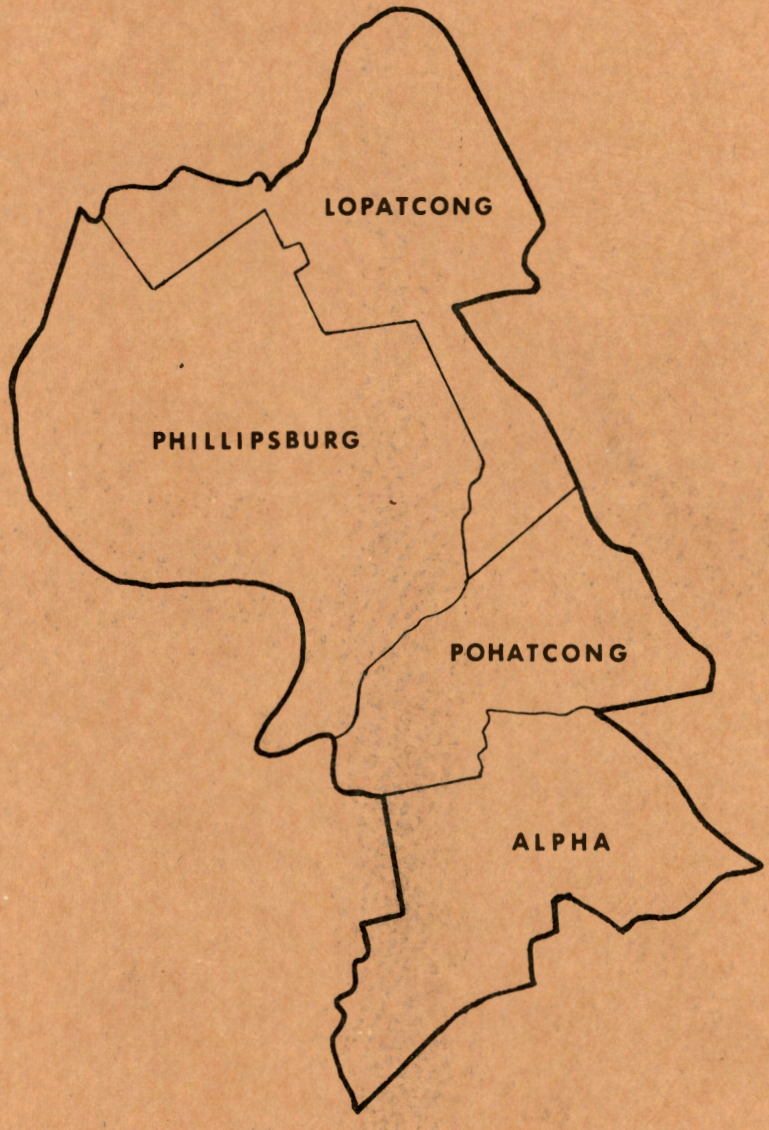
BASE YEAR REPORT

TRAVEL PATTERNS and FACILITIES INVENTORY



phillipsburg

URBAN AREA TRANSPORTATION STUDY

PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

1972 BASE YEAR REPORT

TRAVEL PATTERNS AND FACILITIES INVENTORY

Cooperating Agencies

Alpha Borough

Lopatcong Township

Phillipsburg Town

Pohatcong Township

Warren County

New Jersey Department of Transportation

U.S. Department of Transportation,
Federal Highway Administration

May 1974

COMMITTEE STRUCTURE

POLICY COMMITTEE

Mr. Alex Orfanelli Councilman	Alpha Borough
Honorable Richard Cline Mayor	Lopatcong Township
*Honorable Anthony J. Stillo Mayor	Phillipsburg Town
Honorable Frank Poch Mayor	Pohatcong Township
Mr. Benjamin J. Bosco Director, Board of Chosen Freeholders	Warren County
Mr. Robert A. Engle Director, Division of Comprehensive Transportation Planning	New Jersey Department of Transportation
Mr. William Schmitt, Jr. Planning and Research Engineer	Federal Highway Administration

TECHNICAL ADVISORY COMMITTEE

Mr. Leo Santowasso Engineer Robert C. Bogart and Associates	Alpha Borough
Mr. C. Douglas Cherry Engineer	Lopatcong Township Pohatcong Township
*Mr. John O'Donnell Engineer	Phillipsburg Town
Mr. Frank Wilkinson Engineer	Warren County
Mr. John E. Obermeier Chief, Bureau of Urban Planning	New Jersey Department of Transportation
Mr. Paul Lenk Assistant Planning and Research Engineer	Federal Highway Administration

*Chairman

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OVERVIEW

The Phillipsburg study area consists of 5,400 acres and has a population of 25,400

There are 131 miles of roads within the cordon, of which 41.9 miles are on the network

Average weekday daily travel is 141,000 vehicle trips: 63,000 internal, 28,000 through, and 50,000 with one end in the study area

Average trip length is 2.2 miles or 4.5 minutes

The majority of trips using the Focht Toll Bridge do not have a destination in the study area, but the opposite is true for Free Bridge traffic

Truck travel accounts for an unusually high portion of all travel, at some locations in excess of 30%

Peak hour travel is comparatively low, only 7% of the daily total

Locations with 5 or more accidents annually were exclusively on four roads: U.S. 22, N.J. 57, Roseberry Street, and Main Street in Phillipsburg

INTRODUCTION

The Phillipsburg Study Area is a part of the Allentown-Bethlehem-Easton urban area. The New Jersey portion lies within Warren County and contains four municipalities: Alpha Borough, Lopatcong Township (part), Town of Phillipsburg, and Pohatcong Township (part).

The objective of the initial phase of the Phillipsburg Urban Area Transportation Study is to describe fully existing conditions for the 1972 base year. Three types of inventories are required to execute this task: socio-economic and land use characteristics, transportation facilities and travel patterns.

Socio-economic data for the zonal and municipal levels is contained in "PUATS Base Year Report: Socio-economic Findings", dated June, 1973. Findings on travel patterns and transportation facilities will be covered in this report.

An inventory of highway transportation facilities is presented first. Included are: network mileage summaries by jurisdiction, federal assistance, and functional classification; volume-capacity comparisons; accident data to show high-incident locations; and an inventory of on-street parking regulations. Public transportation facilities are described briefly, but bus and train travel is practically non-existent.

Highway travel patterns are covered in the second part of this report. A comprehensive travel survey (i.e. home interview and truck registration surveys) was not done because of the prohibitive cost involved. Instead, external trips were inventoried by means of roadside interview survey; and internal trip patterns were simulated with a trip generation model and gravity model distribution.

TRANSPORTATION FACILITIES

INVENTORY

HIGHWAY FACILITIES

Base Year Network

There are 41.9 miles of roads and 13.5 miles of connectors on the 1972 Base Year Network, which is shown in Figure 1. The jurisdictional breakdown appears in Table 1. Note that all of the state and county mileage is on the network, but only 23% of the total municipal mileage is included.

This simplification is necessary to produce a system of nodes and links that is more manageable. The effect of omitting some roads is to cluster neighboring trip origins and destinations. Instead of listing an exact origin and destination for a given trip, all trip ends within a traffic zone are loaded at the centroid. There are 40 centroids, one for each of the 40 traffic zones. Each centroid is joined to the network by one or more connectors. A connector is a fictitious link and does not represent an existing road. Connectors are shown as dashed lines in Figure 1.

Federal-aid System

The selection of Federal-aid systems is intended to promote the "general welfare and the national and civil defense, and to become the pattern for a long-range program of highway development to serve the major classes of traffic...The designation of the Federal-aid highway system...insures continuity in the direction of expenditures of available Federal-aid funds" (PPM 10-1).

A mileage breakdown for the Federal-aid System is presented in Tables 2A to 2D. Definitions for the five categories are given in Key Sheet 1. Figure 2 shows the Federal-aid designation of network roads.

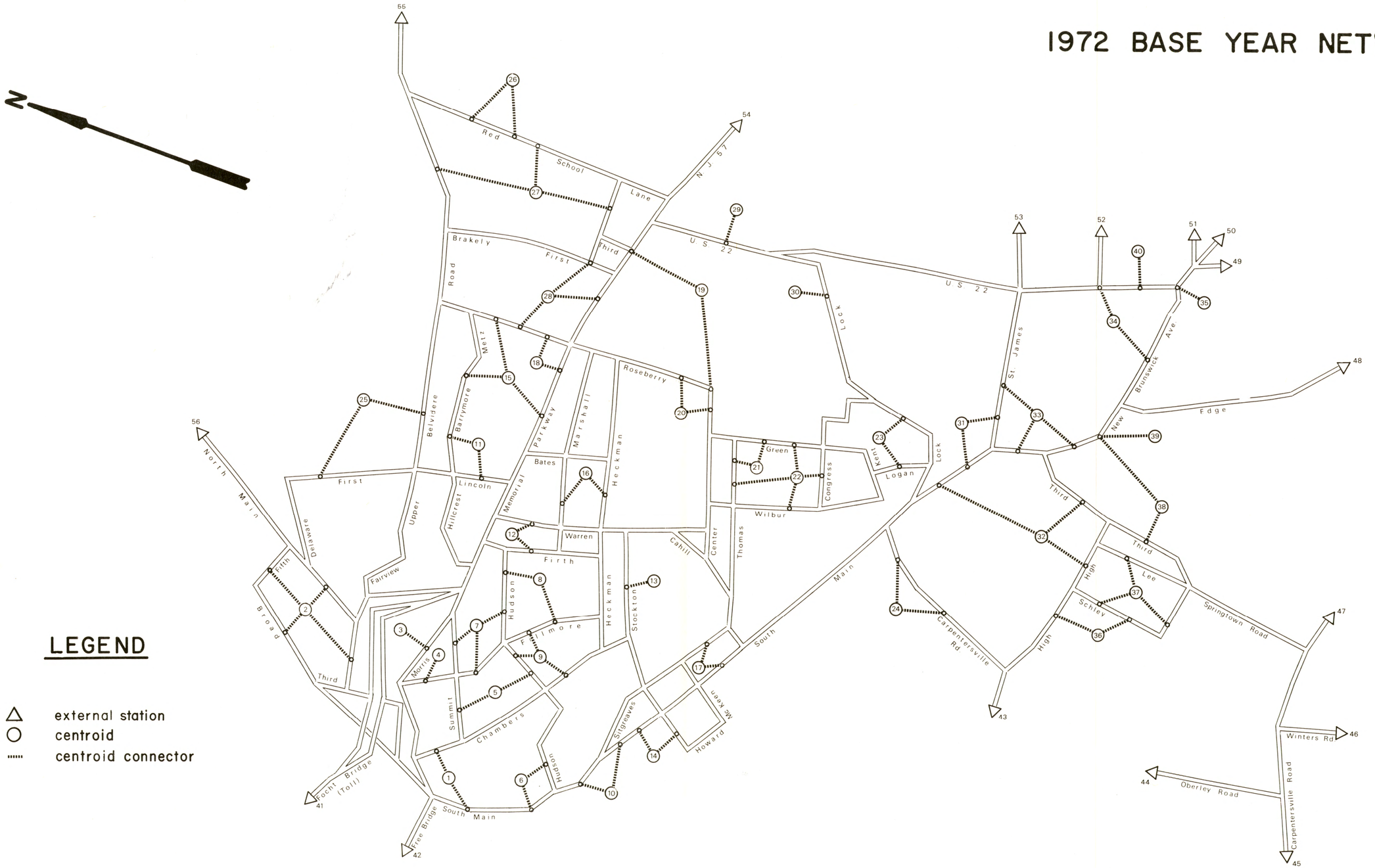
1972 BASE YEAR NETWORK MILEAGE SUMMARY

TABLE 1 – DISTRIBUTION BY JURISDICTION

MUNICIPALITY	STATE	COUNTY	MUNICIPAL	DEL. RIVER JOINT TOLL BR. COMMISSION	TOTAL
Phillipsburg	1.1	0.6	21.0	0.7	23.4
Alpha	0.3	3.1	1.3	0.0	4.7
Lopatcong (part)	2.3	1.8	3.8	0.0	7.9
Pohatcong (part)	2.0	2.8	0.5	0.0	5.3
Greenwich (part)	0.6	0.0	0.0	0.0	0.6
TOTAL	6.3	8.3	26.6	0.7	41.9
Percent on the Network	100%	100%	23%	100%	32%

FIGURE 1

1972 BASE YEAR NETWORK



PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

KEY SHEET 1

CATEGORIES OF FEDERAL-AID HIGHWAY SYSTEMS

Federal-aid Interstate - consists of route of highest importance; connects principal metropolitan areas and industrial centers.

Federal-aid Primary - major intercity highways not on the interstate system; includes important loops, belt highways and spurs.

Federal-aid Secondary - consists of pricipal secondary and feeder routes in rural and urban areas.

Federal-aid Urban - major routes within an urbanized area, e.g. South Main Street in Phillipsburg.

1972 BASE YEAR NETWORK MILEAGE SUMMARY

TABLE 2A - FEDERAL-AID SYSTEM

MUNICIPALITY	FEDERAL AID INTERSTATE	FEDERAL AID PRIMARY	FEDERAL AID SECONDARY	FEDERAL AID URBAN	NON FEDERAL AID		TOTAL (on network)
					NETWORK	NON NETWORK	
Phillipsburg	–	1.7	0.6	3.5	16.9	40.6	22.7
Alpha	–	0.0	1.4	0.3	3.0	16.0	4.7
Lopatcong (part)	–	2.3	1.5	0.0	4.1	18.0	7.9
Pohatcong (part)	–	0.6	0.9	1.5	2.3	14.4	5.3
Greenwich (part)	–	0.6	0.0	0.0	0.0	0.0	0.6
TOTAL	–	5.2	4.4	5.3	26.3	89.0	41.2
Percent on the Network		100%	100%	100%	23%	–	32%

1972 BASE YEAR NETWORK MILEAGE SUMMARY

TABLE 2B - STATE JURISDICTION

MUNICIPALITY	FEDERAL AID INTERSTATE	FEDERAL AID PRIMARY	FEDERAL AID SECONDARY	FEDERAL AID URBAN	NON FEDERAL AID	TOTAL
Phillipsburg	–	0.8	0.0	0.0	0.3	1.1
Alpha	–	0.0	0.0	0.3	0.0	0.3
Lopatcong (part)	–	2.3	0.0	0.0	0.0	2.3
Pohatcong (part)	–	0.6	0.0	1.4	0.0	2.0
Greenwich (part)	–	0.6	0.0	0.0	0.0	0.6
TOTAL	–	4.3	0.0	1.7	0.3	6.3
Percent on the Network		100%		100%	100%	100%

1972 BASE YEAR NETWORK MILEAGE SUMMARY

TABLE 2C - COUNTY JURISDICTION

MUNICIPALITY	FEDERAL AID INTERSTATE	FFDERAL AID PRIMARY	FEDERAL AID SECONDARY	FEDERAL AID URBAN	NON FEDERAL AID	TOTAL
Phillipsburg	–	0.0	0.6	0.0	0.0	0.6
Alpha	–	0.0	1.4	0.0	1.7	3.1
Lopatcong (part)	–	0.0	1.5	0.0	0.3	1.8
Pohatcong (part)	–	0.0	0.9	0.0	1.9	2.8
Greenwich (part)	–	0.0	0.0	0.0	0.0	0.0
TOTAL	–	0.0	4.4	0.0	3.9	8.3
Percent on the Network			100%		100%	100%

1972 BASE YEAR NETWORK MILEAGE SUMMARY

TABLE 2D - MUNICIPAL JURISDICTION

MUNICIPALITY	FEDERAL AID INTERSTATE	FEDERAL AID PRIMARY	FEDERAL AID SECONDARY	FEDERAL AID URBAN	NON FEDERAL AID		TOTAL (on network)
					NETWORK	NON NETWORK	
Phillipsburg	–	0.9	0.0	3.5	16.6	40.6	21.0
Alpha	–	0.0	0.0	0.0	1.3	16.0	1.3
Lopatcong (part)	–	0.0	0.0	0.0	3.8	18.0	3.8
Pohatcong (part)	–	0.0	0.0	0.1	0.4	14.4	0.5
Greenwich (part)	–	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	–	0.9	0.0	3.6	22.1	89.0	26.6
Percent on the Network		100%		100%	20%	–	23%

FIGURE 2

FEDERAL-AID SYSTEM

LEGEND

- Federal Aid Primary
- Federal Aid Secondary
- Federal Aid Urban

PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

1968 Functional Classification

The objective of functional classification is to group streets and highways according to the type of travel service they provide. This system attempts to channelize flow through the network by defining the role that each road should assume. Locals are for land access, arterials for mobility, and collectors as an interface between the two.

All existing public roads were classified according to their most logical usage to serve present travel and land use, without regard to funding or jurisdictional classification. The 1968 Functional Classification for the network is summarized in Table 3. Key Sheet 2 defines the relevant terms. Note that about 40% of the mileage is functionally classified as local.

Volume-Capacity Comparisons

Comparisons of 1972 traffic volumes to road capacities are shown in Figure 3. Link capacities were estimated from tables in the Highway Capacity Manual. Traffic volumes were obtained from coverage counts where available.

The range of service levels and corresponding color code are indicated in the legend of Figure 3. Service level is a measure of the quality of travel. Key Sheet 3 contains brief descriptions of the significance of each level designation.

Typically, an urban street is designated for a level of service C. Service levels E and F, or a volume-capacity ratio greater than 1.0, denote a condition of unstable flow and low operating speeds. Stoppages may occur for short or long periods, especially during peak conditions, due to bottlenecks

KEY SHEET 2

1968 FUNCTIONAL CLASSIFICATION TERMS

Interstate - includes all completed portions of the Interstate System

Other principal arterial - all non-interstate principal arterials

Rural principal arterial - serves corridor movements of substantial state-wide or interstate travel; serves all urban areas over 50,000 and most over 25,000

Rural minor arterial - links cities and larger towns; complements principal arterial network

Rural major collector - serves more important intracounty travel corridors

Rural minor collector - provides service to remaining smaller communities; links locally important traffic generators

Rural local - a "catch all" for remaining rural mileage; primarily to provide access to adjacent land

Urban principal arterial - carries major portion of through traffic on city streets; highest traffic volume corriders

Urban minor arterial - augments principal arterial system; serves trips of moderate length; places a greater emphasis on land access than principal

Urban collector - channels traffic from local streets into the arterial systems

Urban local - again a "catch all" for remining urban mileage; mostly direct access to abutting land, discourages through traffic movement

TABLE 3 - 1968 FUNCTIONAL CLASSIFICATION

NOTE: 0.2 MILES OF URBAN COLLECTOR STREETS NOT ON NETWORK

1968 FUNCTIONAL CLASSIFICATION	CORDON-WIDE				
	STATE	COUNTY	MUNICIPAL	OTHER	TOTAL
LOCAL	—	2.7	14.0	0.3	17.0
RURAL INTERSTATE	—	—	—	—	—
OTHER RURAL PRINCIPAL ARTERIALS	2.4	—	—	—	2.4
RURAL MINOR ARTERIALS	0.9	—	—	—	0.9
RURAL MAJOR COLLECTORS	—	0.3	—	—	0.3
RURAL MINOR COLLECTORS	—	0.3	—	—	0.3
URBAN INTERSTATE	—	—	—	—	—
URBAN FREEWAYS AND EXPRESSWAYS: CONNECTING LINKS OF RURAL PRINCIPAL ARTERIALS	0.3	—	—	0.4	0.7
URBAN FREEWAYS AND EXPRESSWAYS: CONNECTING LINKS OF RURAL MINOR ARTERIALS	—	—	—	—	—
OTHER URBAN FREEWAYS AND EXPRESSWAYS	—	—	—	—	—
URBAN PRINCIPAL ARTERIALS: CONNECTING LINKS OF RURAL PRINCIPAL ARTERIALS	1.3	—	—	—	1.3
URBAN PRINCIPAL ARTERIALS: CONNECTING LINKS OF RURAL MINOR ARTERIALS	1.4	—	2.4	—	3.8
OTHER URBAN PRINCIPAL ARTERIALS	—	—	0.9	—	0.9
URBAN MINOR ARTERIAL STREETS	—	3.7	3.5	—	7.2
URBAN COLLECTOR STREETS	—	1.3	5.8	—	7.1
TOTAL	6.3	8.3	26.6	0.7	41.9

KEY SHEET 3

LEVEL OF SERVICE

Level of service A - free flow with low volumes and high speeds

Level of service B - stable flow with minor reductions in speed due to increased volumes

Level of service C - flow still stable, but higher volumes do affect speeds and maneuverability

Level of service D - approaches unstable flow, conditions are tolerable; temporary restrictions to flow may cause severe drops in operating speeds.

Level of service E - flow is unstable and volumes are at or near capacity; stoppages of short duration may occur

Level of service F - a forced flow operation at low speeds; downstream congestion may cause flow stoppages for short or long periods

FIGURE 3

VOLUME - CAPACITY RATIOS

LEGEND

V/C RANGE	SERVICE LEVEL
.59 and under	A
.60 to .79	B or C
.80 to .99	D or E
1.00 to 1.19	F
1.20 and over	F

PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

downstream. As indicated by the solid and dashed red lines on Figure 3, nearly all locations of unstable flow are on or approaching South Main Street and Alternate U.S. Route 22.

The traffic and physical characteristics of the traffic impeded locations were re-examined (i.e., approach width, amount of green signal time, etc.), but no firm conclusions can be made until more is known about peak hour operations. A series of speed-delay runs will be made on these problem road sections during the most congested travel periods, as this is the best single indicator of a roadway's performance.

Parking Regulations

An on-site inventory was made to determine parking regulations on the network roads. In Phillipsburg the Traffic Ordinance of 1970, updated to 1972, was also used as a source. Three types of parking conditions were considered: unrestricted, time limit or metered, and prohibited. Existing parking conditions are shown on Figure 4.

Accidents

Table 4 is a jurisdictional breakdown of accidents, injuries, and fatalities for the years 1969, 1970, and 1971. The data is from New Jersey accident records, verified where possible by municipal records.

Figure 5 shows locations where the three-year average is 5 or more accidents per year. Along U.S. 22, accidents are reported to the nearest milepost, so each location indicated represents a section of roadway and not an intersection.

FIGURE 4

PARKING REGULATIONS

LEGEND

Parking Prohibited

Metered or Time Limit

PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

TABLE 4 - ACCIDENT SUMMARIES

	1969			1970			1971		
	ACC	INJ	FAT	ACC	INJ	FAT	ACC	INJ	FAT
ALPHA	24	17	0	22	15	1	17	5	0
Municipal	7	0		16	4	0	7	1	
County	17	17		6	11	1	9	4	
State (22A)	0	0		0	0	0	1	0	
LOPATCONG	136	116	2	106	99	0	134	108	0
Municipal	13	10	0	9	8		16	4	
County	31	28	1	28	31		27	22	
State (22, 57)	92	78	1	69	60		91	82	
PHILLIPSBURG	299	191	1	305	122	2	325	206	0
Municipal	222	143	1	215	86	1	248	159	
County	17	12	0	18	8	0	18	10	
State (22)	60	36	0	72	28	1	59	37	
POHATCONG	84	59	2	83	60	1	85	47	0
Municipal	11	11	0	12	6	0	4	5	
County	49	36	2	40	33	1	33	15	
State (22, 22A)	24	12	0	31	21	0	48	27	

ACC = ACCIDENTS, INJ = INJURIES, FAT = FATALITIES

DATA SOURCE: BUREAU OF ACCIDENT RECORDS, NEW JERSEY DEPARTMENT OF TRANSPORTATION

FIGURE 5

ACCIDENT LOCATIONS

LEGEND

Average Annual Accidents (1968-70)

○ 5 accidents
○ 10 accidents

Reported To Nearest Milepost

PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

BUS FACILITIES

Phillipsburg is served, on a weekday basis, by 11 Eastbound and 10 Westbound Transport of New Jersey buses. They stop at Route 22 and Roseberry Street on the NYC - Allentown - Washington route and also the Allentown-Atlantic City route (1 bus in each direction daily). In most cases, the nearest stop Eastbound is Clinton.

Four bus routes, two regional and two local, were operated by Trans-Bridge Lines through June of 1970. All local bus service in Phillipsburg was halted when a request for an operating subsidy could not be financed by Warren County.

AIR FACILITIES

There are no operational airports with in the Study Area, however, a STOLPORT is proposed as a part of the State Airport System ("A Master Plan for Transportation", New Jersey Department of Transportation, 1972.) The nearest public facilities are Sky Manor (12 miles), a public-use private airport, and the Allentown-Bethlehem-Easton airport (15 miles). The latter is served on a regular basis by three major airlines and one local company.

TRAIN FACILITIES

The last rail passenger service in Phillipsburg was discontinued in 1967. At one time, Phillipsburg was served by three lines: Delaware-Lackawanna and Western (Hoboken), Penn Central (Trenton), and Central of New Jersey (Jersey City).

TRAVEL PATTERNS

HIGHWAY TRAVEL

EXTERNAL TRIP PATTERNS

A representative sample of all vehicular traffic entering and leaving the Study area was obtained by a roadside origin and destination survey. A description of the survey procedure and summaries of the data are given below.

Roadside Interview Survey

A roadside origin and destination survey was conducted in the Phillipsburg area between May 1 and June 8, 1972. Of the 16 cordon crossing locations, 9 were interview stations, as indicated on Map 1 (Appendix).

A twelve hour survey period for each location was decided upon. Interviewing was done at each station in two six-hour shifts, 7 a.m. to 1 p.m. and 1 p.m. to 7 p.m. Due to manpower limitations, the two shifts were not consecutive, but generally on the same day of the week.

The information recorded for each interview included: vehicle type, number of persons in vehicle, trip origin and destination, purpose at destination, and state of registration. A sample interview form is included in the Appendix.

Traffic counts were recorded by machine for the 24-hour periods preceding, during and following the survey to insure that the sampling occured during a period of representative traffic flow. In addition, classification counts were taken during the interview period to check that each vehicle type was being sampled at an acceptable rate, and to establish a universe of trucks for factoring purposes. A sample of 41.9% of all cordon crossings was obtained from the roadside survey.

Coding

Trip ends were coded by traffic zone for the PUATS cordon area and the Easton portion of the Pennsylvania Department of Transportation cordon area. (Allentown-Bethlehem-Easton). Trip ends for the remaining portion of the Pennsylvania cordon area and for the rest of New Jersey were coded by municipality. All other trip ends were coded by state or province.

Of the 29,307 interviews coded, 26,953 (92%) were valid for computer processing.

Computer Processing

To obtain trip tables, network loadings, and other summaries, the external survey data was input to the computer programs of Federal Highway Administration Urban Transportation Planning Battery. The flow chart in Figure 6 is a simplified version of the Battery operation. There is not sufficient space to display all the tables constructed. Most of what follows is in summary form.

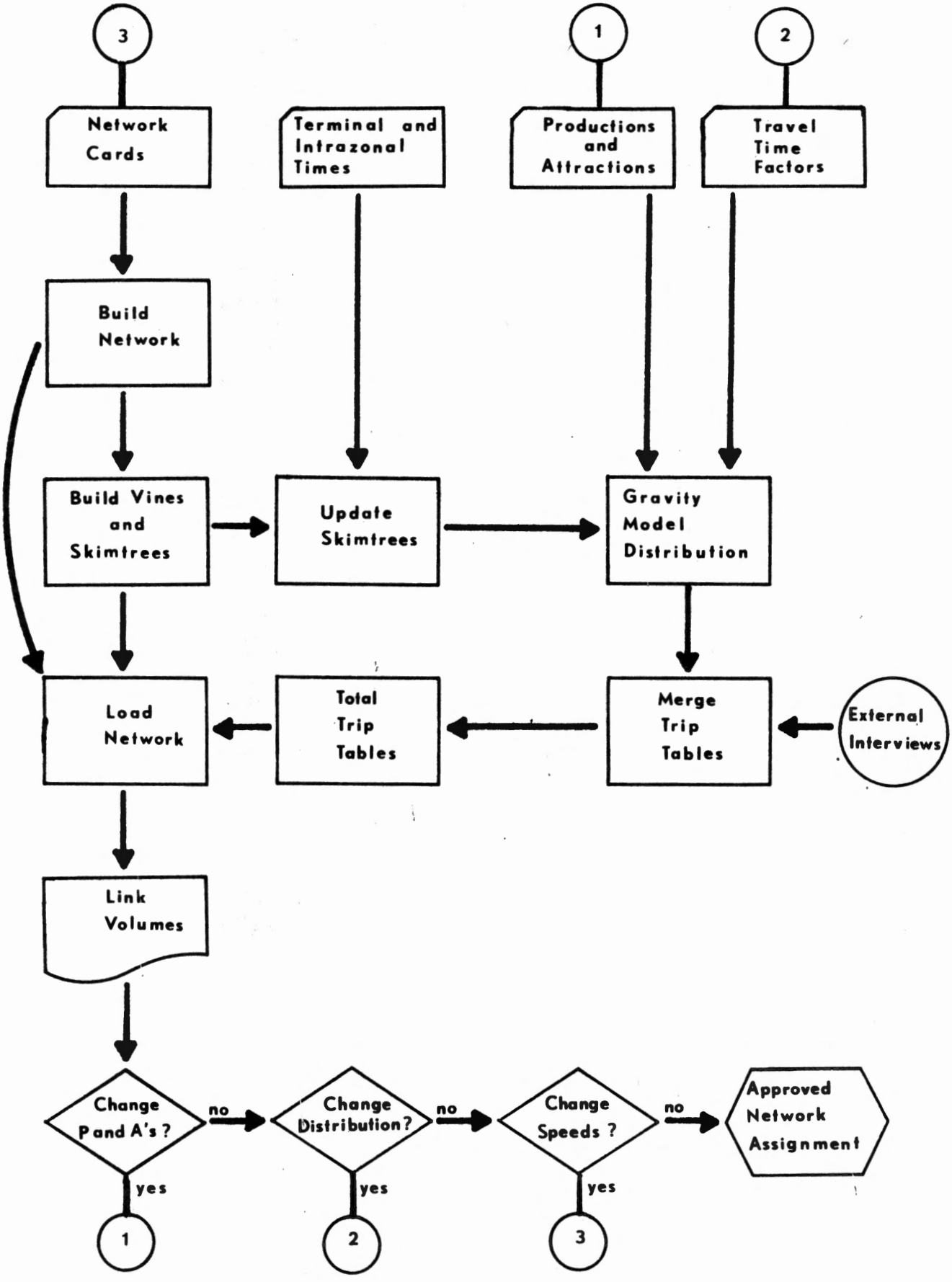


FIGURE 6 - FLOW CHART OF TRIP ASSIGNMENT PROCESS

Summary of Interview Data

Three trip categories were used in the processing of interview data: internal-external (or origin end in the Study area), external-internal (or destination end in the Study area), and external-external (neither end in the Study area). Table 5A shows the breakdown for these categories. Note that a third of the trips were passing through the area. Since trip attraction is a function of population, the small Study area population gives rise to a high percentage of through trips.

Origin and destination trip tables were built for seven purposes: to auto-home, to auto-work, to auto-shopping, to auto-other, truck, taxi, and total purpose. No taxi trips were intercepted, so the number of daily taxi trips was estimated by a telephone survey of taxi companies. The breakdown by purpose is shown in Table 5B.

With the metropolitan area of the Lehigh Valley so close to the center of Phillipsburg, the exchange of work and shopping trips across the bridge is of great interest. Work and shopping trips entering and leaving the Study area are summarized in Tables 6 and 7 respectively.

In Table 6 there are several activities on which to focus attention. First, there is a net influx of work trips. This agrees with the socio-economic finding that employment within the cordon exceeds the estimated labor force. Second, less than half of the workers leaving the Study area have a destination in Pennsylvania. This is because work trips are attracted as far away as Newark, and also because there are some large employers not too far outside the cordon area in New Jersey.

The shopping trip analysis in Table 7 leads to some interesting observations. As expected, most of the shopping trips leaving the Study area cross the bridges to Pennsylvania. But there are more shopping trips from Pennsylvania to the Phillipsburg area than vice versa. Considering the large size and variety of Easton's shopping center, the opposing movement is expected. Because the roadside survey only covered the period up to 7 p.m., the sampling of shopping trips might have been biased.

TABLE 5A - EXTERNAL SURVEY DATA: BREAKDOWN by CATEGORY

TRIP CATEGORY	NUMBER OF TRIPS	PERCENT
INTERNAL-EXTERNAL (Leaving Study Area)	24,706	31.7
EXTERNAL-INTERNAL (Entering Study Area)	25,069	32.2
EXTERNAL-EXTERNAL (Through Trips)	28,174	36.1
TOTAL	77,949	100 %

TABLE 5B - EXTERNAL SURVEY DATA: BREAKDOWN by PURPOSE

TRIP PURPOSE	NUMBER OF TRIPS	PERCENT
AUTO-HOME (TO)	23,851	30.6
AUTO-WORK (TO)	14,181	18.2
AUTO-SHOPPING (TO)	6,072	7.8
*AUTO-OTHER (TO)	19,153	24.6
TRUCK	14,666	18.8
TAXI	26	0.0
TOTAL TRIPS	77,949	100 %

* Includes recreation, personal business, etc.

TABLE 6 - WORK TRIP ANALYSIS

	DAILY WORK TRIPS (VEHICLES)
Total leaving Study area	4786
To Pennsylvania by bridges	2306
Leaving Study area by other stations	2480 *
Total entering Study area	5632
From Pennsylvania by bridges	3658
Entering Study area by other stations	1974 *

* Excludes bridges

TABLE 7 - SHOPPING TRIP ANALYSIS

	DAILY SHOPPING TRIPS (VEHICLES)
Total leaving Study area	1449
To Pennsylvania by bridges	1064
Leaving Study area by other stations	385 *
Total entering Study area	3598
From Pennsylvania by bridges	1396
Entering Study area by other stations	2202 *

* Excludes bridges

Cordon Crossing Summary

Machine counts were recorded at all 16 external stations so that the factored roadside survey trips could be distributed to non-interview stations. Table 8 gives a breakdown of 24-hour machine counts (axles/2) and trip table loading (vehicles) for all external stations. Asterisks (*) denote non-interview stations.

Table 9 shows the directional cordon crossings by axles/2 (from machine counts) and vehicles (from classification counts). The last two columns, labeled "Factored Vehicles" and "Trip Table Values" do not match exactly because exit-entrance stations were not recorded for through trips. Only the station of the interview was recorded. Therefore, it was necessary to estimate and add the second cordon crossing location during the editing process, according to the stated destination.

The classification count summary in Table 10 gives a breakdown of automobiles and trucks by direction. The last column shows the percentage of trucks of 3 axles or more. Note that most heavy truck trips are between the toll bridge and I-78.

TABLE 8 - CORDON CROSSING SUMMARY: DISTRIBUTION TO NON-INTERVIEW STATIONS

STATION	LOCATION	24-HOUR ADJUSTED MACHINE COUNTS (AXLES/2)	24-HOUR FACTORED TRIP TABLE (VEHICLES)	% TOTAL VEHICLES
1	Toll Bridge	39,897	33,745	31.8
2	Free Bridge	19,959	19,845	18.7
* 3	County 34	514	576	0.5
* 4	Oberly Road	145	155	0.2
* 5	County 35	685	676	0.6
* 6	Winters Road	51	66	0.1
7	Springtown Road	5,124	4,749	4.5
** 8	Unnamed	46	33	0.0
** 9	Still Valley	681	686	0.7
10	N.J. 173	3,233	3,126	2.9
11	I-78	25,801	19,140	18.0
*** 12	County 38	714	656	0.6
13	County 519	4,169	3,793	3.6
14	N.J. 57	13,663	11,868	11.2
15	County 20	5,781	5,780	5.4
16	County 21	1,222	1,229	1.2
	TOTALS	121,685	106,123	100%

* Grouped with Station 7

** Grouped with Station 10

*** Grouped with Station 13

TABLE 9 - CORDON CROSSING SUMMARY: DIRECTIONAL TRAFFIC

STATION	OUTBOUND (12 HR) AXLES/2	OUTBOUND (12 HR) VEHICLES +	INBOUND (12 HR) AXLES/2	INBOUND (12 HR) VEHICLES +	TOTAL AXLES/2	TOTAL VEHICLES +	24 HOUR ADJUSTED AXLES/2	24 HOUR ADJUSTED FACTORED VEHICLES	24 HOUR ADJUSTED TRIP TABLE VALUES
1	13,774	10,911	12,863	10,818	26,637	21,729	39,897	32,603	33,745
2	6,428	6,428	6,683	6,683	13,111	13,111	19,959	19,966	19,845
* 7	2,033	2,081	2,317	2,272	4,350	4,353	6,519	6,433	6,222
** 10	1,202	1,188	1,349	1,342	2,551	2,530	3,960	3,955	3,845
11	7,321	5,623	9,014	6,644	16,335	12,267	25,801	19,437	19,140
*** 13	1,451	1,419	1,535	1,493	2,986	2,912	4,883	4,798	4,449
14	4,457	4,027	4,611	3,981	9,068	8,008	13,663	12,211	11,868
15	1,965	1,941	2,073	2,041	4,038	3,982	5,781	5,708	5,780
16	404	383	373	326	777	709	1,222	1,126	1,229
TOTALS	39,035	34,001	40,818	35,600	79,853	69,601	121,685	106,237	106,123

* Includes Stations 3,4,5 and 6

** Includes Stations 8 and 9

*** Includes Station 12

\+ From Classification Counts of Roadside Survey

TABLE 10 - CLASSIFICATION COUNT SUMMARY*

	OUTBOUND			INBOUND			BOTH DIRECTIONS				
STATION	CARS	TRUCKS	TOTAL	CARS	TRUCKS	TOTAL	CARS	TRUCKS	TOTAL	% ALL TRUCKS	% HEAVY ** TRUCKS
1	7,881	3,030	10,911	8,149	2,669	10,818	16,030	5,699	21,729	26.2	21.7
2	5,585	843	6,428	5,830	853	6,683	11,415	1,696	13,111	12.9	0.0
7	1,710	371	2,081	1,913	359	2,272	3,623	730	4,353	16.8	2.1
10	1,020	168	1,188	1,132	210	1,342	2,152	378	2,530	14.9	1.2
11	3,819	1,804	5,623	4,274	2,370	6,644	8,093	4,174	12,267	34.0	24.8
13	1,106	313	1,419	1,208	285	1,493	2,314	598	2,912	20.5	3.4
14	3,155	872	4,027	3,041	940	3,981	6,196	1,812	8,008	22.6	10.1
15	1,644	297	1,941	1,712	329	2,041	3,356	626	3,982	15.7	1.6
16	274	109	383	212	114	326	486	223	709	31.5	7.8
TOTAL	26,194	7,807	34,001	27,471	8,129	35,600	53,665	15,936	69,601		

* 7 a.m. to 7 p.m., 12 hours

** 3 axles or more

Peak Hour Summary

Travel during the peak hour of 4 to 5 p.m. accounts for about 7% of total daily travel, as shown in Table 11. This is a mild peaking and would not appear to cause any unusual travel conditions.

Truck percentages in the peak hour are consistent with daily totals (Table 10), except at the toll bridge and I-78 where the proportion of truck trips actually declined for the peak hour. Also, the proportion of trips for trucks of three axles or more is uniformly lower in the peak hour than on a daily basis, but still above average.

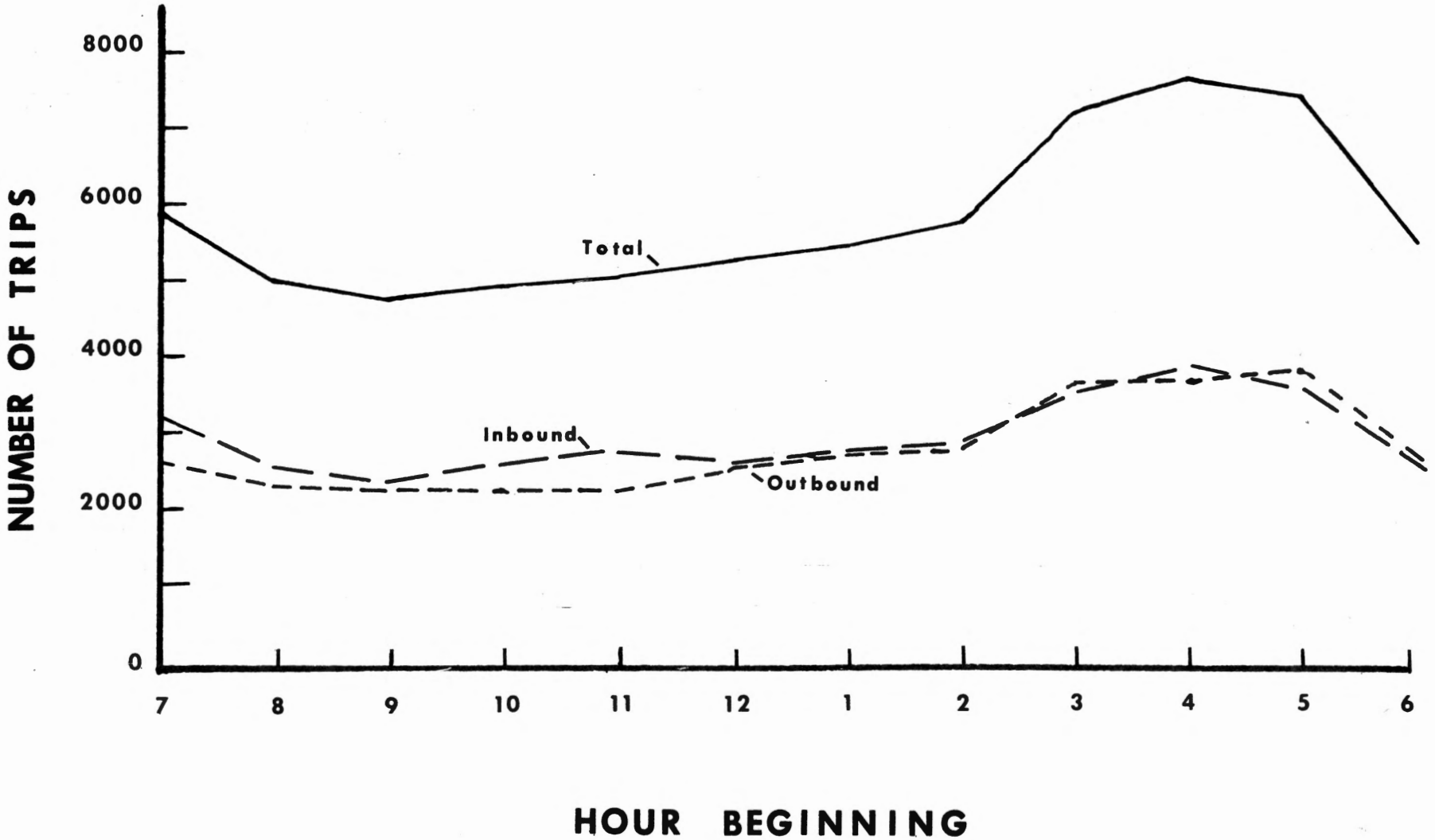
Figure 7 shows that the difference in directional flow during the peak hour is very small. The greatest difference between outbound and inbound trips occurs during the late morning hours. The shape of the three curves also reinforces that rush hour peaking is low.

TABLE 11 - PEAK HOUR TRAVEL (4 to 5 p.m.)

STATION	PEAK HR. VEHICLES	%DAILY TOTAL	%PEAK TOTAL	CARS	ALL TRUCKS	%TRUCKS	HEAVY TRUCKS*	%HEAVY TRUCKS
1	2,402	7.4	32.0	1,910	492	20.5	275	11.4
2	1,361	6.8	18.1	1,198	163	12.0	0	0.0
7	549	8.5	7.3	468	81	14.8	5	0.9
10	288	7.3	3.8	229	59	20.5	2	0.7
11	1,113	5.7	14.8	790	323	29.0	232	20.8
13	336	7.0	4.5	288	48	14.3	0	0.0
14	866	7.1	11.5	696	170	19.6	60	6.9
15	503	8.8	6.7	422	81	16.1	6	1.2
16	88	7.8	1.2	60	28	31.8	3	3.4
TOTAL	7,506		100%	6,061	1,445		583	

* 3 axles or more

FIGURE 7 - HOURLY TRIP VOLUMES



Desire Lines

The purpose of a Desire Line diagram is to focus attention on major travel corridors in the Study area. Knowledge of where people want to travel can be used to evaluate a transportation network's ability to meet those desires.

For the PUATS region, all major corridors include one of the two bridges, as shown in Figures 8A and 8B. Internal trip ends were grouped by municipality for ease of presentation. A major corridor is defined to have a minimum daily two-way volume of 1000 trips. In both figures, the relative magnitudes of the volumes is emphasized by the size of the numerals.

For the Toll Bridge, the largest travel corridor is through trips to and from Interstate 78. Local trips to Phillipsburg and through trips to N.J. 57 are next in priority. From the Free Bridge, the opposing situation is evident. Through trips are much less significant, and the overwhelming majority of trips crossing the bridge have trip ends in Phillipsburg. Thus, the Free Bridge serves primarily local traffic and the Toll Bridge through traffic.

FIGURE 8A - DESIRE LINES for TOLL BRIDGE

Major Corridors Only

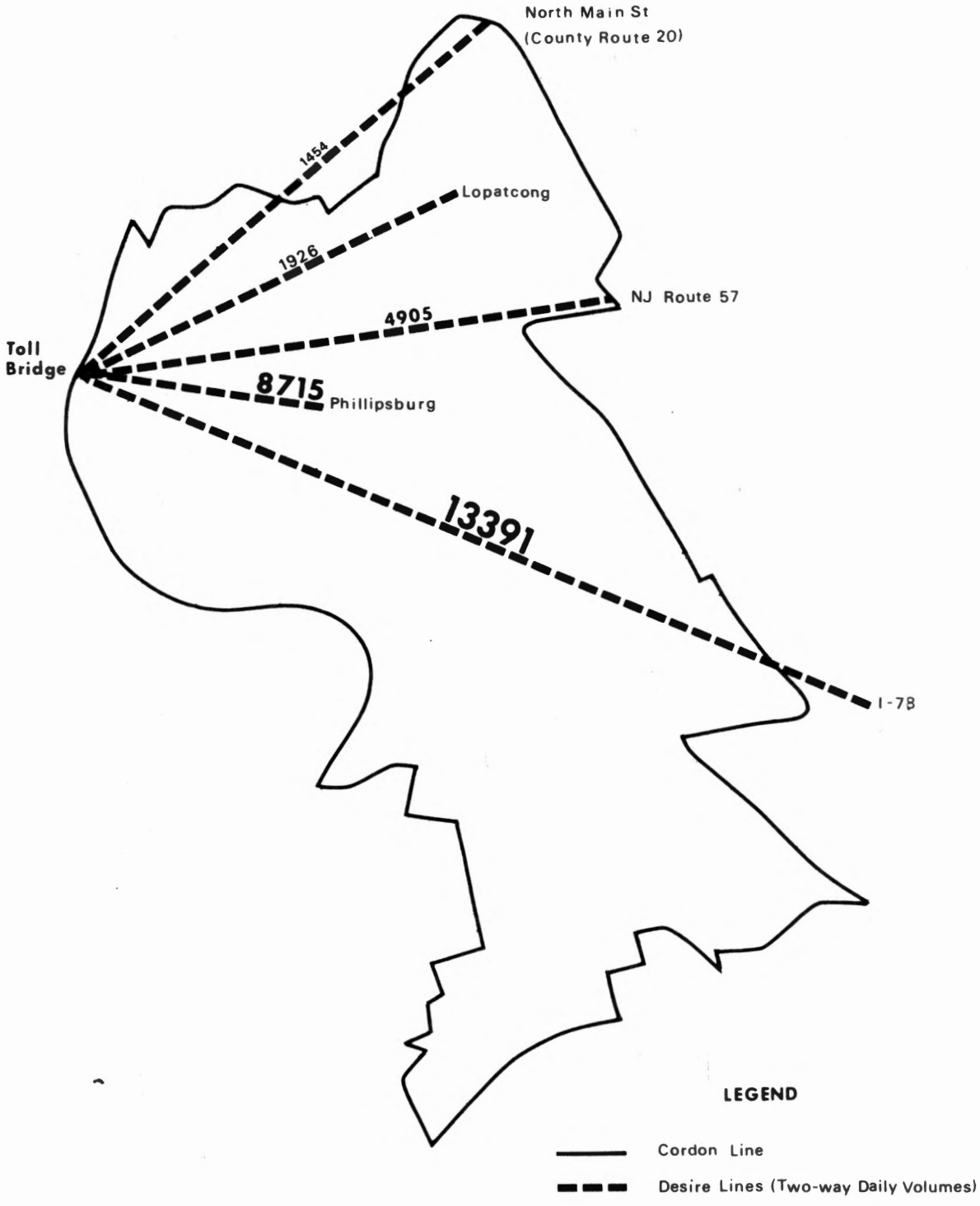
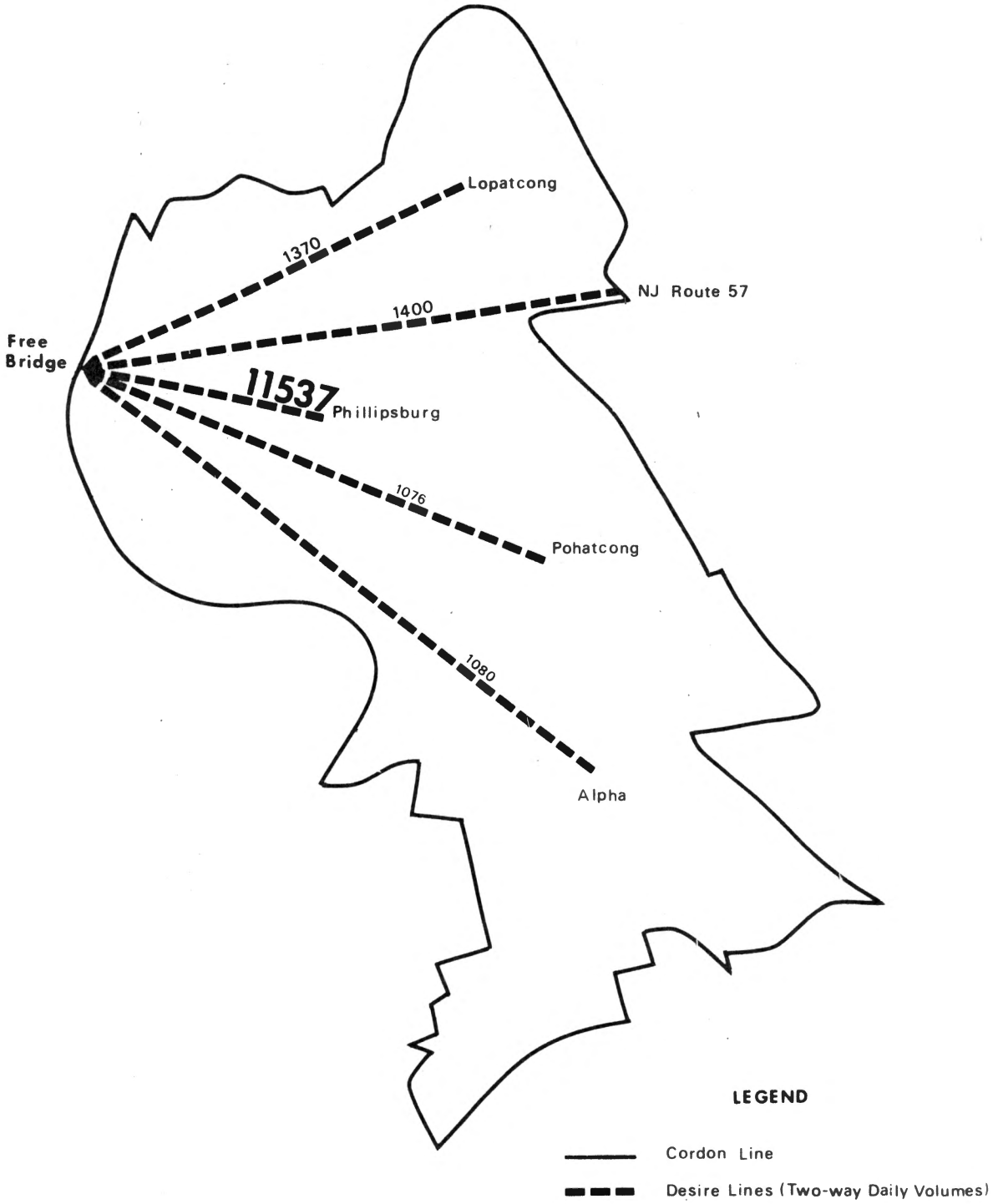


FIGURE 8B – DESIRE LINES for FREE BRIDGE

Major Corridors Only



INTERNAL TRIP PATTERNS

Because a corresponding survey was not done for intra-cordon trips, it was necessary to "synthesize" or simulate internal travel. This was done on a zonal basis by estimating trip productions and attractions, and distributing the productions for each zone with a gravity model.

Internal Simulation Model

The approach used in the internal simulation followed closely the procedures developed for Madisonville, Kentucky - an area of about the same population as Phillipsburg. The basic premise is that similar areas have comparable travel patterns. From comprehensive origin and destination studies for other small urban areas, a simulation model was formulated. The simulation process consists of two distinct, but interactive phases - trip generation and trip distribution.

Trip generation at the zonal level was related to three socio-economic variables: population, total employment, and non-industrial employment. These parameters were used to estimate each zone's ability to produce and attract trips. Three trip purposes were used for both production and attraction equations: home based work, home based non-work, and non-home based.

The internal simulation model consists of a set of six generation equations - three attraction and three production. All are of the following form:

$$T_i = a\,(\text{population})_i + b\,(\text{employment})_i + c\,(\text{non-industrial employment})_i$$

where: i = zone indicator

T_i = number of trips produced in (or attracted to) zone i

a,b,c, = trip generation coefficients

Trip distribution was accomplished with a standard gavity model. Friction factors, or resistance to travel between pairs of zones, were as recommended in "Traffic Assignment and Distribution for Small Urban Areas" (U.S. Bureau of Public Roads, 1965).

Model Calibration

The ultimate check of the simulation process was that it had to reproduce the ground counts within acceptable limits. After the internal trips were generated and distributed, they were then loaded on the Study Network along with the external trips. At all locations for which machine counts were available, the simulated volume was compared to the actual volume. By noting the magnitude and percentage of volume differences, deficencies in the model were identified.

The model was fine tuned in stages, starting with the highest volume links. Changes were made first in the generation equations, then in the network speeds. The first step caused area-wide changes in network loading, while the second step was more localized. After six iterations of the generation-distribution process, an acceptable loading was attained.

At the five screenline locations, the load/count ratio was 1.10, or a difference of 10%. The fact that 60% of this discrepancy was at one checkpoint made the overall screenline check appear better than the stated error.

Summary of Simulation Results

The internal simulation model produced a total of 68,380 trips. Of these, 5,320 were intrazonal, so that 63,060 trips were loaded on the network.

Table 12A lists the final set of trip generation equations. As footnoted, the production and attraction estimates for a few zones were modified to reflect certain known conditions, e.g. traffic volumes at Ingersoll-Rand and Hilcrest Shopping Center. Table 12B lists the production and attraction trip ends for the forty internal zones. Refer to Map 2 in the Appendix for zone location.

Zone-to-zone trip volumes and network loading will be presented in the next section, Travel Summary.

TABLE 12A - TRIP GENERATION EQUATIONS

Key:

HBW	=	home based work
HBN	=	home based nonwork
NHB	=	non-home based
P	=	population
E	=	total employment
R	=	non-industrial employment

Production Equations

HBW	=	0.763P
HBN	=	1.308P
NHB	=	0.218P + 1.090E

Attraction Equations

HBW	=	1.799E
HBN	=	0.708P + 2.562R
NHB	=	0.218P + 1.090E

Note: Adjustments were made in the production and attraction totals for several zones, so not all totals are as generated by these equations.

TABLE 12B - INTERNAL TRIP TOTAL BY ZONE

ZONE *	PROD	ATTR	TRIP ENDS
19303	1091	1063	2154
19201	2064	3024	5088
19301	873	602	1475
19302	2058	876	2934
19305	1974	1130	3104
19304	1179	1573	2752
19306	2267	1016	3283
19307	1533	743	2276
19308	2293	1114	3407
19401	1450	1572	3022
19202	639	1284	1923
19203	1991	1790	3781
19204	2137	1167	3304
19402	2791	2836	5627
19206	2268	2662	4930
19205	5201	7167	12368
19501	3542	7180	10722
19207	525	829	1354
19101	545	2722	3267
19102	1635	861	2496
19103	719	564	1283
19104	4220	2953	7173
19105	1901	919	2820
19502	1753	626	2379
15604	1655	770	2425
15605	108	99	207
15602	3952	2114	6066
15603	1635	6329	7964
15699	328	1520	1848
15601	106	302	408
20704	2106	833	2939
20701	1293	896	2189
20702	2332	1115	3447
20703	293	1336	1629
20799	27	126	153
02803	2036	1716	3752
02802	1805	1070	2875
02801	3739	2980	6719
02804	256	584	840
07999	60	317	377
TOTAL	68,380	68,380	136,760

* Order of listing same as Square Trip Table

TRAVEL SUMMARY

Principal information on travel for the base year is contained in the Square Trip Table and Network Assignment. Following a description of these items is a Travel Synopsis.

1972 Square Trip Table

The 1972 Square Trip Table can be found in the inside back cover. The data is period of survey (not factored to AADT), all purpose and all vehicle types. Rows/columns 1 to 40 are the internal zones, and rows/columns 41 to 56 correspond to external stations 1 to 16. Each row represents a trip origin (from) and each column a trip destination (to).

The subtotal headings need some explanation: I-I are trips generated from the internal simulation, I-X,X-I cordon crossing trips with one end in the Study area, and X-X through trips. Of the 141,009 trips recorded, 63,060 are internal and 77,949 are from the roadside survey.

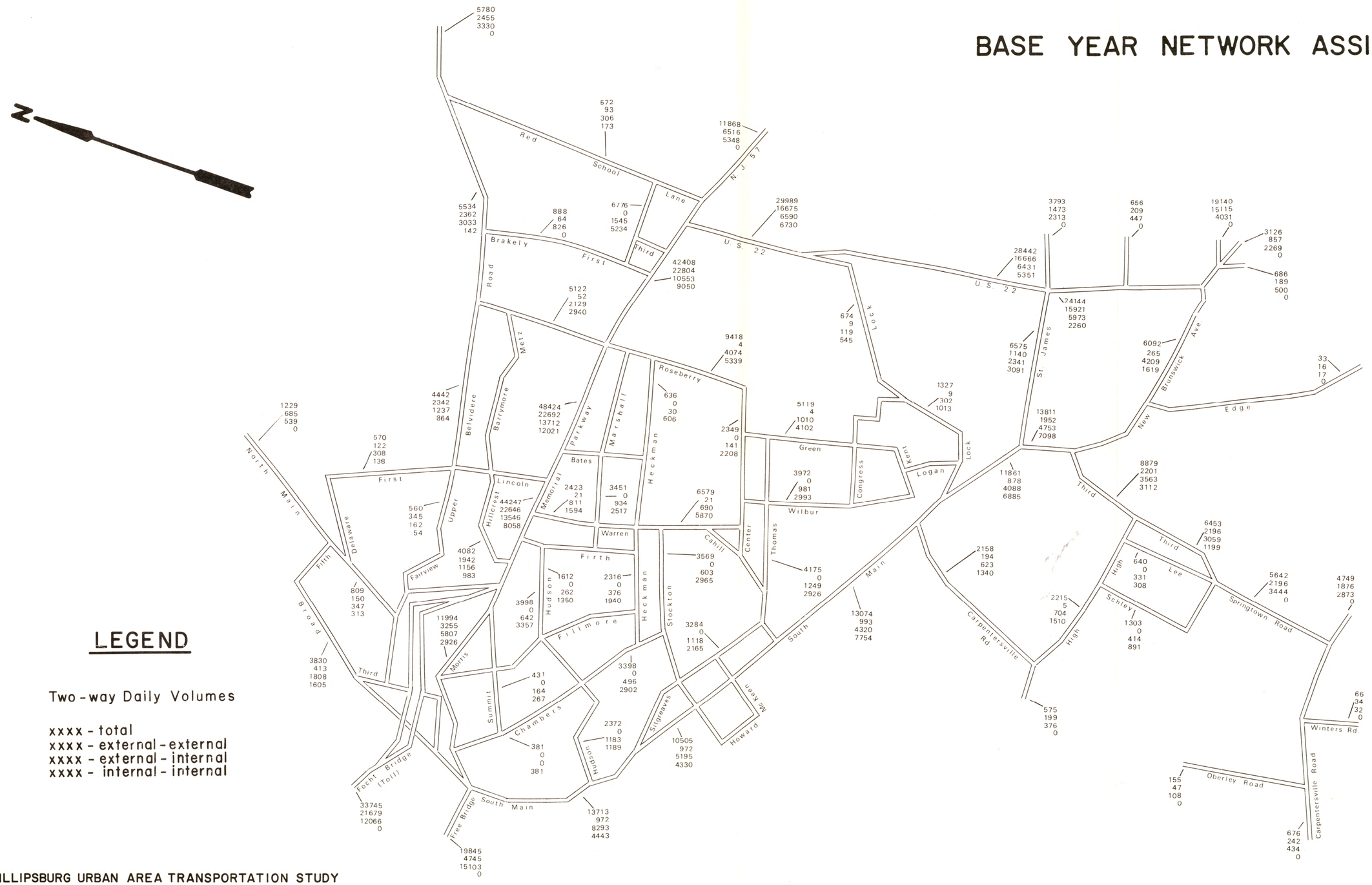
Base Year Network Assignment

The Base Year Network Assignment is shown in Figure 9. Limited space makes it impossible to give the load volumes on all links, so a representative grouping of locations was selected.

For the 16 external stations, the breakdown is: total trips, through trips, and cordon crossing trips excluding through trips. At internal locations, the simulation loading is also shown.

FIGURE 9

BASE YEAR NETWORK ASSIGNMENT



LEGEND

Two-way Daily Volumes

xxxx - total
xxxx - external-external
xxxx - external-internal
xxxx - internal-internal

PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

Travel Synopsis

Table 13 summarizes travel characteristics of the Study area, based on daily estimates. The trip rates listed, such as trips per dwelling unit, appear inflated due to the area's size and location. The proximity to the Allentown-Bethlehem-Easton urban area makes the PUATS population base of 25,000 unrealistic for the measurement of trip activity. The Study area behaves more like an area of 50,000 population.

Located on a major east-west route, the Study area also has a high percentage of through trips which have no relationship to the area's socio-economic base. Because Easton supplies 30% of the cordon area's labor force as well as many of the metropolitan services not available in Phillipsburg, the exchange of trips across the bridge is unusually high.

Car occupancy was obtained from the roadside survey. Trip length is estimated from the combined internal and external trip tables.

TABLE 13 - TRAVEL SYNOPSIS

Daily vehicle trips	141,009
roadside survey	77,949
internal simulation	63,060
Average car occupancy	1.3
Daily person trips	183,000
Daily vehicle trips (excluding through)	113,000
Daily person trips (excluding through)	147,000
+Vehicle trips per dwelling unit	12.9
+Person trips per dwelling unit	16.8
+Vehicle trips per person	4.4
+Person trips per person	5.8
Average trip length	2.2 miles 4.5 minutes
*Daily vehicle miles of travel	316,000
*Daily vehicle hours of travel	10,500

+Excludes through trips
*Excludes intrazonal trips

APPENDIX

FO PU-

PHILLIPSBURG URBAN AREA TRANSPORTATION STUDY

EXTERNAL SURVEY ROADSIDE INTERVIEW FORM

CARD 3 STATION NO. ____ TRAVEL DATE ____ HOUR BEGINNING ____ INBOUND / OUTBOUND ____ INTERVIEWER NAME ____

A	B	C	D	E	F	G
VEHICLE TYPE	TOTAL PERSONS IN VEHICLE	WHERE DID THIS TRIP BEGIN ? (TRIP ORIGIN)	WHERE WILL THIS TRIP END ? (TRIP DESTINATION)	PURPOSE (TO)	STATE OF REGISTRATION	RIVER CROSSING
		ESTABLISHMENT OR STREET & NUMBER CITY STATE	ESTABLISHMENT OR STREET & NUMBER CITY STATE		1. N. J. 2. PA. 3. OTHER	1. TOLL 2. FREE 3. NONE
		ESTABLISHMENT OR STREET & NUMBER CITY STATE	ESTABLISHMENT OR STREET & NUMBER CITY STATE		1. N. J. 2. PA. 3. OTHER	1. TOLL 2. FREE 3. NONE
		ESTABLISHMENT OR STREET & NUMBER CITY STATE	ESTABLISHMENT OR STREET & NUMBER CITY STATE		1. N. J. 2. PA. 3. OTHER	1. TOLL 2. FREE 3. NONE
		ESTABLISHMENT OR STREET & NUMBER CITY STATE	ESTABLISHMENT OR STREET & NUMBER CITY STATE		1. N. J. 2. PA. 3. OTHER	1. TOLL 2. FREE 3. NONE
		ESTABLISHMENT OR STREET & NUMBER CITY STATE	ESTABLISHMENT OR STREET & NUMBER CITY STATE		1. N. J. 2. PA. 3. OTHER	1. TOLL 2. FREE 3. NONE

VEHICLE TYPE (COLUMN 'A')

1. PASSENGER CAR
2. TAXI

SINGLE UNIT TRUCK

3. 2 AXLES, 4 TIRES
4. 2 AXLES, 6 TIRES
5. 3 AXLES

TRACTOR SEMI-TRAILER COMB.

6. 3 AXLES
7. 4 AXLES
8. 5 AXLES
9. TRUCK & SEPARATE TRAILER
0. OTHER

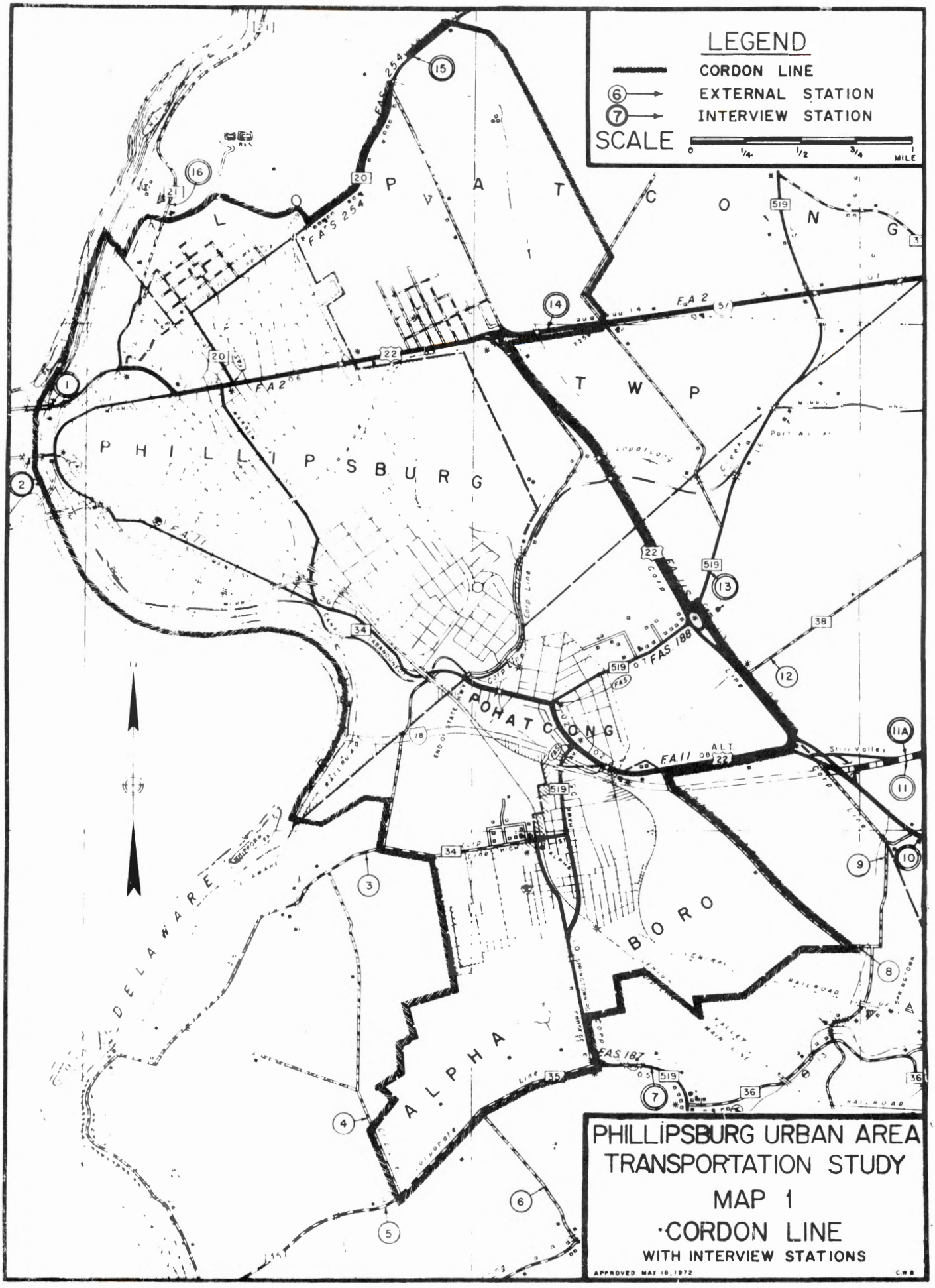
TRIP PURPOSE (COLUMN 'E')

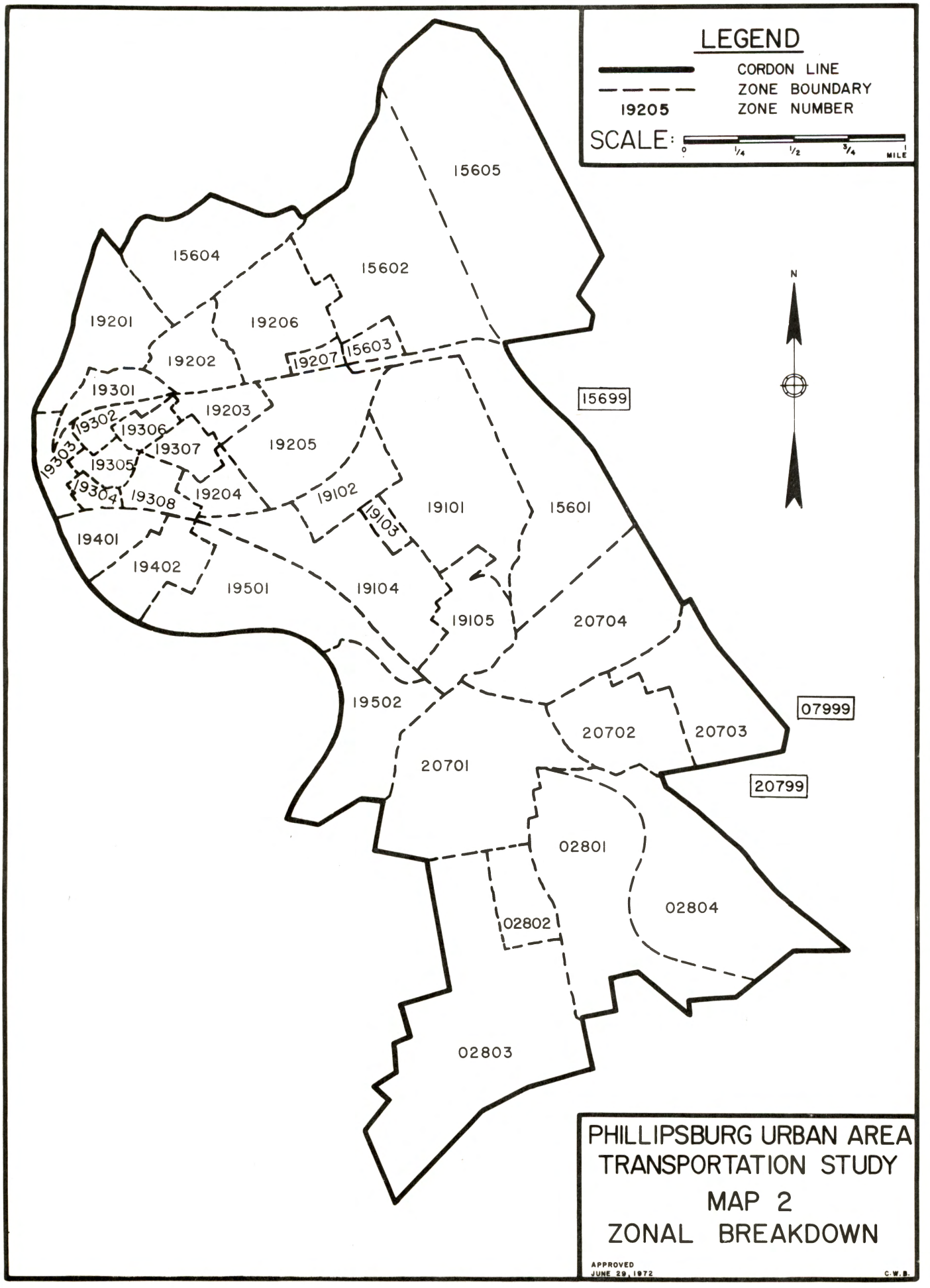
AUTOMOBILES

1. HOME
2. WORK
3. SHOPPING
4. RECREATION
5. OTHER

TRUCKS

1. PICK UP GOODS
2. DELIVER GOODS
3. SERVICE
4. PERSONAL BUSINESS


LEGEND
CORDON LINE
EXTERNAL STATION
INTERVIEW STATION
SCALE
0
1/4
1/2
3/4
1 MILE
PHILLIPSBURG
PHILLIPSBURG URBAN AREA
TRANSPORTATION STUDY
MAP 1
CORDON LINE
WITH INTERVIEW STATIONS
APPROVED MAY 18, 1972


LEGEND
CORDON LINE
ZONE BOUNDARY
19205 ZONE NUMBER
SCALE: 0 1/4 1/2 3/4 1 MILE
N
15605
15604
15602
19201
19206
19202
19207
15603
19301
19203
19302
19306
19303
19307
19205
19305
19304
19308
19204
19102
19101
15601
19103
19401
19402
19501
19104
19105
20704
19502
20702
20703
20701
02801
02802
02804
02803
15699
07999
20799
PHILLIPSBURG URBAN AREA
TRANSPORTATION STUDY
MAP 2
ZONAL BREAKDOWN
APPROVED
JUNE 29, 1972
C.W.B.

1972 SQUARE TRIP TABLE

I - I = INTERNAL - INTERNAL

I - X = INTERNAL - EXTERNAL

X - I = EXTERNAL - INTERNAL

X - X = EXTERNAL - EXTERNAL