02:43	11/20/97	10:10	0.41	15	9
GEBUENA-FLORE-0010I	9ek2010f	0:02:51	11/20/97	10:25	0.41	14	9
GEBUENA-FLORE-0010I	9ek2107b	0:01:04	11/21/97	7:05	0.41	37	23
GEBUENA-FLORE-0010I	9ek2107g	0:01:29	11/21/97	7:30	0.41	27	17
GEBUENA-FLORE-0010I	9ek2108a	0:01:25	11/21/97	8:00	0.41	28	17
GEBUENA-FLORE-0010I	9ek2108g	0:03:00	11/21/97	8:30	0.41	13	8
GEBUENA-FLORE-0010I	9ek2407a	0:01:48	11/24/97	7:00	0.41	22	14
GEBUENA-FLORE-0010I	9ek2407f	0:00:57	11/24/97	7:25	0.41	42	26
GEBUENA-FLORE-0010I	9ek2407k	0:01:46	11/24/97	7:50	0.41	22	14
GEBUENA-FLORE-0010I	9ek2408e	0:01:30	11/24/97	8:20	0.41	26	16
GEBUENA-FLORE-0010I	9el0413i	0:02:26	12/4/97	13:40	0.41	16	10
GEBUENA-FLORE-0010I	9el0414c	0:01:51	12/4/97	14:10	0.41	21	13
GEBUENA-FLORE-0010I	9el0907a	0:01:23	12/9/97	7:00	0.41	29	18
GEBUENA-FLORE-0010I	9el0907e	0:01:24	12/9/97	7:20	0.41	28	18
GEBUENA-FLORE-0010I	9el0907h	0:01:42	12/9/97	7:35	0.41	23	15
GEBUENA-FLORE-0010I	9el0907l	0:01:33	12/9/97	7:55	0.41	26	16
GEBUENA-FLORE-0010I	9el0908c	0:01:32	12/9/97	8:10	0.41	26	16
GEBUENA-FLORE-0010I	9el0908g	0:02:03	12/9/97	8:30	0.41	19	12
GEBUENA-FLORE-0010I	9el1516d	0:01:26	12/15/97	16:15	0.41	28	17
GEBUENA-FLORE-0010I	9el1516j	0:01:28	12/15/97	16:45	0.41	27	17
GEBUENA-FLORE-0010I	9el1517d	0:01:27	12/15/97	17:15	0.41	27	17
GEBUENA-FLORE-0010I	9el1517f	0:01:29	12/15/97	17:25	0.41	27	17
GEBUENA-FLORE-0010I	9el1707g	0:01:33	12/17/97	7:30	0.41	26	16
GEBUENA-FLORE-0010I	9el1707j	0:01:26	12/17/97	7:45	0.41	28	17
GEBUENA-FLORE-0010I	9el1907a	0:01:04	12/19/97	7:00	0.41	37	23
GEBUENA-FLORE-0010I	9el1907d	0:01:25	12/19/97	7:15	0.41	28	17
GEBUENA-FLORE-0010I	9el1907h	0:02:09	12/19/97	7:35	0.41	18	11

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GEBUENA-FLORE-0010I	9el1908c	0:01:22	12/19/97	8:10	0.41	29	18
GEBUENA-FLORE-0010I	9el1908g	0:02:50	12/19/97	8:30	0.41	14	9
GEBUENA-FLORE-0010I	9ea0816f	0:01:44	1/8/98	16:25	0.41	23	14
GEBUENA-FLORE-0010I	9ea0816l	0:01:33	1/8/98	16:55	0.41	26	16
GEBUENA-FLORE-0010I	9ea0817g	0:00:56	1/8/98	17:30	0.41	43	26
GEBUENA-TRINI-ZARZA	9ei0216a	0:00:56	9/2/97	16:00	0.57	59	37
GEBUENA-TRINI-ZARZA	9ei0216f	0:00:58	9/2/97	16:25	0.57	57	35
GEBUENA-TRINI-ZARZA	9ei0216l	0:00:57	9/2/97	16:55	0.57	58	36
GEBUENA-TRINI-ZARZA	9ei0217h	0:00:54	9/2/97	17:35	0.57	61	38
GEBUENA-TRINI-ZARZA	9ei1615g	0:00:54	9/16/97	15:30	0.57	61	38
GEBUENA-TRINI-ZARZA	9ek1907a	0:01:05	11/19/97	7:00	0.57	51	32
GEBUENA-TRINI-ZARZA	9ek1907h	0:01:10	11/19/97	7:35	0.57	47	29
GEBUENA-TRINI-ZARZA	9ek1907l	0:01:32	11/19/97	7:55	0.57	36	22
GEBUENA-TRINI-ZARZA	9ek1908e	0:01:02	11/19/97	8:20	0.57	53	33
GEBUENA-TRINI-ZARZA	9ek2009k	0:01:03	11/20/97	9:50	0.57	52	33
GEBUENA-TRINI-ZARZA	9ek2010c	0:01:01	11/20/97	10:10	0.57	54	34
GEBUENA-TRINI-ZARZA	9ek2010f	0:01:07	11/20/97	10:25	0.57	49	31
GEBUENA-TRINI-ZARZA	9ek2107b	0:01:01	11/21/97	7:05	0.57	54	34
GEBUENA-TRINI-ZARZA	9ek2107g	0:01:26	11/21/97	7:30	0.57	38	24
GEBUENA-TRINI-ZARZA	9ek2108a	0:01:14	11/21/97	8:00	0.57	45	28
GEBUENA-TRINI-ZARZA	9ek2108g	0:01:15	11/21/97	8:30	0.57	44	27
GEBUENA-TRINI-ZARZA	9ek2407a	0:01:08	11/24/97	7:00	0.57	49	30
GEBUENA-TRINI-ZARZA	9ek2407f	0:00:59	11/24/97	7:25	0.57	56	35
GEBUENA-TRINI-ZARZA	9ek2407k	0:01:03	11/24/97	7:50	0.57	52	33
GEBUENA-TRINI-ZARZA	9ek2408e	0:01:02	11/24/97	8:20	0.57	53	33
GEBUENA-TRINI-ZARZA	9el0413i	0:01:02	12/4/97	13:40	0.57	53	33
GEBUENA-TRINI-ZARZA	9el0414c	0:01:04	12/4/97	14:10	0.57	52	32
GEBUENA-TRINI-ZARZA	9el0907a	0:01:05	12/9/97	7:00	0.57	51	32
GEBUENA-TRINI-ZARZA	9el0907e	0:01:11	12/9/97	7:20	0.57	47	29
GEBUENA-TRINI-ZARZA	9el0907h	0:01:06	12/9/97	7:35	0.57	50	31
GEBUENA-TRINI-ZARZA	9el0907l	0:01:29	12/9/97	7:55	0.57	37	23
GEBUENA-TRINI-ZARZA	9el0908c	0:01:29	12/9/97	8:10	0.57	37	23
GEBUENA-TRINI-ZARZA	9el0908g	0:00:59	12/9/97	8:30	0.57	56	35
GEBUENA-TRINI-ZARZA	9el1516d	0:01:02	12/15/97	16:15	0.57	53	33
GEBUENA-TRINI-ZARZA	9el1516j	0:01:06	12/15/97	16:45	0.57	50	31
GEBUENA-TRINI-ZARZA	9el1517d	0:01:05	12/15/97	17:15	0.57	51	32
GEBUENA-TRINI-ZARZA	9el1517f	0:01:05	12/15/97	17:25	0.57	51	32
GEBUENA-TRINI-ZARZA	9el1707g	0:01:10	12/17/97	7:30	0.57	47	29
GEBUENA-TRINI-ZARZA	9el1707j	0:01:00	12/17/97	7:45	0.57	55	34
GEBUENA-TRINI-ZARZA	9el1907a	0:01:23	12/19/97	7:00	0.57	40	25

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GEBUENA-TRINI-ZARZA	9el1907d	0:01:07	12/19/97	7:15	0.57	49	31
GEBUENA-TRINI-ZARZA	9el1907h	0:01:20	12/19/97	7:35	0.57	41	26
GEBUENA-TRINI-ZARZA	9el1908c	0:01:26	12/19/97	8:10	0.57	38	24
GEBUENA-TRINI-ZARZA	9el1908g	0:01:11	12/19/97	8:30	0.57	47	29
GEBUENA-TRINI-ZARZA	9ea0816l	0:01:40	1/8/98	16:55	0.57	33	21
GEBUENA-TRINI-ZARZA	9ea0817g	0:00:59	1/8/98	17:30	0.57	56	35
GEBUENA-ZARZA-COMME	9ei0216a	0:01:19	9/2/97	16:00	0.58	43	26
GEBUENA-ZARZA-COMME	9ei0216f	0:01:45	9/2/97	16:25	0.58	32	20
GEBUENA-ZARZA-COMME	9ei0216l	0:02:07	9/2/97	16:55	0.58	26	16
GEBUENA-ZARZA-COMME	9ei0217h	0:01:48	9/2/97	17:35	0.58	31	19
GEBUENA-ZARZA-COMME	9ei1615g	0:02:16	9/16/97	15:30	0.58	25	15
GEBUENA-ZARZA-COMME	9ek1907a	0:04:34	11/19/97	7:00	0.58	12	8
GEBUENA-ZARZA-COMME	9ek1907h	0:02:24	11/19/97	7:35	0.58	23	15
GEBUENA-ZARZA-COMME	9ek1907l	0:02:48	11/19/97	7:55	0.58	20	12
GEBUENA-ZARZA-COMME	9ek1908e	0:01:58	11/19/97	8:20	0.58	28	18
GEBUENA-ZARZA-COMME	9ek2009k	0:02:38	11/20/97	9:50	0.58	21	13
GEBUENA-ZARZA-COMME	9ek2010c	0:02:12	11/20/97	10:10	0.58	25	16
GEBUENA-ZARZA-COMME	9ek2010f	0:02:15	11/20/97	10:25	0.58	25	16
GEBUENA-ZARZA-COMME	9ek2107b	0:02:59	11/21/97	7:05	0.58	19	12
GEBUENA-ZARZA-COMME	9ek2107g	0:03:12	11/21/97	7:30	0.58	18	11
GEBUENA-ZARZA-COMME	9ek2108a	0:02:09	11/21/97	8:00	0.58	26	16
GEBUENA-ZARZA-COMME	9ek2108g	0:02:38	11/21/97	8:30	0.58	21	13
GEBUENA-ZARZA-COMME	9ek2407a	0:02:18	11/24/97	7:00	0.58	24	15
GEBUENA-ZARZA-COMME	9ek2407f	0:02:19	11/24/97	7:25	0.58	24	15
GEBUENA-ZARZA-COMME	9ek2407k	0:02:10	11/24/97	7:50	0.58	26	16
GEBUENA-ZARZA-COMME	9ek2408e	0:01:56	11/24/97	8:20	0.58	29	18
GEBUENA-ZARZA-COMME	9el0413i	0:01:51	12/4/97	13:40	0.58	30	19
GEBUENA-ZARZA-COMME	9el0414c	0:02:02	12/4/97	14:10	0.58	28	17
GEBUENA-ZARZA-COMME	9el0907a	0:03:13	12/9/97	7:00	0.58	17	11
GEBUENA-ZARZA-COMME	9el0907e	0:02:21	12/9/97	7:20	0.58	24	15
GEBUENA-ZARZA-COMME	9el0907h	0:02:02	12/9/97	7:35	0.58	28	17
GEBUENA-ZARZA-COMME	9el0907l	0:02:15	12/9/97	7:55	0.58	25	16
GEBUENA-ZARZA-COMME	9el0908c	0:01:43	12/9/97	8:10	0.58	33	20
GEBUENA-ZARZA-COMME	9el0908g	0:01:43	12/9/97	8:30	0.58	33	20
GEBUENA-ZARZA-COMME	9el1516d	0:02:22	12/15/97	16:15	0.58	24	15
GEBUENA-ZARZA-COMME	9el1516j	0:01:59	12/15/97	16:45	0.58	28	18
GEBUENA-ZARZA-COMME	9el1517d	0:02:18	12/15/97	17:15	0.58	24	15
GEBUENA-ZARZA-COMME	9el1517f	0:01:59	12/15/97	17:25	0.58	28	18
GEBUENA-ZARZA-COMME	9el1707g	0:02:50	12/17/97	7:30	0.58	20	12
GEBUENA-ZARZA-COMME	9el1707j	0:03:31	12/17/97	7:45	0.58	16	10

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GEBUENA-ZARZA-COMME	9el1907a	0:03:36	12/19/97	7:00	0.58	16	10
GEBUENA-ZARZA-COMME	9el1907d	0:01:59	12/19/97	7:15	0.58	28	18
GEBUENA-ZARZA-COMME	9el1907h	0:03:06	12/19/97	7:35	0.58	18	11
GEBUENA-ZARZA-COMME	9el1908c	0:02:49	12/19/97	8:10	0.58	20	12
GEBUENA-ZARZA-COMME	9el1908g	0:02:44	12/19/97	8:30	0.58	20	13
GEBUENA-ZARZA-COMME	9ea0816l	0:01:06	1/8/98	16:55	0.58	51	32
GEBUENA-ZARZA-COMME	9ea0817g	0:00:59	1/8/98	17:30	0.58	57	35
GECOMME-ACME_-CALLA	ceh0707a	0:01:13	8/7/97	7:00	0.74	59	37
GECOMME-ACME_-CALLA	ceh0707g	0:01:08	8/7/97	7:30	0.74	63	39
GECOMME-ACME_-CALLA	ceh0707k	0:01:10	8/7/97	7:50	0.74	61	38
GECOMME-ACME_-CALLA	ceh0708c	0:01:04	8/7/97	8:10	0.74	67	42
GECOMME-ACME_-CALLA	ceh0708g	0:01:06	8/7/97	8:30	0.74	65	40
GECOMME-ACME_-CALLA	cei3014e	0:01:41	9/30/97	14:20	0.74	43	26
GECOMME-ACME_-CALLA	cej0107h	0:01:53	10/1/97	7:35	0.74	38	24
GECOMME-ACME_-CALLA	cej0108a	0:01:39	10/1/97	8:00	0.74	43	27
GECOMME-ACME_-CALLA	cej0108i	0:01:26	10/1/97	8:40	0.74	50	31
GECOMME-ACME_-CALLA	cej0116a	0:01:37	10/1/97	16:00	0.74	44	28
GECOMME-ACME_-CALLA	cej0116f	0:01:54	10/1/97	16:25	0.74	38	23
GECOMME-ACME_-CALLA	cej0116j	0:01:07	10/1/97	16:45	0.74	64	40
GECOMME-ACME_-CALLA	cej0117b	0:01:20	10/1/97	17:05	0.74	54	33
GECOMME-ACME_-CALLA	cej0117g	0:01:38	10/1/97	17:30	0.74	44	27
GECOMME-ACME_-CALLA	cej0207b	0:01:32	10/3/97	7:05	0.74	47	29
GECOMME-ACME_-CALLA	cej0207g	0:02:39	10/3/97	7:30	0.74	27	17
GECOMME-ACME_-CALLA	cej0208d	0:01:46	10/3/97	8:15	0.74	40	25
GECOMME-ACME_-CALLA	cej0208h	0:01:40	10/3/97	8:35	0.74	43	27
GECOMME-ACME_-CALLA	cei3014a	0:01:30	10/30/97	14:00	0.74	48	30
GECOMME-ACME_-CALLA	cei3014i	0:01:41	10/30/97	14:40	0.74	43	26
GECOMME-ACME_-CALLA	cei3015j	0:01:51	10/30/97	15:45	0.74	39	24
GECOMME-ACME_-CALLA	cei3016k	0:01:35	10/30/97	16:50	0.74	45	28
GECOMME-ACME_-CALLA	cei3017d	0:01:20	10/30/97	17:15	0.74	54	33
GECOMME-ACME_-CALLA	cei3017i	0:01:28	10/30/97	17:40	0.74	49	30
GECOMME-ACME_-CALLA	cea0616f	0:01:13	1/6/98	16:25	0.74	59	37
GECOMME-ACME_-CALLA	cea0616l	0:01:10	1/6/98	16:55	0.74	61	38
GECOMME-ACME_-CALLA	cea0617e	0:01:16	1/6/98	17:20	0.74	57	35
GECOMME-ACME_-CALLA	cea0617j	0:01:19	1/6/98	17:45	0.74	54	34
GECOMME-BUENA-SW24T	ceh0707g	0:00:22	8/7/97	7:30	0.2	53	33
GECOMME-BUENA-SW24T	ceh0707k	0:00:20	8/7/97	7:50	0.2	58	36
GECOMME-BUENA-SW24T	ceh0708c	0:00:21	8/7/97	8:10	0.2	55	34
GECOMME-BUENA-SW24T	ceh0708g	0:00:23	8/7/97	8:30	0.2	50	31
GECOMME-BUENA-SW24T	ceh0708k	0:00:22	8/7/97	8:50	0.2	53	33

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GECOMME-BUENA-SW24T	cei3014e	0:00:21	9/30/97	14:20	0.2	55	34
GECOMME-BUENA-SW24T	cej0107h	0:00:22	10/1/97	7:35	0.2	53	33
GECOMME-BUENA-SW24T	cej0108a	0:00:23	10/1/97	8:00	0.2	50	31
GECOMME-BUENA-SW24T	cej0108i	0:00:19	10/1/97	8:40	0.2	61	38
GECOMME-BUENA-SW24T	cej0116a	0:00:23	10/1/97	16:00	0.2	50	31
GECOMME-BUENA-SW24T	cej0116f	0:00:20	10/1/97	16:25	0.2	58	36
GECOMME-BUENA-SW24T	cej0116j	0:00:20	10/1/97	16:45	0.2	58	36
GECOMME-BUENA-SW24T	cej0117b	0:00:28	10/1/97	17:05	0.2	41	26
GECOMME-BUENA-SW24T	cej0117g	0:00:21	10/1/97	17:30	0.2	55	34
GECOMME-BUENA-SW24T	cej0207b	0:00:24	10/3/97	7:05	0.2	48	30
GECOMME-BUENA-SW24T	cej0207g	0:00:21	10/3/97	7:30	0.2	55	34
GECOMME-BUENA-SW24T	cej0208d	0:00:20	10/3/97	8:15	0.2	58	36
GECOMME-BUENA-SW24T	cej0208h	0:00:20	10/3/97	8:35	0.2	58	36
GECOMME-BUENA-SW24T	cei3014a	0:00:20	10/30/97	14:00	0.2	58	36
GECOMME-BUENA-SW24T	cei3014i	0:00:20	10/30/97	14:40	0.2	58	36
GECOMME-BUENA-SW24T	cei3015j	0:00:21	10/30/97	15:45	0.2	55	34
GECOMME-BUENA-SW24T	cei3016k	0:00:21	10/30/97	16:50	0.2	55	34
GECOMME-BUENA-SW24T	cei3017d	0:00:23	10/30/97	17:15	0.2	50	31
GECOMME-BUENA-SW24T	cei3017i	0:00:18	10/30/97	17:40	0.2	64	40
GECOMME-BUENA-SW24T	cea0616f	0:00:25	1/6/98	16:25	0.2	46	29
GECOMME-BUENA-SW24T	cea0616l	0:00:27	1/6/98	16:55	0.2	43	27
GECOMME-BUENA-SW24T	cea0617e	0:00:21	1/6/98	17:20	0.2	55	34
GECOMME-BUENA-SW24T	cea0617j	0:00:24	1/6/98	17:45	0.2	48	30
GECOMME-GENMC-OLDHW	ceh0707g	0:00:41	8/7/97	7:30	0.39	55	34
GECOMME-GENMC-OLDHW	ceh0707k	0:00:33	8/7/97	7:50	0.39	68	43
GECOMME-GENMC-OLDHW	ceh0708c	0:01:42	8/7/97	8:10	0.39	22	14
GECOMME-GENMC-OLDHW	ceh0708g	0:01:08	8/7/97	8:30	0.39	33	21
GECOMME-GENMC-OLDHW	ceh0708k	0:02:28	8/7/97	8:50	0.39	15	10
GECOMME-GENMC-OLDHW	cei3014e	0:01:09	9/30/97	14:20	0.39	33	20
GECOMME-GENMC-OLDHW	cej0107h	0:01:47	10/1/97	7:35	0.39	21	13
GECOMME-GENMC-OLDHW	cej0108a	0:01:33	10/1/97	8:00	0.39	24	15
GECOMME-GENMC-OLDHW	cej0108i	0:01:08	10/1/97	8:40	0.39	33	21
GECOMME-GENMC-OLDHW	cej0116a	0:01:27	10/1/97	16:00	0.39	26	16
GECOMME-GENMC-OLDHW	cej0116f	0:01:34	10/1/97	16:25	0.39	24	15
GECOMME-GENMC-OLDHW	cej0116j	0:01:26	10/1/97	16:45	0.39	26	16
GECOMME-GENMC-OLDHW	cej0117b	0:01:40	10/1/97	17:05	0.39	23	14
GECOMME-GENMC-OLDHW	cej0117g	0:01:35	10/1/97	17:30	0.39	24	15
GECOMME-GENMC-OLDHW	cej0207b	0:01:25	10/3/97	7:05	0.39	27	17
GECOMME-GENMC-OLDHW	cej0207g	0:01:38	10/3/97	7:30	0.39	23	14
GECOMME-GENMC-OLDHW	cej0208d	0:01:19	10/3/97	8:15	0.39	29	18

Transguide ID	Filename	Travel Time (minutes)	Date	Time	Length	Speed	
						km/h	mph
GECOMME-GENMC-OLDHW	cej0208h	0:01:06	10/3/97	8:35	0.39	34	21
GECOMME-GENMC-OLDHW	cei3014a	0:00:54	10/30/97	14:00	0.39	42	26
GECOMME-GENMC-OLDHW	cei3014i	0:01:04	10/30/97	14:40	0.39	35	22
GECOMME-GENMC-OLDHW	cei3015j	0:01:34	10/30/97	15:45	0.39	24	15
GECOMME-GENMC-OLDHW	cei3016k	0:01:34	10/30/97	16:50	0.39	24	15
GECOMME-GENMC-OLDHW	cei3017d	0:01:30	10/30/97	17:15	0.39	25	16
GECOMME-GENMC-OLDHW	cei3017i	0:01:32	10/30/97	17:40	0.39	25	15
GECOMME-GENMC-OLDHW	cea0616f	0:01:31	1/6/98	16:25	0.39	25	15
GECOMME-GENMC-OLDHW	cea0616l	0:01:26	1/6/98	16:55	0.39	26	16
GECOMME-GENMC-OLDHW	cea0617e	0:01:33	1/6/98	17:20	0.39	24	15
GECOMME-GENMC-OLDHW	cea0617j	0:01:33	1/6/98	17:45	0.39	24	15
GECOMME-NW39T-ACME_	ceh0707a	0:00:56	8/7/97	7:00	0.5	52	32
GECOMME-NW39T-ACME_	ceh0707g	0:00:48	8/7/97	7:30	0.5	60	38
GECOMME-NW39T-ACME_	ceh0707k	0:00:53	8/7/97	7:50	0.5	55	34
GECOMME-NW39T-ACME_	ceh0708c	0:00:50	8/7/97	8:10	0.5	58	36
GECOMME-NW39T-ACME_	ceh0708g	0:00:51	8/7/97	8:30	0.5	57	35
GECOMME-NW39T-ACME_	ceh0708k	0:00:53	8/7/97	8:50	0.5	55	34
GECOMME-NW39T-ACME_	cei3014e	0:00:53	9/30/97	14:20	0.5	55	34
GECOMME-NW39T-ACME_	cej0107h	0:01:15	10/1/97	7:35	0.5	39	24
GECOMME-NW39T-ACME_	cej0108a	0:01:13	10/1/97	8:00	0.5	40	25
GECOMME-NW39T-ACME_	cej0108i	0:00:56	10/1/97	8:40	0.5	52	32
GECOMME-NW39T-ACME_	cej0116a	0:01:00	10/1/97	16:00	0.5	48	30
GECOMME-NW39T-ACME_	cej0116f	0:00:47	10/1/97	16:25	0.5	62	38
GECOMME-NW39T-ACME_	cej0116j	0:00:44	10/1/97	16:45	0.5	66	41
GECOMME-NW39T-ACME_	cej0117b	0:00:50	10/1/97	17:05	0.5	58	36
GECOMME-NW39T-ACME_	cej0117g	0:00:49	10/1/97	17:30	0.5	59	37
GECOMME-NW39T-ACME_	cej0207b	0:00:48	10/3/97	7:05	0.5	60	38
GECOMME-NW39T-ACME_	cej0207g	0:00:52	10/3/97	7:30	0.5	56	35
GECOMME-NW39T-ACME_	cej0208d	0:00:49	10/3/97	8:15	0.5	59	37
GECOMME-NW39T-ACME_	cej0208h	0:00:44	10/3/97	8:35	0.5	66	41
GECOMME-NW39T-ACME_	cei3014a	0:01:04	10/30/97	14:00	0.5	45	28
GECOMME-NW39T-ACME_	cei3014i	0:00:49	10/30/97	14:40	0.5	59	37