

# Data Services for Statewide Transportation

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•THE STARTING POINT in the comprehensive transportation planning process is the definition and measurement of related activities. Immediate, short-term plans can utilize secondary source data. However, long-term plans must rely on the actual measurement of spatial and temporal parameters such as trip length and frequency and location and volume of travel for each mode under study.

## SCALE AND CONSISTENCY OF STATEWIDE PLANNING DATA

The utility of data in reaching solutions depends on the ability of the user to know what data he needs and how they must be brought to bear on the problem to be solved. It would be wasteful for a government agency to move forward with a huge data-gathering program without first establishing the need for and the uses of the data to be gathered. The first task is to design a rational inventory program so that the data obtained will be consistent in scale with the uses for which they are intended.

Data scale can be thought of in another way. In statewide transportation planning, certain information will be used to examine intercity travel such as that by air passengers. On the other hand, for urban planning, data may be gathered for use in studying the problems involved in moving to and from air or rail terminals.

Unforeseen needs for data may arise even though the inventory was designed as carefully as possible. For example, the evaluation phase of most urban studies requires data in more detail than the original inventory provided. Therefore, in New York State we are attempting to design statewide inventories that anticipate the many ways, in addition to statewide planning, in which this information can be used.

In statewide planning, data must also be consistent for each of the different modes. Trips by goods traveling from terminal to terminal and by people from door-to-door will involve several modes. A consistency in data definition and format is essential for the difficult task of relating intermodal data to choice, user, and other aspects of intercity travel demand and supply.

## INVENTORIES

The inventories that are to be taken for statewide transportation planning (Fig. 1) are described in the "Prospectus for a Statewide Transportation Planning Process" (1968) and summarized in the following.

### Facilities

The first inventory involves establishment of a network representing all existing transportation facilities and points of interchanges among modes. The purpose of this is twofold: (a) to understand the potential and limitations of existing facilities, and (b) to provide a basis for systematic simulation of the capabilities and inadequacies of proposed facility improvements.

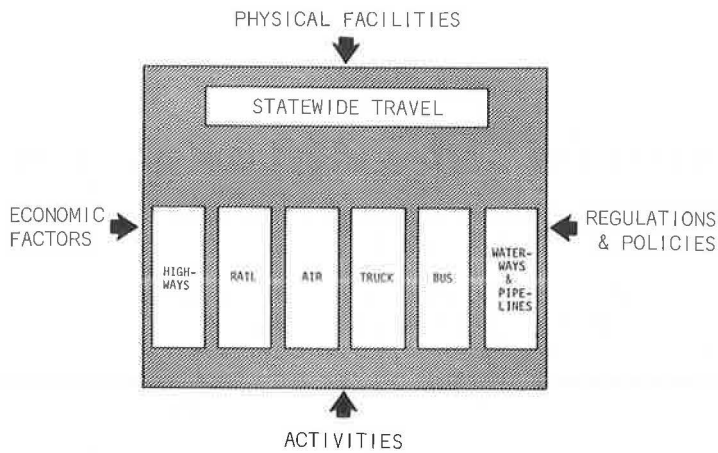


Figure 1. General inventories for statewide transportation planning.

The traveled way, conveyance, level of service, and terminal facilities will be identified and quantified for each mode. These will include such items as the following:

1. Traveled way
  - a. Highway—mileage, speed, accidents, width, condition.
  - b. Rail—length, location and number of tracks, control.
2. Conveyance
  - a. Air—number and type of commercial and private aircraft.
  - b. Bus—number and condition.
3. Level of service
  - a. Highway—freedom of movement, ton-miles of truck available.
  - b. Rail—schedule of freight and passenger trains, seat and ton-miles available.
4. Terminal facilities
  - a. Rail—location and capacity to handle equipment at passenger and freight yards.
  - b. Air—capability at airports of handling persons and goods, speed of passage through terminal.
  - c. Waterway and pipeline—mechanical facilities to handle cargo.

### Person Travel

Measurement of person travel (Fig. 2) must produce an adequate representation of its amount and distribution, both temporal and spatial. In addition, this measurement of travel must relate the characteristics of the trip, the traveler, and the transportation system. The process of measuring person travel, therefore, is one of developing sampling techniques, selecting a temporal profile to provide weekday, weekend, and long holiday weekend distributions, and relating tripmaking and mode selection to socioeconomic characteristics of households.

Statewide person travel on the highway network can be stratified into three categories—through, interstate, and intrastate. In New York, plans are under way to conduct roadside interviews at points on major border crossings for interstate and long-distance travel. These interviews will collect information on the magnitude and characteristics of out-of-state and long-distance travel. In addition, numerous home interviews will be conducted outside urban areas to gather data on intrastate person travel. This will result in a trip generation study in which the reasons for travel are related to population and activities that attract or generate travel. Follow-up interviews will gather seasonal and weekend information.

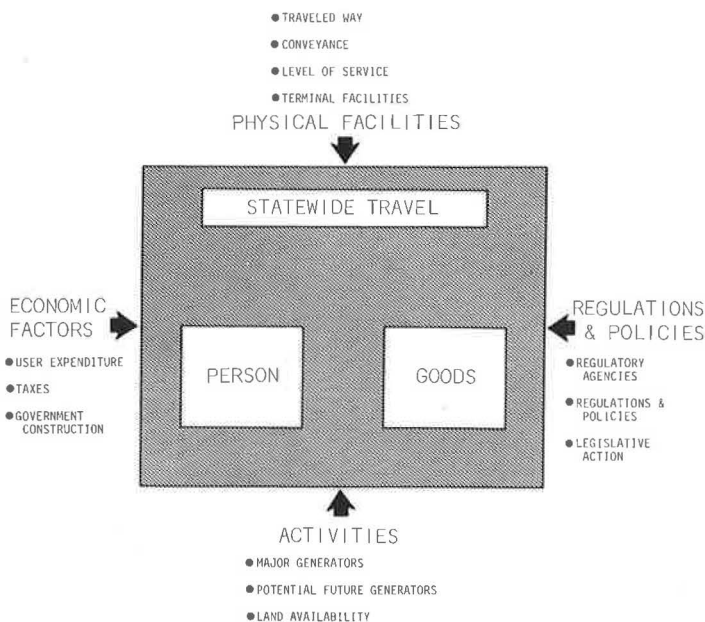


Figure 2. Inventories of person and goods travel by mode.

Because such a large portion of intrastate travel is interurban, the statewide home interviews will be supplemented with updated home interview data in the urban study areas. The returns in increased sample size and accuracy will result in a much greater understanding of total statewide travel. Some of the basic data needed from these home interviews to establish a base for statewide planning include household characteristics such as location, income, family size, and auto ownership, and trip characteristics such as purpose, rate, size of party, and origin-destination. One need not be an expert in statistics to appreciate the sample size necessary to assure any measure of accuracy in each of the many data "cells" or even by a geographic stratification.

Although much of the data on the magnitude and characteristics of common-carrier passenger travel in New York State can be obtained from secondary sources, supplemental interviews will be taken on the carrier vehicles themselves to obtain more accurate and complete information concerning local points of origin and destination, purpose of travel, and socioeconomic characteristics, travel times and costs, and the relationship of choice of mode to cost and quality of transportation services. Currently there is an air passenger survey under way in western New York gathering this type of information.

### Goods Travel

The measurement of the flow of goods to and from as well as within New York State will also be inventoried. This will produce a representation of the volume and distribution of goods transport. Sources of data by mode will be as follows:

1. Rail and common-carrier truck—A sample of waybills at major freight terminals will be taken to determine commodity flow patterns throughout the state.
2. Private-carrier truck—Permit file of New York State Department of Tax and Finance will be used to select sample for survey of movements of private carriers, as well as sources for water, pipeline, and air carriers.

A necessary part of these surveys will be the cooperation of the common carrier industry, which may well be more responsive to a broad systematic inventory than to a one-shot effort, especially when resulting data will be useful and available to them.

### Economic Factors

The basic purpose of the inventory of economic factors is to determine total transportation investment, employment, and rate of return. To determine the role of transportation in the economy of New York State, transportation expenditures and investment must be analyzed by relating statewide consumption of goods and services to national expenditure rates. An inventory will be made of selected common carriers by examining revenue and rate of return as well as government expenditures and taxing structures for transportation modes.

An inventory will also be undertaken of the size and value of the manufacturing industry, including plants, employees, value of shipments, and capital expenditures. This will aid in assessing the value of these industries to the state's economic stability and provide data on the merits of relocation and expansion.

### Transport Regulations and Policies

An understanding of the regulations governing the transportation system is equally as important as knowledge regarding the system's physical features. This inventory will use secondary source material as well as interviews with transportation policymakers. The major aspects of this data-gathering are the review and catalog of existing regulatory agencies, regulations, and policies; the means for implementing regulations; and the manner in which policies are formulated and interpreted.

### Activities

To forecast travel requires information on the location and intensity of sited activities. In addition, long-range planning requires an understanding of the location of potential opportunities for future activity. Therefore, an identification and quantification must be made of land available for development within the state for these major travel-generating activities. Figure 3 shows the percentage of used and usable land in each U. S. G. S. quadrangle in New York State.

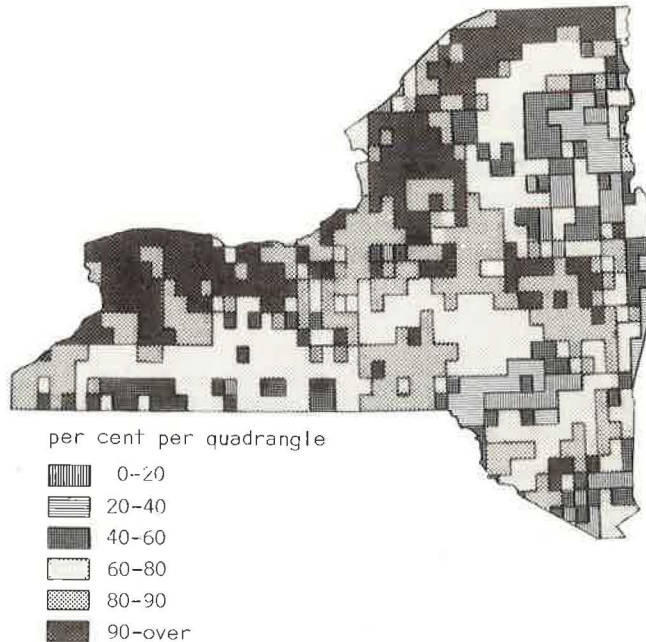


Figure 3. Used and usable land by U.S.G.S. quadrangle in New York State.

## INTEGRATION OF STATEWIDE AND URBAN STUDY DATA

The inventory phases of the studies in the six major upstate urban areas were completed some time ago. Therefore, a vast resource of information exists for these activity concentrations, including detailed data on the transportation network, land use and geographic coding controls, and a complete travel file containing the results of home interview, cordon, and commercial vehicle surveys. Efforts are now being made to update information on both the physical highway network and the regional traffic flows in most of these urban areas. In addition, both the detailed land use files and the travel files will soon be updated. This, then, leads to two major points concerning the relationships of statewide and urban data files:

1. There is a vast amount of data already available from the urban studies that can be utilized in the statewide study. For example, much of the trip generation studies that were done with urban data can be used for the developing areas of the state. In addition, the geographic coding of block and parcel data in the urban areas can be converted to Universal Transverse Mercator coordinates for the coordination of all areas both in and out of the state. One use of this would be the calculation of trip lengths and times, not only from terminal to terminal at the statewide level, but also the terminal link with home at the urban level. This information is necessary because many statewide trips end in urban areas. Another use of the urban files would be the study of land uses around major airports to evaluate zoning controls and to seek other solutions to the increasing noise problem.

2. The knowledge gained in the urban studies with regard to sampling techniques and statistical accuracy will prove beneficial and provide certain economies in developing procedures for statewide inventories.

## UPDATING PROCESS

Statewide planning, like that in urban areas, involves long-term and expensive public works projects. A certain amount of flexibility is therefore necessary in order to update and carry on a continuing planning process after the initial phases are completed. In addition to long-term flexibility, there must also be the capability of incorporating recurring changes in pertinent items of data. For example, air passenger seat miles can be obtained from the schedules of airlines. However, airline schedules frequently change, and the design of coding formats must allow the insertion of these changes so that the planning data base is kept up to date.

## INVENTORIES AND DATA SOURCES BY MODE

In the remainder of this paper, we shall look at each mode separately and give the status of each modal inventory along with some examples of the graphics developed to display inventory data. The sheer magnitude and complexity of the data demand sample illustrative visuals, both computer- and hand-prepared, to make the data manageable during the evaluation and planning phase.

### Highways

The highway network for statewide planning has been established as shown in Figure 4. This network consists of those federal, state, and county routes that carry the majority of the travel by all highway modes. It is the network that will be used for statewide assignment and simulation purposes. In addition, the physical characteristics of this network have been inventoried for use in analyzing capacity and level of service of the major network segments. Traffic counts available for all major highways in the state compared with the capacity calculations obtained in a physical inventory give the volume/capacity ratio or level of service afforded by a route.



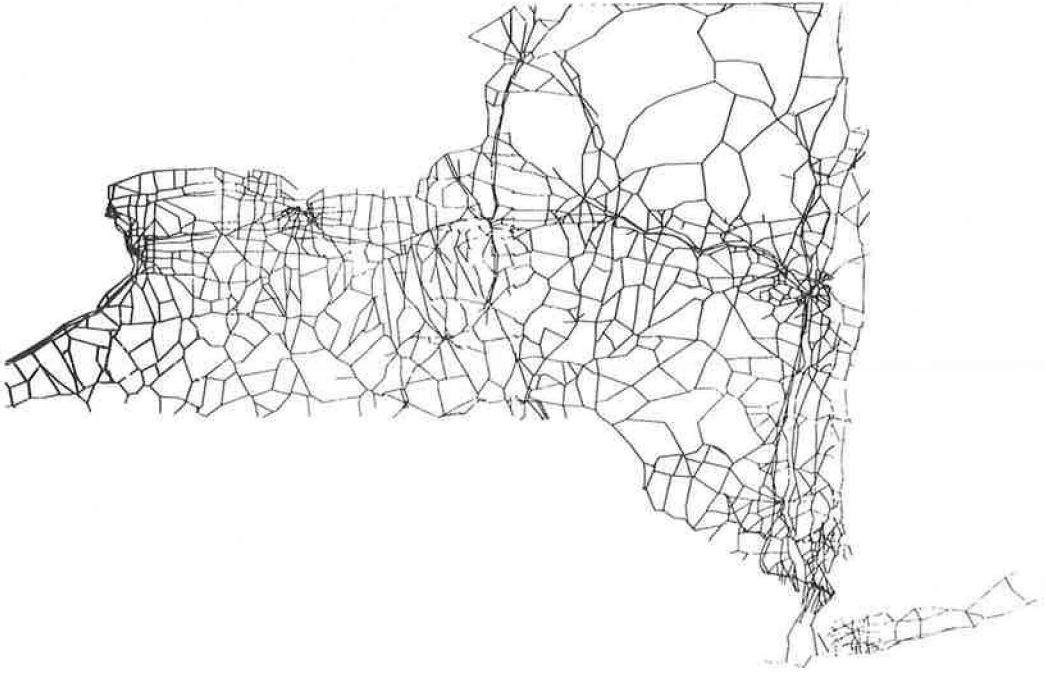


Figure 4. Highway network selected for transportation planning in New York.

Figure 5 shows those highway segments that are operating at an unacceptable level of service in the Poughkeepsie area north of New York City. For this same area we can illustrate many other physical parameters, such as the number of lanes. The highway data already obtained can also be used for intermodal examinations, as illustrated by Figure 6, which shows the access time from all points in the state to the nearest major commercial airport.

These illustrations are extremely helpful in examining the type of airport access available to all the residents of the state. However, key segments of the data are missing, such as origins and destinations, purposes, trip lengths, and important socioeconomic data for reason and mode choice determinations, and these will soon be obtained in the statewide cordon and home interviews.

### Rail

The physical inventory of the railroad network consisted of researching various secondary sources such as the Public Service Commission reports and the "Official Guide of Railways." Coding manuals are now complete along with formats for both the physical network and passenger use surveys, which will involve gathering data on the entire rail network, the amount and type of equipment, schedules, and seat- and ton-miles of railroad service available. The railroad network tape format contains some 400 characters of information. Additional field surveys will include passenger travel, goods movements, special terminal information of passenger and goods handling, and other items pertinent to railroad service and use evaluations.

### Air

The airline inventories are similar to those for railroads and are somewhat farther along. Secondary sources such as schedules issued by the airlines have been coded using expanded formats similar to those for the railroads. Now available are tables

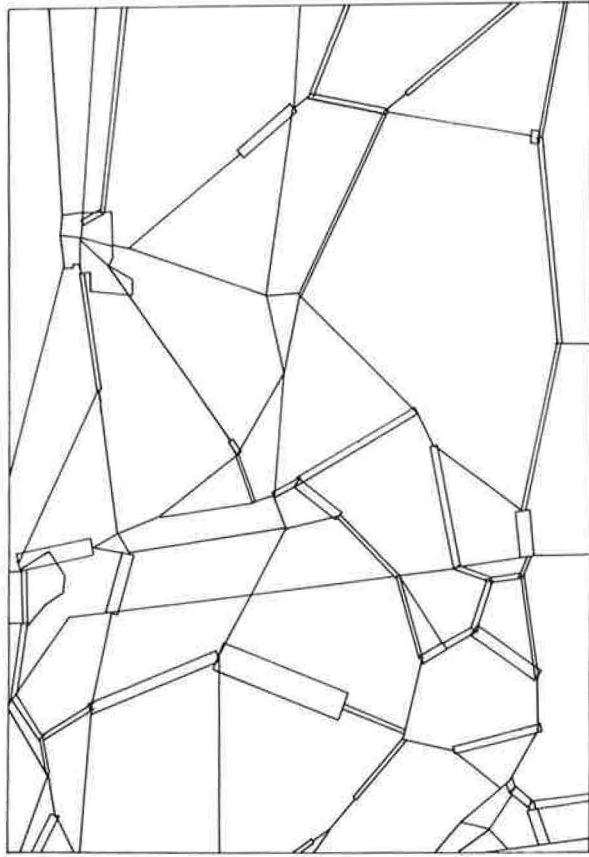


Figure 5. Congested areas where traffic volumes exceed roadway capacity shown by computer-drawn bands.

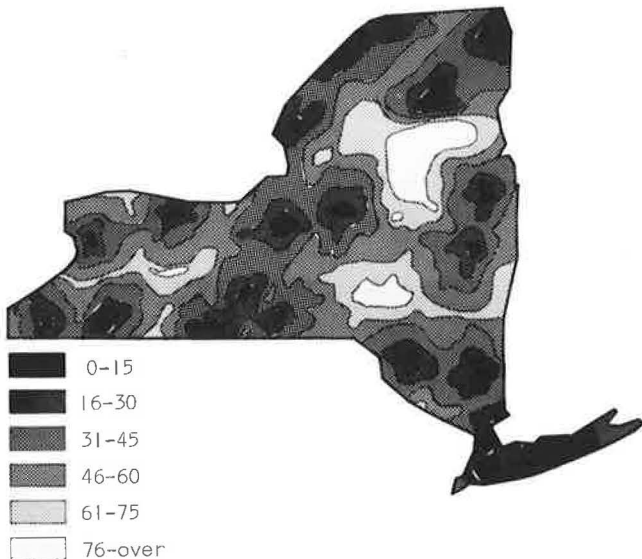


Figure 6. Travel time to nearest airport in New York State.

0-15

16-30

31-45

46-60

61-75

76-over

minutes to nearest airport

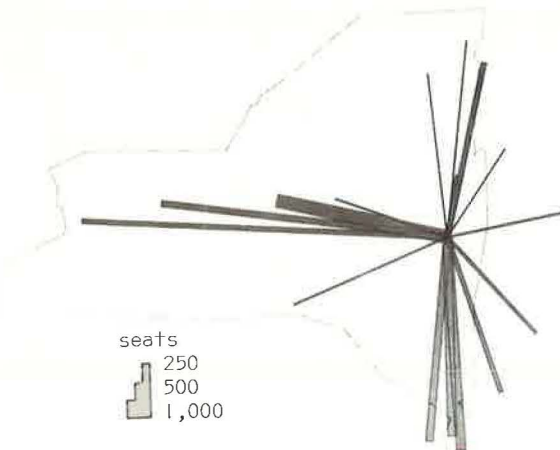


Figure 7. Airplane seats available daily from Albany County Airport.

that show the air service provided to travelers in the state including seats available, number of flights between cities, equipment types, facilities to handle persons and goods, and land uses adjacent to major airports. Work is also under way on general aviation inventories.

Figure 7 is computer-drawn and shows the number of seats available daily from Albany County Airport nonstop to all other cities; connecting flights are not shown. The frequent non-stop service to airports in Syracuse and New York City is evident, as are the few to Buffalo, only 300 miles away. Figures 8 and 9 illustrate some of the data on the temporal distribution of airline service. Figure 8 shows the expected distribution of service at Albany with morning and

evening peaks. In contrast is the service available to the industrial city of Buffalo shown in Figure 9. Service is light during the rush hours and very heavy around noon. When these facts are made known, it becomes possible to determine whether or not this is a reasonable or desirable situation. Why is service in these two cities so different and should it be?

Truck

Goods movement by trucks is by either common or private carriers. Information on both is essential. The New York State Department of Tax and Finance will be used as a source of information on private carriers when this inventory is started.

Secondary source publications issued by the American Trucking Association were used to obtain data about common carriers. The certificates of public convenience and necessity issued to the carriers from the Interstate Commerce Commission and the Public Service Commission were also used to computerize the carriers' operational rights.

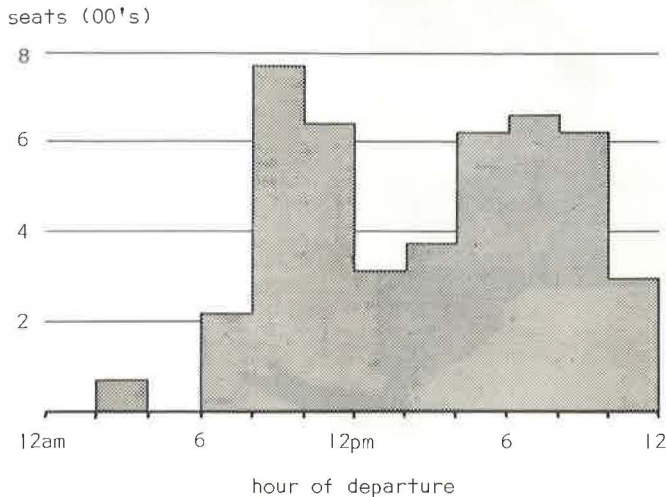


Figure 8. Daily airline seats available from Albany by hour of departure.



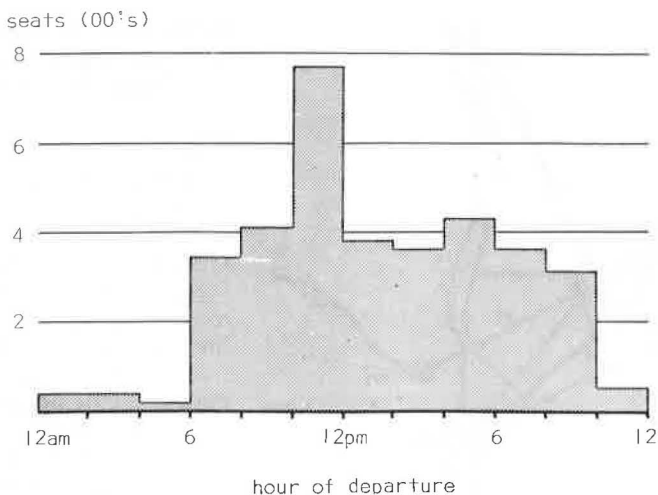


Figure 9. Daily airline seats available from Buffalo by hour of departure.

A pilot survey was made for a large-scale study of the common motor-carrier operation in New York. It involved the extraction of a sample of freight bills from a large carrier with both interstate and intrastate operating rights and with terminals maintained in ten states. The sample was taken from the Albany terminal on all out-bound traffic for a number of days. This pilot sample was used to test formats, programs, methodology, and record-keeping in obtaining samples as well as the output data, with a view to a study on a larger scale with a set universe. This full inventory of the goods movement by truck will be undertaken immediately after the common-carrier passenger movements have been ascertained.

Figure 10 is an example of the output from this pilot truck inventory; it shows the weight of total commodities shipped from Albany to major destination points within the state. This could also be stratified by the various commodities. Other items of data could be displayed graphically, such as the number of trucks over 5 tons and their des-

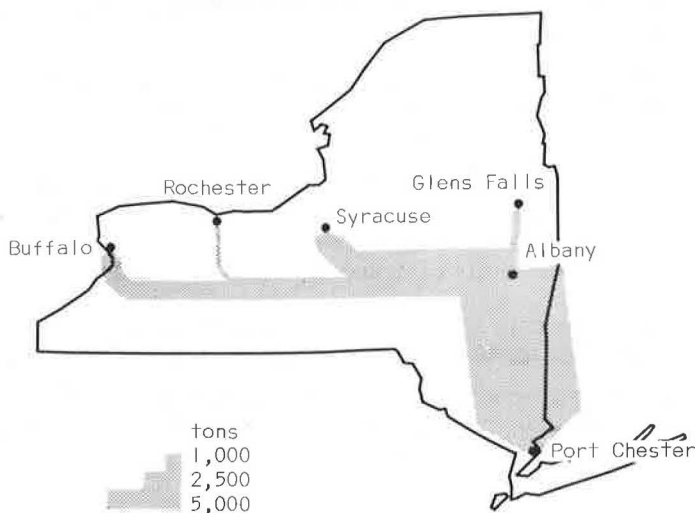


Figure 10. Tons of goods shipped from Albany by motor carrier.

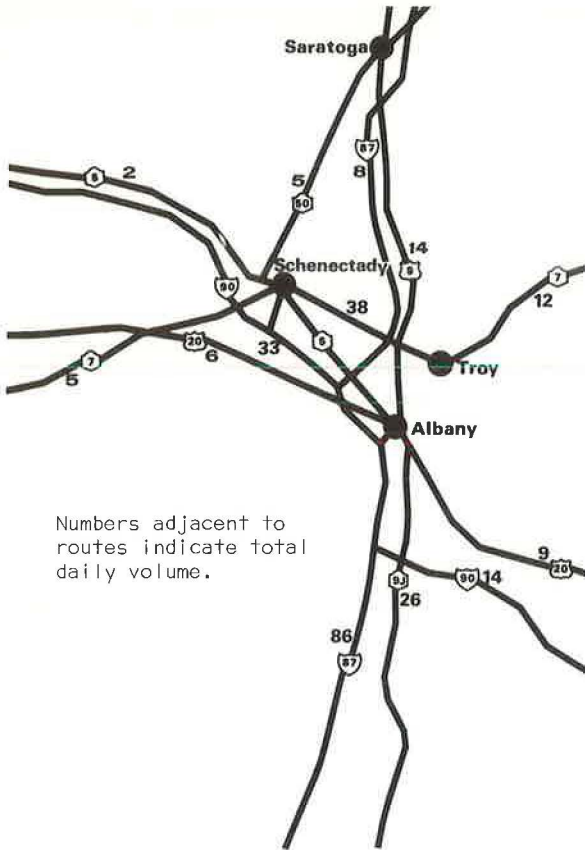


Figure 11. Daily intercity bus volumes on major routes near Albany.

tinations from Albany, equipment capacities, prices of commodities, and shipment times.

### Bus

The coding of all intercity bus movements is currently under way. These include schedules, stops, frequency of service, equipment, fares, capacity, and speed for the major carriers. Figure 11 shows the number of intercity buses on major routes near Albany. Eventually, the computer will produce displays of information of this type for the entire statewide network. It will then be possible to differentiate between areas of inadequate and adequate bus service. These displays would also assist the Public Service Commission to differentiate quickly between the various carriers' service rights.

### CONCLUSION

In summary, the inventories are now being taken of the physical description of the networks, service, and equipment, including the development of coding and computer formats. The design of questionnaires and sample selection procedures to survey the actual use of these modes is also under way. Close cooperation

is maintained between the Data Services Section, which gathers the data, and the Statewide Planning Section, which uses the data.

A program to provide data services to statewide transportation planning must give attention to at least three areas:

1. Consistency must be maintained in the data-gathering phase and the scale of the data should be compatible with the planning intent. Millions of bits of data are not much good if they neither can nor will be used. In addition, there must be consistency of definitions of data among the different transportation modes. This will permit efficient examination of the total intermodal travel of persons and goods.

2. The various data needs for statewide transportation planning necessitate the gathering of a tremendous volume of information. Because of its magnitude, the inventory program must be carefully designed and carried out to insure a workable data base at a reasonable cost.

3. The magnitude of the data also requires quickly prepared, simple graphics. Formats for tabulation must be carefully designed with consistent and meaningful terminology.

In many of these areas, procedures and methodology have been developed and need only to be applied to statewide transportation planning. Many others represent new ground that must be explored and charted.