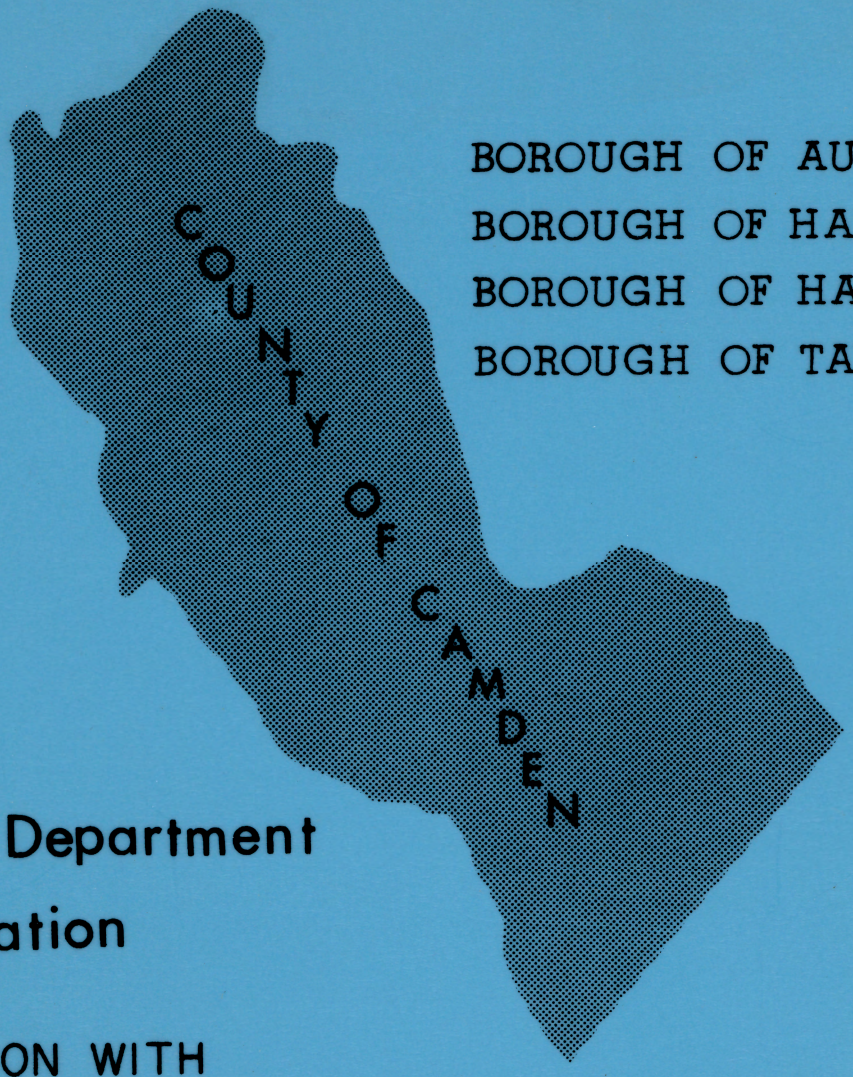
.90
T764
1974a
v.5

TOPICS STUDY



BOROUGH OF AUDUBON
BOROUGH OF HADDONFIELD
BOROUGH OF HADDON HEIGHTS
BOROUGH OF TAVISTOCK

T-4002 (6)

PREPARED FOR

New Jersey Department of Transportation

IN COOPERATION WITH

U.S. Department of Transportation
Federal Highway Administration

KAMMERER, SYMES ASSOCIATES INC.
CONSULTING ENGINEERS
CHERRY HILL, NEW JERSEY

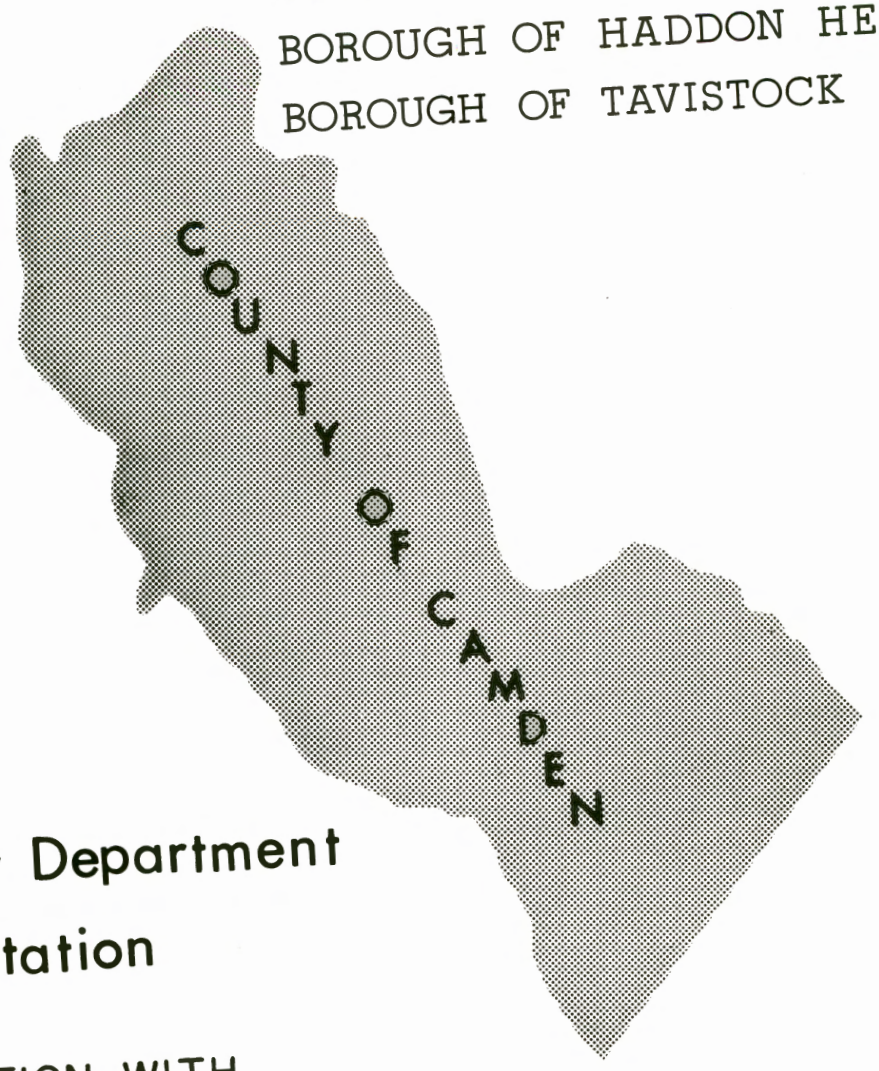
New Jersey State Library

January 1974

T164
74a
v5

TOPICS STUDY

BOROUGH OF AUDUBON
BOROUGH OF HADDONFIELD
BOROUGH OF HADDON HEIGHTS
BOROUGH OF TAVISTOCK



T-4002 (6)

PREPARED
FOR

New Jersey Department
of Transportation

IN COOPERATION WITH

U.S. Department of Transportation
Federal Highway Administration

KAMMERER, SYMES AND ASSOCIATES INC.
CONSULTING ENGINEERS
CHERRY HILL, NEW JERSEY

January 1974

Kammerer, Symes & Associates, Inc.
CONSULTING ENGINEERS
P. O. BOX 151 - ROCKHILL ROAD, CHERRY HILL, N. J. 08002
PHONE 609-424-2615
55 MOSSHILL LANE, WILLINGBORO, N. J. 08046
PHONE 609-877-2390

January 31, 1974

Mr. John C. Kohl
Commissioner of Transportation
N.J. Department of Transportation
1035 Parkway Avenue
Trenton, New Jersey 08625

Director of the Board of
Chosen Freeholders
Camden County Freeholders Office
Court House
Camden, New Jersey

Re: TOPICS Study

Gentlemen:

We are pleased to submit our TOPICS (Traffic Operations Program to Increase Capacity and Safety) Study for the County of Camden. The recommendations included are designed to improve the flow and safety for major roadways within the specific municipalities mentioned in this report.

The report summarizes the studies conducted for the purpose of analyzing the conditions on the existing arterial and collector roadways, identifying major problem areas and recommending short and long range solutions to major problem areas.

We are most appreciative of the opportunity to have been of service to the Department of Transportation and the County of Camden on this assignment.

Respectfully Submitted,

KAMMERER, SYMES & ASSOCIATES, INC.

Allan M Kammerer

Allan M. Kammerer, P.E.,P.P.
Executive Vice-President

AMK:hes

ACKNOWLEDGEMENTS

We are most appreciative to the following organizations and agencies for their assistance and cooperation during the course of this study:

FEDERAL HIGHWAY ADMINISTRATION

NEW JERSEY DEPARTMENT OF TRANSPORTATION

NEW JERSEY DIVISION OF MOTOR VEHICLES

COUNTY OF CAMDEN

BOROUGH OF AUDUBON

BOROUGH OF AUDUBON PARK

BOROUGH OF BARRINGTON

BOROUGH OF BELLMAWR

BOROUGH OF BERLIN

TOWNSHIP OF BERLIN

BOROUGH OF BROOKLAWN

TOWNSHIP OF CHERRY HILL

BOROUGH OF CLEMENTON

BOROUGH OF COLLINGSWOOD

BOROUGH OF GIBBSBORO

CITY OF GLOUCESTER

TOWNSHIP OF GLOUCESTER

TOWNSHIP OF HADDON

BOROUGH OF HADDONFIELD

BOROUGH OF HADDON HEIGHTS

BOROUGH OF HI-NELLA

ACKNOWLEDGEMENTS, CONTINUED

BOROUGH OF LAUREL SPRINGS

BOROUGH OF LAWNSIDE

BOROUGH OF LINDENWOLD

BOROUGH OF MAGNOLIA

BOROUGH OF MERCHANTVILLE

BOROUGH OF MOUNT EPHRAIM

BOROUGH OF OAKLYN

TOWNSHIP OF PENNSAUKEN

BOROUGH OF PINE HILL

BOROUGH OF PINE VALLEY

BOROUGH OF RUNNEMEDE

BOROUGH OF SOMERDALE

BOROUGH OF STRATFORD

BOROUGH OF TAVISTOCK

TOWNSHIP OF VOORHEES

TOWNSHIP OF WATERFORD

BOROUGH OF WOODLYNNE

DELAWARE RIVER PORT AUTHORITY

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

HERBERT H. SMITH ASSOCIATES

TRANSPORT OF NEW JERSEY

URBAN ENGINEERS

TABLE OF CONTENTS

PAGE

CHAPTER 1

THE TOPICS PROGRAM 1-1

CHAPTER 2

SUMMARY OF RECOMMENDATIONS 2-1

- TRAFFIC SIGNALS - BOROUGH OF AUDUBON 2-1
- TRAFFIC SIGNALS - BOROUGH OF HADDONFIELD 2-1
- TRAFFIC SIGNALS - BOROUGH OF HADDON HEIGHTS 2-1
- ROADWAY GEOMETRY 2-2
- TRAFFIC FLOW 2-2
- PARKING CONTROLS 2-2
- PARKING CONTROLS - BOROUGH OF AUDUBON 2-2
- PARKING CONTROLS - BOROUGH OF HADDONFIELD 2-2
- PARKING CONTROLS - BOROUGH OF HADDON HEIGHTS 2-3
- SIGNS AND PAVEMENT MARKINGS 2-3
- TRAFFIC REGULATIONS AND ENFORCEMENT 2-3
- LONG RANGE PLANNING 2-3

CHAPTER 3

STUDY DESCRIPTION 3-1

- STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF AUDUBON 3-1
- STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF HADDONFIELD 3-1
- STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF HADDON HEIGHTS 3-2
- STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF TAVISTOCK 3-2
- STUDY ROADWAY SYSTEM 3-2
- THE ANALYTICAL APPROACH 3-3
- OPERATIONAL REVIEW 3-3
- PROJECT PRIORITY 3-3

CHAPTER 4

DATA COLLECTION 4-1

CHAPTER 5

ACCIDENT RECORDS 5-1

- CAUSES - BOROUGH OF AUDUBON 5-1
- CAUSES - BOROUGH OF HADDONFIELD 5-1
- CAUSES - BOROUGH OF HADDON HEIGHTS 5-2
- SUMMARY 5-2

CHAPTER 6

TRAFFIC VOLUMES 6-1

- TRAFFIC VOLUMES 6-1
- SYSTEM CAPACITY 6-1

CHAPTER 7

TRAFFIC INFLUENCES 7-1

- PARKING - BOROUGH OF AUDUBON 7-1
- PARKING - BOROUGH OF HADDONFIELD 7-1
- PARKING - BOROUGH OF HADDON HEIGHTS 7-1
- PARKING - GENERAL 7-1

PAGE

TRAFFIC CONTROL DEVICES - BOROUGH OF AUDUBON 7-2
TRAFFIC CONTROL DEVICES - BOROUGH OF HADDONFIELD 7-2
TRAFFIC CONTROL DEVICES - BOROUGH OF HADDON HEIGHTS 7-2
PEDESTRIAN MOVEMENTS 7-3
ROADWAY LIGHTING 7-3
ROADWAY GEOMETRY 7-3

CHAPTER 8

BUS AND TRUCK OPERATIONS 8-1

BUS SERVICE 8-1
BUS SERVICE - BOROUGH OF AUDUBON 8-1
BUS SERVICE - BOROUGH OF HADDONFIELD 8-1
BUS SERVICE - BOROUGH OF HADDON HEIGHTS 8-2
BUS SERVICE - BOROUGH OF TAVISTOCK 8-2
TRUCK OPERATIONS 8-2
INFLUENCE ON TRAFFIC 8-3

CHAPTER 9

TRAFFIC REGULATION AND ENFORCEMENT 9-1

ORDINANCES 9-1
CODIFICATION AND APPROVAL - BOROUGH OF AUDUBON 9-1
CODIFICATION AND APPROVAL - BOROUGH OF HADDONFIELD 9-1
CODIFICATION AND APPROVAL - BOROUGH OF HADDON HEIGHTS 9-1
CODIFICATION AND APPROVAL - GENERAL 9-2
ENFORCEMENT 9-2
ACCIDENT RECORDS - BOROUGH OF AUDUBON 9-2
ACCIDENT RECORDS - BOROUGH OF HADDONFIELD 9-2
ACCIDENT RECORDS - BOROUGH OF HADDON HEIGHTS 9-2

CHAPTER 10

GENERAL INFORMATION ON IMPROVEMENTS 10-1

IMPROVEMENTS 10-1
TRAFFIC CONTROL DEVICES 10-1
PHYSICAL ROADWAY SYSTEM 10-1
TRAFFIC FLOW 10-1
PARKING - BOROUGH OF AUDUBON 10-2
PARKING - BOROUGH OF HADDONFIELD 10-2
PARKING - BOROUGH OF HADDON HEIGHTS 10-2

CHAPTER 11

AREA WIDE CONSIDERATIONS 11-1

LAND USE 11-1
GROWTH FACTORS 11-1
IMPROVED CRITERIA 11-1
PROJECT PRIORITIES 11-1
PROBLEM AREAS - BOROUGH OF AUDUBON 11-1
PROBLEM AREAS - BOROUGH OF HADDONFIELD 11-2
PROBLEM AREAS - BOROUGH OF HADDON HEIGHTS 11-2
PROBLEM AREAS - GENERAL 11-3

CHAPTER 12

INTERSECTIONS INVOLVING STATE HIGHWAYS - GROUP FIVE 12-1

BOROUGH OF AUDUBON 12-1
BOROUGH OF HADDON HEIGHTS 12-1

CHAPTER 13

		PAGE
DETAILED RECOMMENDATIONS		13-1
PROJECT NO. AU-1	NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES U.S. ROUTE 30 AND NICHOLSON ROAD	13-2
Problems - Nicholson Road and East and West Atlantic Avenues		13-2
Recommendations		13-2
Benefits		13-3
Problems - U.S. Route 30 and Nicholson Road		13-3
Recommendations		13-4
Benefits		13-4
Estimated Costs		13-4
PROJECT NO. AU-2	HOPKINS AVENUE, BARRETT AVENUE AND PINE STREET	13-5
Problems		13-5
Recommendations		13-5
Benefits		13-5
Estimated Costs		13-6
PROJECT NO. AU-3	KINGS HIGHWAY AND CRYSTAL LAKE AVENUE	13-7
Problems		13-7
Recommendations		13-7
Benefits		13-7
Estimated Costs		13-7
PROJECT NO. AU-4	IMPROVEMENT TO THE FLOW OF TRAFFIC ALONG EAST AND WEST ATLANTIC AVENUES	13-8
Problems		13-8
Recommendations		13-8
Benefits		13-8
Estimated Costs		13-8
PROJECT NO. AU-5	KINGS HIGHWAY AND WEST ATLANTIC AVENUE	13-9
Problems		13-9
Recommendations		13-9
Benefits		13-10
Estimated Costs		13-10
PROJECT NO. AU-6	KINGS HIGHWAY, NINTH AVENUE AND WYOMING AVENUE	13-11
Problems		13-11
Recommendations		13-11
Benefits		13-11
Estimated Costs		13-11
PROJECT NO. AU-7	ENTRANCES TO THE BLACK HORSE PIKE SHOPPING CENTER FROM NICHOLSON ROAD	13-12
Problems		13-12
Recommendations		13-12
Benefits		13-12
Estimated Costs		13-13
PROJECT NO. AU-8	EAST ATLANTIC AVENUE AND PINE STREET	13-14
Problems		13-14
Recommendations		13-14
Benefits		13-14
Estimated Costs		13-15

	PAGE
PROJECT NO. AU-9 CRYSTAL LAKE AVENUE AND HOPKINS AVENUE	13-16
Problems	13-16
Recommendations	13-16
Benefits	13-17
Estimated Costs	13-17
PROJECT NO. HA-1 KINGS HIGHWAY AND HADDON AVENUE	13-18
Problems	13-18
Recommendations	13-19
Benefits	13-20
Estimated Costs	13-21
PROJECT NO. HA-2 HADDON AVENUE, EUCLID AVENUE AND TANNER STREET	13-22
Problems	13-22
Recommendations	13-22
Benefits	13-23
Estimated Costs	13-23
PROJECT NO. HA-3 HADDON AVENUE, ELLIS STREET AND SNOWDEN AVENUE	13-24
Problems	13-24
Recommendations	13-24
Benefits	13-25
Estimated Costs	13-25
PROJECT NO. HA-4 KINGS HIGHWAY, POTTER STREET AND GROVE STREET	13-26
Problems	13-26
Recommendations	13-27
Benefits	13-28
Estimated Costs	13-29
PROJECT NO. HA-5 KINGS HIGHWAY, WEST END AVENUE AND CHEWS LANDING ROAD	13-30
Problems	13-30
Recommendations	13-30
Benefits	13-31
Estimated Costs	13-31
PROJECT NO. HA-6 MAPLE AVENUE AND GROVE STREET	13-32
Problems	13-32
Recommendations	13-32
Benefits	13-33
Estimated Costs	13-33
PROJECT NO. HA-7 INTERCONNECTION OF TRAFFIC SIGNALS ALONG KINGS HIGHWAY	13-34
Problems	13-34
Recommendations	13-34
Benefits	13-35
Estimated Costs	13-35
PROJECT NO. HA-8 POTTER STREET AND ELLIS STREET	13-36
Problems	13-36
Recommendations	13-36
Benefits	13-37
Estimated Costs	13-37

PAGE

PROJECT NO. HA-9 IMPROVEMENT TO THE FLOW OF TRAFFIC ALONG HADDON AVENUE 13-38
Problems 13-38
Recommendations 13-38
Benefits 13-38
Estimated Costs 13-38

PROJECT NO. HA-10 KINGS HIGHWAY AND WARWICK ROAD 13-39
Problems 13-39
Recommendations 13-40
Benefits 13-40
Estimated Costs 13-40

PROJECT NO. HA-11 KINGS HIGHWAY AND TANNER STREET 13-41
Problems 13-41
Recommendations 13-42
Benefits 13-42
Estimated Costs 13-42

PROJECT NO. HA-12 KINGS HIGHWAY AND HINCHMAN AVENUE 13-43
Problems 13-43
Recommendations 13-43
Benefits 13-43
Estimated Costs 13-43

PROJECT NO. HA-13 KINGS HIGHWAY AND CHESTNUT STREET 13-44
Problems 13-44
Recommendations 13-44
Benefits 13-44
Estimated Costs 13-44

PROJECT NO. HH-1 EAST AND WEST ATLANTIC AVENUES AND STATION AVENUE 13-45
Problems 13-45
Recommendations 13-45
Benefits 13-46
Estimated Costs 13-46

PROJECT NO. HH-2 U.S. ROUTE 30 AND STATION AVENUE 13-47
Problems 13-47
Recommendations 13-47
Benefits 13-48
Estimated Costs 13-48

PROJECT NO. HH-3 NINTH AVENUE AND STATION AVENUE 13-49
Problems 13-49
Recommendations 13-49
Benefits 13-50
Estimated Costs 13-50

PROJECT NO. HH-4 CLEMENTS BRIDGE ROAD, EAST ATLANTIC AVENUE AND BARRINGTON AVENUE 13-51
Problems 13-51
Recommendations 13-51
Benefits 13-52
Estimated Costs 13-52

GENERAL RECOMMENDATIONS

PROJECT NO. G-1 TYPICAL LEFT TURN LANE PAVEMENT MARKINGS G-1
Problems G-1
Recommendations G-1
Benefits G-1
Estimated Costs G-1

PAGE

PROJECT NO. G-2 GENERAL SPEED LIMITS G-2
Problems G-2
Recommendations G-2
Benefits G-2

CHAPTER 14

IMPLEMENTATION 14-1

RIGHT OF WAY 14-1
CONSTRUCTION COSTS 14-1
ENGINEERING 14-1

CHAPTER 15

SYSTEMS MAINTENANCE AND EVALUATION 15-1

TRAFFIC SIGNALS 15-1
SIGNS AND PAVEMENT MARKINGS 15-1
EVALUATION 15-1

LIST OF ILLUSTRATIONS

ILLUSTRATIONS — PRECEDING PAGE

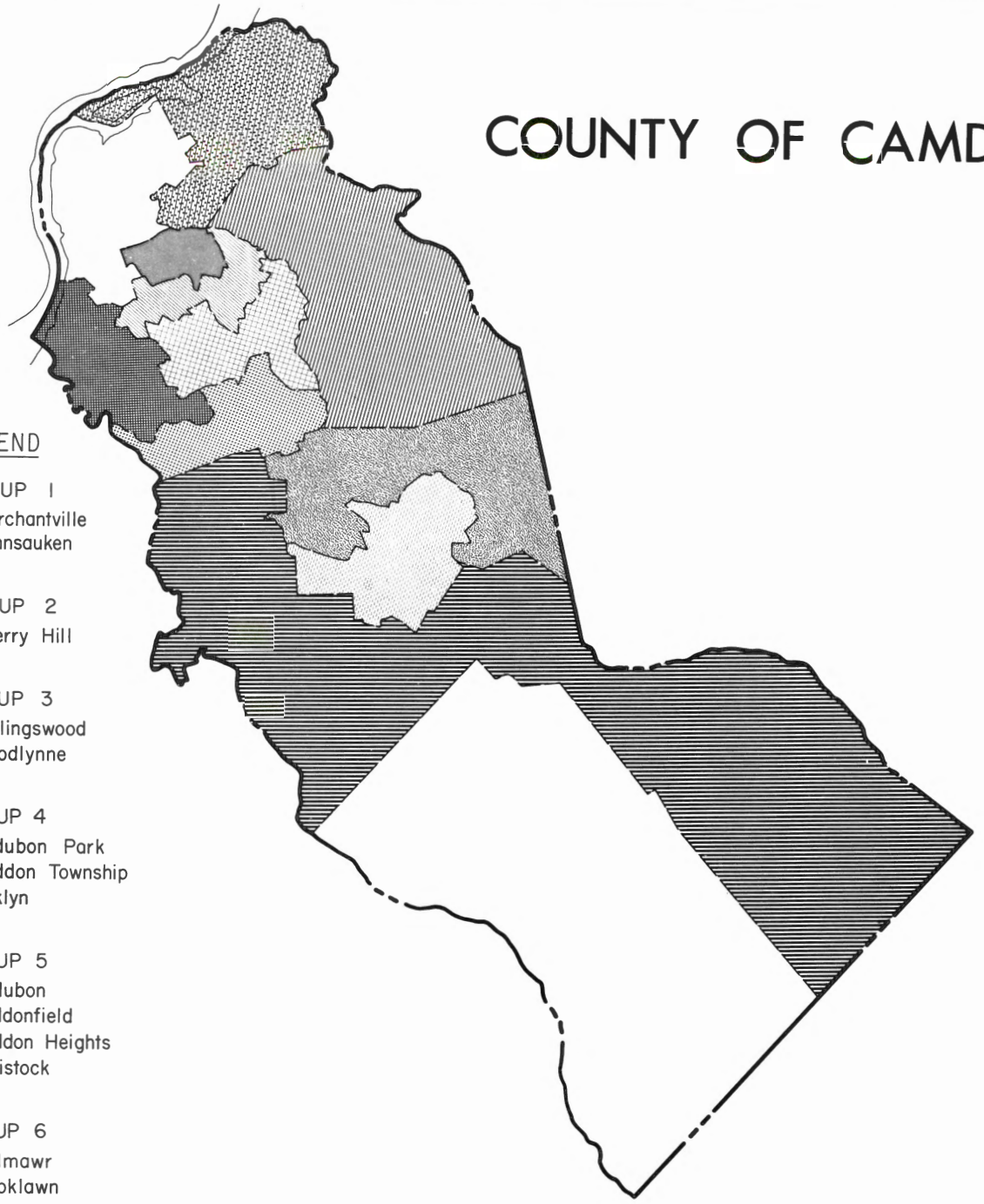
EXHIBIT NO. 1 - AREA MAP 3-1
EXHIBIT NO. 2 - LAND USE MAP 3-1
EXHIBIT NO. 3 - INITIAL STUDY SYSTEM AND RECOMMENDED FEDERAL AID SYSTEM MAP 5-1
TABLE NO. 4 - SUMMARY OF ACCIDENT TYPES BOROUGH OF AUDUBON 5-2
TABLE NO. 5 - SUMMARY OF ACCIDENT TYPES BOROUGH OF HADDONFIELD 5-2
TABLE NO. 6 - SUMMARY OF ACCIDENT TYPES BOROUGH OF HADDON HEIGHTS 5-2
TABLE NO. 7 - SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS - BOROUGH OF AUDUBON 5-2
TABLE NO. 8 - SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS - BOROUGH OF HADDONFIELD 5-2
TABLE NO. 9 - SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS - BOROUGH OF HADDON HEIGHTS 6-1
CHART NO. 10 - MONTHLY TRAFFIC VARIATION OF A TYPICAL WEEKDAY ON ROUTE 30 AS % OF A.A.D.T. 6-2
EXHIBIT NO. 11 - 1970 A.A.D.T. VOLUMES 7-2
EXHIBIT NO. 12 - EXISTING ON-STREET PARKING RESTRICTIONS BOROUGH OF HADDONFIELD 7-2
EXHIBIT NO. 13 - EXISTING OFF-STREET PARKING LOTS BOROUGH OF HADDONFIELD 7-3
EXHIBIT NO. 14 - LOCATIONS OF EXISTING TRAFFIC SIGNALS 13-1
EXHIBIT NO. 15 - LOCATIONS OF RECOMMENDED IMPROVEMENTS 13-4
EXHIBIT NO. 16 - NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES U.S. ROUTE 30 AND NICHOLSON ROAD 13-6
EXHIBIT NO. 17 - HOPKINS AVENUE, BARRETT AVENUE AND PINE STREET 13-11
EXHIBIT NO. 18 - KINGS HIGHWAY, NINTH AVENUE AND WYOMING AVENUE 13-21
EXHIBIT NO. 19 - KINGS HIGHWAY AND HADDON AVENUE 13-23
EXHIBIT NO. 20 - HADDON AVENUE, EUCLID AVENUE AND TANNER STREET 13-25
EXHIBIT NO. 21 - HADDON AVENUE, ELLIS STREET AND SNOWDEN AVENUE 13-29
EXHIBIT NO. 22 - KINGS HIGHWAY, POTTER STREET AND GROVE STREET 13-31
EXHIBIT NO. 23 - KINGS HIGHWAY, WEST END AVENUE AND CHEWS LANDING ROAD

		PRECEDING PAGE
EXHIBIT NO. 24	POTTER STREET AND ELLIS STREET	13-37
EXHIBIT NO. 25	KINGS HIGHWAY AND TANNER STREET	13-42
EXHIBIT NO. 26	EAST AND WEST ATLANTIC AVENUES AND STATION AVENUE	13-46
EXHIBIT NO. 27	CLEMENTS BRIDGE ROAD, EAST ATLANTIC AVENUE AND BARRINGTON AVENUE	13-52
EXHIBIT NO. G-1	TYPICAL LEFT TURN LANE PAVEMENT MARKINGS	G-1

APPENDIX

	PAGE
DEFINITIONS	A-1
WARRANTS	A-3

COUNTY OF CAMDEN



LEGEND

GROUP 1
- Merchantville
- Pennsauken

GROUP 2
- Cherry Hill

GROUP 3
- Collingswood
- Woodlynne

GROUP 4
- Audubon Park
- Haddon Township
- Oaklyn

GROUP 5
- Audubon
- Haddonfield
- Haddon Heights
- Tavistock

GROUP 6
- Bellmawr
- Brooklawn
- Gloucester City
- Mt. Ephraim

GROUP 7
- Barrington
- Lawnside
- Magnolia
- Runnemede

GROUP 8
- Hi Nella
- Laurel Springs
- Somerdale
- Stratford
- Voorhees Township

GROUP 9
- Clementon
- Gibbsboro
- Lindenwold

GROUP 10
- Berlin
- Berlin Township
- Gloucester Township
- Pine Hill
- Pine Valley
- Waterford Township

AREA MAP

EXHIBIT NO. 1

Kammerer, Symes & Assoc.
Consulting Engineers

CHAPTER 1

THE TOPICS PROGRAM

The authorization, scope and objectives of the TOPICS Program and its ultimate aims are set forth in the following:

> "Policy and Procedure Memorandum 21-18", of May 12, 1972, Federal Highway Administration, United States Department of Transportation, refers to "-- the development of a TOPICS plan based on a systematic traffic engineering analysis --". TOPICS means Traffic Operations Program to Increase Capacity and Safety. The objective of the Program is not to supplant long range planning but to complement it.
>
> The Program is administered under the authority provided by Section 10 of the Federal-Aid Highway Act of 1968, approved August 23, 1968, which amended Chapter 1 of Title 23, United States Code, by adding a new Section 135, "Urban Area Traffic Operations Improvement Programs".

This report provides traffic improvement recommendations under the Camden County TOPICS Program for Audubon Borough, Haddonfield Borough, Haddon Heights Borough and Tavistock Borough, based on the type of systematic traffic engineering analyses called for by the Act of 1968, as amended.

The objective of TOPICS is to obtain better use of existing streets and roadways by improvements which will fit into and become part of a general long range highway plan. In brief, it will be a series of short range improvements which will mesh with those for the long range.

Among the more important considerations are adequate traffic engineering, up-dated pavement marking systems, more efficient channeling of intersecting traffic, more responsive signals, improved street lighting, and construction or reconstruction of short sections of highway where traffic problems exist.

The following is a list of the types of improvements which may be eligible for financing under the TOPICS Program.

a. Channelization of intersections.

b. Widening traffic lanes.

c. Provide additional traffic lanes on approaches to signalized intersections.

d. Install traffic control systems to make traffic signal operation responsive to traffic conditions.

e. Install traffic surveillance systems.

f. Upgrade traffic control signs and pavement markings.

g. Provide improved areas for loading and unloading bus passengers including separate bus lanes and shelters.

h. Upgrade highway and or street lighting.

i. Modifications associated with restricting curb parking.

j. Construction of pedestrian grade separations or highway grade separations at complex intersections.

k. Limited construction or reconstruction where such an improvement is essential for route continuity along a street of otherwise adequate width.

The report which follows describes the study findings and sets forth recommended solutions to existing problem areas.

CHAPTER 2

SUMMARY OF RECOMMENDATIONS

The following summary of recommendations outlines the recommended improvements which are detailed later in this report.

TRAFFIC SIGNALS - BOROUGH OF AUDUBON

Most of the existing signalized intersections within the Borough are overloaded during the early morning and evening rush hours and during the heavy evening shopping hours. All of the signalized intersections are equipped with semi-actuated traffic signals. Recommendations to provide additional turning lanes and adjustment to the signal phasing are also included in this report. No new traffic signals have been proposed in the Borough, however, recommended projects are included in Chapter 13 of this report for the reconstruction and or modification of traffic signals at the following locations:

a. Kings Highway and West Atlantic Avenue

b. Route 30 and Nicholson Road

TRAFFIC SIGNALS - BOROUGH OF HADDONFIELD

All of the existing signalized intersections within the Borough of Haddonfield are overloaded during the early morning and evening rush hours and during the heavy evening shopping hours. All of the signalized intersections are equipped with fixed time traffic signals. Recommendations to provide additional turning lanes and adjustment to the signal phasing are also included in this report. New traffic signals have been proposed at the intersections of Kings Highway, West End Avenue and Chews Landing Road; Maple Avenue and Grove Street; and Haddon Avenue, Euclid Avenue and Tanner Street. Recommended projects are included in Chapter 13 of this report for the reconstruction and or modification of traffic signals at the following locations:

a. Kings Highway, Potter Street and Grove Street

b. Kings Highway and Haddon Avenue

c. Kings Highway and Tanner Street

d. Kings Highway and Warwick Road

TRAFFIC SIGNALS - BOROUGH OF HADDON HEIGHTS

All of the existing signalized intersections within the Borough are overloaded during the early morning and evening rush hours and during the heavy evening shopping hours. Three (3) of the four (4) signalized intersections are equipped with semi-actuated signals and one (1) is fixed time. Recommendations to provide additional turning lanes and adjustment to the signal phasing are also included in this report. New traffic signals have been proposed at the intersections of East and West Atlantic Avenues and Station Avenue and Clements Bridge Road, East Atlantic Avenue and Barrington Avenue. A recommended project is included in Chapter 13 of this report for the modification of the traffic signal at the intersection of Route 30 and Station Avenue.

ROADWAY GEOMETRY

Major roadways have exceeded their capacity with present traffic. With traffic continuing to increase, recommendations have been included to widen main arteries and improve geometry.

TRAFFIC FLOW

Recommendations have been included regarding the improvement of the flow of traffic for Haddon Avenue, Kings Highway and the Central Business District in the Borough of Haddonfield and are detailed in Chapter 13 of this report.

The smooth flow of traffic on several of the arterial and collector roads in the study area is hampered by insufficient roadway widths. Recommendations to improve this situation are also included in Chapter 13 of this report.

PARKING CONTROLS

Restriction of parking in certain areas of the Boroughs will greatly facilitate the smooth flow of traffic. Included in Chapter 13 of this report are recommendations for the restriction of parking in shopping areas and on main collector streets within residential neighborhoods.

Parking should be restricted on the following roads:

BOROUGH OF AUDUBON

a. East and West Atlantic Avenues

b. Crystal Lake Avenue

c. Hopkins Avenue

d. Kings Highway

e. Merchant Street

f. Nicholson Road

g. Pine Street

h. Route 30

BOROUGH OF HADDONFIELD

a. Chews Landing Road

b. Ellis Street

c. Euclid Avenue

d. Grove Street

e. Haddon Avenue

f. Kings Highway

g. Potter Street

h. Tanner Street

i. Warwick Road

BOROUGH OF HADDON HEIGHTS

a. East and West Atlantic Avenues

b. Kings Highway

c. Station Avenue

d. Route 30

e. Route 168

SIGNS AND PAVEMENT MARKINGS

Many locations are deficient in signing and pavement markings. Specific recommendations include standardizing signs and pavement markings, providing restricted turning lanes at signalized and unsignalized intersections and additional regulatory signs as required.

TRAFFIC REGULATIONS AND ENFORCEMENT

The analysis of the existing traffic regulations in the Borough of Audubon, the Borough of Haddonfield and the Borough of Haddon Heights indicates that they cover the requirements of the Municipalities. However, the analysis of the enforcement of existing regulations indicates that greater emphasis should be placed on the enforcement of speed limits, stop controls and yield controls.

LONG RANGE PLANNING

Many of the improvements recommended in this report will solve immediate traffic problems in the study area. With the growth anticipated during the seventies and beyond in this area, steps should be taken to plan for the additional capacity which will be required along existing routes plus the need for additional routes to by-pass built-up areas. With this end in mind, the Camden County Planning Department has prepared a report titled "Master Plan for Highways", amended May, 1971, which provides a guide for developing an improved highway system.

To insure that adequate right of way is available for future expansion, restrictions should be placed on the development of remaining lands adjacent to existing roads. This can be accomplished through the local Planning and Zoning Boards.

CHAPTER 3

STUDY DESCRIPTION

STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF AUDUBON

Audubon Borough is a residential and commercial community located in the northwestern part of Camden County with portions of Haddon Township serving as the western, northern and eastern border, Audubon Park and Oaklyn serving as the northwestern border and Haddon Heights serving as the southern border of the community. The 1970 population of ten thousand, eight hundred (10,800) people shows an increase of four hundred (400) or three point five (3.5) percent over the 1960 population of ten thousand, four hundred (10,400) people.

The Borough's many collector roads feed the major arterials, Route 30 and Route 168, with heavy daily commuter traffic. Routes 30 and 168 are further congested because they are direct accesses to many shore points, *(See Exhibit Nos. 2 and 3)*.

Audubon Borough covers an area of one point five (1.5) square miles. It is one of the smaller municipalities in Camden County and contains a very limited industrial area which does not affect traffic patterns in the area. The commercial area lies primarily along Route 30 and on Merchant Street between Route 30 and Creston Street in addition to a large shopping center located at the intersection of Route 168 and Nicholson Road. *(See Exhibit No. 2)*.

The terrain is generally flat and has no serious effect on the normally heavy traffic within the study area. The traffic within the Borough is generated by local and commuter usage in addition to the shopping center located at Route 168 and Nicholson Road. The area between Nicholson Road and Cuthbert Road along Route 30 causes somewhat of a hazardous condition due to the awkward geometry and heavy traffic volumes.

STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF HADDONFIELD

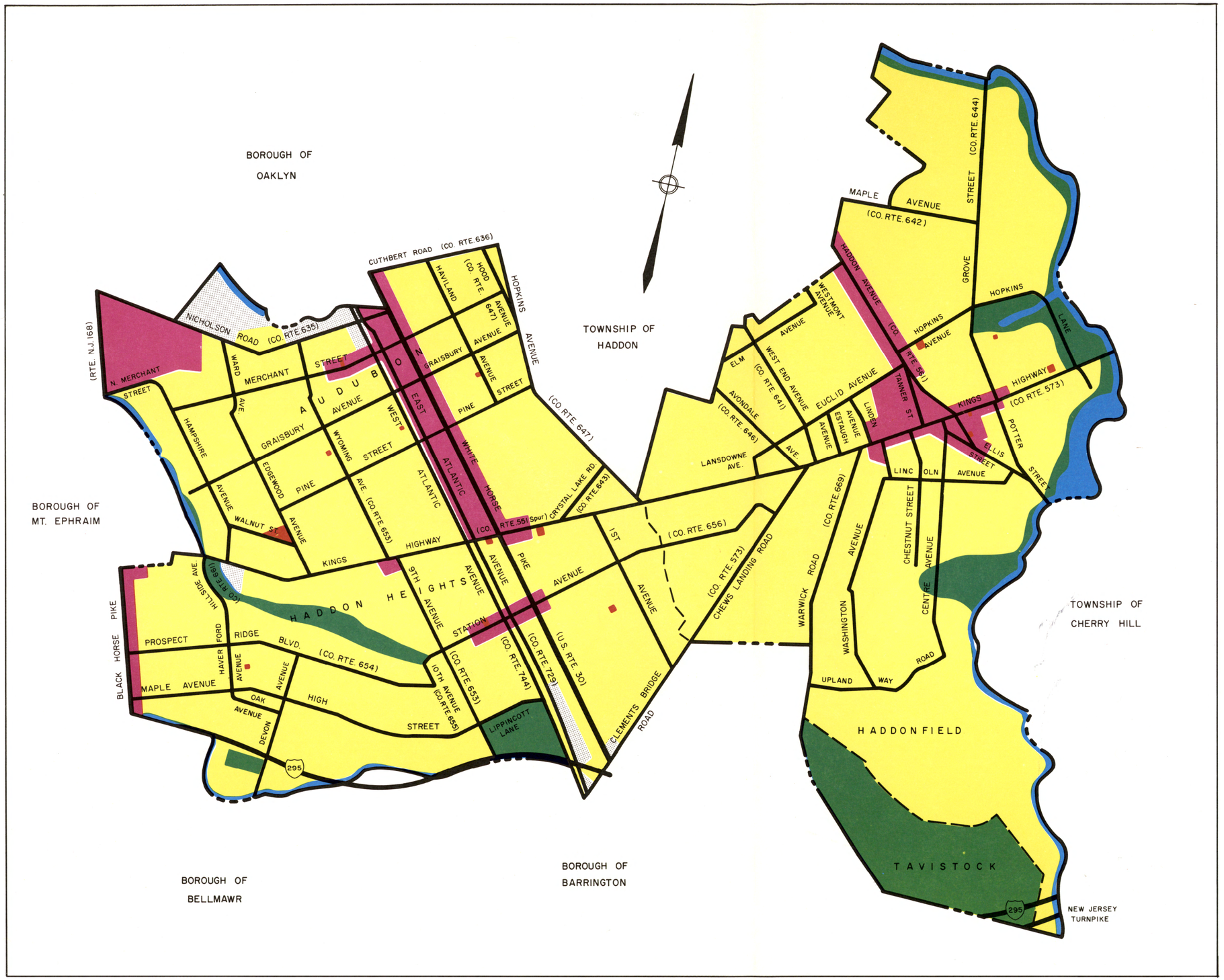
Haddonfield Borough is a residential and commercial community located in the north-central part of Camden County with the Cooper River serving as the northern border, Cherry Hill serving as the eastern border, Tavistock and Haddon Heights serving as the southern border and Haddon Township serving as the western border of the community. The 1970 population of thirteen thousand, two hundred (13,200) is approximately the same as the 1960 population denoting a rather insignificant change in the growth rate of the Borough.

The Borough's many collector roads feed the major arterial routes with heavy volumes of commuter traffic. Additional heavy volumes of traffic have been generated by the Haddonfield Station of the Rapid Transit System. *(See Exhibit Nos. 2 and 3)*.

Haddonfield covers an area of three (3) square miles. It is one of the smaller municipalities in Camden County and contains no industrial areas as such. The Central Business District (C.B.D.) is located along Kings Highway between Grove Street and Warwick Road. The Central Business District has a profound effect on the traffic patterns in the area. *(See Exhibit No. 2)*.

LAND USE MAP

EXHIBIT NO. 2



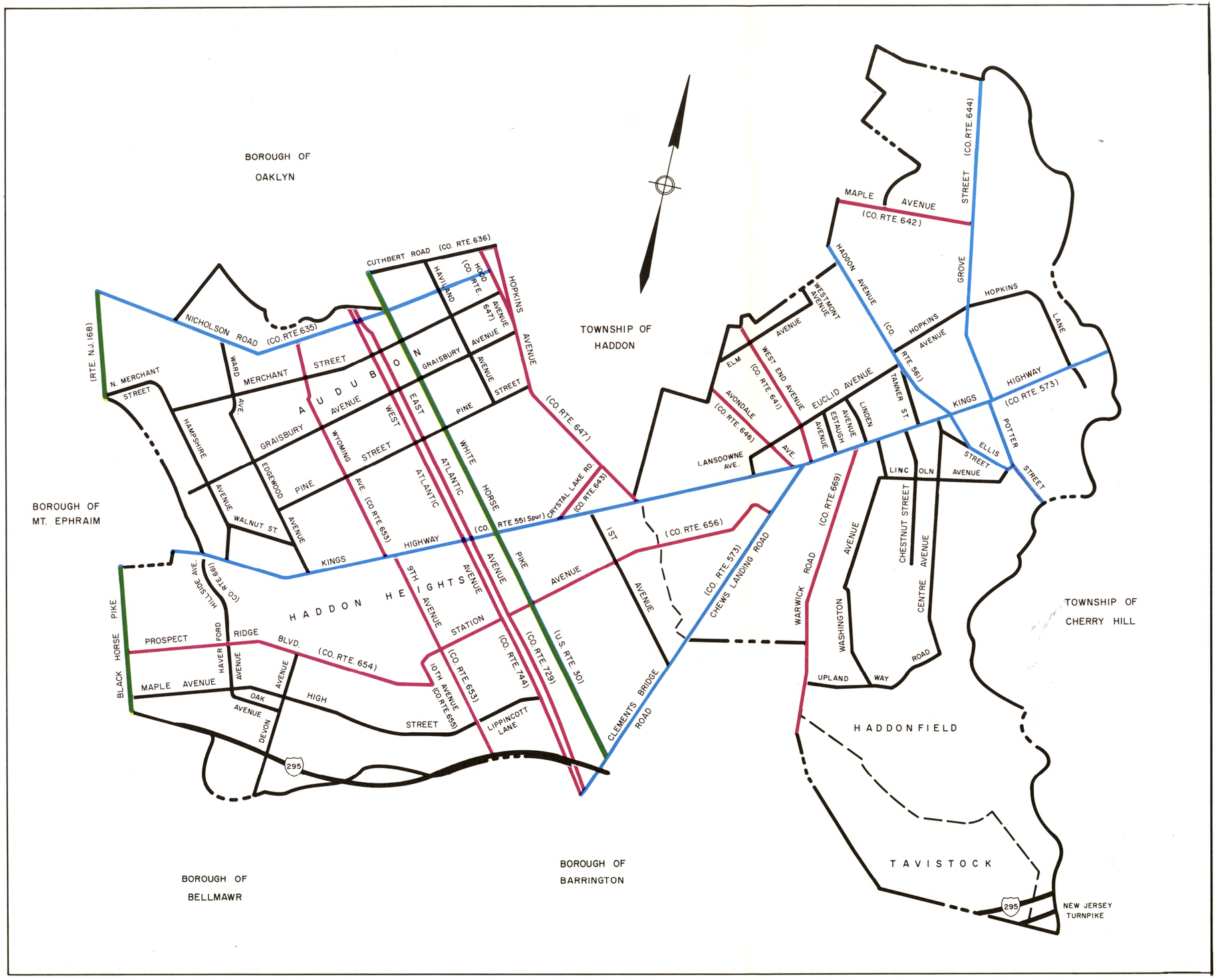
Business & Professional
Residential
Governmental, Educational & Civic
Parks & Recreation
Industrial
Lakes & Streams

LAND USE MAP

EXHIBIT NO. 2

INITIAL STUDY SYSTEM &
RECOMMENDED FEDERAL AID SYSTEM MAP

EXHIBIT NO. 3



SCALE

300' 0 900' 1800'

Streets in the Initial Study System	
Primary Type I (State Highways)	2.89 miles
Secondary – F.A.S. (County Roads)	0.00 miles
Primary Type II (Proposed)	12.69 miles
Federal Aid Urban System	9.29 miles

INITIAL STUDY SYSTEM &
RECOMMENDED FEDERAL AID SYSTEM MAP

EXHIBIT NO. 3

Kammerer, Symes & Assoc.
Consulting Engineers

The terrain, generally flat to gently rolling, has no serious effect on the traffic within the area. Narrow streets, on-street parking, sharp corner radii and increased traffic volumes combine to cause serious traffic congestion. The Haddonfield Station of the Rapid Transit system also contributes heavily to this situation.

STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF HADDON HEIGHTS

Haddon Heights Borough is a mixed residential, commercial and light industrial community located in the northwestern part of Camden County with Audubon serving as the northern border, Haddonfield and Barrington serving as the eastern border, Bellmawr and Barrington serving as the southern border and Mount Ephraim serving as the western border of the community. The 1970 population of nine thousand, four hundred (9,400) people shows an increase of only one hundred (100) or one point one (1.1) percent over the 1960 population of nine thousand, three hundred (9,300) people.

The Borough's several collector roads feed the major arterials, Route 30 and Route 168 which, in turn, feed traffic into and away from Interstate Route 295. *(See Exhibit Nos. 2 and 3).*

Haddon Heights covers an area of two (2) square miles. It is one of the smaller municipalities in Camden County and contains a few small scattered industrial areas. The Central Business District (C.B.D.) is located along Station Avenue between Route 30 and Eighth Avenue. The Central Business District has little effect on the traffic problems encountered in the area.

The terrain, generally flat to gently rolling, has no serious effect on the traffic within the area. Increased volumes on East Atlantic Avenue and Station Avenue cause come congestion in that area.

STUDY AREA - COUNTY OF CAMDEN - BOROUGH OF TAVISTOCK

The Borough of Tavistock is a small residential community with one half of its entire area taken up by the Tavistock Country Club. The Borough is located in the north-central part of Camden County with Haddonfield serving as the northern and eastern borders, Lawnside serving as the southern border and Barrington serving as the western border of the community. *(See Exhibit No. 2)*

The Borough has a population of ten (10) people, consists only of local roads, has gently rolling terrain and no traffic problems at all.

STUDY ROADWAY SYSTEM

The roadways and intersections included in the initial study system were developed through field inspections by the Consultant and meetings with Municipal, County and State officials.

The study system was composed of existing Federal-Aid Urban, Federal-Aid Primary and Secondary routes and major connector and collector streets within the Boroughs. *(See Exhibit No. 3)*

Through the initial investigation of traffic volumes and accident data, the study system was reduced to that shown also on *Exhibit No. 3* and consists of the Federal-Aid Urban System, Federal-Aid Primary, Type I, Federal-Aid Secondary and Federal-Aid Primary Type II roads. The Federal-Aid Primary Type II System is composed of major connector and collector streets located within the Boroughs. Road mileage for each system is included on *Exhibit No. 3.*

THE ANALYTICAL APPROACH

A sequence was developed by which those locations exhibiting poor traffic operation characteristics were identified, corrective measures formulated, relative importance of each location compared and an improvement schedule developed. The roadways were analyzed in terms of their accident history, or safety, their ability to handle traffic volume, or capacity, and their ability to move traffic, or travel quality.

The first step in the study was the collection of data. The following is the data which was collected relative to the roadways within the study network:

1. Traffic data from Municipal, County and State Officials including ordinances relating to traffic, accident records and traffic volumes.

2. Traffic operation data from extensive ground surveys including rights of way, signs, pavement markings, inventories of intersections, public transportation and traffic signals.

3. Peak and off-peak traffic volumes and intersection turning movements.

4. Classification of traffic as to passenger cars, buses, trucks and tractor-trailers.

5. Spot speed checks and time delay studies for peak and off-peak hours.

OPERATIONAL REVIEW

During the operational review, data was gathered at various locations. This review included the analysis of the data collected with the purpose of identifying operational problems and developing workable solutions.

PROJECT PRIORITY

Following the development of solutions to problem areas, a tentative priority was developed for each project based on the accident history, volume-capacity ratio and quality of flow established from the time delay studies. Project priorities developed were reviewed with Municipal and County Officials and the final list of priorities, as presented in this report, reflects the results of that meeting.

Upon completion of the preparation of preliminary design and cost estimates, a schedule for the implementation of the projects on the priority list was developed.

CHAPTER 4

DATA COLLECTION

Data for the TOPICS study was collected during the period March 1971 through September 1972 by the Consultant and included the following:

a. Traffic Volumes - traffic volumes and turning movements were determined at specific locations for various durations.

b. Roadway Inventory - right of way and roadway widths, type and condition of pavement, location of curbs, shoulders, sidewalks, poles and trees, etc.

c. Traffic Control Devices - location of and condition of traffic control devices such as traffic signals, signs and pavement markings.

d. Accident History - records of all reported accidents were reviewed, but only locations where five (5) or more accidents occurred per year for the years 1968, 1969 and 1970, were studied extensively and included in this report.

e. Time and Delay - travel speeds on roads within the study area were graphically recorded, using electronic equipment, for peak and off-peak periods.

f. General Observations - during the study period, observations were made by both the Consultant and local officials of traffic operations, pedestrian problem areas, roadway lighting and the enforcement of existing traffic regulations.

At the outset of the project, meetings were held with Municipal and County Officials, members of the Police Departments and the Consultant to introduce personnel, to develop lines of communication and to explain the various procedures to be used.

At the completion of the field inventory phase of the work, the Consultant contacted Municipal and County Officials to review the data collected, familiarize them with the TOPICS Program and to obtain their views on problems within the study area.

CHAPTER 5

ACCIDENT RECORDS

Accident records for locations reporting five (5) or more accidents per year for any one year from 1968 through 1970, enabled comparisons to be made for several different factors. An analysis was made of the data collected for the purpose of developing accident patterns which might be based on day or night, weather conditions, roadway conditions, traffic control and traffic density.

CAUSES - BOROUGH OF AUDUBON

In the Borough of Audubon, eight (8) of the eighteen (18) intersections which can be classed as accident breeding had accident experience of five (5) or more accidents per year. Of these, two (2) repeated in each of the three (3) reporting years, five (5) repeated twice and one (1) intersection experienced five (5) or more accidents in only one year.

From the accident data collected, five (5) types of accidents were noted. In order of their frequency of occurrence, they were:

1. Right Angle
2. Left Turn
3. Same Direction
4. Fixed Object
5. Pedestrian

Table No. 4 lists all accidents that were identifiable by type. Most significant were those classified as right angle. These accounted for fifty-seven point three (57.3) percent of all accidents. Failure of the driver to exercise safe driving habits, misjudging speed of traffic and failure to obey traffic control devices were contributing factors to this condition. Our findings indicate that sixty-nine (69) percent of all accidents occurred during the daylight hours. This report will include recommendations to attempt to materially reduce the number of accidents.

CAUSES - BOROUGH OF HADDONFIELD

In the Borough of Haddonfield fourteen (14) of the twenty (20) intersections which can be classed as accident breeding had accident experience of five (5) or more accidents per year. Of these, three (3) repeated in each of the three (3) reporting years, two (2) repeated twice and nine (9) only once each.

From the accident data collected, six (6) types of accidents were noted. In order of their frequency of occurrence they were:

1. Same Direction
2. Left Turn
3. Fixed Object

TABLE NO. 4

SUMMARY OF ACCIDENT TYPES
PERIOD JAN. 1968 - DEC. 1970
LOCATIONS WITH 5 OR MORE ACCIDENTS PER YEAR

BOROUGH OF AUDUBON

TYPE	TOT. NO.	NIGHT	DAY	ROAD CONDITION			INJURIES	FATALITIES	% TOTAL ACCIDENTS
				WET	DRY	ICE			
RIGHT ANGLE (R.A.)	74	20	54	9	64	1	43	0	57.3
LEFT TURN (L.T.)	24	6	18	7	17	0	7	0	18.6
SAME DIRECTION (S.D.)	24	11	13	6	18	0	11	0	18.6
FIXED OBJECT (F.O.)	6	3	3	2	4	0	3	0	4.7
PEDESTRIAN (PED.)	1	0	1	0	1	0	1	0	0.8
HEAD ON (H.O.)	0	0	0	0	0	0	0	0	0.0
TOTAL	129	40	89	24	104	1	65	0	100.0

4. Right Angle

5. Head On

6. Pedestrian

Table No. 5 lists all accidents that were identifiable by type. Most significant were those classified as same direction. These accounted for thirty-five point nine (35.9) percent of all accidents. Failure of the driver to exercise safe driving habits, misjudging speed of traffic and failure to obey traffic control devices were contributing factors to this condition. Our findings indicate that sixty-eight (68) percent of all accidents occurred during the daylight hours. This report will include recommendations to attempt to materially reduce the number of accidents.

CAUSES - BOROUGH OF HADDON HEIGHTS

In the Borough of Haddon Heights ten (10) of the fifteen (15) intersections which can be classed as accident breeding had accident experience of five (5) or more accidents per year. Of these three (3) repeated in each of the three reporting years and seven (7) occurred in only one of the three (3) reporting years.

From the accident data collected six (6) types of accidents were noted. In order of their frequency of occurrence they were:

1. Same Direction

2. Left Turn

3. Right Angle

4. Fixed Object

5. Pedestrian

6. Head On

Table No. 6 lists all accidents that were identifiable by type. Most significant were those classified as same direction. These accounted for thirty-four point one (34.1) percent of all accidents. Failure of the driver to exercise safe driving habits, misjudging speed of traffic and failure to obey traffic control devices were contributing factors to this condition. Our findings indicate that sixty-nine (69) percent of all accidents occurred during the daylight hours. This report will include recommendations to attempt to materially reduce the number of accidents.

SUMMARY

In order to make effective recommendations, it is necessary to detail the number of each accident type at the reporting locations. *Table No. 7 (Audubon), Table No. 8 (Haddonfield), and Table No. 9 (Haddon Heights)* present summaries of this data. From the accident reports filed for these locations, collision diagrams were prepared and a detailed analysis based on the circumstances and conditions surrounding each accident was made. The number and severity of the occurrences at any given location became an integral part of the decision making process required to select the locations needing improvement. The nature of the individual accidents at a specific location became a decisive factor in the design of the appropriate improvement.

TABLE NO. 5

SUMMARY OF ACCIDENT TYPES
PERIOD JAN. 1968 - DEC. 1970
LOCATIONS WITH 5 OR MORE ACCIDENTS PER YEAR

BOROUGH OF HADDONFIELD

TYPE	TOT. NO.	NIGHT	DAY	ROAD CONDITION			INJURIES	FATALITIES	% TOTAL ACCIDENTS
				WET	DRY	ICE			
RIGHT ANGLE (R.A.)	43	8	35	8	34	1	7	0	19.1
LEFT TURN (L.T.)	48	18	30	16	32	0	6	0	21.2
SAME DIRECTION (S.D.)	81	21	60	21	55	5	18	0	35.9
FIXED OBJECT (F.O.)	45	20	25	13	27	5	11	2	19.8
PEDESTRIAN (PED.)	2	0	2	0	2	0	2	0	0.9
HEAD ON (H.O.)	7	4	3	0	5	2	0	0	3.1
TOTAL	226	71	155	58	155	13	44	2	100.0

TABLE NO. 6

SUMMARY OF ACCIDENT TYPES
PERIOD JAN. 1968 - DEC 1970
LOCATIONS WITH 5 OR MORE ACCIDENTS PER YEAR

BOROUGH OF HADDON HEIGHTS

TYPE	TOT. NO.	NIGHT	DAY	ROAD CONDITION			INJURIES	FATALITIES	% TOTAL ACCIDENTS
				WET	DRY	ICE			
RIGHT ANGLE (R.A.)	58	16	42	15	42	1	20	0	26.4
LEFT TURN (L.T.)	64	21	43	13	47	4	15	0	29.1
SAME DIRECTION (S.D.)	75	24	51	13	60	2	19	0	34.1
FIXED OBJECT (F.O.)	14	4	10	4	8	2	1	0	6.3
PEDESTRIAN (PED.)	5	3	2	1	4	0	5	0	2.3
HEAD ON (H.O.)	4	1	3	1	3	0	2	0	1.8
TOTAL	220	69	151	47	164	9	62	0	100.0

TABLE NO. 7

SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS

BOROUGH OF AUDUBON

INTERSECTION	YEAR	TOTAL	RIGHT ANGLE	LEFT TURN	SAME DIRECT.	FIXED OBJECT	PEDEST.	HEAD ON
CRYSTAL LAKE AVENUE & HOPKINS STREET	1968	1	1	0	0	0	0	0
	1969	5	5	0	0	0	0	0
	1970	5	4	1	0	0	0	0
ENTRANCE TO BLACKHORSE PIKE SHOPPING CENTER (Route 168 Exits)	1968	6	5	0	1	0	0	0
	1969	2	1	0	1	0	0	0
	1970	9	6	1	1	1	0	0
ENTRANCE TO BLACKHORSE PIKE SHOPPING CENTER (Nicholson Road Exits)	1968	1	0	1	0	0	0	0
	1969	6	1	1	4	0	0	0
	1970	3	0	0	1	2	0	0
ROUTE 168 & NICHOLSON ROAD	1968	10	10	0	0	0	0	0
	1969	8	8	0	0	0	0	0
	1970	1	1	0	0	0	0	0
ROUTE 30 & MERCHANT STREET	1968	4	1	3	0	0	0	0
	1969	5	2	1	1	1	0	0
	1970	8	4	4	0	0	0	0
ROUTE 30 & PINE STREET	1968	5	3	1	1	0	0	0
	1969	8	5	1	1	1	0	0
	1970	7	2	0	4	0	1	0
ROUTE 30 & NICHOLSON ROAD	1968	6	1	3	2	0	0	0
	1969	8	0	3	4	1	0	0
	1970	5	0	3	2	0	0	0
EAST ATLANTIC AVENUE & PINE STREET	1968	2	2	0	0	0	0	0
	1969	7	6	0	1	0	0	0
	1970	7	6	1	0	0	0	0

TABLE NO. 8

SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS

BOROUGH OF HADDONFIELD

INTERSECTION	YEAR	TOTAL	RIGHT ANGLE	LEFT TURN	SAME DIRECT.	FIXED OBJECT	PEDEST.	HEAD ON
HADDON AVENUE & EUCLID AVENUE	1968	1	1	0	0	0	0	0
	1969	3	0	0	1	2	0	0
	1970	5	1	0	1	3	0	0
HADDON AVENUE & HAWTHORNE STREET	1968	2	1	0	1	0	0	0
	1969	0	0	0	0	0	0	0
	1970	6	2	1	2	1	0	0
HADDON AVENUE & HOPKINS STREET	1968	2	0	0	1	0	0	1
	1969	5	0	3	0	2	0	0
	1970	4	0	1	2	0	1	0
KINGS HIGHWAY & CHESTNUT STREET	1968	7	1	0	5	0	0	1
	1969	4	1	0	3	0	0	0
	1970	3	0	1	1	1	0	0
KINGS HIGHWAY, CHEWSLANDING ROAD & WEST END AVENUE	1968	7	3	3	0	1	0	0
	1969	7	0	2	4	1	0	0
	1970	11	1	6	2	2	0	0
KINGS HIGHWAY & HADDON AVENUE	1968	11	1	1	6	3	0	0
	1969	11	1	1	8	1	0	0
	1970	6	2	2	2	0	0	0
KINGS HIGHWAY & HINCHMAN AVENUE	1968	1	1	0	0	0	0	0
	1969	5	1	1	2	1	0	0
	1970	6	3	0	0	3	0	0
KINGS HIGHWAY, POTTER STREET & GROVE STREET	1968	20	2	12	2	3	0	1
	1969	15	1	3	5	6	0	0
	1970	15	2	6	5	1	0	1
KINGS HIGHWAY & TANNER STREET	1968	3	0	0	3	0	0	0
	1969	6	1	0	3	2	0	0
	1970	2	0	0	2	0	0	0
KINGS HIGHWAY & WARWICK ROAD	1968	2	0	0	1	1	0	0
	1969	4	1	0	3	0	0	0
	1970	5	1	0	3	1	0	0
KINGS HIGHWAY & WASHINGTON AVENUE	1968	0	0	0	0	0	0	0
	1969	6	3	1	1	0	1	0
	1970	6	3	0	3	0	0	0
MAPLE AVENUE & GROVE STREET	1968	4	1	2	1	0	0	0
	1969	2	0	0	2	0	0	0
	1970	6	1	0	3	2	0	0
POTTER STREET & ELLIS STREET	1968	4	2	0	0	2	0	0
	1969	7	1	0	2	3	0	1
	1970	4	1	0	1	1	0	1
WARWICK ROAD & HICKORY AVENUE	1968	3	1	1	0	0	0	1
	1969	0	0	0	0	0	0	0
	1970	5	2	1	0	2	0	0

TABLE NO. 9

SUMMARY OF ACCIDENTS AT REPORTING LOCATIONS

BOROUGH OF HADDON HEIGHTS

INTERSECTION	YEAR	TOTAL	RIGHT ANGLE	LEFT TURN	SAME DIRECT.	FIXED OBJECT	PEDEST	HEAD ON
EAST ATLANTIC AVENUE & STATION AVENUE	1968	2	2	0	0	0	0	0
	1969	5	5	0	0	0	0	0
	1970	4	1	1	1	1	0	0
9TH STREET & STATION AVENUE	1968	2	1	1	0	0	0	0
	1969	3	3	0	0	0	0	0
	1970	5	4	0	0	0	1	0
ROUTE 30 & CLEMENTS BRIDGE ROAD	1968	19	5	4	9	1	0	0
	1969	14	3	3	4	2	0	2
	1970	17	7	1	7	2	0	0
ROUTE 30 & GARDEN STREET	1968	4	2	0	1	0	1	0
	1969	5	1	1	1	2	0	0
	1970	2	1	0	1	0	0	0
ROUTE 30 & HADDON STREET	1968	3	0	0	2	0	0	1
	1969	8	2	0	2	4	0	0
	1970	3	1	0	2	0	0	0
ROUTE 30 & KINGS HIGHWAY	1968	19	3	9	6	1	0	0
	1969	21	2	12	6	0	1	0
	1970	29	1	16	10	0	1	1
ROUTE 30 & STATION AVENUE	1968	6	1	2	2	0	1	0
	1969	12	5	1	5	1	0	0
	1970	13	2	5	6	0	0	0
ROUTE 168 & MAPLE AVENUE	1968	2	0	1	1	0	0	0
	1969	1	0	1	0	0	0	0
	1970	5	1	2	2	0	0	0
ROUTE 168 & PROSPECT RIDGE AVENUE	1968	1	0	0	1	0	0	0
	1969	3	1	1	1	0	0	0
	1970	6	3	0	3	0	0	0
ROUTE 168 & SYCAMORE STREET	1968	1	0	1	0	0	0	0
	1969	0	0	0	0	0	0	0
	1970	5	1	2	2	0	0	0

CHAPTER 6

TRAFFIC VOLUMES

Data for projection of traffic volumes and the conversion of traffic counts to Annual Average Daily Traffic (A.A.D.T.) was furnished by the New Jersey Department of Transportation. This data was supplemented by traffic counts taken at specific locations for various durations.

TRAFFIC VOLUMES

The weekday traffic volumes encountered during the survey periods were higher than the A.A.D.T. volumes from May through December and lower than the A.A.D.T. volumes from January through April, due mainly to the monthly variations in traffic. *Chart No. 10* indicates traffic variations by months for Route 30 in the general area of Audubon, Haddonfield, Haddon Heights and Tavistock. The A.A.D.T. volume for Route 30 is ninety (90) percent of the volume of traffic recorded on an average June day. This chart confirms the effects of the heavy volumes of holiday and vacation traffic experienced during the year in urbanized areas such as the Borough of Audubon, the Borough of Haddonfield and the Borough of Haddon Heights.

The daily traffic counts taken at specific locations indicate that traffic is generally uniform throughout the week. Sunday traffic volumes were the lowest with Friday traffic volumes the highest when compared to an average day.

The average daily traffic exhibits a morning peak between 7:30 a.m. and 8:30 a.m., declines slightly, then increases again between 12:30 p.m. and 1:30 p.m., declines once again and reaches an afternoon peak at 5:30 p.m. before tapering off in the evening hours.

1970 A.A.D.T. volumes on the study roadways are illustrated on *Exhibit No. 11*. Chews Landing Road, Grove Street, Haddon Avenue, Kings Highway, Nicholson Road, Warwick Road, Route 30 and Route 168 carry the heaviest volumes in the study area. The above mentioned roads serve as the main arterial routes for the study area. They carry heavy commuter traffic and intersect with the collector and feeder streets from the residential areas.

SYSTEM CAPACITY

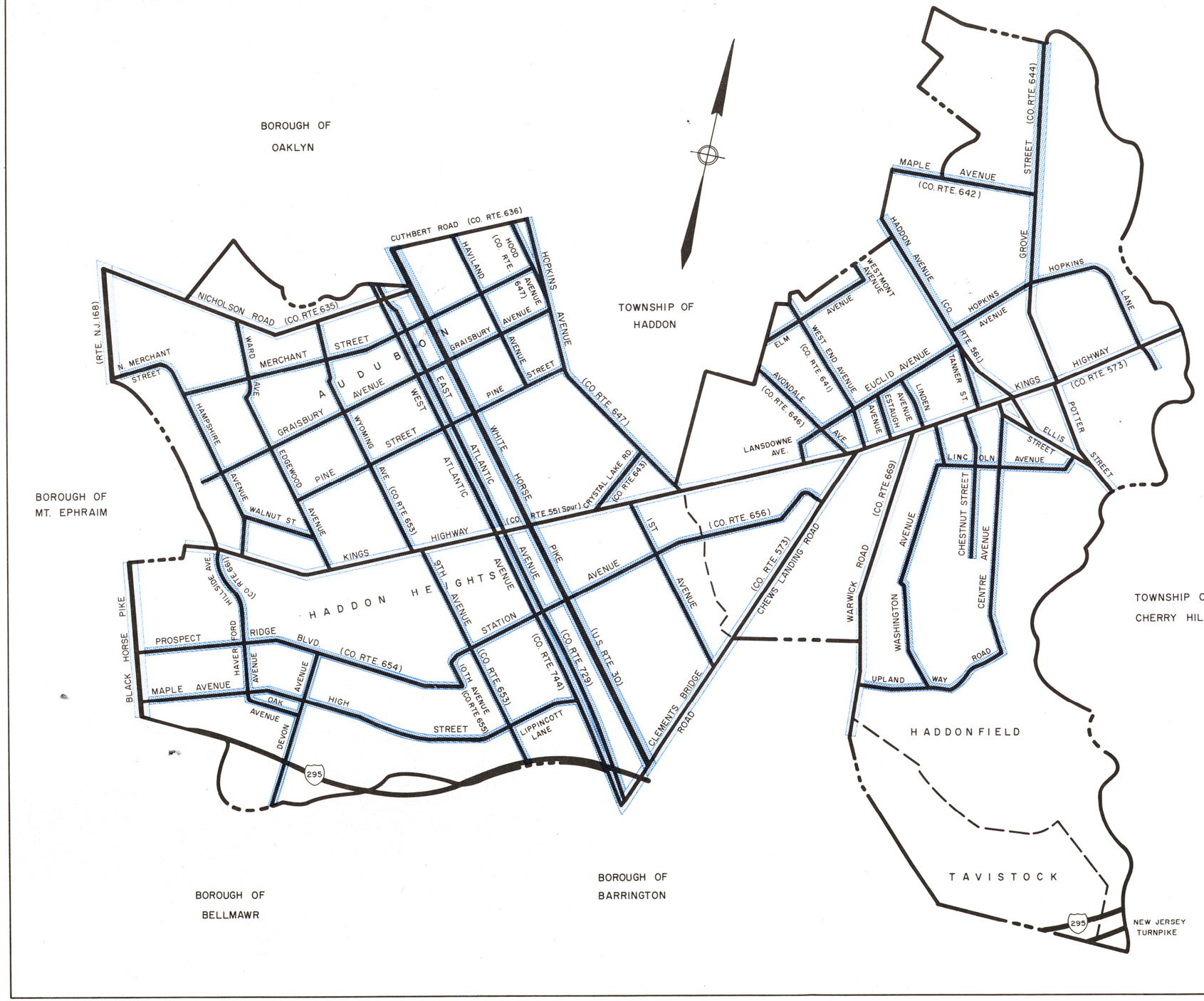
The relationship of traffic volume to roadway capacity is an accepted method of measuring the ability of a street to carry existing and projected traffic. The nature of the street system in this study area is such that intersection capacities are the controlling factors in determining the overall capacities of the roadways to handle traffic.

The capacity of the major intersection approaches was calculated and compared to the peak hour traffic volume. The peak hour traffic volume was used in computing levels of service.

The capacity (as defined in the 1965 Highway Capacity Manual) was computed for critical segments of the roadways in the study area for use in making a comparison with the demand hourly volumes. The resulting quotient, termed volume-capacity ratio (i.e., the V/C ratio), is

1970 A.A.D.T. VOLUMES

EXHIBIT NO. 11



0 - 5,000
5 - 15,000
15 - 25,000
25 - 40,000
40,000 & Over

1970 A.A.D.T. VOLUMES

EXHIBIT NO. 11

a useful index for identifying locations deficient in capacity. As the value of the ratio approaches one (1), the intersection approach volume converges to the maximum number of vehicles possible under prevailing roadway and traffic conditions, regardless of delay or restricted maneuverability.

Inspection of the resulting V/C ratios indicated the following locations are deficient in capacity:

BOROUGH OF AUDUBON

a. Route 30 and Kings Highway

b. Route 30 and Nicholson Road

BOROUGH OF HADDONFIELD

a. Haddon Avenue, Euclid Avenue and Tanner Street

b. Kings Highway and Haddon Avenue

c. Kings Highway, Potter Street and Grove Street

d. Kings Highway and Warwick Road

BOROUGH OF HADDON HEIGHTS

a. Route 30 and Kings Highway

CHAPTER 7

TRAFFIC INFLUENCES

This chapter discusses the traffic influences exerted by parking supply and usage, traffic control devices, roadway lighting, pedestrian movements and roadway geometry.

PARKING - BOROUGH OF AUDUBON

At present there is no metered parking within the Borough. Parking is restricted on most of the roads making up the study system.

Business is conducted primarily along Route 30, Merchant Street, Pine Street and the Black Horse Pike Shopping Center. In most of these areas there is little off street parking with the exception of the Black Horse Pike Shopping Center which has more than ample off-street parking facilities.

PARKING - BOROUGH OF HADDONFIELD

There is some metered parking within the Borough, primarily along Kings Highway and on some of the adjacent streets within the Central Business District. *(See Exhibit Nos. 12 and 13).*

Business is conducted primarily along Kings Highway between Linden Avenue, Grove Street and Potter Street in addition to Haddon Avenue between Snowden Avenue and the Borough Line. There are some off street parking facilities in the Central Business District and the Haddonfield Station of the High Speed Line has ample off street parking for commuters.

PARKING - BOROUGH OF HADDON HEIGHTS

At present there is no metered parking within the Borough. Parking is restricted on some of the roads making up the study system.

Business is conducted primarily along Station Avenue between Route 30 and Eighth Avenue and also along Route 168 between Wayne Avenue and Maple Avenue. Off street parking is available at many of the stores located in this area.

PARKING - GENERAL

Some parking problems which are of concern are generated by the collector residential streets. Parking is permitted on both sides of these streets in many areas of the municipalities studied in this report and causes hazardous driving conditions due to the narrow roadways (twenty-eight (28) to thirty-six (36) feet) and offset street alignment. Those residential collector streets which the Consultant believes should have restricted parking are listed under the recommendations in this report.

TRAFFIC CONTROL DEVICES - BOROUGH OF AUDUBON

Traffic signals are located and operating at the following intersections.

LOCATION	TYPE	WARRANT SATISFIED	SIGNAL APPROVAL
a. Route 30 and Kings Highway	Semi-Actuated	1	Approved
b. Route 30 and Merchant Street	Semi-Actuated	2	Approved
c. Route 30 and West Nicholson Road	Semi-Actuated	2	Approved
d. Route 30 and Pine Street	Semi-Actuated	2	Approved
e. Route 168 and Merchant Street	Semi-Actuated	2	Approved
f. Route 168 and Nicholson Road	Semi-Actuated	1	Approved

TRAFFIC CONTROL DEVICES - BOROUGH OF HADDONFIELD

Traffic signals are located and operating at the following intersections.

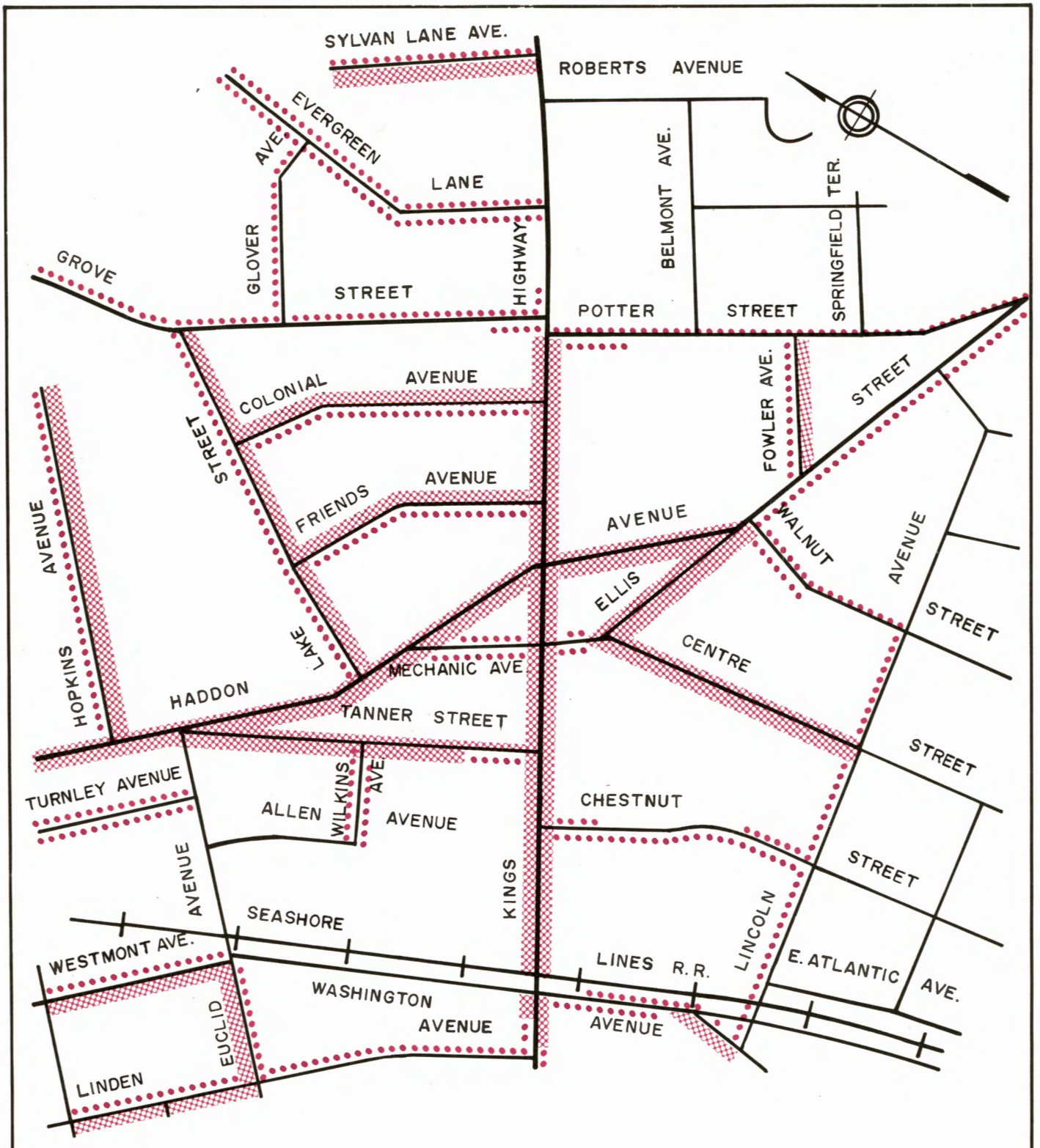
LOCATION	TYPE	WARRANT SATISFIED	SIGNAL APPROVAL
a. Kings Highway and Grove Street	Fixed Time	2	*
b. Kings Highway and Haddon Avenue	Fixed Time	1	*
c. Kings Highway and Tanner Street	Fixed Time	2	*
d. Kings Highway and Warwick Road	Fixed Time	2	Approved

* Denotes signals where approvals could not be found.

TRAFFIC CONTROL DEVICES - BOROUGH OF HADDON HEIGHTS

Traffic signals are located and operating at the following intersections.

LOCATION	TYPE	WARRANT SATISFIED	SIGNAL APPROVAL
a. Route 30 and Clements Bridge Road	Fixed Time	1	Approved

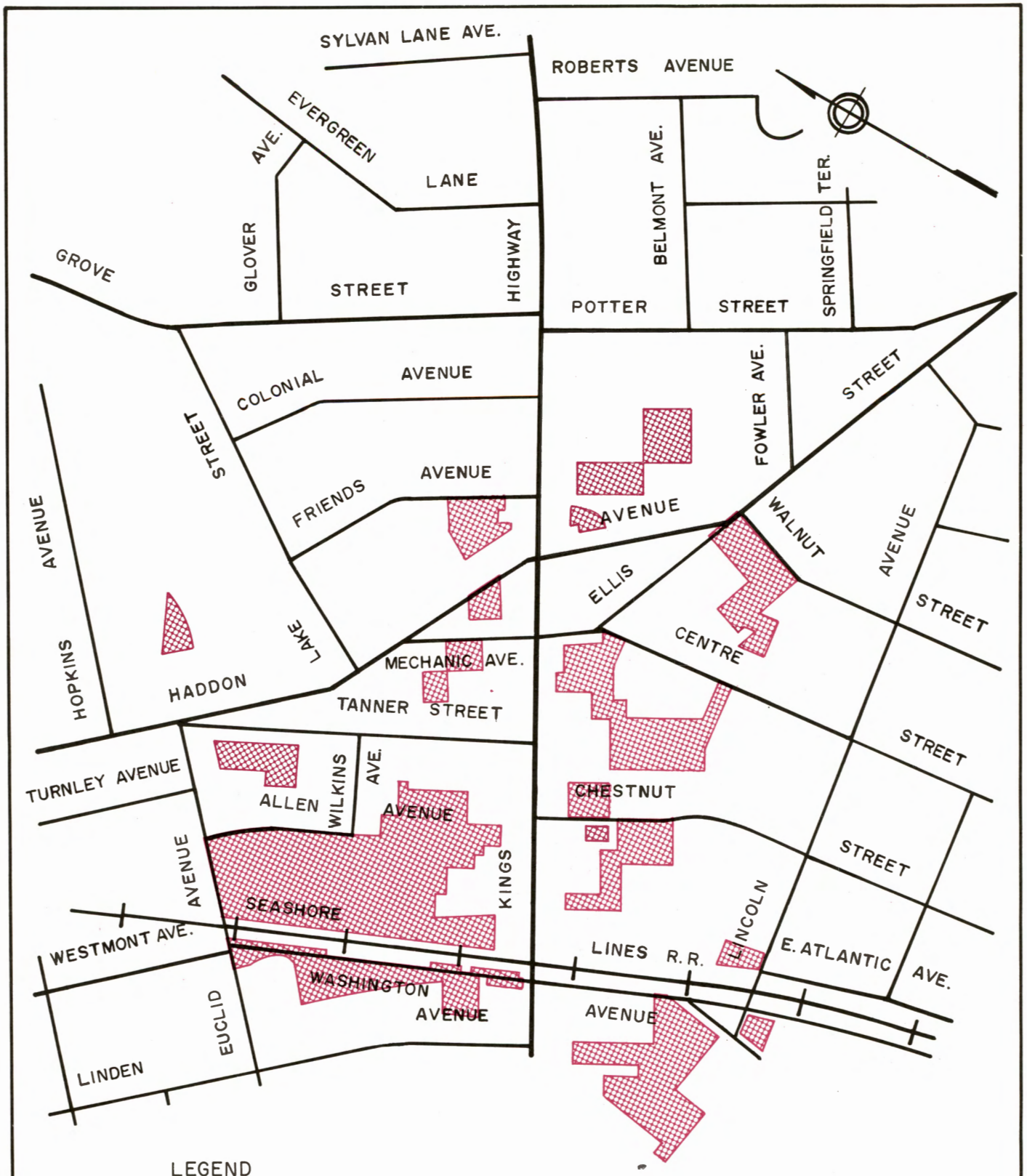


EXISTING ON STREET PARKING RESTRICTIONS

BOROUGH OF HADDONFIELD

EXHIBIT NO. 12

Kommerer, Symes & Assoc.
Consulting Engineers



EXISTING OFF STREET PARKING LOTS
BOROUGH OF HADDONFIELD
EXHIBIT NO. 13

Kammerer, Symes & Assoc.
Consulting Engineers

LOCATION	TYPE	WARRANT SATISFIED	SIGNAL APPROVAL
b. Route 30 and Kings Highway	Semi-Actuated	1	Approved
c. Route 30 and Station Avenue	Semi-Actuated	2	Approved
d. Route 168 and Ramps G and K to Interstate Route 295	Semi-Actuated	2	Approved

Exhibit No. 14 shows the existing traffic signal locations within the municipalities studied in this report. All of these signals are warranted in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways. Additional signal installations accompanied by improvements to existing facilities will be discussed under "Detailed Recommendations".

Timing cycles vary from ninety (90) to seventy (70) seconds for most of the signals in this area.

PEDESTRIAN MOVEMENTS

Pedestrian movements are not a major problem in any of the municipalities studied in this report. The Borough of Audubon encounters some pedestrian traffic in the Central Business District during the heavy shopping hours. In the Borough of Haddonfield pedestrian traffic is heaviest along Kings Highway in the Central Business District and along Haddon Avenue. In the Borough of Haddon Heights the only location where there is any concentration of pedestrian traffic is the intersection of Route 30 and Station Avenue, to reiterate however, none of the above-mentioned locations pose any serious problems.

During the beginning and ending of school hours there is heavy pedestrian traffic at all schools, which is controlled by crossing guards. At those schools where signalized intersections are close, it is the practice for the children to walk to the intersection, for guidance by the crossing guard. The crossing guards have little or no adverse effect on traffic.

ROADWAY LIGHTING

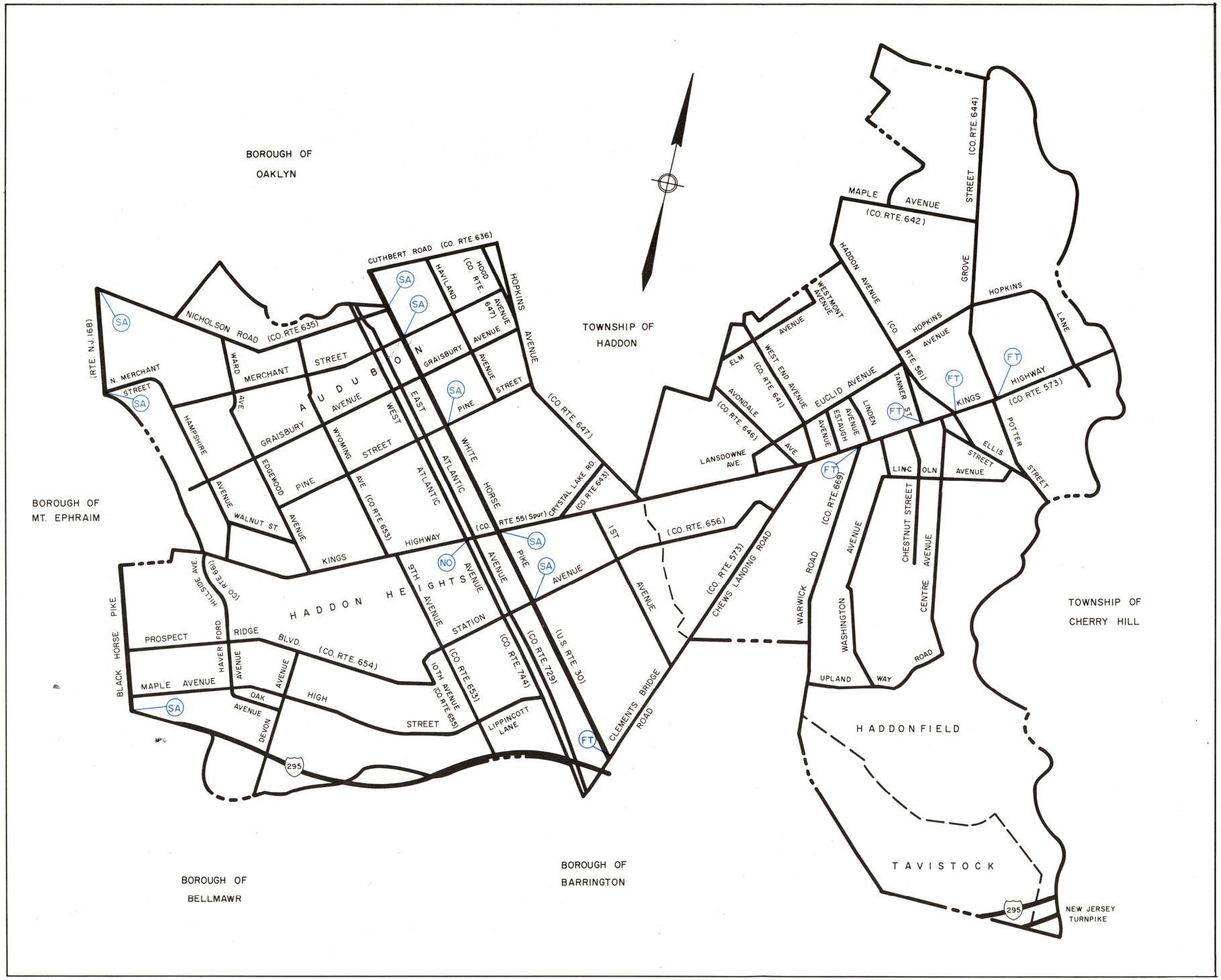
Most of the municipal roadways appear to be adequately lighted, but lighting on the County roads is, in general, confined to intersections. Even though many of the County roads will be reconstructed in the near future, there is a present need for additional lighting due to the existing poor condition of these roadways.

ROADWAY GEOMETRY

Geometry on most of the roadways is good. Some of the collector streets have cartways varying from thirty-six (36) to forty (40) feet. These roads are suitable for two (2) lane but not four (4) lane operation. In many cases where separate turning lanes have been provided, their effectiveness has been reduced due to inadequate width and length.

LOCATIONS OF EXISTING
TRAFFIC SIGNALS

EXHIBIT NO. 14



SA Semi - Actuated

FT Fixed Time

NO Not in Operation

LOCATIONS OF EXISTING
TRAFFIC SIGNALS

EXHIBIT NO. 14

CHAPTER 8

BUS AND TRUCK OPERATIONS

BUS SERVICE

There are two (2) public transit agencies operating in the Borough of Haddonfield and the Borough of Tavistock. These agencies are:

a. Transport of New Jersey - Interstate

b. Dial-A-Ride - Local

Transport of New Jersey also operates in the Borough of Audubon and the Borough of Haddon Heights.

Transport of New Jersey is operating a temporary feeder system in conjunction with the Port Authority Transit Corporation (PATCO) High Speed Line. It involves the rerouting of twenty (20) bus lines to terminate at various PATCO stations in addition to a modified normal local service.

The deadline for the trial system was February 1, 1973; however it has been extended to the latter part of 1973, at which time it will revert to the original system unless the outcome of the experiment is favorable and further monies are appropriated by the New Jersey Legislature to subsidize the program. The Consultant recommends that the system be continued and even further implemented, if possible.

BOROUGH OF AUDUBON

Transport of New Jersey operates twelve (12) bus routes throughout the Borough, providing transportation to Philadelphia in addition to many southern New Jersey communities. These routes serve the areas along Route 30, Route 168, Cuthbert Road, Hopkins Avenue, Kings Highway, Nicholson Road (Audubon Park vicinity) Merchant Street (in C.B.D.) and Crystal Lake Avenue. Service is provided daily at fifteen (15) minute intervals between 6:00 a.m. and 7:00 p.m. and half hour to one hour intervals between 7:00 p.m. and 6:00 a.m. Service is augmented during the morning and evening heavy travel hours of 6:30 a.m. - 8:00 a.m. and 3:30 p.m. - 6:00 p.m. During these hours, service is provided at approximately five (5) minute intervals. The Saturday schedule runs with intervals of one (1) hour and on Sundays the intervals are two (2) hours. There are presently two (2) lines rerouted to stop at the Collingswood PATCO station, five (5) lines to stop at the Broadway (Camden City) PATCO station, one (1) line to stop at the Ferry Avenue PATCO station and one (1) line to stop at the City Hall (Camden City) PATCO station, all the lines being from Audubon and surrounding communities.

BOROUGH OF HADDONFIELD

Transport of New Jersey operates five (5) bus routes throughout the Borough, providing transportation to Philadelphia in addition to many southern New Jersey communities. These routes serve the areas along Kings Highway, Haddon Avenue, Potter Street, Grove Street,

Avondale Avenue, West End Avenue, Maple Avenue, Warwick Road and Gill Road. Service is provided daily at half hour intervals, from 5:00 a.m. to 10:00 p.m., and is augmented during the morning and evening heavy travel hours of 6:30 a.m. - 8:30 a.m. and 3:30 p.m. - 6:00 p.m. During these hours, service is provided at approximately ten (10) minute intervals. An abbreviated schedule of one (1) hour intervals between 5:30 a.m. and 10:00 p.m. is used on Saturdays. There is no service on Sundays or holidays. There are presently six (6) lines rerouted to the Haddonfield PATCO station and two (2) lines rerouted to the City Hall (Camden City) PATCO station from Haddonfield and surrounding communities.

The Dial-A-Ride system is sponsored by both the Federal Urban Mass Transit Administration and the New Jersey Department of Transportation. This system somewhat follows a basic route pattern but deviates from it to accommodate the passengers. Transportation is obtained by telephone request, and service is "door to door", twenty-four (24) hours per day, seven (7) days a week. Dial-A-Ride serves the entire Borough plus portions of surrounding communities. It also provides service to and from the Cherry Hill Mall.

BOROUGH OF HADDON HEIGHTS

Transport of New Jersey operates ten (10) bus routes throughout the Borough, providing transportation to Philadelphia in addition to many southern New Jersey communities. These routes serve the areas along Route 30, Route 168, Kings Highway, Second Avenue, Ninth Avenue, Station Avenue (south of Route 30) and Sycamore Street. Service is provided daily at fifteen (15) minute intervals between 6:00 a.m. and 7:00 p.m. and half hour to one (1) hour intervals between 7:00 p.m. and 6:00 a.m. Service is augmented during the morning and evening heavy travel hours of 6:30 a.m. - 8:00 a.m. and 3:30 p.m. - 6:00 p.m. During these hours, service is provided at approximately five (5) minute intervals. The Saturday schedule runs with intervals of one (1) hour and Sundays have scheduled intervals of two (2) hours. There are presently four (4) lines rerouted to stop at the Broadway (Camden City) and Haddonfield PATCO stations, two (2) routes stopping at the Ferry Avenue and Westmont PATCO stations and one (1) route stopping at the City Hall (Camden City) PATCO station, all the routes being from Haddon Heights and surrounding communities.

BOROUGH OF TAVISTOCK

Transport of New Jersey operates one (1) bus route serving the Borough which provides transportation to Philadelphia in addition to many southern New Jersey communities. This route serves the area along Warwick Road. Service is provided daily, except Saturdays and Sundays, on a limited basis with only a few trips during the morning and evening hours of heavy travel. There is presently one (1) route stopping at the Haddonfield PATCO station from Tavistock and surrounding communities.

TRUCK OPERATIONS

There are no trucking operations of any major significance other than local deliveries in the Borough of Audubon, the Borough of Haddonfield, the Borough of Haddon Heights or the Borough of Tavistock.

INFLUENCE ON TRAFFIC

The current patterns and volumes of truck traffic have no adverse influence on the flow of traffic in the Borough of Audubon, the Borough of Haddonfield or the Borough of Haddon Heights. The current patterns and routes of buses, however, account for added congestion and delay, especially along Route 30 and Route 168. This is due to the high traffic volumes and narrow streets that have insufficient shoulder area for a bus to safely pull off and transfer passengers. Buses are forced to stop in a "through" lane thereby impeding the flow of traffic. Recommendations for relocating or improving existing bus stops are detailed in Chapter 13 of this report.

CHAPTER 9

TRAFFIC REGULATION AND ENFORCEMENT

This chapter is concerned with Municipal ordinances and State laws, the enforcement thereof and the effects on traffic.

ORDINANCES

Title 39 of the Revised Statutes of the State of New Jersey "Motor Vehicles and Traffic Regulations" governs the regulating powers of local municipalities with respect to local roadways. In accordance with R.S. 39:4-197, the municipality has the power to adopt ordinances concerning traffic and parking as follows:

a. Speed limits.

b. One-way streets.

c. Placement of stop and yield signs.

d. Areas of restricted parking.

e. Restricting heavy commercial vehicles on certain streets.

f. Establishing bus and taxi stops.

g. Establishing curb loading zones.

h. Traffic signals.

All ordinances pertaining to the above must be approved by the Commissioner of the New Jersey Department of Transportation.

CODIFICATION AND APPROVAL

BOROUGH OF AUDUBON

Section 92 of the Code of the Borough of Audubon lists twenty-four (24) ordinances pertaining to traffic. Ordinances 92-1 to 8 and 92-22 to 92-24 have not been approved. Ordinances 92-9 to 21 have been approved.

BOROUGH OF HADDONFIELD

Traffic laws and ordinances for the Borough of Haddonfield have not been codified. Fifty-seven (57) have been proposed of which twenty-five (25) have been approved. The categories cover parking, traffic regulations, street signs, one way streets and traffic lights.

BOROUGH OF HADDON HEIGHTS

Traffic laws and ordinances for the Borough of Haddon Heights have not been codified. Twenty-one (21) have been proposed of which thirteen (13) have been approved.

GENERAL

It is the recommendation of the Consultant that where all necessary ordinances have not been proposed and approved, expeditious action be taken to accomplish this goal. Also it is the Consultant's recommendation that all ordinances concerning traffic regulation, control and enforcement be codified into one (1) section.

ENFORCEMENT

The enforcement of parking and signal regulations appears to be generally satisfactory for the Municipalities studied in this report. Speed limits are not enforced as stringently as they should be mainly because many are unreasonably low for the volumes of traffic and type of roads covered. Note must also be made that many of these low speed limits have never been approved by the New Jersey Department of Transportation. Greater emphasis should be placed on the enforcement of stop and yield controls.

ACCIDENT RECORDS

BOROUGH OF AUDUBON

Accident records indicate that fifty-seven point three (57.3) percent of the occurrences were right angle accidents, eighteen point six (18.6) percent were left turn accidents and eighteen point six (18.6) percent were same direction accidents. There seems to be clear indication from these records and field observations that the major causes are failure to obey traffic control devices, misjudging speed of traffic and failure to exercise safe driving habits. Improvement in enforcing these regulations and restricting the indiscriminate use of STOP and YIELD signs and speed limits on roads not included in the study system is considered warranted.

BOROUGH OF HADDONFIELD

Accident records indicate that thirty-five point nine (35.9) percent of the occurrences were same direction accidents and twenty-one point two (21.2) percent were left turn accidents. The same comments made by the Consultant regarding causation in the case of Audubon Borough apply with equal force to the Borough of Haddonfield.

BOROUGH OF HADDON HEIGHTS

Accident records indicate that thirty-four point one (34.1) percent of the occurrences were same direction accidents and twenty-nine point one (29.1) percent were left turn accidents. The same comments made by the Consultant regarding causation in the case of Audubon Borough apply with equal force to the Borough of Haddon Heights.

CHAPTER 10

GENERAL INFORMATION ON IMPROVEMENTS

IMPROVEMENTS

This report covers four (4) basic areas of recommended improvements for the Borough of Audubon, the Borough of Haddonfield and the Borough of Haddon Heights. They are:

a. Traffic control devices.

b. Physical roadway system.

c. Traffic flow.

d. Parking.

TRAFFIC CONTROL DEVICES

This area covers proposed traffic signals, reconstruction of existing signals, pavement markings, signing and channelization.

Some traffic signal installations have been in operation for many years, and should be reconstructed to conform to the Manual on Uniform Traffic Control Devices for Streets and Highways. Other signals need reconstruction to efficiently control the increased traffic demands.

Traffic signal installations reach maximum efficiency when they are set up to be responsive to traffic demands with provisions for fluctuations by means of semi and fully actuated controllers in order to optimize the distribution of green time. Existing and proposed signals can be timed to provide progressive movement of traffic for various volumes which are encountered during the day.

Through the use of pavement markings and/or signs, more efficient use of existing traffic lanes can be achieved. Recommendations include revision of non-standard devices and the placement of traffic control devices on the study network with the objective that increased safety, capacity and desirable quality of flow will be achieved.

PHYSICAL ROADWAY SYSTEM

Recommendations will be made covering renovations to the geometry of the roadway system within the study area to provide additional capacity and smoother traffic flow. Areas of consideration include widening of roadways, restricted turning lanes, channelization and improved riding quality. In areas where geometric improvements have been considered, specific recommendations have been made in an effort to stay within existing rights of way. The area of additional right of way which may be required to construct proposed improvements has been kept to a minimum.

TRAFFIC FLOW

The major roadways of the municipalities studied in this report with the exception of the Borough of Tavistock are presently overloaded with traffic, during peak and off peak hours. All indications of growth in Camden County denote a continued increase in the volumes of traffic. With the existing restrictions on right of way, it will be necessary to reduce the rate of growth of traffic by encouraging traffic to use alternate routes, car pools or mass transportation.

PARKING - BOROUGH OF AUDUBON

The street system in the Borough of Audubon is basically a grid type system with the exception of a few streets located in back of the Black Horse Pike Shopping Center which are based on a curvilinear type design. Some of the homes located in the residential areas have no driveways thereby causing a certain amount of on street parking. However, parking is not a significant problem in the Borough, except in the Central Business District Area and along some sections of Route 30. The previously mentioned Black Horse Pike Shopping Center has ample off street parking facilities.

PARKING - BOROUGH OF HADDONFIELD

The street system in the Borough of Haddonfield is based on a grid type design. Some of the streets have narrow cartways thereby causing somewhat of a parking problem. Some of the homes located in the residential areas have no driveways thereby causing a certain amount of on street parking. Parking is a problem, however, in the Central Business District and along Haddon Avenue. Recommendations for improving this situation are included in Chapter 13 of this report.

PARKING - BOROUGH OF HADDON HEIGHTS

The street system in the Borough of Haddon Heights is based on a grid type design. The few streets with narrow cartway widths do not cause any significant parking problems. Some of the homes located in the residential areas have no driveways thereby causing a certain amount of on street parking. Many places of business are located along Route 168 but these offer an ample number of off street parking facilities. For the most part there are no major parking problems within the Borough.

CHAPTER 11

AREA WIDE CONSIDERATIONS

LAND USE

Traffic flow on the road network studied in this report is heavily influenced by the land use patterns of not only Audubon, Haddonfield, Haddon Heights and Tavistock but also the surrounding communities. In this study, consideration has been given to the changing land use patterns of the entire area.

GROWTH FACTORS

Development of realistic growth factors for use in projecting 1970 traffic volumes to the volumes expected in 1975 and 1980 took into consideration the land use, area, population growth and data on growth of traffic volumes on surrounding roadways.

IMPROVED CRITERIA

Improvements recommended in this report are based on the TOPICS concept of improving the safety, capacity and quality of traffic flow on a selected street system.

A detailed analysis has been made of locations on the study system that are deficient in capacity, have a poor quality of travel, and a high accident incidence to determine those traffic engineering improvements which would be best suited to solving specific problems.

PROJECT PRIORITIES

In the interest of comparing the needs of each location found deficient in the TOPICS Study with that of the other locations, a priority has been developed for each project. The method used considered accident experiences, the volume to capacity ratios and the travel time delays. Through the use of these parameters a tentative priority number was assigned to each deficient area to develop a tentative project list. The priority listing was then reviewed with local and County officials. The final project priorities were established following the review with these officials.

PROBLEM AREAS - BOROUGH OF AUDUBON

The following problem areas were established in the order of their priority.

Project No. AU-1	Nicholson Road and East and West Atlantic Avenues U.S. Route 30 and Nicholson Road
Project No. AU-2	Hopkins Avenue, Barrett Avenue and Pine Street
Project No. AU-3	Kings Highway and Crystal Lake Avenue
Project No. AU-4	Improvement to the Flow of Traffic Along East and West Atlantic Avenues

Project No. AU-5 Kings Highway and West Atlantic Avenue

Project No. AU-6 Kings Highway, Ninth Avenue and Wyoming Avenue

Project No. AU-7 Entrances to the Black Horse Pike Shopping Center From Nicholson Road

Project No. AU-8 East Atlantic Avenue and Pine Street

Project No. AU-9 Crystal Lake Avenue and Hopkins Avenue

PROBLEM AREAS - BOROUGH OF HADDONFIELD

The following problem areas were established in the order of their priority.

Project No. HA-1 Kings Highway and Haddon Avenue

Project No. HA-2 Haddon Avenue, Euclid Avenue and Tanner Street

Project No. HA-3 Haddon Avenue, Ellis Street and Snowden Avenue

Project No. HA-4 Kings Highway, Potter Street and Grove Street

Project No. HA-5 Kings Highway, West End Avenue and Chews Landing Road

Project No. HA-6 Maple Avenue and Grove Street

Project No. HA-7 Interconnection of Traffic Signals Along Kings Highway

Project No. HA-8 Potter Street and Ellis Street

Project No. HA-9 Improvement to the Flow of Traffic Along Haddon Avenue

Project No. HA-10 Kings Highway and Warwick Road

Project No. HA-11 Kings Highway and Tanner Street

Project No. HA-12 Kings Highway and Hinchman Avenue

Project No. HA-13 Kings Highway and Chestnut Street

PROBLEM AREAS - BOROUGH OF HADDON HEIGHTS

The following problem areas were established in the order of their priority.

Project No. HH-1 East and West Atlantic Avenues and Station Avenue

Project No. HH-2 U.S. Route 30 and Station Avenue

Project No. HH-3 Ninth Avenue and Station Avenue

Project No. HH-4 Clements Bridge Road, East Atlantic Avenue and Barrington Avenue

PROBLEM AREAS - GENERAL

Project No. G-1 Typical Left Turn Lane Pavement Markings

Project No. G-2 General Speed Limits

CHAPTER 12

INTERSECTIONS INVOLVING STATE HIGHWAYS - GROUP FIVE

The following is a summary on the status of intersections involving State Highways in the Borough of Audubon, the Borough of Haddonfield, the Borough of Haddon Heights and the Borough of Tavistock, which were studied under the Camden County TOPICS Program. The Borough of Audubon has nine (9) such locations, the Borough of Haddonfield has none, the Borough of Haddon Heights has seven (7) and the Borough of Tavistock has none. The New Jersey Department of Transportation employs a continuing program of study, evaluation and improvement of the State Highway System in its entirety. A meeting was held with State Officials in March of 1972, regarding the problems encountered on State Highways and intersections involving State Highways. Outlined below are the results of that meeting.

BOROUGH OF AUDUBON

1. PROBLEM LOCATIONS FOR WHICH PLANS AND RECOMMENDED SOLUTIONS ARE STATED IN CHAPTER 13 OF THIS REPORT

   a. U.S. Route 30 and Nicholson Road

2. PROBLEM LOCATIONS WHICH ARE CURRENTLY UNDER STUDY BY THE NEW JERSEY DEPARTMENT OF TRANSPORTATION

   a. U.S. Route 30 and Kings Highway

3. LOCATIONS WHICH WERE STUDIED BUT ARE NOT CONSIDERED AS PROBLEM AREAS

   a. U.S. Route 30 and Dowling Avenue

   b. U.S. Route 30 and Ervin Avenue

   c. U.S. Route 30 and Graisbury Avenue

   d. U.S. Route 30 and Merchant Street

   e. U.S. Route 30 and Pine Street

   f. Route N.J. 168 and Merchant Street

   g. Route N.J. 168 and Nicholson Road

BOROUGH OF HADDON HEIGHTS

1. PROBLEM LOCATIONS FOR WHICH RECOMMENDED SOLUTIONS ARE STATED IN NARRATIVE AND/OR GRAPHIC FORM IN CHAPTER 13 OF THIS REPORT

   a. U.S. route 30 and Station Avenue

2. PROBLEM LOCATIONS WHICH ARE CURRENTLY UNDER STUDY BY THE NEW JERSEY DEPARTMENT OF TRANSPORTATION

   a. U.S. Route 30 and Kings Highway

3. LOCATIONS WHICH WERE STUDIED BUT ARE NOT CONSIDERED AS PROBLEM AREAS

   a. U.S. Route 30 and Clements Bridge Road

   b. U.S. Route 30 and Garden Street

   c. Route N.J. 168 and Maple Avenue

   d. Route N.J. 168 and Prospect Ridge Boulevard

   e. Route N.J. 168 and Sycamore Avenue

CHAPTER 13

DETAILED RECOMMENDATIONS

The detailed recommendations presented in this Chapter are divided into two (2) main categories: (1) improvements requiring changes in geometry, and (2) those minor changes requiring only signing or pavement markings.

Twenty-eight (28) recommended projects for improvement are included in this report, nine (9) are located in the Borough of Audubon, thirteen (13) are located in the Borough of Haddonfield, four (4) are located in the Borough of Haddon Heights and two (2) are general in nature. Several projects involve more than one (1) location within the area. The major changes are presented graphically showing the existing and proposed geometry in addition to an aerial photograph of the location. Minor changes have been presented in narrative or graphic form, depending on the nature of the recommendation. *Exhibit No. 15* shows the locations of the recommended improvements.

The recommendations presented have taken into consideration the following:

a. Traffic flow problems.

b. Accidents.

c. Capacity requirements for existing and future traffic flow.

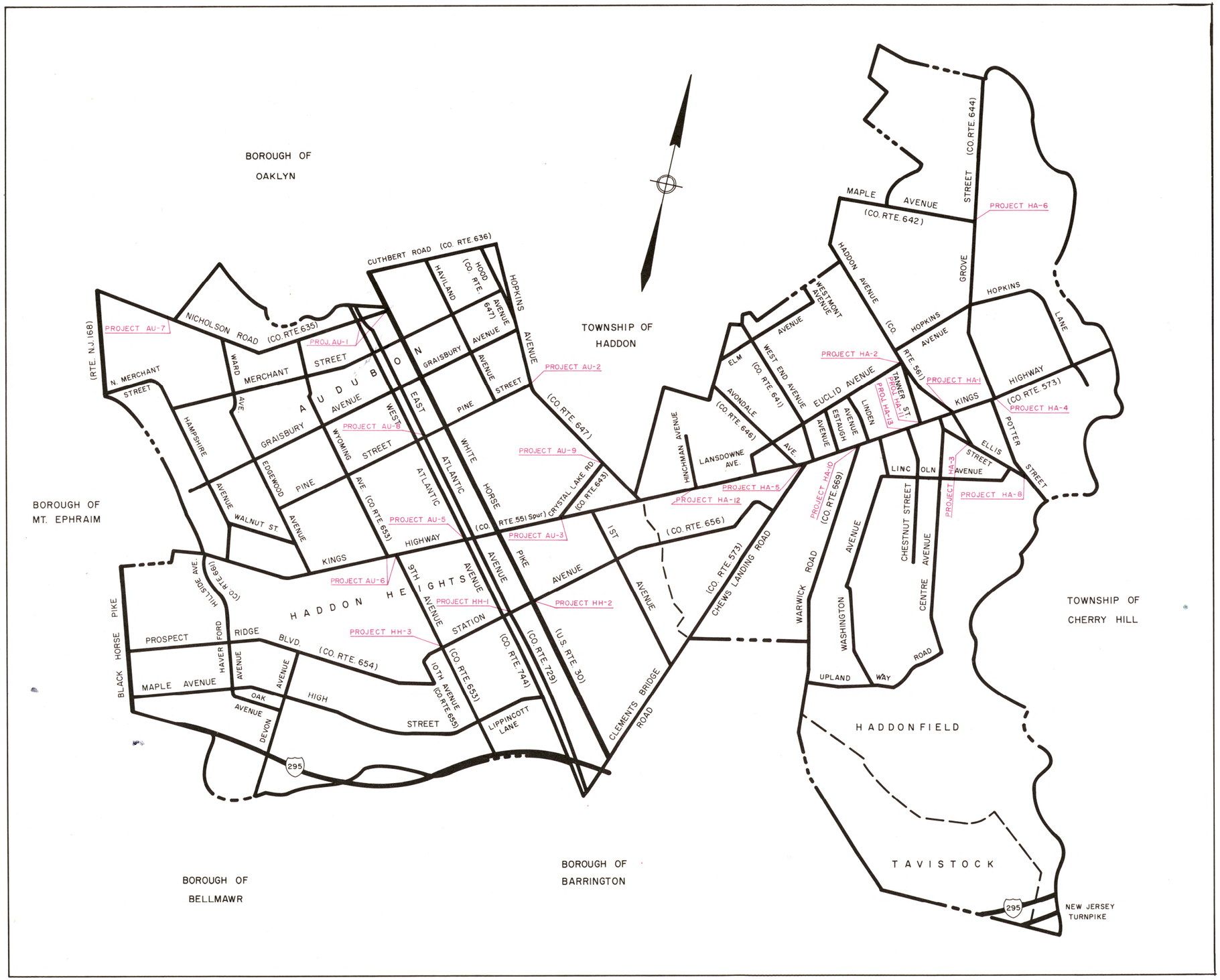
d. Existing topography and land use proposed for each location.

e. Existing and planned geometry of the roadways.

The recommended improvements which follow are listed in the order of priority previously established in conjunction with the Boroughs and the County.

LOCATIONS OF
RECOMMENDED IMPROVEMENTS

EXHIBIT NO. 15



LOCATIONS OF
RECOMMENDED IMPROVEMENTS

EXHIBIT NO. 15

PROJECT IMPROVEMENTS

BOROUGH OF AUDUBON

Kammerer, Symes & Associates, Inc.
CONSULTING ENGINEERS

PROJECT NO. AU-1 NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES
U.S. ROUTE 30 AND NICHOLSON ROAD
BOROUGH OF AUDUBON

Project No. AU-1 covers the reconstruction of the Pennsylvania Reading Seashore Line Bridge 5.65, the vehicular bridge and the intersections of Nicholson Road, East Atlantic and West Atlantic Avenues and Route 30 and Nicholson Road. *(Exhibit No. 16)*.

NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES

a. PROBLEMS

(1) The sight distance for traffic exiting from East and West Atlantic Avenues onto Nicholson Road is restricted by the abutments of both the railroad overpass and the vehicular overpass on Nicholson Road.

(2) Vertical clearance of the railroad overpass and the vehicular overpass is inadequate and does not meet the requirements of truck traffic.

(3) Narrow width of Nicholson Road at the railroad overpass and the vehicular overpass cannot safely accommodate existing volumes of traffic.

(4) Corner radii are not large enough to accommodate safe turning movements.

(5) Near side bus stop restricts the right turn movement on the north approach of West Atlantic Avenue.

(6) The approach roadways on Nicholson Road and West Atlantic Avenue are too narrow to safely accommodate turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
West Atlantic Avenue North Approach	8	71
West Atlantic Avenue South Approach	46	23
Nicholson Road East Approach	1	2
Nicholson Road West Approach	10	1

b. RECOMMENDATIONS

(1) Reconstruct the railroad overpass and the vehicular overpass, by widening to sixty-six (66) feet between abutments and to forty-six (46) feet between curbs. Increase clearance to fourteen (14) feet and six (6) inches.

(2) Widen Nicholson Road to forty-six (46) feet from the west approach of West Atlantic Avenue to Route 30.

(3) Relocate the bus stop to the far side corner on West Atlantic Avenue.

(4) Make East Atlantic Avenue one-way northbound and West Atlantic Avenue one-way southbound as recommended in Project No. AU-4 of this report.

(5) Prohibit parking on all approaches.

c. BENEFITS

(1) Sight distance will be improved.

(2) Friction between buses and other traffic will be reduced.

(3) A safer and smoother flow of traffic will be achieved.

U.S. ROUTE 30 AND NICHOLSON ROAD

a. PROBLEMS

(1) Present levels of service are "F" on the west approach, "B" on the south approach and "C" on the north approach. The 1971 peak volumes for each approach compared to the 1971 average volumes are summarized below.

	1971 PEAK VOLUME VEH./HR.	1971 AVERAGE VOLUME VEH./HR.
Route 30 North Approach	1169	1087
Route 30 South Approach	841	772
Nicholson Road West Approach	396	354

(2) Present level of service, for left turn movements, is "F" on the south approach. The 1971 peak left turn volume for the south approach compared to the 1971 average volume is summarized below:

	1971 PEAK LEFT TURN VOLUME VEH./HR.	1971 AVERAGE LEFT TURN VOLUME VEH./HR.
Route 30 South Approach	88	62

(3) The severe grade drop and tight corner radii at Nicholson Road and Route 30 restrict safe turning movements.

(4) Insufficient clearance time is allocated for traffic moving through the intersection.

(5) Accident records indicate a total of nineteen (19) accidents during the three (3) year period from 1968 through 1970. Of this total, nine (9) were classified as left turn accidents, eight (8) were classified as same direction accidents, one (1) was classified as a right angle accident and one (1) was classified as a collision with a fixed object.

b. RECOMMENDATIONS

(1) Widen Nicholson Road to forty-six (46) feet.

(2) Increase the corner radii and reduce the grade drop at this intersection by raising the grade on Nicholson Road and lowering the grade on Route 30.

(3) Provide an advance green indication for the south approach of Route 30.

(4) Revise the cycle timing to provide a two (2) second minimum all red period following the Route 30 change interval.

(5) Prohibit parking on all approaches.

c. BENEFITS

(1) The capacity and level of service of the west approach of Nicholson Road will be improved.

(2) Capacity for left turns on the south approach of Route 30 will be improved.

(3) Accident potential will be reduced.

(4) The number of left turn and same direction accidents will be reduced.

(5) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 266,400.00
(2) Construction	1,776,000.00
(3) Right of Way	120,000.00
*Total Estimated Cost	$2,162,400.00

* Includes both projects.

PROJECT NO. AU-1

NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES

U.S. ROUTE 30 AND NICHOLSON ROAD

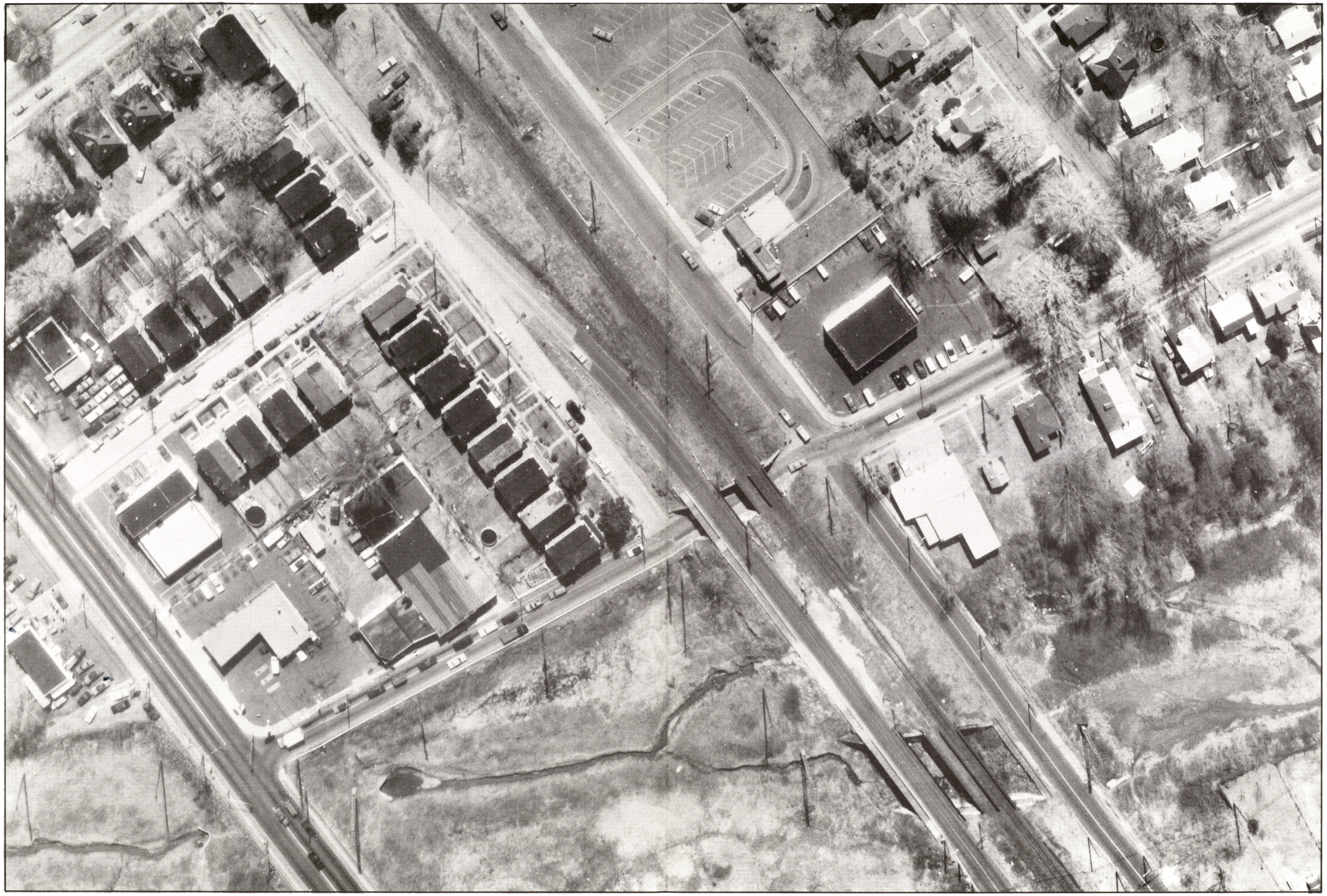
EXHIBIT NO. 16

PROJECT NO. AU-1

NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES

U.S. ROUTE 30 AND NICHOLSON ROAD

EXHIBIT NO. 16

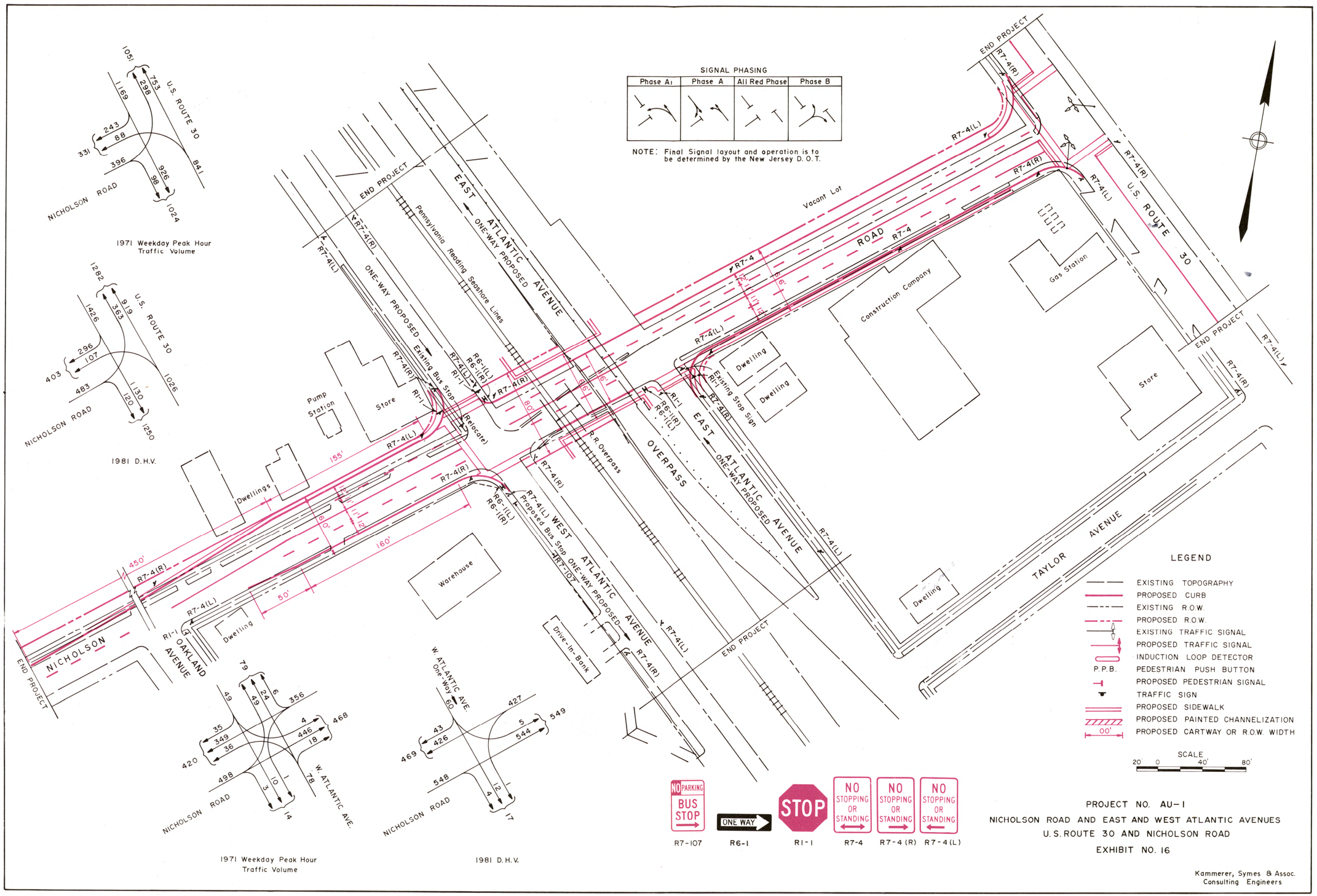


PROJECT NO. AU-1

NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES

U.S. ROUTE 30 AND NICHOLSON ROAD

EXHIBIT NO. 16



PROJECT NO. AU-1

NICHOLSON ROAD AND EAST AND WEST ATLANTIC AVENUES
U.S. ROUTE 30 AND NICHOLSON ROAD

EXHIBIT NO. 16

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. AU-2 HOPKINS AVENUE, BARRETT AVENUE AND PINE STREET BOROUGH OF AUDUBON

Project No. AU-2 covers the reconstruction of the intersection of Hopkins Avenue, Barrett Avenue and Pine Street. *(Exhibit No. 17).*

a. PROBLEMS

(1) Hopkins Avenue intersects Pine Street on a horizontal curve at an angle greater than ninety (90) degrees.

(2) Horizontal alignment for traffic traveling in a northbound and southbound direction along Hopkins Avenue is poor.

(3) The intersection on the south approach of Hopkins Avenue is wide open and does not provide for the safe channelization of traffic.

(4) Traffic exiting from Barrett Avenue, located on the northwest corner, must cross Pine Street to proceed onto Hopkins Avenue.

(5) Near side bus stops on Hopkins Avenue restrict both the right turn movements on the north approach and the flow of traffic on the south approach of the intersection.

(6) The sight distance for traffic exiting from Pine Street onto Hopkins Avenue is restricted by a hedge row on the northwest corner.

b. RECOMMENDATIONS

(1) Flatten the horizontal curve on the south approach of Hopkins Avenue.

(2) Install CURVE AHEAD signs on the Hopkins Avenue approaches.

(3) Provide painted channelization on the south approach as shown on the plan.

(4) Make Barrett Avenue one-way northbound from Pine Street to Graisbury Avenue.

(5) Relocate the bus stops on Hopkins Avenue as shown on the plan.

(6) Remove hedge within the right of way on the northwest corner to improve sight distance.

(7) Prohibit parking on all approaches.

c. BENEFITS

(1) A smoother flow of traffic will be achieved.

(2) Friction between buses and other traffic will be reduced.

(3) Safer left turns from Hopkins Avenue onto Pine Street will be provided.

(4) Sight distance will be improved.

d. ESTIMATED COSTS

(1) Engineering	$ 600.00
(2) Construction	2,500.00
(3) Signs and Markings	600.00
(4) Right of Way	600.00
Total Estimated Cost	$4,300.00

PROJECT NO. AU-2

HOPKINS AVENUE, BARRETT AVENUE AND PINE STREET

EXHIBIT NO. 17

PROJECT NO. AU-2

HOPKINS AVENUE, BARRETT AVENUE AND PINE STREET

EXHIBIT NO. 17



PROJECT NO. AU-2

HOPKINS AVENUE, BARRETT AVENUE AND PINE STREET

EXHIBIT NO. 17

TOWNSHIP OF HADDON

MOUNT VERNON AVENUE

Dwellings

Township Line

HOPKINS AVENUE

R7-107

Proposed Bus Stop

R7-107

R1-1

END PROJECT

R7-4(R)

W1-2(L)

R7-4(L)

Existing Bus Stop (Relocate)

R7-4(R)

Dwellings

Dwellings

Stores

R3-7(L)

R7-4

15'

15'

6'

12'

10'

17'

R3-7(L)

END PROJECT

R7-4(L)

W1-2(R)

AVENUE

15'

15'

R7-4(R)

R7-4

R7-107

R7-107

Proposed Bus Stop

R7-4(L)

R6-1(R)

R6-1(L)

R7-4(R)

BARRETT AVENUE

ONE-WAY PROPOSED

R1-1

18'

18'

R7-4(R)

R7-4(L)

END PROJECT

Dwellings

Dwellings

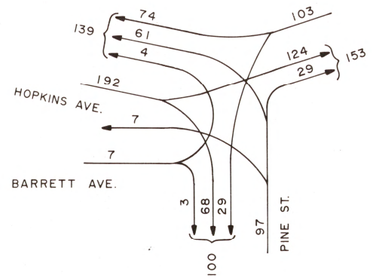
Dwellings

BOROUGH OF AUDUBON

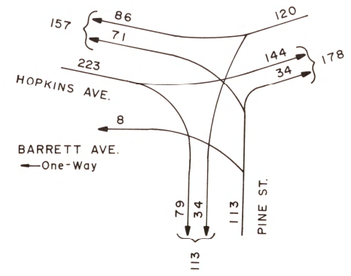
PINE STREET

WESLEYAN AVENUE

LAFAYETTE AVENUE



1973 Weekday Peak Hour Traffic Volume



1983 D.H.V.

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

STOP R1-1

NO PARKING BUS STOP R7-107

NO STOPPING OR STANDING R7-4

NO STOPPING OR STANDING R7-4(L)

NO STOPPING OR STANDING R7-4(R)

LEFT LANE MUST TURN LEFT R3-7(L)

W1-2(R)

W1-2(L)

ONE WAY R6-1

PROJECT NO. AU-2

HOPKINS AVENUE, BARRETT AVENUE AND PINE STREET

EXHIBIT NO. 17

Kammerer, Symes & Assoc.
Consulting Engineers


CRYSTAL
LAKE
AVENUE
KINGS
HIGHWAY

PROJECT NO. AU-3 KINGS HIGHWAY AND CRYSTAL LAKE AVENUE
BOROUGH OF AUDUBON

Project No. AU-3 covers the improvements to the intersection of Kings Highway and Crystal Lake Avenue.

a. PROBLEMS

(1) This is a "Y" intersection, with Crystal Lake Avenue intersecting Kings Highway at a flat angle.

(2) Kings Highway is presently marked for one lane of travel in each direction, and is not wide enough for four (4) lanes.

(3) Vehicles desiring to turn left onto Crystal Lake Avenue from the west approach of Kings Highway must straddle the centerline while waiting to turn.

(4) The intersection does not provide for the safe channelization of traffic.

(5) Pavement markings are not properly maintained.

b. RECOMMENDATIONS

(1) Provide painted channelization, as shown on *Exhibit No. G-1* for left turns from Kings Highway into Crystal Lake Avenue.

(2) Prohibit parking on both sides of Kings Highway between Second and Third Avenues and on both sides of Crystal Lake Avenue for one hundred and fifty (150) feet.

(3) Repaint pavement markings and provide for scheduled maintenance.

c. BENEFITS

(1) Additional stacking space for left turns will be provided.

(2) A smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$130.00
(2) Signs and Markings	670.00
Total Estimated Cost	$800.00

NOTE: This project is shared with Haddon Heights.

PROJECT NO. AU-4 IMPROVEMENT TO THE FLOW OF TRAFFIC ALONG EAST AND WEST ATLANTIC AVENUES

BOROUGH OF AUDUBON

Project No. AU-4 covers the improvement to the flow of traffic along East and West Atlantic Avenues.

a. PROBLEMS

(1) The East Atlantic and West Atlantic Avenue roadway widths are unable to safely accommodate two (2) way traffic and parking.

(2) Angle parking is permitted at several locations along East and West Atlantic Avenues.

(3) Pavement markings are virtually non-existent along East and West Atlantic Avenues.

b. RECOMMENDATIONS

(1) Make East Atlantic Avenue one way northbound from Clements Bridge Road to Oakland Avenue and West Atlantic Avenue one way southbound from Oakland Avenue to Clements Bridge Road.

(2) Remove angle parking from East and West Atlantic Avenues and provide for parallel parking along these roadways.

(3) Provide pavement markings in accordance with the Manual on Uniform Traffic Control Devices.

(4) Introduce the changed street directions in one phase. Advertising of the proposed change in street directions should be instituted in order to acquaint the public prior to the change.

(5) All traffic regulations should be strictly enforced.

c. BENEFITS

(1) A more convenient by-pass route through the Boroughs of Oaklyn, Audubon and Haddon Heights will be provided.

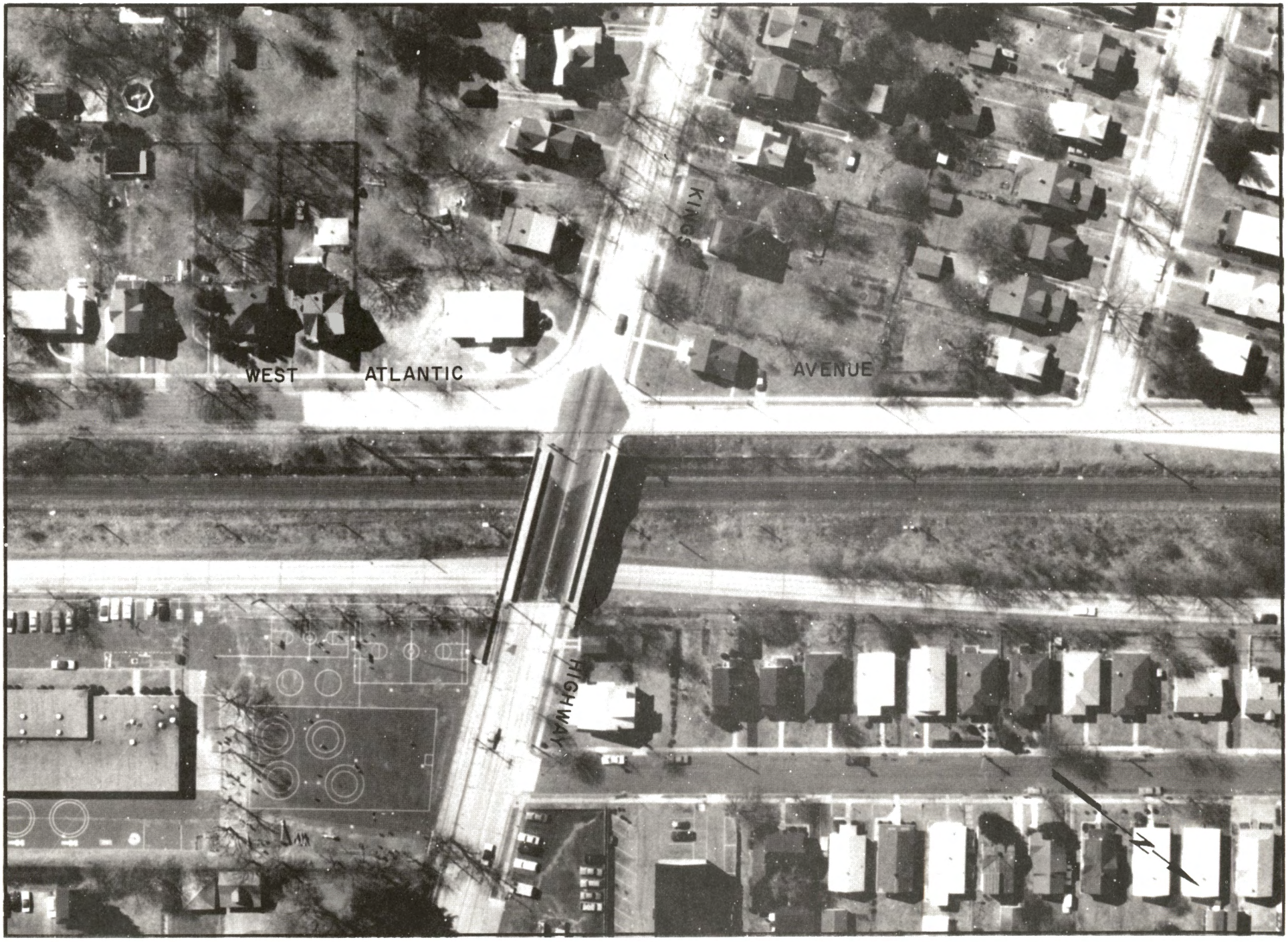
(2) Angle parking will be eliminated.

(3) A safer traffic movement will be provided.

d. ESTIMATED COSTS

(1) Engineering	$1,000.00
(2) Signs and Markings	5,000.00
Total Estimated Cost	$6,000.00

NOTE: This project is shared with Oaklyn and Haddon Heights.


WEST ATLANTIC
KINGS
AVENUE
HIGHWAY

PROJECT NO. AU-5 KINGS HIGHWAY AND WEST ATLANTIC AVENUE
BOROUGH OF AUDUBON

Project No. AU-5 covers the improvements to the intersection of Kings Highway and West Atlantic Avenue.

a. PROBLEMS

(1) An extremely hazardous condition exists at the intersection of Kings Highway and West Atlantic Avenue due to the restricted sight distance caused by the grade of the Kings Highway overpass at East Atlantic Avenue and the railroad tracks.

(2) High traffic volumes on Kings Highway create a hazard for traffic exiting from West Atlantic Avenue.

(3) Traffic volumes on West Atlantic Avenue will increase with the proposed one-way traffic system recommended for East Atlantic Avenue and West Atlantic Avenue.

(4) There is a traffic signal located on the southeast corner which is not in operation.

(5) The northeast and southeast corner radii are not large enough to allow traffic to turn right without crossing into the opposing lane of traffic.

(6) Buses at the near side bus stop on the west approach of Kings Highway restrict right turns from Kings Highway and also cause a sight distance problem.

b. RECOMMENDATIONS

(1) Although this intersection does not meet the warrants for a traffic signal, at this time, consideration should be given to the installation of a semi-actuated traffic signal when the proposed one-way traffic system for East Atlantic and West Atlantic Avenues goes into effect.

(2) This proposed signal should be interconnected with the existing signal installation at Route 30 and Kings Highway.

(3) Remove the existing inoperative signal on the southeast corner.

(4) Increase the northwest and southwest corner radii to a minimum of thirty (30) feet.

(5) Relocate the near side bus stops to mid block on Kings Highway west of the intersection.

NOTE: This project is shared with Haddon Heights.

PROJECT NO. AU-5 KINGS HIGHWAY AND WEST ATLANTIC AVENUE
BOROUGH OF AUDUBON

c. BENEFITS

(1) Accident potential will be reduced.

(2) Sight distance will be improved.

(3) A safer flow of traffic will be achieved.

(4) Friction between buses and right turn movements will be reduced.

d. ESTIMATED COSTS

(1) Engineering	$ 7,000.00
(2) Construction	4,500.00
(3) Signs and Markings	500.00
(4) Traffic Signals	30,000.00
Total Estimated Cost	$42,000.00

PROJECT NO. AU-6 KINGS HIGHWAY, NINTH AVENUE AND WYOMING AVENUE BOROUGH OF AUDUBON

Project No. AU-6 covers the reconstruction of the intersection of Kings Highway, Ninth Avenue and Wyoming Avenue. *(Exhibit No. 18)*.

a. PROBLEMS

(1) Parking in front of the stores located along Kings Highway creates a sight distance problem for traffic exiting from Ninth Avenue onto Kings Highway.

(2) The existing parking restricts the eastbound traffic flow on Kings Highway when a vehicle stops to turn left onto Wyoming Avenue from Kings Highway.

(3) Corner radii are not large enough to accommodate safe turning movements.

b. RECOMMENDATIONS

(1) Eliminate parking in front of the stores on Kings Highway.

(2) Provide off-street parking facilities in the space between the south curb of Kings Highway and the stores.

(3) Increase all corner radii.

(4) Prohibit parking on all approaches to the intersection.

c. BENEFITS

(1) Sight distance will be improved.

(2) Parking situation will be improved.

(3) A smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 2,200.00
(2) Construction	10,400.00
(3) Signs and Markings	700.00
Total Estimated Cost	$13,300.00

NOTE: This project is shared with Haddon Heights.

PROJECT NO. AU-6

KINGS HIGHWAY, NINTH AVENUE AND WYOMING AVENUE

EXHIBIT NO. 18

PROJECT NO. AU-6

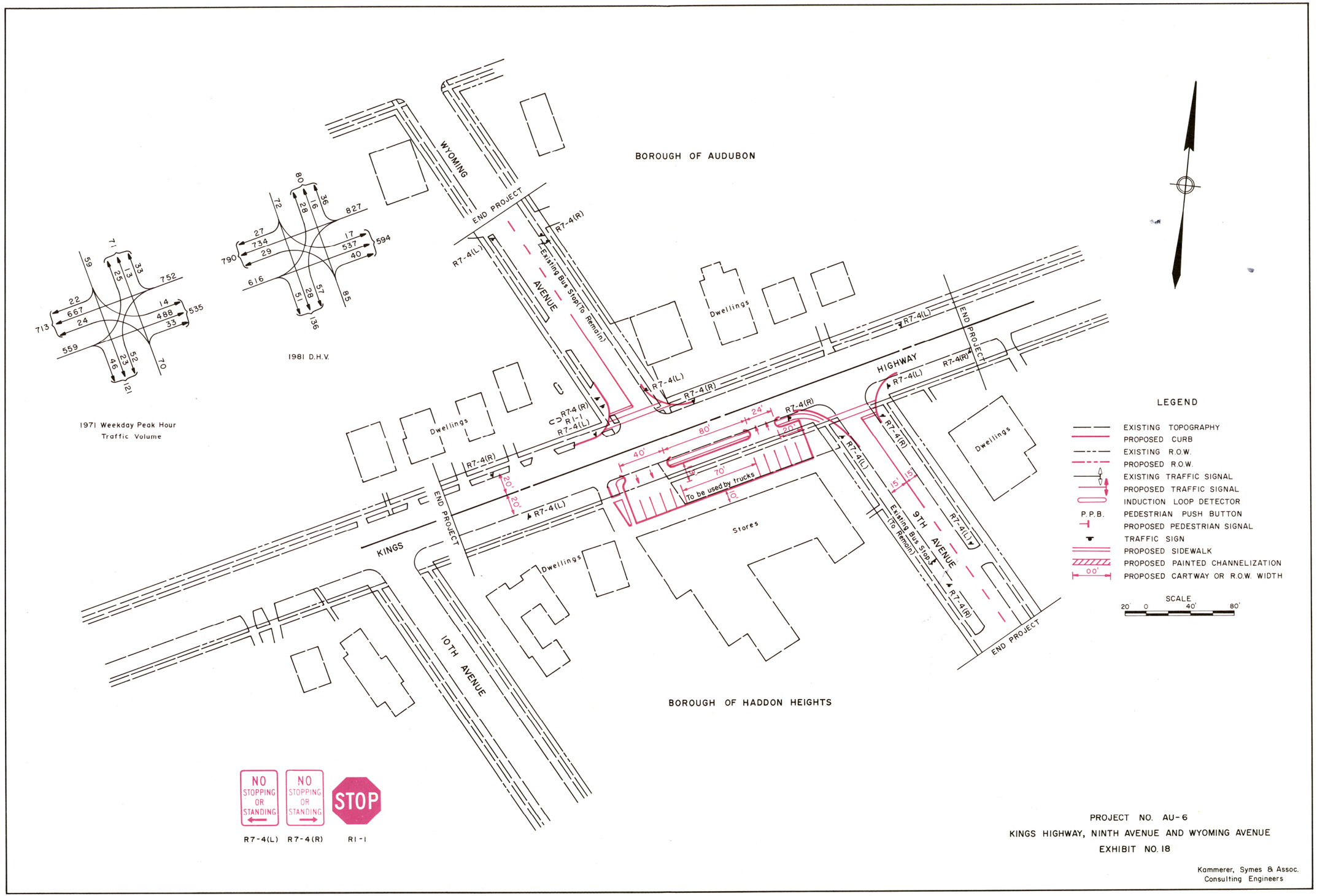
KINGS HIGHWAY, NINTH AVENUE AND WYOMING AVENUE

EXHIBIT NO. 18

PROJECT NO. AU-6

KINGS HIGHWAY, NINTH AVENUE AND WYOMING AVENUE

EXHIBIT NO. 18



PROJECT NO. AU-6
KINGS HIGHWAY, NINTH AVENUE AND WYOMING AVENUE
EXHIBIT NO. 18

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. AU-7 ENTRANCES TO THE BLACK HORSE PIKE SHOPPING CENTER FROM NICHOLSON ROAD

BOROUGH OF AUDUBON

Project No. AU-7 covers the improvements to the flow of traffic at the entrances to the Black Horse Pike Shopping Center from Nicholson Road.

a. PROBLEMS

(1) Several accidents have occurred along Nicholson Road due to vehicles turning into the Shopping Center.

(2) Accident records indicate a total of ten (10) accidents during the three (3) year period from 1968 through 1970. Of this total, five (5) were classified as same direction accidents, two (2) were classified as left turn accidents, two (2) were collisions with fixed objects and one (1) was classified as a right angle accident.

(3) Existing channelization on Nicholson Road is wide open and does not provide for safe turning movements.

(4) The high volumes of traffic on Nicholson Road and the absence of adequate channelization create a hazardous condition for vehicles desiring to enter into and exit from the Shopping Center.

(5) Heavy volumes of traffic use Nicholson Road which is one of the main arterial roadways in the area of Audubon and surrounding communities, connecting Route 130 with Route 168 and Route 30.

(6) Pavement markings are not properly maintained.

b. RECOMMENDATIONS

(1) Reconstruct the median opening on Nicholson Road to provide a left turn lane with sufficient stacking space for westbound traffic entering the Black Horse Pike Shopping Center.

(2) Provide refuge in the median opening on Nicholson Road for the safety of left turn traffic exiting the Shopping Center onto Nicholson Road.

(3) Provide pavement markings and signs in accordance with the current Manual on Uniform Traffic Control Devices.

c. BENEFITS

(1) Accident potential will be reduced.

(2) By channelizing the median opening for turning movements the friction between left turns and through traffic will be reduced.

(3) A safer flow of traffic will be achieved.

PROJECT NO. AU-7 ENTRANCES TO THE BLACK HORSE PIKE SHOPPING CENTER FROM NICHOLSON ROAD

BOROUGH OF AUDUBON

d. ESTIMATED COSTS

(1) Engineering	$1,500.00
(2) Construction	7,200.00
(3) Signs and Markings	450.00
Total Estimated Cost	$9,150.00

EAST ATLANTIC AVENUE

PROJECT NO. AU-8 EAST ATLANTIC AVENUE AND PINE STREET
BOROUGH OF AUDUBON

Project No. AU-8 covers the improvements to the intersection of East Atlantic Avenue and Pine Street.

a. PROBLEMS

(1) The STOP sign located on the southeast corner of East Atlantic Avenue is difficult to see due to its non-standard height and illegally parked cars which cause an obstruction.

(2) The number of accidents has increased during the three (3) year period from 1968 through 1970. Accident records indicate a total of sixteen (16) accidents during this period. In 1968 there was a total of two (2) accidents, in 1969 a total of seven (7) accidents and in 1970, a total of seven (7). Of the three (3) year total, fourteen (14) were classified as right angle accidents, one (1) was classified as a left turn accident and one (1) was classified as a same direction accident.

(3) From the total number of right angle accidents, thirteen (13) involved vehicles exiting from the south approach of East Atlantic Avenue, and were principally caused by the poor visibility of the STOP sign located on the southeast corner.

(4) Parking is permitted too close to the intersection.

(5) Corner radii are not large enough to accommodate safe turning movements.

(6) Lack of Stop lines on the approaches of East Atlantic Avenue causes confusion to drivers traveling on this road.

b. RECOMMENDATIONS

(1) The STOP sign located on the southeast corner of East Atlantic Avenue should be mounted in accordance with the current Manual on Uniform Traffic Control Devices.

(2) Increase the radii to a minimum of thirty (30) feet on the northeast and southeast corners.

(3) Prohibit parking on all four (4) approaches for a minimum of fifty (50) feet.

(4) A stop line should be painted on the south approach in accordance with the current Manual on Uniform Traffic Control Devices.

(5) Eliminate angle parking on East Atlantic Avenue.

c. BENEFITS

(1) The number of right angle accidents will be reduced.

(2) A safer and smoother flow of traffic will be achieved.

PROJECT NO. AU-8 EAST ATLANTIC AVENUE AND PINE STREET
BOROUGH OF AUDUBON

d. ESTIMATED COSTS

(1) Engineering	$ 500.00
(2) Construction	1,900.00
(3) Signs and Markings	600.00
Total Estimated Cost	$3,000.00

HOPKINS
AVENUE
CRYSTAL LAKE
AVENUE

PROJECT NO. AU-9 CRYSTAL LAKE AVENUE AND HOPKINS AVENUE
BOROUGH OF AUDUBON

Project No. AU-9 covers the improvements to the intersection of Crystal Lake Avenue and Hopkins Avenue.

a. PROBLEMS

(1) Tree limbs restrict the view of the STOP signs and red warning flashers located on both approaches of Hopkins Avenue.

(2) The red warning flashers are not located in accordance with the Manual on Uniform Traffic Control Devices.

(3) The STOP AHEAD signs on Hopkins Avenue are located too close to the intersection.

(4) Many drivers disregard the existing STOP signs located on both approaches of Hopkins Avenue.

(5) Accident records indicate a total of eleven (11) accidents during the three (3) year period from 1968 through 1970. Of this total, ten (10) were classified as right angle accidents and one (1) was classified as a left turn accident.

(6) Corner radii are not large enough to accommodate safe turning movements.

(7) Pavement markings are virtually non-existent on all four (4) approaches.

(8) Parking is permitted too close to the intersection.

b. RECOMMENDATIONS

(1) Remove the existing red warning flashers from the Hopkins Avenue approaches.

(2) Install STOP sign beacons on both approaches of Hopkins Avenue in accordance with the Manual on Uniform Traffic Control Devices.

(3) Tree limbs should be kept trimmed to provide a clear view of the STOP signs.

(4) Relocate the STOP AHEAD signs to two hundred and fifty (250) feet in advance of the STOP signs.

(5) Increase all corner radii to forty (40) feet.

(6) Provide the necessary pavement markings in accordance with the current Manual on Uniform Traffic Control Devices.

(7) Prohibit parking on both sides of all four (4) approaches for a minimum of one hundred (100) feet.

NOTE: This project is shared with Haddon Township.

PROJECT NO. AU-9 CRYSTAL LAKE AVENUE AND HOPKINS AVENUE
BOROUGH OF AUDUBON

c. BENEFITS

(1) A better view of the STOP signs will be provided.

(2) The turning movements will be improved.

(3) The number of right angle accidents will be reduced.

(4) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$1,200.00
(2) Construction	4,700.00
(3) Signs and Markings	400.00
(4) Removal and Relocation of Signs	500.00
Total Estimated Cost	$6,800.00

PROJECT IMPROVEMENTS

BOROUGH OF HADDONFIELD

Kammerer, Symes & Associates, Inc.
CONSULTING ENGINEERS

PROJECT NO. HA-1 KINGS HIGHWAY AND HADDON AVENUE
BOROUGH OF HADDONFIELD

Project No. HA-1 covers the reconstruction of the intersection of Kings Highway and Haddon Avenue. *(Exhibit No. 19)*

a. PROBLEMS

(1) Present levels of service are "F" on the north and south approaches and "B" on the east and west approaches. The 1971 peak volumes for each approach compared to the 1971 average volumes are summarized below:

	1971 PEAK VOLUME VEH./HR.	1971 AVERAGE VOLUME VEH./HR.
Haddon Avenue North Approach	739	668
Haddon Avenue South Approach	676	627
Kings Highway East Approach	617	592
Kings Highway West Approach	575	525

(2) Present levels of service for left turn movements are "F" on the north and south approaches and "B" on the east and west approaches. The 1971 peak left turn volumes for each approach compared to the 1971 average volumes are summarized below:

	1971 PEAK LEFT TURN VOLUME VEH./HR.	1971 AVERAGE LEFT TURN VOLUME VEH./HR.
Haddon Avenue North Approach	175	154
Haddon Avenue South Approach	159	156
Kings Highway East Approach	87	81
Kings Highway West Approach	62	50

(3) High traffic volumes on Haddon Avenue restrict and cause excessive delays to traffic turning left onto Kings Highway. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Haddon Avenue North Approach	24	6
Haddon Avenue South Approach	24	12

(4) The northeast and northwest corner radii are not large enough to allow traffic, particularly buses and large trucks to turn right without crossing into the opposing lane of traffic.

(5) The Haddonfield Friends School is located on Haddon Avenue north of the intersection and the Memorial High School is located on Kings Highway, east of the intersection. Children going to and from school must cross this intersection.

(6) Existing signals are post mounted and fixed time, and are not interconnected to provide progressive movement of traffic along Kings Highway.

(7) Signal timing is inadequate for the traffic demand.

(8) Near side bus stop restricts right turn movements from the south approach of Haddon Avenue.

(9) Accident records indicate a total of twenty-eight (28) accidents during the three (3) year period from 1968 through 1970. Of this total, sixteen (16) were classified as same direction accidents, four (4) were classified as left turn accidents, four (4) were classified as right angle accidents and four (4) were classified as collisions with fixed objects.

(10) Heavy volumes of traffic use Kings Highway and Haddon Avenue, which are the main arterial roadways in the Borough of Haddonfield.

(11) Parking is permitted too close to the intersection.

b. RECOMMENDATIONS

(1) Provide a restricted left turn lane for the north and south approaches of Haddon Avenue with sufficient stacking space for the left turn movements.

(2) Provide an advance green indication for the north approach and a lag green indication for the south approach.

(3) Maintain the present fixed time operation and revise the cycle timing to provide additional green time for Haddon Avenue.

(4) Interconnect the traffic signals along Kings Highway to maintain a background cycle for the progressive movement of traffic along Kings Highway.

(5) Provide a separate control for the signal from within the firehouse located on the northeast corner of the intersection.

(6) Increase the northeast and northwest corner radii.

(7) Remove the existing post mounted signals and install new mast arm signals to conform with the current Manual on Uniform Traffic Control Devices.

(8) Provide pedestrian signal indications on all four (4) corners.

(9) Relocate the bus stop on the south approach of Haddon Avenue to mid-block.

(10) Prohibit parking on all four (4) approaches.

(11) Remove the existing left turn arrows from both approaches of Kings Highway.

c. BENEFITS

(1) The capacity and levels of service of the north and south approaches of Haddon Avenue will be improved. Using the 1981 D.H.V., the levels of service after reconstruction are compared with the 1971 levels of service as follows:

	1971 LEVEL OF SERVICE	1981 LEVEL OF SERVICE AFTER RECONSTRUCTION
Haddon Avenue North Approach	F	D
Haddon Avenue South Approach	F	C
Kings Highway East Approach	B	B
Kings Highway West Approach	B	B

(2) Capacity for left turns on all the approaches will be improved.

(3) Delays experienced during peak hours of traffic will be reduced.

(4) Additional stacking space for left turns will be provided.

(5) The movement of fire and emergency service equipment will be improved.

(6) Accident potential will be reduced.

(7) Friction between buses and other traffic will be reduced.

(8) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 4,600.00
(2) Construction	7,400.00
(3) Signs and Markings	500.00
(4) Traffic Signals	15,000.00
Total Estimated Cost	$27,500.00

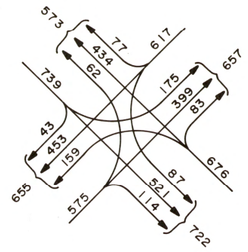
PROJECT NO. HA-1
KINGS HIGHWAY AND HADDON AVENUE
EXHIBIT NO. 19

PROJECT NO. HA-1
KINGS HIGHWAY AND HADDON AVENUE
EXHIBIT NO. 19

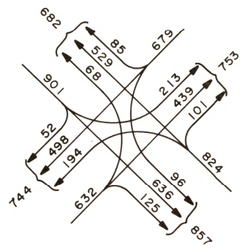
PROJECT NO. HA-1

KINGS HIGHWAY AND HADDON AVENUE

EXHIBIT NO. 19



1971 Weekday Peak Hour
Traffic Volume



1981 D.H.V.

SIGNAL PHASING

Phase A1	Phase A2	Phase A3	Phase B	Fire Phase



R3-7(L) R7-5(R)



R7-107 R7-4(L) R7-4(R) R7-4

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

PROJECT NO. HA-1
KINGS HIGHWAY AND HADDON AVENUE
EXHIBIT NO. 19

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. HA-2 HADDON AVENUE, EUCLID AVENUE AND TANNER STREET BOROUGH OF HADDONFIELD

Project No. HA-2 covers the reconstruction and installation of a new traffic signal at the intersection of Haddon Avenue, Euclid Avenue and Tanner Street. *(Exhibit No. 20).*

a. PROBLEMS

(1) Existing channelization at the intersection of Haddon Avenue, Euclid Avenue and Tanner Street is inadequate to safely accommodate through traffic and turning movements.

(2) High traffic volumes on Haddon Avenue make it difficult for traffic exiting from Euclid Avenue and Tanner Street and cause excessive delays.

(3) The high volumes of traffic on Haddon Avenue and the flat angle of intersection create a hazardous condition for vehicles desiring to turn right from Tanner Street onto Haddon Avenue.

(4) The west approach of Euclid Avenue is not wide enough to safely accommodate turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Euclid Avenue West Approach	23	77

(5) Christ the King School is located between Hopkins Avenue and Euclid Avenue east of the intersection, and Haddonfield Friends School is located on Haddon Avenue, south of the intersection. Children going to and from these schools must cross this intersection.

(6) Heavy volumes of traffic use Haddon Avenue which is one of the main arterial roadways in the Borough of Haddonfield.

(7) Parking is permitted too close to the intersection.

(8) Accident records indicate a total of nine (9) accidents during the three (3) year period from 1968 through 1970. Of this total, five (5) were classified as collisions with fixed objects, two (2) were classified as right angle accidents, and two (2) were classified as same direction accidents.

b. RECOMMENDATIONS

(1) Remove the rubber posts from the Haddon Avenue roadway.

(2) Widen the west approach of Euclid Avenue to provide a restricted lane for the left turn movements onto Haddon Avenue.

(3) Widen the north approach of Haddon Avenue as shown on the plan.

(4) Install a new three (3) phase semi-actuated traffic signal with pedestrian push buttons at the intersection of Haddon Avenue, Euclid Avenue and Tanner Street. Warrant No. 2, Interruption of Continuous Traffic, is satisfied.

(5) Traffic detectors should be located on the Euclid Avenue and Tanner Street approaches.

(6) Provide pedestrian signal indications on all corners.

(7) Make Hopkins Avenue one-way in an eastbound direction from Haddon Avenue to Grove Street and Windsor Avenue one way in a westbound direction from Grove Street to Haddon Avenue.

(8) Advertising of the proposed changes in street directions should be instituted to acquaint the public prior to the change.

(9) Provide school crossing signs for all approaches.

(10) Restrict left turns from the south approach of Haddon Avenue onto Euclid Avenue and Tanner Street.

(11) Prohibit parking on all approaches.

c. BENEFITS

(1) Delays experienced during peak hours of traffic will be reduced.

(2) By reducing the delays on Tanner Street and Euclid Avenue, the quality of travel will be improved.

(3) A safer crossing for school children and pedestrians will be provided.

(4) Accident potential will be reduced.

(5) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 5,600.00
(2) Construction	7,400.00
(3) Signs and Markings	750.00
(4) Traffic Signals	20,000.00
(5) Right of Way	150.00
Total Estimated Cost	$33,900.00

PROJECT NO. HA-2

HADDON AVENUE, EUCLID AVENUE AND TANNER STREET

EXHIBIT NO. 20

PROJECT NO. HA-2

HADDON AVENUE, EUCLID AVENUE AND TANNER STREET

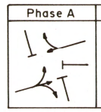
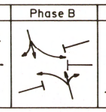
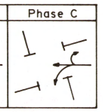
EXHIBIT NO. 20

PROJECT NO. HA-2

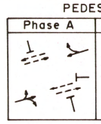
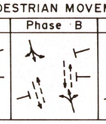
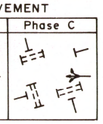
HADDON AVENUE, EUCLID AVENUE AND TANNER STREET

EXHIBIT NO. 20

SIGNAL PHASING

Phase A	Phase B	Phase C
		

PEDESTRIAN MOVEMENT

Phase A	Phase B	Phase C
		

Pedestrian Movement

1971 Weekday Peak Hour
Traffic Volume

1981 D.H.V.

R7-4(L) R7-4(R) R7-5(L)

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20 0 40' 80'

PROJECT NO. HA-2
HADDON AVENUE, EUCLID AVENUE AND TANNER STREET
EXHIBIT NO. 20

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. HA-3 HADDON AVENUE, ELLIS STREET AND SNOWDEN AVENUE BOROUGH OF HADDONFIELD

Project No. HA-3 covers the reconstruction and channelization of the intersection of Haddon Avenue, Ellis Street and Snowden Avenue. *(Exhibit No. 21).*

a. PROBLEMS

(1) The intersection is wide open and the existing channelization is inadequate for the safe flow of traffic.

(2) Ellis Street intersects Haddon Avenue on a horizontal curve at a very flat angle.

(3) Snowden Avenue intersects Haddon Avenue on a horizontal curve and the sight distance for traffic exiting Snowden Avenue onto Haddon Avenue is restricted by a building located on the northeast corner.

(4) The approach roadway on Walnut Street is too narrow to safely accommodate turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Walnut Street	65	35

(5) Corner radii are not large enough to accommodate safe turning movements.

(6) A super market, a major generator of traffic, is located on the southwest corner of the intersection with driveway openings into the intersection.

(7) Parking is permitted on Haddon Avenue and Ellis Street too close to the intersection.

(8) Pavement markings are virtually non-existent at this intersection.

b. RECOMMENDATIONS

(1) Reconstruct and channelize the intersection as shown on the plan and remove the rubber posts from the Haddon Avenue roadway.

(2) Right turn movements from Haddon Avenue onto Ellis Street are to be controlled by a YIELD sign.

(3) Left turn movements from Ellis Street onto Haddon Avenue and through movements onto Snowden Avenue are to be controlled by a STOP sign.

(4) Through movements from Ellis Street traveling south onto Haddon Avenue are to be controlled by a YIELD sign.

(5) Make Snowden Avenue one way eastbound from Haddon Avenue to the parking lot and Harding Avenue one way westbound into Haddon Avenue from the parking lot.

(6) Widen Walnut Street to provide for two (2) lanes of traffic exiting onto Haddon Avenue.

(7) Increase corner radii as shown on the plan.

(8) Provide pavement markings in accordance with the current Manual on Uniform Traffic Control Devices.

(9) Provide additional parking restrictions on all the approaches.

c. BENEFITS

(1) Channelization will improve the flow of traffic.

(2) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 6,200.00
(2) Construction	30,800.00
(3) Signs and Markings	500.00
(4) Right of Way	6,300.00
Total Estimated Cost	$43,800.00

PROJECT NO. HA-3

HADDON AVENUE, ELLIS STREET AND
SNOWDEN AVENUE

EXHIBIT NO. 21

PROJECT NO. HA-3

HADDON AVENUE, ELLIS STREET AND
SNOWDEN AVENUE

EXHIBIT NO. 21

PROJECT NO. HA-3

HADDON AVENUE, ELLIS STREET AND
SNOWDEN AVENUE

EXHIBIT NO. 21

KINGS HIGHWAY

Offices

R7-4(L)

END PROJECT

R1-1

ONE-WAY PROPOSED

HARDING AVENUE

R7-1

R7-1(L)

R6-1(R)
R6-1(L)
R7-4(R)

Post Office

Insurance Building

SNOWDEN AVENUE

HADDON

Dwellings

R1-2

R7-1

ELLIS STREET

R7-1(L)

CENTRE STREET

Super Market

ONE-WAY EXISTING

Parking Lot

Stores

FOWLER AVENUE

AVENUE

R7-1(R)

R7-1(L)

R3-2

R5-1

R7-4(R)

WII-2

RI-2

R7-4(L)

STREET

Gas Station

END PROJECT

WALNUT

50'

75'

22'

20'

14'

12'

11'

15'

13'

10'

SNOWDEN AVE.

HADDON AVE.

ELLIS ST.

WALNUT ST.

1973 Weekday Peak Hour
Traffic Volume

632 7 511 37 15 3 1 10 795 71 43 HADDON AVE. 643 19 709 153 38 919 42 7 98 0 201 147 2 43 4 24 110 73

1983 D.H.V.

762 0 623 67 52 969 SNOWDEN AVE. One-Way 0 4 1 12 18 HADDON AVE. 784 0 865 187 46 1098 51 0 120 0 245 171 2 52 0 29 134 83

ONE WAY R6-1

R3-2

PED XING WII-2

NO STOPPING OR STANDING R7-4(L)

NO STOPPING OR STANDING R7-4(R)

NO PARKING ANY TIME R7-1

NO PARKING ANY TIME R7-1(L)

NO PARKING ANY TIME R7-1(R)

YIELD RI-2

DO NOT ENTER R5-1

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

PROJECT NO. HA-3
HADDON AVENUE, ELLIS STREET AND SNOWDEN AVENUE
EXHIBIT NO. 21

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. HA-4 KINGS HIGHWAY, POTTER STREET AND GROVE STREET BOROUGH OF HADDONFIELD

Project No. HA-4 covers the reconstruction of the intersection of Kings Highway, Potter Street and Grove Street. *(Exhibit No. 22)*.

a. PROBLEMS

(1) Present levels of service for left turn movements are "F" on the west approach, "C" on the east approach and "B" on the north and south approaches. The 1971 peak volumes for each approach compared to the 1971 average volumes are summarized below:

	1971 PEAK LEFT TURN VOLUME VEH./HR.	1971 AVERAGE LEFT TURN VOLUME VEH./HR.
Grove Street North Approach	25	25
Potter Street South Approach	39	32
Kings Highway East Approach	50	43
Kings Highway West Approach	146	139

(2) Present levels of service, for through and right turn movements, are "F" on the north approach, "E" on the west approach and "B" on the south and east approaches. The 1971 peak through and right turn volumes for each approach compared to the 1971 average volumes are summarized below:

	1971 PEAK THROUGH AND RIGHT TURN VOLUME VEH./HR.	1971 AVERAGE THROUGH AND RIGHT TURN VOLUME VEH./HR.
Grove Street North Approach	482	386
Potter Street South Approach	241	208
Kings Highway East Approach	416	391
Kings Highway West Approach	460	411

(3) The approach roadways on Grove and Potter Streets are too narrow to safely accommodate turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Grove Street North Approach	5	48
Potter Street South Approach	14	13

(4) The north and south approaches of Grove Street and Potter Street are offset causing difficulty to drivers traveling through the intersection.

(5) The corner radii are not large enough to allow traffic, particularly buses and large trucks to turn right without crossing into the opposing lane of traffic.

(6) The Haddonfield High School is located on Kings Highway east of the intersection, in addition to several elementary schools which are also located in the vicinity. Children going to and from school must cross Grove Street and Kings Highway at this intersection.

(7) Accident records indicate a total of fifty (50) accidents during the three (3) year period from 1968 through 1970. Of this total, twenty-one (21) were classified as left turn accidents, twelve (12) were classified as same direction accidents, ten (10) were classified as collisions with fixed objects, five (5) were classified as right angle accidents, and two (2) were classified as head on collisions.

(8) The existing signal is a fixed time, post-mounted installation and is not in accordance with the current Manual on Uniform Traffic Control Devices.

(9) Near side bus stop restricts right turn movements on the west approach of the intersection.

b. RECOMMENDATIONS

(1) Widen Grove Street and Potter Street to thirty-seven (37) feet and provide adequate stacking space for turning movements.

(2) Install a fixed time, three (3) phase traffic signal with pedestrian signal indications. Warrant No. 2, Interruption of Continuous Traffic, is satisfied.

(3) Provide separate phases for the north and south approaches.

(4) Provide an advance green indication for the west approach of Kings Highway.

(5) Traffic signals are to be interconnected with the existing signals along Kings Highway within the Borough of Haddonfield.

(6) Increase all corner radii as shown on the plan.

(7) Relocate the bus stop on the near southwest corner of Kings Highway to the far side corner.

(8) Remove the existing left turn arrows from the north approach of Grove Street.

(9) Prohibit parking on all approaches.

c. BENEFITS

(1) Capacity of intersection will be increased.

(2) The capacity and levels of service of the north and west approaches of Grove Street and Kings Highway will be improved. Using the 1971 D.H.V., the levels of service of the intersection after reconstruction are compared with 1981 levels of service as follows:

	1971 LEVEL OF SERVICE	1981 LEVEL OF SERVICE AFTER RECONSTRUCTION
Grove Street North Approach	F	C
Potter Street South Approach	B	B
Kings Highway East Approach	C	C
Kings Highway West Approach	E	C

(3) Capacity for left turns on the west approach of Kings Highway will be improved.

(4) Additional stacking space for right and left turns will be provided.

(5) A safer pedestrian crossing will be provided.

(6) High accident potential will be reduced.

(7) Friction between buses and other traffic will be reduced.

(8) A safer and smoother flow of traffic will be achieved.

PROJECT NO. HA-4 KINGS HIGHWAY, POTTER STREET AND GROVE STREET
BOROUGH OF HADDONFIELD

d. ESTIMATED COSTS

(1) Engineering	$ 7,300.00
(2) Construction	21,000.00
(3) Signs and Markings	700.00
(4) Traffic Signals	15,000.00
Total Estimated Cost	$44,000.00

PROJECT NO. HA-4

KINGS HIGHWAY, POTTER STREET AND

GROVE STREET

EXHIBIT NO. 22

PROJECT NO. HA-4

KINGS HIGHWAY, POTTER STREET AND

GROVE STREET

EXHIBIT NO. 22

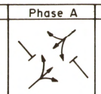
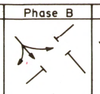
PROJECT NO. HA-4

KINGS HIGHWAY, POTTER STREET AND

GROVE STREET

EXHIBIT NO. 22

SIGNAL PHASING

Phase A1	Phase A	Phase B	Phase C
			

R7-107 S1-1 S2-1

R7-4(L) R7-4(R) R7-1(L) R7-1(R) R7-1

1971 Weekday Peak Hour Traffic Volume

1981 D.H.V.

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20' 0 40' 80'

PROJECT NO. HA-4
KINGS HIGHWAY, POTTER STREET AND GROVE STREET
EXHIBIT NO. 22

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. HA-5 KINGS HIGHWAY, WEST END AVENUE AND CHEWS LANDING ROAD BOROUGH OF HADDONFIELD

Project No. HA-5 covers the reconstruction and installation of a new traffic signal at the intersection of Kings Highway, West End Avenue and Chews Landing Road. *(Exhibit No. 23)*.

a. PROBLEMS

(1) A high accident potential is created due to the offset of Chews Landing Road and West End Avenue.

(2) Accident records indicate a total of twenty-five (25) accidents during the three (3) year period from 1968 through 1970. Of this total, eleven (11) were classified as left turn accidents, six (6) were classified as same direction accidents, four (4) were classified as right angle accidents and four (4) were classified as collisions with fixed objects.

(3) The high volume of traffic on Kings Highway and the flat angle of intersection create a hazardous condition for vehicles exiting from Chews Landing Road onto Kings Highway.

(4) Horizontal alignment for eastbound and westbound traffic along Kings Highway is poor.

(5) The approach roadways are too narrow to safely accommodate turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
West End Avenue North Approach	15	3
Chews Landing Road South Approach	2	49
Kings Highway East Approach	43	13
Kings Highway West Approach	5	3

(6) High traffic volumes on Kings Highway make it difficult for traffic exiting both approaches of Chews Landing Road and West End Avenue and cause excessive delays.

(7) Near side bus stop restricts right turn movements on the north approach of West End Avenue and Kings Highway.

b. RECOMMENDATIONS

(1) Reconstruct all approaches of the intersection

(2) Realign the north and south approaches of West End Avenue and Chews Landing Road in addition to the east and west approaches of Kings Highway.

(3) Construct channelization islands on the northeast and southwest corners for right turn movements.

(4) The right turn movement from the west approach of Kings Highway onto Chews Landing Road should be allowed at all times and controlled by a YIELD sign.

(5) Install a new semi-actuated traffic signal with pedestrian push buttons, Warrant No. 1, Minimum Vehicular Volume, is satisfied.

(6) Traffic detectors should be located on the West End Avenue and Chews Landing Road approaches.

(7) This new signal should be interconnected with the existing signals along Kings Highway to provide for the progressive movement of traffic.

(8) Relocate the existing bus stop on the northwest corner of Kings Highway and West End Avenue as shown on the plan.

(9) Prohibit parking on all approaches.

c. BENEFITS

(1) Accident potential will be reduced.

(2) A safer and smoother flow of traffic will be achieved.

(3) Friction between buses and other traffic will be reduced.

d. ESTIMATED COSTS

(1) Engineering	$ 21,000.00
(2) Construction	83,700.00
(3) Signs and Markings	1,700.00
(4) Traffic Signals	20,000.00
(5) Right of Way	25,600.00
Total Estimated Cost	$152,000.00

PROJECT NO. HA-5

KINGS HIGHWAY, WEST END AVENUE AND

CHEWS LANDING ROAD

EXHIBIT NO. 23

PROJECT NO. HA-5

KINGS HIGHWAY, WEST END AVENUE AND

CHEWS LANDING ROAD

EXHIBIT NO. 23

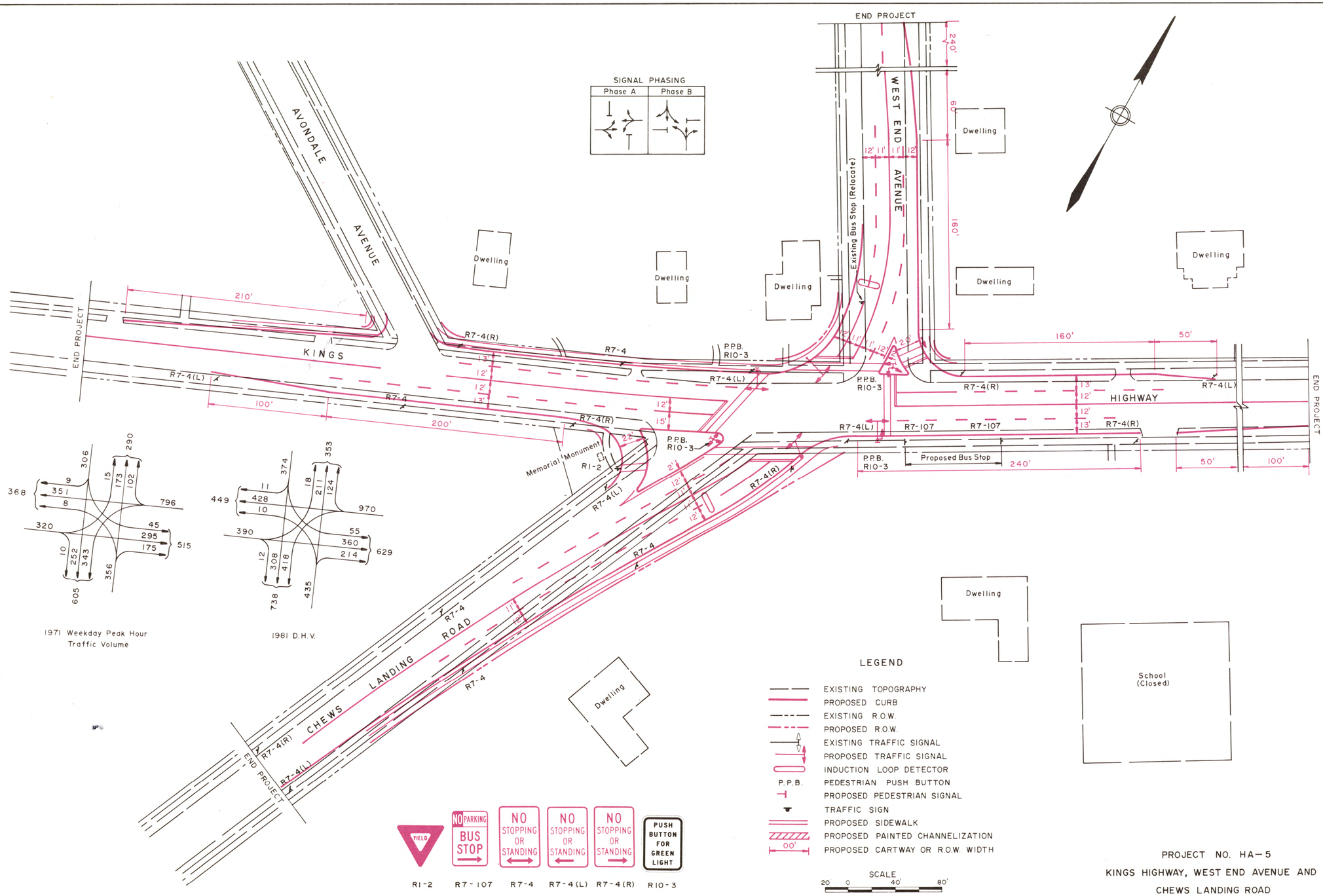

GROVE
STREET
MAPLE
AVENUE

PROJECT NO. HA-5

KINGS HIGHWAY, WEST END AVENUE AND

CHEWS LANDING ROAD

EXHIBIT NO. 23



PROJECT NO. HA-5

KINGS HIGHWAY, WEST END AVENUE AND CHEWS LANDING ROAD

EXHIBIT NO. 23

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. HA-6 MAPLE AVENUE AND GROVE STREET
BOROUGH OF HADDONFIELD

Project No. HA-6 covers the reconstruction and installation of a new traffic signal at the intersection of Maple Avenue and Grove Street.

a. PROBLEMS

(1) High traffic volumes on Grove Street make it difficult for traffic exiting from both approaches of Maple Avenue and cause excessive delays.

(2) The approach roadways on Maple Avenue and Grove Street are not wide enough to safely accommodate turning movements. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Maple Avenue East Approach	56	22
Maple Avenue West Approach	85	5
Grove Street North Approach	1	16
Grove Street South Approach	5	1

(3) Corner radii are not large enough to accommodate safe turning movements.

(4) Heavy volumes of traffic use Grove Street which is one of the main arterial roadways in the Borough of Haddonfield.

(5) Near side bus stop on the south approach of Grove Street restricts all movements on Grove Street and creates a hazardous condition between buses turning left onto Maple Avenue and the northbound traffic on Grove Street.

(6) Accident records indicate a total of twelve (12) accidents during the three (3) year period from 1968 through 1970. Of this total, six (6) were classified as same direction accidents, two (2) were classified as right angle accidents, two (2) were classified as left turn accidents and two (2) were classified as collisions with fixed objects.

b. RECOMMENDATIONS

(1) Install a new semi-actuated traffic signal with pedestrian push buttons. Warrant No. 2, Interruption of Continuous Traffic, is satisfied.

(2) The intersection should be reconstructed in accordance to the plan submitted on November 2, 1972, by Kammerer, Symes and Associates, Inc., of Cherry Hill, New Jersey, to the Department of Transportation, Division of Traffic Engineering, Traffic Bureau.

PROJECT NO. HA-6 MAPLE AVENUE AND GROVE STREET
BOROUGH OF HADDONFIELD

c. BENEFITS

(1) Accident potential will be reduced.

(2) Friction between buses and other traffic will be reduced.

(3) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 7,800.00
(2) Construction	23,000.00
(3) Signs and Markings	700.00
(4) Traffic Signals	15,000.00
(5) Right of Way	1,000.00
Total Estimated Cost	$47,500.00

PROJECT NO. HA-7 INTERCONNECTION OF TRAFFIC SIGNALS ALONG KINGS HIGHWAY

BOROUGH OF HADDONFIELD

Project No. HA-7 covers the interconnection of traffic signals to provide for the progressive movement of traffic along Kings Highway within the Borough of Haddonfield.

a. PROBLEMS

(1) Existing signals along Kings Highway are fixed time installations and are not physically interconnected to provide for the progressive movement of traffic.

(2) Traffic is required to make many more stops than would be required by a system timed to provide progressive movement of traffic at the posted speed limit.

(3) During peak hours excessive delays are created by the inadequate timing of the existing traffic signals and the parking conditions.

(4) Accident records indicate a total of one hundred twenty-five (125) accidents during the three (3) year period from 1968 through 1970 at the following locations:

a. Kings Highway, West End Avenue and Chews Landing Road

b. Kings Highway and Warwick Road

c. Kings Highway and Tanner Street

d. Kings Highway and Haddon Avenue

e. Kings Highway, Potter Street and Grove Street

Of this total, forty-nine (49) were classified as same direction accidents, thirty-six (36) were classified as left turn accidents, twenty-two (22) were classified as collisions with fixed objects, sixteen (16) were classified as right angle accidents and two (2) were classified as head on collisions.

b. RECOMMENDATIONS

(1) Provide an interconnected system of traffic signals along Kings Highway which will measure speed, volume and density and also adjust the cycle, offset and split to the demands of traffic in the system. The offset change will be accomplished gradually, thereby causing a smoother transition of the traffic along Kings Highway at the following intersections in the Borough of Haddonfield.

a. Kings Highway, West End Avenue and Chews Landing Road.

b. Kings Highway and Warwick Road

c. Kings Highway and Tanner Street

d. Kings Highway and Haddon Avenue

e. Kings Highway, Potter Street and Grove Street

(2) Develop the time space diagram to provide progressive timing of the signals along Kings Highway from Chews Landing Road to Potter and Grove Streets.

(3) Interconnect the traffic signals along Kings Highway, within the Borough of Haddonfield, to maintain the background cycles designed for the progressive system.

(4) Provide the necessary training in the form of a concentrated course of study, preferably given by the manufacturer, to Borough personnel for operation and maintenance of the system.

(5) Eliminate manual control on all the signals along Kings Highway within the Borough of Haddonfield.

(6) Prohibit parking along the south side of Kings Highway between Chews Landing Road and Potter Street from 7:00 a.m. to 9:00 a.m. and along the north side between West End Avenue and Grove Street from 4:00 p.m. to 6:00 p.m.

(7) Provide a master plan for the development of additional parking facilities. Consideration should be given to the construction of multi-level parking garages.

c. BENEFITS

(1) The capacity and level of service along Kings Highway will be improved.

(2) Accident potential will be reduced.

(3) Better observance of signal commands and, in general, greater respect for traffic control measures will be gained, due to the efficiency of the recommended system.

(4) Delays experienced during peak hours of traffic will be reduced.

d. ESTIMATED COSTS

(1) Engineering	$ 4,500.00
(2) Traffic Signals	22,500.00
Total Estimated Cost	$27,000.00

PROJECT NO. HA-8 POTTER STREET AND ELLIS STREET
BOROUGH OF HADDONFIELD

Project No. HA-8 covers the reconstruction of the intersection of Potter Street and Ellis Street. *(Exhibit No. 24)*.

a. PROBLEMS

(1) The intersection is wide open and the existing channelization is inadequate for the safe flow of traffic.

(2) The high volumes of traffic on Ellis Street and the flat angle of intersection create a hazardous condition for vehicles exiting Potter Street onto Ellis Street.

(3) Horizontal alignment for traffic along Potter Street is poor.

(4) The sight distance for traffic exiting Potter Street onto Ellis Street is restricted by a retaining wall on the northwest corner.

(5) Pavement markings are virtually non-existent at this intersection.

(6) Many drivers disregard the existing STOP sign located on the approach of Potter Street.

(7) Accident records indicate a total of fifteen (15) accidents during the three (3) year period from 1968 through 1970. Of this total, six (6) were classified as collisions with fixed objects, four (4) were classified as right angle accidents, three (3) were classified as same direction accidents and two (2) were classified as head on collisions.

(8) Parking is permitted too close to the intersection.

(9) The narrow width of the bridge on Ellis Street, located east of the intersection cannot accommodate existing volumes of traffic.

b. RECOMMENDATIONS

(1) Reconstruct the north approach of the intersection as shown on the plan.

(2) Remove the median island on Ellis Street.

(3) Reconstruct the channelization island on Potter Street.

(4) Install a STOP AHEAD sign on the Potter Street approach.

(5) Future consideration should be given to widening the bridge east of the intersection, to provide for four (4) lanes of traffic.

(6) Prohibit parking on all three (3) approaches.

(7) Prohibit left turns from Ellis Street onto Potter Street.

(8) Provide pavement markings in accordance with the current Manual on Uniform Traffic Control Devices.

c. BENEFITS

(1) Accident potential will be reduced.

(2) A safer and smoother flow of traffic will be achieved.

(3) Driver confusion will be reduced.

d. ESTIMATED COSTS

(1) Engineering	$ 3,000.00
(2) Construction	15,000.00
(3) Signs and Markings	350.00
Total Estimated Cost	$18,350.00

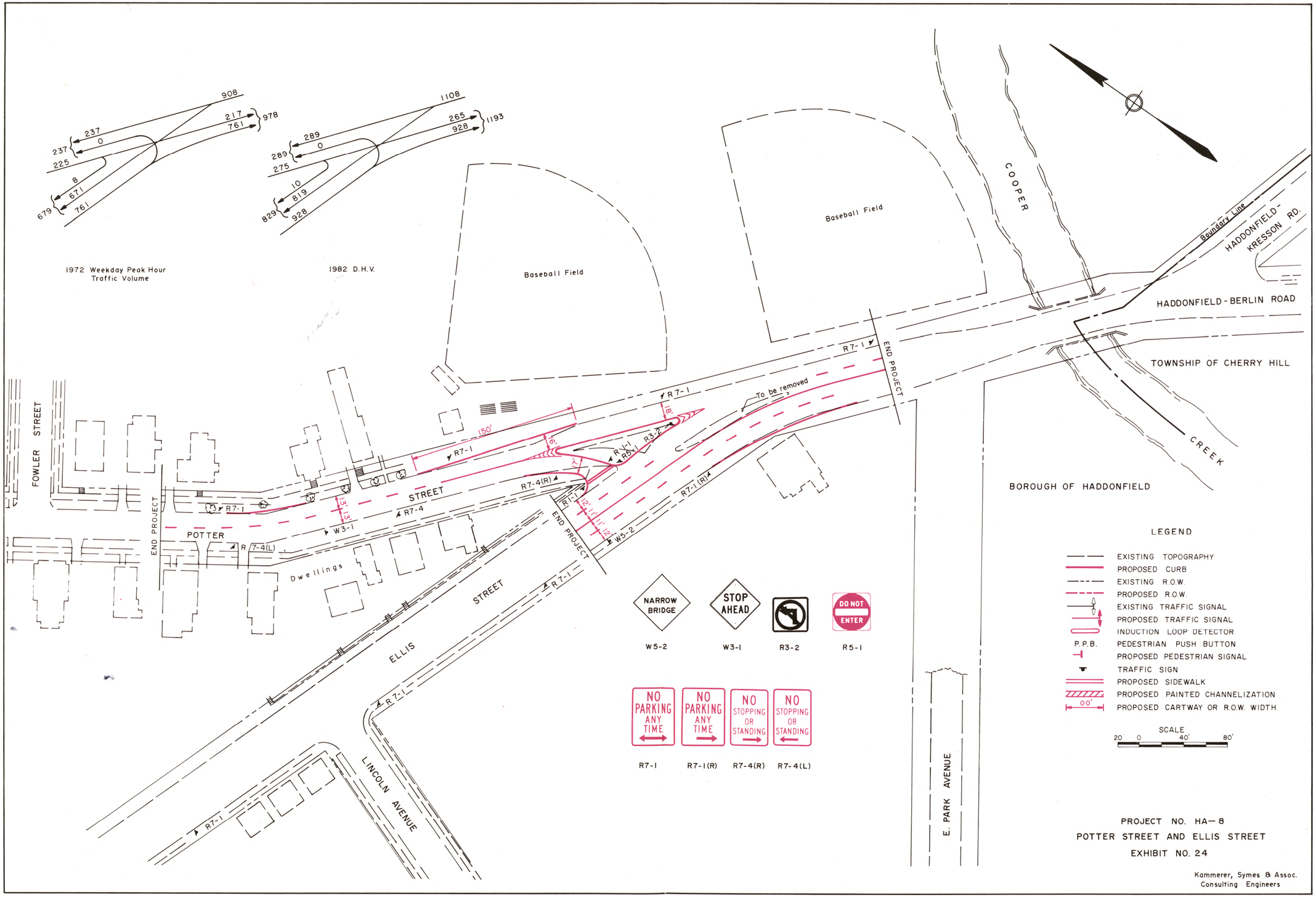
PROJECT NO. HA-8
POTTER STREET AND ELLIS STREET
EXHIBIT NO. 24

PROJECT NO. HA-8
POTTER STREET AND ELLIS STREET
EXHIBIT NO. 24

PROJECT NO. HA-8

POTTER STREET AND ELLIS STREET

EXHIBIT NO. 24



PROJECT NO. HA-8
POTTER STREET AND ELLIS STREET
EXHIBIT NO. 24

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. HA-9 IMPROVEMENT TO THE FLOW OF TRAFFIC ALONG HADDON AVENUE

BOROUGH OF HADDONFIELD

Project No. HA-9 covers the improvement to the flow of traffic along Haddon Avenue within the Borough of Haddonfield.

a. PROBLEMS

(1) Heavy volumes of traffic use Haddon Avenue which is one of the main arterial roadways in the Borough of Haddonfield.

(2) Parking is permitted on both sides of Haddon Avenue, restricting the flow of traffic along this roadway.

(3) There is no posted speed limit along Haddon Avenue within the Borough of Haddonfield.

(4) Many stores located along Haddon Avenue do not have rear delivery entrances, thereby causing trucks to double park on Haddon Avenue to make deliveries.

b. RECOMMENDATIONS

(1) Prohibit parking on both sides of Haddon Avenue during the peak hours.

(2) The speed limit should be posted at 35 m.p.h. along Haddon Avenue, as the result of a speed study taken along this road.

(3) Parking regulations should be enforced more strictly.

(4) Future consideration should be given to the construction of multilevel parking facilities.

c. BENEFITS

(1) Friction between parked vehicles and through traffic will be reduced.

(2) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 350.00
(2) Signs and Markings	1,750.00
Total Estimated Cost	$2,100.00

KINGS
HIGHWAY
WARWICK
ROAD
N

PROJECT NO. HA-10 KINGS HIGHWAY AND WARWICK ROAD
BOROUGH OF HADDONFIELD

Project No. HA-10 covers the improvement to the intersection of Kings Highway and Warwick Road.

a. PROBLEMS

(1) This is a signalized "T" intersection. Present levels of service for left turn movements are "F" on the east approach and "C" on the south approach. The 1971 peak left turn volumes for these approaches compared to the 1971 average volumes are summarized below:

	1971 PEAK LEFT TURN VOLUME VEH./HR.	1971 AVERAGE LEFT TURN VOLUME VEH./HR.
Warwick Road South Approach	231	193
Kings Highway East Approach	384	301

(2) Present levels of service for through and right turn movements are "B" on the south, east and west approaches. The 1971 peak through and right turn volumes for each approach compared to the 1971 average volumes are summarized below:

	1971 PEAK THROUGH AND RIGHT TURN VOLUME VEH./HR.	1971 AVERAGE THROUGH AND RIGHT TURN VOLUME VEH./HR.
*Warwick Road South Approach	193	164
**Kings Highway East Approach	527	429
Kings Highway West Approach	549	469

*Right Turn Volumes
**Through Volumes

(3) Accident records indicate a total of eleven (11) accidents during the three (3) year period from 1968 through 1970. Of this total, seven (7) were classified as same direction accidents, two (2) were classified as right angle accidents and two (2) were classified as collisions with fixed objects.

(4) Overhanging branches obstruct the visibility of the signals controlling the Warwick Road approach.

(5) Signal timing and equipment is not capable of adjusting to the variations in traffic demand.

(6) During peak hours excessive delays for left turn traffic from the east approach are created due to the insufficient amount of green time allocated to this approach.

(7) Existing signal is a fixed time installation and is not interconnected to provide for the progressive movement of traffic along Kings Highway.

b. RECOMMENDATIONS

(1) Provide a separate phase for the east approach of Kings Highway.

(2) Trim overhanging brances that obstruct visibility of signals.

(3) Interconnect existing signal with the other signal installations along Kings Highway within the Borough of Haddonfield.

(4) Enforce parking regulations on all three (3) approaches.

c. BENEFITS

(1) Capacity for left turns on the east approach of Kings Highway will be improved.

(2) Delays experienced during peak hours of traffic will be reduced.

(3) Visibility of signals will be improved.

(4) Accident potential will be reduced.

(5) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$1,200.00
(2) Construction	1,200.00
Total Estimated Cost	$2,400.00

PROJECT NO. HA-11 KINGS HIGHWAY AND TANNER STREET
BOROUGH OF HADDONFIELD

Project No. HA-11 covers the improvements to the intersection of Kings Highway and Tanner Street. *(Exhibit No. 25).*

a. PROBLEMS

(1) This is a signalized "T" intersection. Present levels of service are "F" on the north approach and "B" on the east and west approaches. The 1971 peak volumes for each approach compared to the 1971 average volumes are summarized below:

	1971 PEAK VOLUME VEH./HR.	1971 AVERAGE VOLUME VEH./HR.
Tanner Street North Approach	425	330
Kings Highway East Approach	646	562
Kings Highway West Approach	768	706

(2) Existing signals are post mounted and they blend in with the trees along Kings Highway.

(3) Accident records indicate a total of eleven (11) accidents during the three (3) year period from 1968 through 1970. Of this total, eight (8) were classified as same direction accidents, two (2) were classified as collisions with fixed objects and one (1) was classified as a right angle accident.

(4) Corner radii are not large enough to accommodate safe turning movements.

(5) Pavement markings are virtually non-existent on Tanner Street.

(6) Existing regulatory signs on Tanner Street and Kings Highway are not in accordance with the current Manual on Uniform Traffic Control Devices.

(7) Parking is permitted too close to the intersection on the east approach of Kings Highway.

(8) Signal timing and equipment is not capable of adjusting to the variations in traffic demand.

(9) The existing signal is a fixed time installation and is not interconnected to provide progressive movement of traffic along Kings Highway.

(10) Excessive delays are created on Tanner Street during peak hours by insufficient green time allocated to this approach.

PROJECT NO. HA-11 KINGS HIGHWAY AND TANNER STREET
BOROUGH OF HADDONFIELD

b. RECOMMENDATIONS

(1) Provide additional green time for the north approach of Tanner Street.

(2) Reconstruct the traffic signals to provide signals over the roadway.

(3) Future consideration should be given to widening Tanner Street to a minimum of thirty-six (36) feet.

(4) Provide the proper regulatory signs in accordance with the current Manual on Uniform Traffic Control Devices.

(5) Increase the radii on the northeast and northwest corners to a minimum of thirty (30) feet.

(6) Provide proper pavement markings on Tanner Street in accordance with the current Manual on Uniform Traffic Control Devices.

(7) Prohibit parking for one hundred (100) feet on the east approach of Kings Highway and enforce the existing parking regulations.

c. BENEFITS

(1) Capacity of intersection will be improved.

(2) Delays on Tanner Street will be reduced and the level of service on all approaches improved.

(3) Accident potential will be reduced.

(4) A safer and smoother flow of traffic will be achieved.

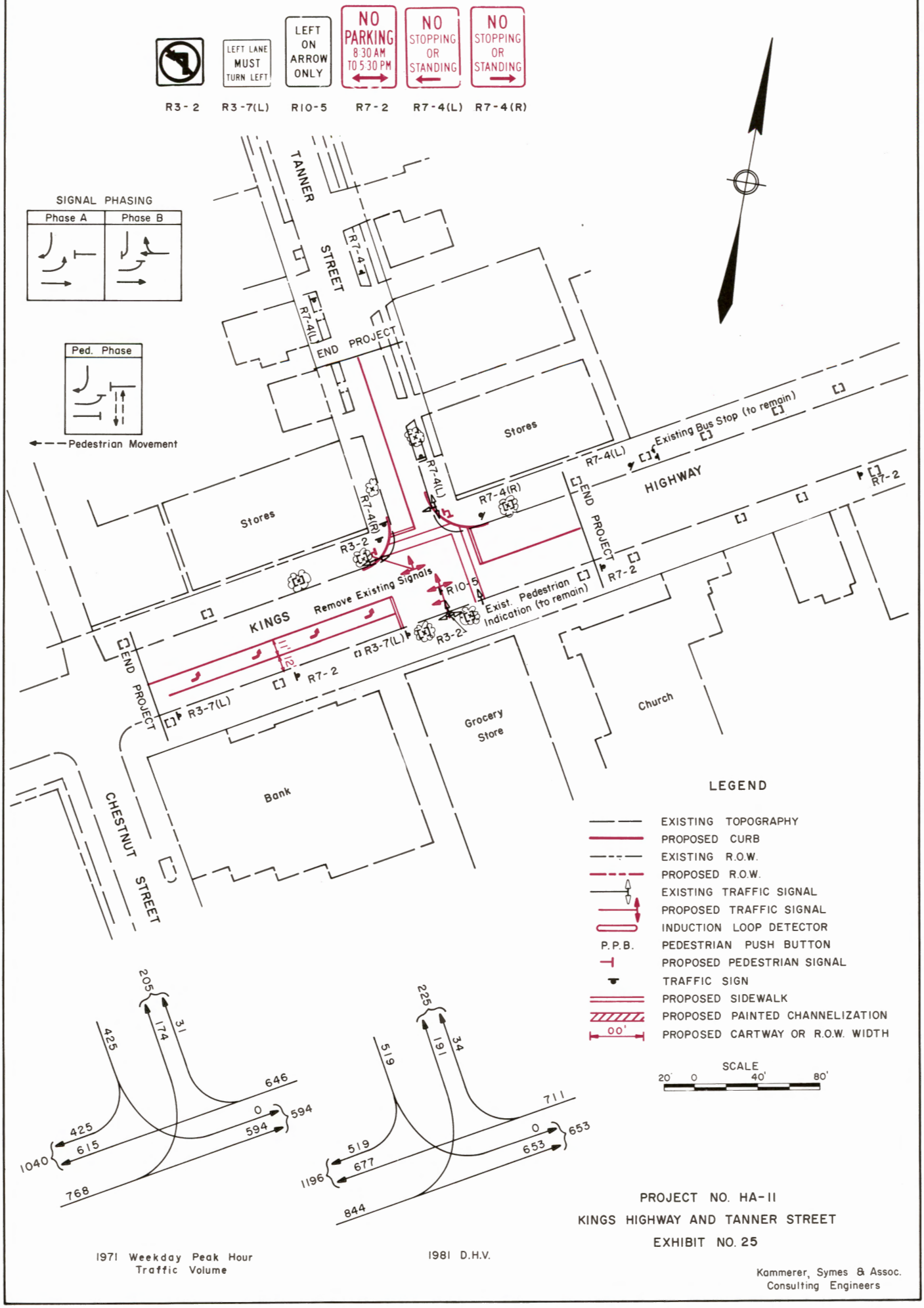
d. ESTIMATED COSTS

(1) Engineering	$ 2,500.00
(2) Construction	2,500.00
(3) Signs and Markings	350.00
(4) Traffic Signals	10,000.00
Total Estimated Cost	$15,350.00

PROJECT NO. HA-11

KINGS HIGHWAY AND TANNER STREET

EXHIBIT NO. 25


R3-2
LEFT LANE MUST TURN LEFT
R3-7(L)
LEFT ON ARROW ONLY
R10-5
NO PARKING 8:30 AM TO 5:30 PM
R7-2
NO STOPPING OR STANDING
R7-4(L)
NO STOPPING OR STANDING
R7-4(R)
SIGNAL PHASING
Phase A
Phase B
Ped. Phase
Pedestrian Movement
TANNER STREET
R7-4
R7-4(L)
END PROJECT
Stores
Stores
R7-4(L)
Existing Bus Stop (to remain)
HIGHWAY
R7-4(R)
R7-4(L)
R7-4(R)
R3-2
END PROJECT
R7-2
Remove Existing Signals
R10-5
Exist. Pedestrian Indication (to remain)
KINGS
R3-7(L)
R3-2
END PROJECT
R7-2
R3-7(L)
Grocery Store
Church
Bank
CHESTNUT STREET
LEGEND
EXISTING TOPOGRAPHY
PROPOSED CURB
EXISTING R.O.W.
PROPOSED R.O.W.
EXISTING TRAFFIC SIGNAL
PROPOSED TRAFFIC SIGNAL
INDUCTION LOOP DETECTOR
P.P.B. PEDESTRIAN PUSH BUTTON
PROPOSED PEDESTRIAN SIGNAL
TRAFFIC SIGN
PROPOSED SIDEWALK
PROPOSED PAINTED CHANNELIZATION
00' PROPOSED CARTWAY OR R.O.W. WIDTH
SCALE
20' 0 40' 80'
205
31
174
425
646
0
594
425
615
594
1040
768
225
34
191
519
711
0
653
519
677
653
1196
844
1971 Weekday Peak Hour Traffic Volume
1981 D.H.V.
PROJECT NO. HA-11
KINGS HIGHWAY AND TANNER STREET
EXHIBIT NO. 25
Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. HA-11

KINGS HIGHWAY AND TANNER STREET

EXHIBIT NO. 25

KINGS
HIGHWAY
AVENUE
HINCHMAN
N

PROJECT NO. HA-12 KINGS HIGHWAY AND HINCHMAN AVENUE
BOROUGH OF HADDONFIELD

Project No. HA-12 covers the improvements to the intersection of Kings Highway and Hinchman Avenue.

a. PROBLEMS

(1) The number of accidents has increased during the three (3) year period 1968, 1969 and 1970. Accident records indicate a total of twelve (12) accidents during this period. In 1968, there was a total of one (1) accident, in 1969 a total of five (5) accidents and in 1970, a total of six (6) accidents. Of this total, five (5) were classified as right angle accidents, four (4) were classified as collisions with fixed objects, two (2) were classified as same direction accidents and one (1) was classified as a left turn accident.

(2) The sight distance for traffic exiting from Hinchman Avenue onto Kings Highway is restricted by large trees.

(3) Vehicles parked on Kings Highway are too close to the intersection.

(4) Corner radii are not large enough to accommodate safe turning movements.

b. RECOMMENDATIONS

(1) Prohibit parking on both sides of Kings Highway for a minimum of one hundred (100) feet in an easterly and westerly direction from the intersection.

(2) Remove the large tree located on the southeast corner of Kings Highway and Hinchman Avenue.

(3) Increase all corner radii to a minimum of thirty (30) feet.

c. BENEFITS

(1) High accident potential will be reduced.

(2) The number of right angle accidents will be reduced.

(3) Sight distance will be improved.

(4) A safer flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 600.00
(2) Construction	3,000.00
(3) Signs and Markings	300.00
	$3,900.00

N
CHESTNUT STREET
KINGS HIGHWAY

PROJECT NO. HA-13 KINGS HIGHWAY AND CHESTNUT STREET
BOROUGH OF HADDONFIELD

Project No. HA-13 covers the improvements to the intersection of Kings Highway and Chestnut Street.

a. PROBLEMS

(1) This is a "T" intersection with no STOP sign located on Chestnut Street.

(2) Accident records indicate a total of fourteen (14) accidents during the three (3) year period from 1968 through 1970. Of this total, nine (9) were classified as same direction accidents, two (2) were classified as right angle accidents, one (1) was classified as a left turn accident, one (1) was classified as a collision with a fixed object and one (1) was classified as a head on collision.

(3) Eastbound traffic on Kings Highway makes it difficult for traffic turning left from the east approach of Kings Highway onto Chestnut Street.

(4) Existing NO LEFT TURN sign facing the Chestnut Street approach is not in accordance with the current Manual on Uniform Traffic Control Devices.

b. RECOMMENDATIONS

(1) Install a STOP sign on Chestnut Street.

(2) Install an R10-7, DO NOT BLOCK INTERSECTION sign on the west approach of Kings Highway to prevent eastbound traffic on Kings Highway from blocking the intersection of Kings Highway and Chestnut Street when the signal at Tanner Street and Kings Highway turns red for the Kings Highway approaches.

(3) Remove the existing NO LEFT TURN signs at this intersection and install new NO LEFT TURN signs in accordance with the current Manual on Uniform Traffic Control Devices.

(4) Provide for stricter enforcement of all traffic regulations.

c. BENEFITS

(1) Accident potential will be reduced.

(2) By preventing the eastbound traffic on Kings Highway from blocking the intersection of Kings Highway and Chestnut Street, the friction between left turn movements from the west approach of Kings Highway and the through movement will be reduced.

d. ESTIMATED COSTS

(1) Signs and Markings	$200.00
Total Estimated Cost	$200.00

PROJECT IMPROVEMENTS

BOROUGH OF HADDON HEIGHTS

Kammerer, Symes & Associates, Inc.
CONSULTING ENGINEERS

PROJECT NO. HH-1 EAST AND WEST ATLANTIC AVENUES AND STATION AVENUE BOROUGH OF HADDON HEIGHTS

Project No. HH-1 covers the reconstruction and installation of a new traffic signal at the intersection of East and West Atlantic Avenues and Station Avenue. *(Exhibit No. 26).*

a. PROBLEMS

(1) High traffic volumes on Station Avenue make it difficult for traffic exiting the approaches of East and West Atlantic Avenues and cause excessive delays.

(2) Accident records indicate a total of eleven (11) accidents during the three (3) year period from 1968 through 1970. Of this total, eight (8) were classified as right angle accidents, one (1) was classified as a left turn accident, one (1) was classified as a same direction accident and one (1) was classified as a collision with a fixed object. From the total number of right angle accidents, five (5) occurred during 1969.

(3) The high number of right angle accidents, eight (8), represents seventy-three (73) percent of the total number of accidents occurring at this location during the three (3) year period.

(4) The corner radii are not large enough to allow traffic, particularly buses and large trucks to turn right without crossing into the opposing lane of traffic.

(5) Parking is permitted too close to the intersection.

(6) Existing angle parking on East Atlantic Avenue and West Atlantic Avenue represents a potential hazard for the traffic traveling along these roadways.

(7) Pavement markings are not properly maintained.

b. RECOMMENDATIONS

(1) Reconstruct the intersection as shown on the plan.

(2) Install a new semi-actuated traffic signal with pedestrian push buttons at the intersection of East and West Atlantic Avenues and Station Avenue. Warrant No. 1, Minimum Vehicular Volume, is satisfied.

(3) Traffic detectors are to be located on the East Atlantic Avenue south approach and on the West Atlantic Avenue north approach.

(4) Provide sufficient clearance time for traffic to move through the intersection.

(5) Increase all corner radii.

(6) Make East Atlantic Avenue one-way northbound and West Atlantic Avenue one-way southbound as recommended in Project No. AU-4, Borough of Audubon.

(7) Advertising of the proposed changes in street directions should be instituted to acquaint the public prior to the change.

(8) Prohibit parking on all approaches.

(9) Remove the angle parking pavement markings, and provide parallel parking on the west side of East Atlantic Avenue and on the east side of West Atlantic Avenue.

(10) Install BLANK-OUT signs at East Atlantic and West Atlantic Avenues to be actuated by railroad traffic.

(11) Provide pavement markings in accordance with the current Manual on Uniform Traffic Control Devices.

c. BENEFITS

(1) Accident potential will be reduced.

(2) The number of right angle accidents will be reduced.

(3) Hazard of angle parking will be eliminated.

(4) A more convenient by-pass route through the Borough will be provided.

d. ESTIMATED COSTS

(1) Engineering	$ 4,700.00
(2) Construction	8,000.00
(3) Signs and Markings	500.00
(4) Traffic Signals	15,000.00
Total Estimated Cost	$28,200.00

PROJECT NO. HH-1

EAST AND WEST ATLANTIC AVENUES AND STATION AVENUE

EXHIBIT NO. 26

PROJECT NO. HH-1

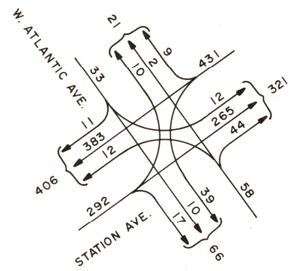
EAST AND WEST ATLANTIC AVENUES AND STATION AVENUE

EXHIBIT NO. 26

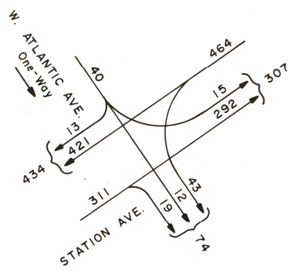
PROJECT NO. HH-1

EAST AND WEST ATLANTIC AVENUES AND STATION AVENUE

EXHIBIT NO. 26



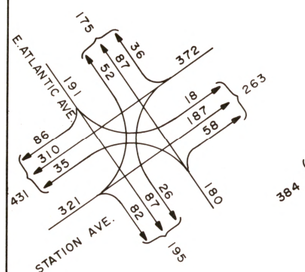
1971 Weekday Peak Hour Traffic Volume



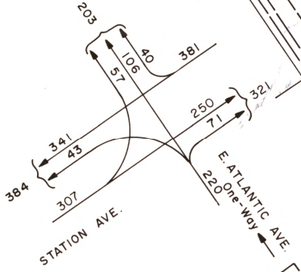
1981 D.H.V.

SIGNAL PHASING

Phase A	Phase B	Phase C	R.R. Phase



1971 Weekday Peak Hour Traffic Volume



1981 D.H.V.



R6-1 R3-1 R3-2



R10-3 R7-4(L) R7-4(R) R7-108(L) R7-108(R) R5-1

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE
20 0 40' 80'

PROJECT NO. HH-1
EAST AND WEST ATLANTIC AVENUES AND STATION AVENUE
EXHIBIT NO. 26

Kammerer, Symes & Assoc.
Consulting Engineers

STATION
AVENUE
U.S. ROUTE 30
N

PROJECT NO. HH-2 U.S. ROUTE 30 AND STATION AVENUE
BOROUGH OF HADDON HEIGHTS

Project No. HH-2 covers the improvements to the intersection of Route 30 and Station Avenue.

a. PROBLEMS

(1) Low hanging branches from large trees located near the intersection restrict the visibility of the signals.

(2) Accident records indicate a total of thirty-one (31) accidents during the three (3) year period from 1968 through 1970. Of this total, thirteen (13) were classified as same direction accidents, eight (8) were classified as left turn accidents, eight (8) were classified as right angle accidents, one (1) was classified as a collision with a fixed object and one (1) as an accident involving a pedestrian.

(3) From the total number of same direction accidents, eleven (11) involved vehicles traveling on both approaches of Route 30.

(4) The high number of same direction accidents was principally caused by the poor visibility of the signals.

(5) Insufficient clearance time is allocated for traffic moving through the intersection.

(6) Corner radii are not large enough to accommodate safe turning movements.

(7) Parking is permitted too close to the intersection on the west approach.

b. RECOMMENDATIONS

(1) Low hanging branches should be trimmed to increase the visibility of the signals.

(2) Provide back plates for all signals over the roadway.

(3) Provide sufficient clearance time for traffic to move through the intersection.

(4) Restrict parking for a minimum of sixty (60) feet on both sides of the west approach and enforce the parking restrictions on all other approaches.

(5) Increase all corner radii to a minimum of thirty (30) feet.

(6) Final signal operation is to be determined by the New Jersey Department of Transportation.

PROJECT NO. HH-2 U.S. ROUTE 30 AND STATION AVENUE
BOROUGH OF HADDON HEIGHTS

c. BENEFITS

(1) Accident potential will be reduced.

(2) The number of same direction accidents will be reduced.

(3) Visibility of the signals will be increased.

(4) A safer flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 640.00
(2) Construction	3,000.00
(3) Signs	200.00
Total Estimated Cost	$3,840.00

NINTH
STATION
AVENUE
AVENUE

PROJECT NO. HH-3 NINTH AVENUE AND STATION AVENUE
BOROUGH OF HADDON HEIGHTS

Project No. HH-3 covers the improvements to the intersection of Ninth Avenue and Station Avenue.

a. PROBLEMS

(1) The sight distance for traffic exiting from Ninth Avenue onto Station Avenue is restricted by large trees located on the west approach of Station Avenue, close to the intersection.

(2) Near side bus stops on the Station Avenue approaches restrict the right turn movements from Station Avenue onto Ninth Avenue and also restrict the sight distance for the traffic exiting from both approaches of Ninth Avenue.

(3) The high volumes of traffic on Station Avenue and the restricted sight distance create a hazardous condition for vehicles exiting from both approaches of Ninth Avenue onto Station Avenue.

(4) The number of accidents has steadily increased during the three (3) year period from 1968 through 1970. Accident records indicate a total of ten (10) accidents, two (2) in 1968, three (3) in 1969 and five (5) in 1970. Of this total, eight (8) were classified as right angle accidents, one (1) was classified as a left turn accident and one (1) an accident involving a pedestrian.

(5) Corner radii are not large enough to accommodate safe turning movements.

(6) Parking is permitted too close to the intersection.

(7) Pavement markings are not properly maintained.

b. RECOMMENDATIONS

(1) Remove trees located within the right of way on the northeast and southwest corners of this intersection.

(2) Relocate the existing near side bus stops on Station Avenue to the far side corners.

(3) Increase all corner radii to a minimum of thirty (30) feet.

(4) Install a larger STOP sign in addition to a STOP AHEAD sign on both approaches of Ninth Avenue.

(5) Prohibit parking for a minimum of one hundred (100) feet on both sides of all four (4) approaches.

(6) Provide pavement markings in accordance with the current Manual on Uniform Traffic Control Devices.

PROJECT NO. HH-3 NINTH AVENUE AND STATION AVENUE
BOROUGH OF HADDON HEIGHTS

c. BENEFITS

(1) Sight distance will be improved.

(2) Accident potential will be reduced.

(3) The number of right angle accidents will be reduced.

(4) Friction between buses and other traffic will be reduced.

(5) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 900.00
(2) Construction	3,900.00
(3) Signs and Markings	500.00
Total Estimated Cost	$5,300.00

PROJECT NO. HH-4 CLEMENTS BRIDGE ROAD, EAST ATLANTIC AVENUE AND BARRINGTON AVENUE

BOROUGH OF HADDON HEIGHTS

Project No. HH-4 covers the reconstruction of the intersection and installation of a new traffic signal at Clements Bridge Road, East Atlantic Avenue and Barrington Avenue. *(Exhibit No. 27)*.

a. PROBLEMS

(1) High traffic volumes on Clements Bridge Road make it difficult for traffic exiting from the Barrington Avenue and East Atlantic Avenue approaches and cause excessive delays.

(2) The flat angle of intersection creates a hazardous condition for vehicles exiting from the Barrington Avenue and East Atlantic Avenue approaches onto Clements Bridge Road.

(3) Heavy volumes of traffic use Clements Bridge Road which is one of the main arterial roadways in Camden County.

(4) Parking is permitted too close to the intersection.

(5) Corner radii are not large enough to accommodate safe turning movements.

(6) There is a railroad grade crossing at this intersection.

(7) Railroad pavement markings are non-existent on the Clements Bridge Road approaches.

(8) The approach roadways, on Clements Bridge Road are not wide enough to safely accommodate the turning movements and through traffic. The percentage of turning movements is as follows:

	% LEFT TURNS	% RIGHT TURNS
Clements Bridge Road North Approach	3	4
Clements Bridge Road South Approach	12	6

b. RECOMMENDATIONS

(1) Widen the north and south approaches.

(2) Install a new semi-actuated traffic signal with pedestrian push buttons and a railroad pre-emptor at the intersection of Clements Bridge Road, East Atlantic Avenue and Barrington Avenue. Warrant No. 2, Interruption of Continuous Traffic, is satisfied.

(3) Provide a separate phase for the east approach of East Atlantic Avenue and the west approach of Barrington Avenue.

NOTE: This project is shared with Barrington.

(4) Traffic detectors are to be located on the west approach of Barrington Avenue and on the east approach of East Atlantic Avenue.

(5) Make Barrington Avenue one way east from the Borough line to Trenton Avenue and East Atlantic Avenue one way west from Clements Bridge Road to Oakland Avenue in the Borough of Oaklyn.

(6) Eliminate the angle parking on the East Atlantic Avenue and Barrington Avenue approaches.

(7) Relocate the bus stop on the northwest corner of Barrington Avenue and Clements Bridge Road further away from this intersection as shown on the plan.

(8) Install railroad crossing gates on the Clements Bridge Road approaches.

(9) Provide railroad grade crossing pavement markings on Clements Bridge Road in accordance with the Manual on Uniform Traffic Control Devices.

(10) Prohibit parking on all four (4) approaches as shown on the plan.

c. BENEFITS

(1) Capacity of intersection will be improved.

(2) Delays experienced during peak hours of traffic will be reduced.

(3) A safer and smoother flow of traffic will be achieved.

d. ESTIMATED COSTS

(1) Engineering	$ 8,000.00
(2) Construction	19,400.00
(3) Signs and Markings	600.00
(4) Traffic Signals	20,000.00
(5) Right of Way	3,000.00
Total Estimated Cost	$51,000.00

PROJECT NO. HH-4

CLEMENTS BRIDGE ROAD, EAST ATLANTIC AVENUE AND BARRINGTON AVENUE

EXHIBIT NO. 27

PROJECT NO. HH-4

CLEMENTS BRIDGE ROAD, EAST ATLANTIC AVENUE AND BARRINGTON AVENUE

EXHIBIT NO. 27



PROJECT NO. HH-4

CLEMENTS BRIDGE ROAD, EAST ATLANTIC AVENUE AND BARRINGTON AVENUE

EXHIBIT NO. 27

BOROUGH OF HADDON HEIGHTS

EAST ATLANTIC AVENUE

PENNSYLVANIA READING

KINGSTON AVENUE

BARRINGTON AVENUE

READING AVENUE

CLEMENTS BRIDGE

PAGE AVENUE

HAINES AVE.

SEASHORE LINES

END PROJECT

Proposed One Way

Existing One Way

Proposed R.R. Gates

Existing Bus Stop (Relocate)

Proposed Bus Stop

Stores

Office Bldg.

Cafe

Lumber Company

R7-4(L)

R7-4(R)

R10-3 PPB

R7-1(L)

R7-1(R)

R7-1

R6-1

R7-107

12'

15'

17'

SIGNAL PHASING

Phase A	Phase B	Phase C	R.R. Phase

1971 Weekday Peak Hour Traffic Volume

1981 D.H.V.

LEGEND

- EXISTING TOPOGRAPHY
- PROPOSED CURB
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING TRAFFIC SIGNAL
- PROPOSED TRAFFIC SIGNAL
- INDUCTION LOOP DETECTOR
- P.P.B. PEDESTRIAN PUSH BUTTON
- PROPOSED PEDESTRIAN SIGNAL
- TRAFFIC SIGN
- PROPOSED SIDEWALK
- PROPOSED PAINTED CHANNELIZATION
- 00' PROPOSED CARTWAY OR R.O.W. WIDTH

SCALE 20' 0 40' 80'

ONE WAY R6-1

NO PARKING ANY TIME R7-1(L)

NO PARKING ANY TIME R7-1

NO PARKING ANY TIME R7-1(R)

NO STOPPING OR STANDING R7-4(L)

NO STOPPING OR STANDING R7-4(R)

NO PARKING BUS STOP R7-107

PUSH BUTTON FOR GREEN LIGHT R10-3

PROJECT NO. HH-4

CLEMENTS BRIDGE ROAD, EAST ATLANTIC AVENUE AND BARRINGTON AVENUE

EXHIBIT NO. 27

Kammerer, Symes & Assoc.
Consulting Engineers

GENERAL RECOMMENDATIONS

PROJECT NO. G-1 TYPICAL LEFT TURN LANE PAVEMENT MARKINGS

Several of the arterial and collector roads in the study area do not have sufficient width to be marked for two (2) lanes of traffic in each direction. Provisions for left turn lanes are desirable at many of the major intersections with connector streets. *(Exhibit No. G-1).*

a. PROBLEMS

(1) Roads on the study system with cartway widths between thirty-six (36) and forty (40) feet are marked for one lane of travel in each direction.

(2) Vehicles desiring to turn into the main connector streets within a residential area must straddle the centerline while waiting to turn.

(3) On-coming traffic receives no pre-warning that a vehicle is straddling the centerline.

b. RECOMMENDATIONS

(1) Construct painted channelization to provide one (1) lane of through traffic in each direction plus a center lane for turning vehicles at locations in the study system which have cartway widths between thirty-six (36) and forty (40) feet and are marked for one lane of travel in each direction.

c. BENEFITS

(1) Will provide a protected area for vehicles to wait for clearance to make left turn movements, thereby reducing exposure to head-on, rear-end and same direction accidents.

(2) Driver confusion will be eliminated.

d. ESTIMATED COSTS

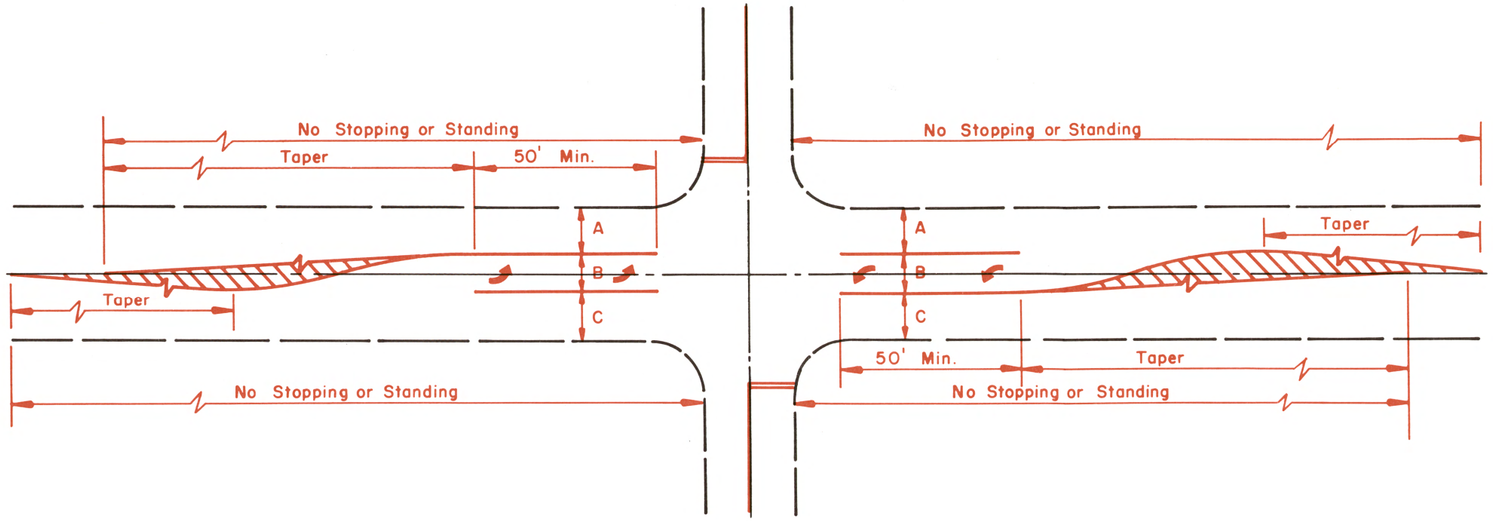
(1) Engineering	$150.00
(2) Signs and Markings	750.00
*Total Estimated Cost	*$900.00

*Denotes cost of typical intersection

PROJECT NO. G-1

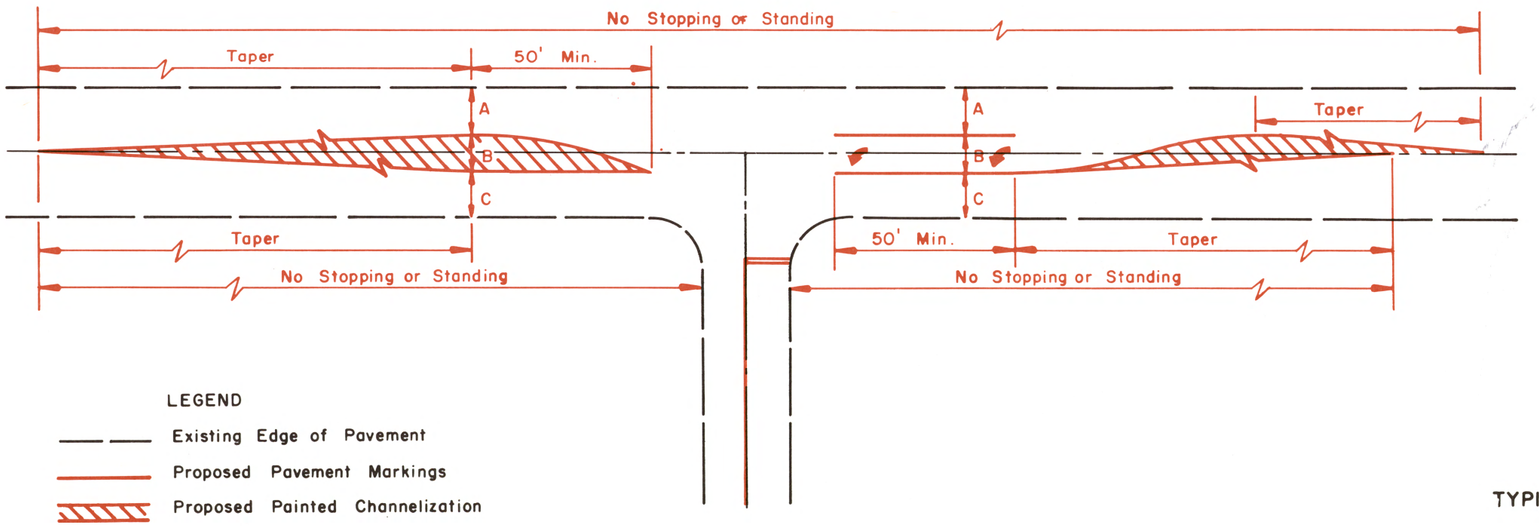
TYPICAL LEFT TURN LANE PAVEMENT MARKINGS

EXHIBIT NO. G-1



TYPICAL FOUR WAY INTERSECTION

TRAFFIC LANE	CARTWAY WIDTH		
	36'	38'	40'
A	13'	13'	14'
B	10'	12'	12'
C	13'	13'	14'
TAPER	200'	240'	240'



TYPICAL THREE WAY INTERSECTION

TRAFFIC LANE	CARTWAY WIDTH		
	36'	38'	40'
A	13'	13'	14'
B	10'	12'	12'
C	13'	13'	14'
TAPER	200'	240'	240'

PROJECT NO. G-1

TYPICAL LEFT TURN LANE PAVEMENT MARKINGS

EXHIBIT NO. G-1

Kammerer, Symes & Assoc.
Consulting Engineers

PROJECT NO. G-2 GENERAL SPEED LIMITS

Project No. G-2 covers general speed limits within the study area.

a. PROBLEMS

(1) Unrealistically low speed limits are in force on many roads within the study area.

(2) Unrealistic speed limits result in driver disrespect for speed limit signs.

(3) Drivers who obey these speed limits actually create a hazardous condition.

b. RECOMMENDATIONS

(1) Arterial roadways should be speed zoned in accordance with the Manual on Uniform Traffic Control Devices.

c. BENEFITS

(1) A safer and smoother flow of traffic will be achieved.

(2) Greater respect for traffic control measures will be gained.

CHAPTER 14

IMPLEMENTATION

The basis for the selection of Projects for proposed improvements as stated previously was the increase of intersection and roadway capacities, improvement of the quality of travel and the reduction of accident potential.

The requirements of the TOPICS Program for the Study Area referred to in this report states that a feasible schedule of time and costs be established to implement the projects within a five (5) year period, 1973 - 1978. This Chapter presents a summary of the parameters used for implementation.

RIGHT OF WAY

Several of the Projects will require the acquisition of additional right of way. While these projects may not be scheduled for construction in the early phases, the acquisition of right of way should proceed as scheduled to restrict development of vacant land and take advantage of the lowest possible price. The acquisition of right of way by a governmental agency is a complex process which involves many functions from the time the right of way plans are completed by the engineers until the right of way personnel can begin their job of acquisition. Right of way estimates given in this report have been escalated at an annual rate of six (6) percent per year. It should be noted that acquisition for rights-of-way on all highway projects must comply with the following statutes:

a. STATE - Chapter 361, Laws of New Jersey 1971.
Assembly Bill No. 504, approved December 21, 1971.
"Eminent Domain Act of 1971".

b. STATE - Chapter 47, Laws of New Jersey 1972.
Senate Bill No. 987, approved June 1, 1972.
"Uniform Transportation Replacement Housing and Relocation Act".

c. FEDERAL- Public Law 91-646, 91st Congress.
Senate Bill No. 1, approved January 2, 1971.
"Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970".

CONSTRUCTION COSTS

The estimated costs for recommended projects are based on the experience of the Consultant and the cost of similar work.

In recent years, the "Engineering News Record" Construction Cost Index has increased an average of five (5) percent per year; however, in 1968, the increase in the index was ten (10) percent. The costs shown in the schedules in this Chapter have been escalated at the rate of eight (8) percent per year.

ENGINEERING

In addition to the early acquisition of right of way, early preparation of plans and specifications is essential to the orderly completion of the projected schedule.

A minimum period of one (1) year should be scheduled to obtain project approvals, obtain right of way and prepare engineering drawings for each project. On more complex and expensive projects, the period will be considerably longer.

Estimated engineering fees include the preparation of right of way plans, preliminary design, final design, construction layout and construction inspection. A factor of twenty (20) percent of the estimated construction cost was used to estimate the engineering fees. The fees estimated in this schedule have been escalated at the rate of six (6) percent per year.

CHAPTER 15

SYSTEMS MAINTENANCE AND EVALUATION

The projects recommended in this report do not increase the road mileage within the municipalities studied. Three (3) new signals have been added to the system in the Borough of Haddonfield, two (2) new signals have been added to the system in the Borough of Haddon Heights, while none have been added to either the Borough of Audubon or the Borough of Tavistock.

Signals, signs and pavement markings on State Highways are maintained by the State. The changes recommended with the exception of initial cost would have an insignificant change in the maintenance budget. The estimated maintenance cost for the recommended changes would be one hundred twenty (120) dollars for the Borough of Audubon, three hundred (300) dollars for the Borough of Haddonfield and forty (40) dollars for the Borough of Haddon Heights, which would increase the current maintenance budgets to seven hundred twenty (720) dollars, one thousand, eight hundred (1,800) dollars and two hundred twenty (220) dollars respectively.

TRAFFIC SIGNALS

Traffic signals on municipal and county roads are currently maintained by the municipalities. It is the recommendation of this report that the County of Camden take a more active part in the design and installation of traffic signals on County roads. More specifically it is felt that the County should review and approve the design, participate financially in the construction cost and take the responsibility for maintaining the signal after installation.

Since only five (5) new signals have been recommended in this report estimates for maintenance of signals within the Boroughs should be increased slightly.

SIGNS AND PAVEMENT MARKINGS

Provisions should be made in the Municipal Budgets for annual repainting of pavement markings on a pre-determined schedule. The schedule should be based on past experience of traffic volumes. Additional monies should be budgeted for signs to cover the cost of painting, cleaning, replacement, vandalism and placement of new signs as changes in traffic volumes and experience require.

EVALUATION

The improvements recommended should be evaluated by a qualified traffic engineer as to their effectiveness. Through such a study, the effectiveness of each project can be evaluated in eliminating the problem areas outlined in the report.

APPENDIX

DEFINITIONS

ACTUATED SIGNALS: A type of traffic control signal in which the intervals are varied in accordance with the demands of traffic as registered by the actuation of detectors.

AVERAGE ANNUAL DAILY TRAFFIC: The total yearly volume divided by the number of days in the year, commonly abbreviated as A.A.D.T.

CAPACITY: The maximum number of vehicles which has a reasonable expectation of passing over a given section of a lane or a roadway in one direction (or in both directions for a two-lane or a three-lane highway) during a given time period under prevailing roadway and traffic conditions.

CARTWAY WIDTHS: Widths of roadways between curbs or travel way including shoulders.

CENTRAL BUSINESS DISTRICT (C.B.D.): That portion of a municipality in which the dominant land use is for intense business activity.

CHANNELIZATION OF TRAFFIC: The separation or regulation of conflicting traffic movements into definite paths of travel by use of pavement markings, raised islands, or other suitable means to facilitate the safe and orderly movement of traffic, both vehicular and pedestrian.

COLLECTOR STREETS: Streets providing through movements between major arterials and local streets and having direct access to abutting property.

CORNER RADII: The radius, in feet, for curb or edge of paving joining intersecting roadways.

DESIGN HOUR VOLUME (D.H.V.): The future hourly volume used for design (two-way unless otherwise specified), usually the thirtieth (30th) highest hourly volume of the design year.

FIXED TIME SIGNALS: A type of traffic control signal which directs traffic to stop and permits it to proceed in accordance with predetermined time schedules.

GEOMETRY: Engineering data, which defines the alinement of roadways and intersections, consisting of curve radii, angles and distances.

GREEN TIME: The actual time that a green traffic light is on for a given approach during one cycle.

INTERSECTION CAPACITY: The computed maximum number of vehicles per hour that can be handled by an intersection.

JUGHANDLE: A separate lane turning off of a roadway expressly for accommodating turning movements, frequently used to eliminate left turn movements from the main roadway.

LEVEL OF SERVICE: A qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience and operating costs.

PEAK-HOUR TRAFFIC: The highest number of vehicles found to be passing over a section of a lane or a roadway during sixty (60) consecutive minutes.

PROGRESSIVE TIMING SYSTEM: A signal system in which the successive signal faces controlling a given street give "go" indications in accordance with a time schedule to permit (as nearly as possible) continuous operation of groups of vehicles along the street at a planned rate of speed, which may vary in different parts of the system.

RIGHT OF WAY: An easement giving the right to pass across land; as that portion of land dedicated for use as a travel way and within which roadways are constructed.

SPOT SPEED CHECKS: A method used to measure the instantaneous speed of a vehicle at a specified location.

THE THIRTIETH (30TH) HIGHEST HOUR VOLUME: The hourly volume on a given roadway that is exceeded by twenty-nine (29) hourly volumes during a designated year.

TIME DELAY STUDIES: Studies to determine the average travel time on an arterial or highway and the points of, duration and cause of delays.

TOPICS: Traffic Operations Program to Increase Capacity and Safety.

TRAFFIC VOLUME: The number of vehicles that pass over a given section of a lane or a roadway during a time period of one hour or more. Volume can be expressed in terms of daily traffic or annual traffic, as well as on an hourly basis.

VOLUME/CAPACITY RATIO: Ratio of actual vehicular volume or demand to the computed possible capacity for a given section of roadway.

WARRANTS FOR TRAFFIC SIGNAL INSTALLATION

Traffic control signals should not be installed unless one or more of the signal warrants in the Manual on Uniform Traffic Control Devices are met. Information should be obtained by means of engineering studies and compared with the requirements set forth in the warrants. If these requirements are not met, a traffic signal should neither be put into operation nor continued in operation (if already installed).

The warrants are as follows:

a. WARRANT NO. 1 - MINIMUM VEHICULAR VOLUME

b. WARRANT NO. 2 - INTERRUPTION OF CONTINUOUS TRAFFIC

c. WARRANT NO. 3 - MINIMUM PEDESTRIAN VOLUME

d. WARRANT NO. 4 - SCHOOL CROSSING

e. WARRANT NO. 5 - PROGRESSIVE MOVEMENT

f. WARRANT NO. 6 - ACCIDENT EXPERIENCE

g. WARRANT NO. 7 - SYSTEMS WARRANT

h. WARRANT NO. 8 - COMBINATION OF WARRANTS