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Memo summarizing the Dec. 1983  
traffic engineering report

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Di # 3280

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MEMO SUMMARIZING THE

DECEMBER, 1983, TRAFFIC ENGINEERING REPORT

WARREN TOWNSHIP, NEW JERSEY

BY JOHN E. CHRIST, P.E.

REGARDING THE

TIMBER TRACT

SKYTOP TRACT

AMG TRACT

RECEIVED

OCT 15 1984

JUDGE SERPENTELLI'S CHAMBERS

WITH & WITHOUT POSSIBLE FUTURE NEARBY OFFICE SITES

PREPARED FOR

WARREN TOWNSHIP

SOMERSET COUNTY, NEW JERSEY

BY

JOHN E. CHRIST, P.E.

80 CRTON ROAD

WEST CALDWELL, N.J. 07006

OCTOBER 11, 1984

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RESUME OF JOHN E. CHRIST, P.E.

PURPOSE OF MEMO

The purpose of this memo is to summarize the full report dated December, 1983. For full details and reasoning that report should be referred to.

SITES INCLUDED

SITE #1 TIMBER TRACT - 350 UNITS RESIDENTIAL

SITE #2 SKYTOP TRACT - 1400 UNITS RESIDENTIAL

SITE #3 ANG TRACT

SITE #4 POSSIBLE AT&T plus BELLEMEADE OFFICE SITES SOUTH OF RT.78 - 500,000 sq. ft.

SITE #5 POSSIBLE OFFICE SITES NORTH OF RT. 78 - 1,050,000 SQ. FT.

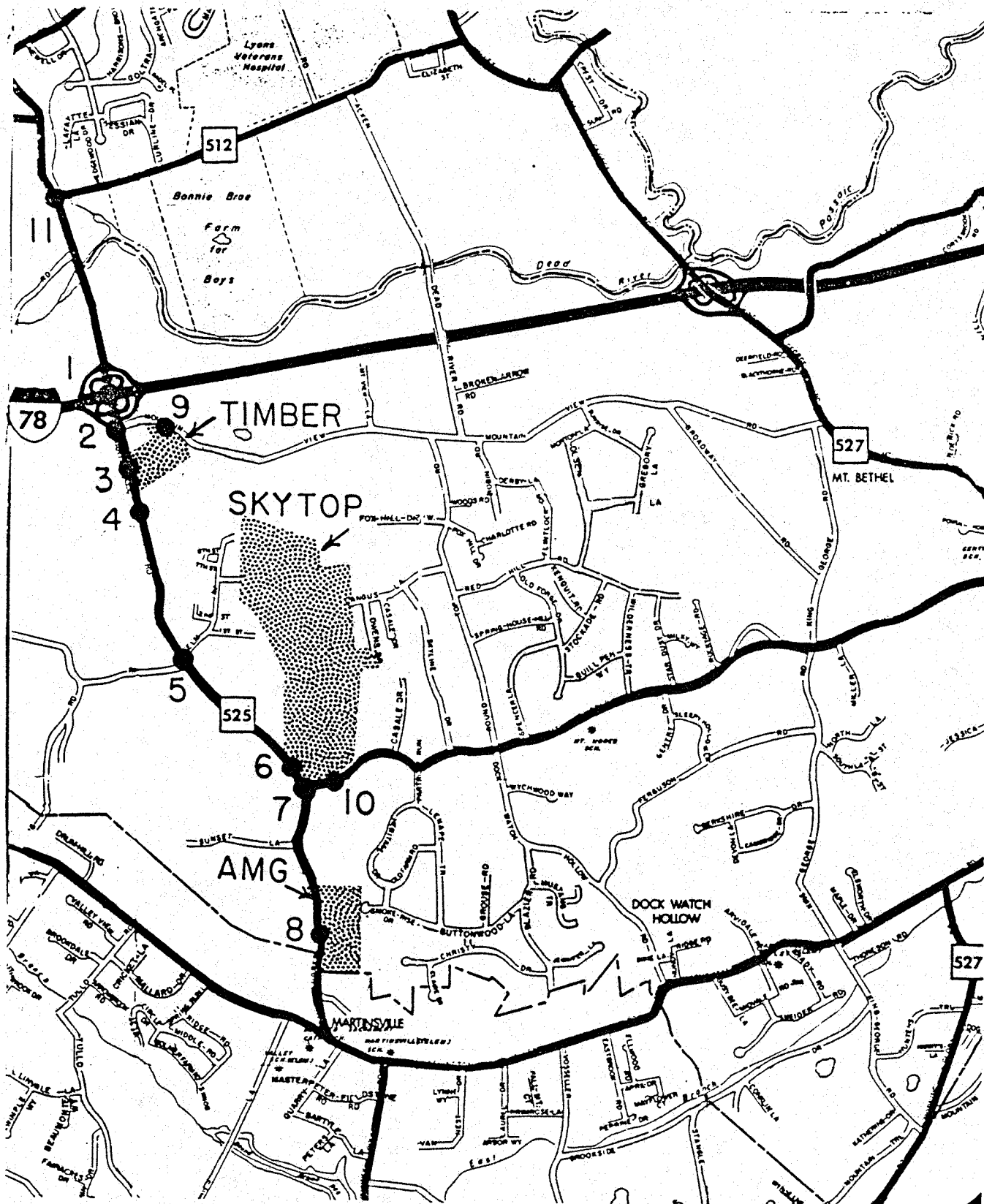
The location of these sites is shown on the map on Page 2 of this memo.

INTERSECTIONS INCLUDED

The intersections included are shown on the map on page 2. Intersection 1,2,5, and 7 exist. Intersection 3,6,8,9, and 10 would be created as part of the construction of the subject multi-family residential developments. Intersection 4 would be created by the construction of office development off the west side of Martinsville-Liberty Corner Road south of Route I-78 in Bernards Township.

# SITE AND INTERSECTION LOCATION MAP

WARREN, N. J.



### TRAFFIC COUNT LOCATIONS

Traffic counts were conducted for the December 1983 study at:

Intersection 2 - Martinsville-Liberty Corner Road and Mountain View Road

Intersection 7 - Martinsville-Liberty Corner Road and Mountain View Road

An unnumbered intersection - The southerly terminus of Martinsville-Liberty Corner Road at Washington Valley Road

These traffic counts were used to estimate the existing traffic volumes at Intersections 3 through 10. Note that no new updated traffic counts were taken for this memo

The 1983 traffic volumes were expanded at an annually compounded interest rate of 3% per year for 5 years to give 1988 background traffic volumes for use in the capacity analyses.

### TRIP GENERATION FACTORS

Vehicular trip generation factors for apartments, townhouses, and condominiums, as well as offices, contained in TRIP GENERATION, 1982, by the Institute of Transportation Engineers, were used in this study. These factors are well accepted by Traffic Engineering Professionals. They have been found to be reasonable by traffic counts taken in central and northern New Jersey by the undersigned.

## TRAFFIC DATA MANAGEMENT

A computerized traffic data management program was used. With this program, each sites's contribution to each intersection movement at all of the included intersections is calculated and printed out. The program also totals volumes from all sites adding them to the expanded existing traffic volumes. This program allows "What if?" solutions by easily changing the various inputs, such as: number of housing units, square feet of office development, trip generation factors, use on a site, and the percentage of traffic for each use on each site to the various boundary points in the Tableau. Reference should be made to the December 1983 report and its appendixes for the print-outs.

## INTERSECTION CAPACITY ANALYSIS

For signalized intersections the Critical Movement Analysis (CMA) based on CIRCULAR 212 of the Transportation Research Board, as programmed for the Apple Computer by the Transportation Research Institute of the University of Florida, was used. The Level of service A (the highest level) to E (the worst level) for signalized intersection is described in the December, 1983 report, beginning on page 3-2. The lowest Level of service that should be accepted at a signalized intersection in the area would be Level of service C.



For unsignalized intersections a computer Super-Calc Spread Sheet adaption of the method in CIRCULAR\_212 was used. The Levels of service for an unsignalized intersection are described on pages 3-1 and 3-2 of the December 1983 report.

The text accompanying the intersection capacity calculation sheets can not readily be condensed without losing their meaning. Therefore, pages 3-5 through 3-14, without the calculation sheets, are included in this section. They state Levels of service for varying roadway configurations at the studied intersections.

CAPACITY ANALYSIS FOR MARTINSVILLE-LIBERTY CORNER ROAD & MOUNTAIN  
VIEW ROAD  
INTERSECTION 2

This intersection has been recently improved with roadway widening and the installation of a traffic signal. The lane configuration for northbound traffic is one lane for through traffic and one lane for right turns. For southbound traffic there is one lane for through traffic and two lanes for left turns. There are single lanes for left turns and right turns separated by a triangular shaped channelizing island for traffic entering the intersection on Mountain View Road.

The CMA analysis was used for this intersection. Note again that the left turns from the stem of the "T" are entered as straight through traffic as required for the program.

The first tests were for the A.M. peak hour and the P.M. peak hour for the resulting 1988 traffic volumes without any future office buildings in place. The A.M. peak hour was the more critical with a Level of service E at a saturation rate of 94%. The P.M. peak hour showed a Level of service B at a saturation rate of 57%. The Level of service E in the A.M. peak hour would be intolerable in this area. Therefore, further widening of Martinsville-Liberty Corner Road would be required for 1988 conditions with just the high density residential development proposed by others for the three residential sites included in the study. The addition of a northbound through lane would raise the Level of service to B at a saturation rate of 59%, which would be satisfactory.

The addition of the future office buildings as described in the INTRODUCTION with the additional northbound through lane would drop the Level of service in the A.M. peak hour to a C at a saturation rate of 77%.

The P.M. peak hour would be the more critical with a Level of service for this geometry dropping to D at a saturation rate of 85%. Note that Level of service D ranges from a saturation rate of 80% to 89%. A Level of service D should not be accepted in this area. Therefore, an additional lane for southbound traffic should be added. Then with six lanes in the north approach and a seven lane width in the south approach a Level of service A at a saturation rate of 52% is indicated. Note that the additional southbound lane would not affect the Level of service for the A.M. peak hour.

From the above it can be seen that an additional lane would have to be added for northbound traffic for the 1988 resulting traffic flow without any additional office buildings being constructed in the area. If office development occurs as described in the INTRODUCTION then two additional lanes would be needed beyond the recent improvement, one for northbound through traffic and one for southbound through traffic.

CAPACITY ANALYSIS FOR MARTINSVILLE-LIBERTY CORNER ROAD & TIMBER  
TRACT ROADWAY  
INTERSECTION 3

This will be a "T" type intersection located south of Mountain View Road. All approaches are assumed to be three lanes wide. The middle lane in the south approach will be unused. The first tests were for the 1988 A.M. and P.M. peak hours without additional office buildings in the area. The A.M. peak hour was the more critical. The right and left turns from the site roadway show Level of service D and E respectively. Therefore, more traffic exiting the Timber Tract would use Mountain View Road than was chosen for the traffic tableau, lowering the Level of service at Intersection 2.

With the addition of future office traffic the Level of service drops to F for both the left and right turns exiting the site, with demand exceeding capacity. This analysis would indicate that nearly all of the exiting Timber Site traffic would use Mountain View Road, lowering the level of service at Intersection 2.

CAPACITY ANALYSIS FOR MARTINSVILLE-LIBERTY CORNER ROAD & A FUTURE  
ROADWAY TO A POTENTIAL OFFICE PARK SITE  
INTERSECTION 4

This intersection currently does not exist. It would be constructed only for the Residential and Future Office traffic scenario. It is obvious that five lanes in Martinsville-Liberty Corner Road and a traffic signal would be required. The number of lanes in the new roadway would be determined when the total development size is known. For the traffic tableau 500,000 gross square feet of office space was assumed. The property could hold a complex with a much greater size.

Because of the unknowns, a CMA analysis was not done for this intersection.

CAPACITY ANALYSIS FOR MARTINSVILLE-LIBERTY CORNER ROAD & MOUNTAIN  
ROAD - ELM AVENUE  
INTERSECTION 5

The unsignalized intersection capacity analysis shows Levels of service D, E, & F for various side street movements for the 1988 traffic resulting from the residential development without any future office building traffic. These levels of service are, of course, not acceptable. Therefore, a signalized intersection analysis was performed.

The CMA analysis shows a Level of service B at 60% saturation rate in the A.M. peak hour and a Level of service A at 44% saturation for the residences only scenario in 1988 with all intersection approaches being forty feet wide. For the 1988 residences and future office building scenario the CMA analysis indicates a Level of service E at a saturation rate of 101% during the A.M. peak hour with the same forty foot wide roadway. The next test was to add a through lane in both directions on Martinsville-Liberty Corner Road resulting in a sixty-two foot wide traffic carrying section. Then the CMA analysis indicates a Level of service C at a saturation rate of 67% for the A.M. peak hour and a Level of service A at a saturation rate of 51% for the P.M. peak hour.

It should be noted that Martinsville Road would have to be at least four lanes wide for significant distances for the five lane signalized intersection to perform at the level of service indicated. Martinsville Road should be at least four lanes wide from Mountain Road-Elm Avenue to Mountain View Road because these intersections are only about one mile apart with Intersection 4 located between them.

CAPACITY ANALYSIS FOR MARTINSVILLE-LIBERTY CORNER ROAD AND THE  
POSSIBLE ~~HILLTOP~~<sup>SKYTOP</sup> SITE ROADWAY  
INTERSECTION 6

The ~~Hilltop~~<sup>Skytop</sup> Tract has frontage on Martinsville-Liberty Corner Road north of Mt. Horeb Road. It is not known whether or not the applicant proposes to have site access directly to Martinsville-Liberty Corner Road. Therefore, site access was included in the traffic tableau, but with only 10% of site ingress-egress movements assigned to it.

The unsignalized intersection capacity analysis indicates a poor level of service for left turns exiting the site. Considering the proximity of this intersection to Intersection 7 at Mt. Horeb Road and Martinsville-Liberty Corner Road, and the new Pingry School on the opposite side of the roadway, a left turn stacking lane for ingress traffic and the prohibition of left turns for egress traffic should be used.

CAPACITY ANALYSIS FOR MARTINSVILLE-LIBERTY CORNER ROAD & MT.  
HOREB ROAD  
INTERSECTION 7

There is a large triangular shaped channelizing island in the Mt. Horeb Road (east) approach to this intersection. Two-way traffic is allowed on all three sides of this channelizing island. This does not conform to modern day standards of intersection design. Therefore, a conventional intersection was assumed for the capacity analysis.

For the residential only scenario the unsignalized intersection capacity analysis shows a Level of service D for both the A.M. and P.M. peak hours. For the resulting 1988 Residential and Future Office Building traffic, the unsignalized intersection capacity analysis indicates that the left turning movement from Mt. Horeb Road will have a Level of service E in the A.M. peak hour, and Level of service F with the capacity exceeded in the P.M. peak hour. Therefore, a signalized intersection capacity analysis was calculated.

The CMA analysis indicates a Level of service C at a saturation rate of 73% during the 1988 A.M. peak hour and a Level of service B at a saturation rate of 62% during the P.M. peak hour. Both roadways were assumed to have riding surfaces forty feet wide.

Level of service C at a saturation rate of 73% is acceptable for 1988. It does not leave much capacity for future development. Because of this and the location of the Pingry School and the possible Intersection 6, and the fact that five lanes will be needed less than a mile to the north at the intersection with Mountain Road - Elm Avenue, it is recommended that Martinsville-Liberty Corner Road be five lanes wide at its intersection with Mt. Horeb Road.



CAPACITY ANALYSIS FOR MARTINSVILLE-LIBERTY CORNER ROAD & THE AMG  
SITE ROADWAY  
INTERSECTION 8

This intersection will be located off the east side of Martinsville-Liberty Corner Road south of Mt. Horeb Road. The unsignalized intersection capacity analysis indicates that there will be a Level of service D for the left turn egress movement from the AMG site in both peak hours. The demand for this movement will be about 7% of the available reserve. Therefore, the Level of service D reflects delay to the average vehicle turning left from the site and not the ability to make the movement itself. A traffic signal would not be recommended for this intersection for the projected 1988 traffic volumes.

CAPACITY ANALYSIS FOR MOUNTAIN VIEW ROAD AND THE TIMBER SITE  
ROADWAY  
INTERSECTION 9

There is very little difference in capacity at this intersection between the residential only and the residential and office scenarios. The unsignalized intersection capacity analysis shows a Level of service D for the left turn egress movement during the 1988 A.M. peak hour for both scenarios. The demand for the left turn egress movement will be 43% of the available reserve, meaning that there will be some queuing of vehicles making the left turn egress movement. A traffic signal would not be recommended at this location.

SKYTOP

CAPACITY ANALYSIS FOR MT. HOREB ROAD & THE ~~HILLTOP~~ SITE ROADWAY  
INTERSECTION 10

The unsignalized intersection capacity analysis indicates that in 1988 there will be a Level of service D for the left turn egress movement from the site in both peak hours with the residential and office scenario. The demand will be 52% of reserve capacity. Interaction could be expected with some queuing of the left turn egress movement. A traffic signal would not be recommended. It would be recommended that a left turn stacking lane be constructed in the eastbound Mt. Horeb road approach.

ROADWAY RECOMMENDATIONS, AS STATED IN THE DECEMBER 1983  
REPORT

The following recommendations are for roadway sections between the major intersections. Where greater widths are needed at intersections the intersection recommendations would prevail. Reference was made to TABLE 11-8, Table 11-9, 11-10, and Table 11-11 contained in A POLICY ON GEOMETRIC DESIGN OF RURAL HIGHWAYS, 1965, by the American Association of State Highway Officials. These Tables show the design capacities of 2-lane 2-way Highways for Average Running Speeds ranging from 35 mph to 50 mph. When the values in these Tables are exceeded, a four lane roadway is recommended.

Reference to the available data indicates that Martinsville-Liberty Corner Road should be four lanes wide (riding surface minimum forty-four feet wide) with an additional width for shoulders from Washington Valley Road to Mt. Horeb Road.

The reference data and traffic data show that a minimum of four lanes is needed for Martinsville-Liberty Corner Road from Mt. Horeb Road north to Route 1-78. The roadway was not studied north of Mountain View Road, immediately south of Route 1-78. Because five lanes are desirable at Mt. Horeb Road and necessary at Mountain Road, with a six lane width necessary at Mountain View Road, it is recommended that Martinsville-Liberty Corner Road be at least five lanes wide plus shoulders from Mt. Horeb Road to Route 1-78. The center lane would be exclusively for left turning traffic.

Mt. Horeb Road was studied only in the proximity of Martinsville-Liberty Corner Road and the Skytop\* site roadway. Further studies would be needed to determine the appropriate roadway width east of the Skytop site roadway. From just east of the Skytop site to Martinsville-Liberty Corner Road it is recommended that Mt. Horeb Road be three lanes wide. The center lane would be for left turns only.

CONCLUSIONS, AS STATED IN THE DECEMBER 1983 REPORT

It can be concluded that it is appropriate to use the scenario where both the 2700 residence proposed by others and the future 1,550,000 gross square feet of office space in the area are developed. It is likely that the actual demand for development may exceed these numbers. With this development traffic added to the existing traffic expanded to 1988 values, it can be seen that extensive widening will be needed for Martinsville-Liberty Corner Road from Washington Valley Road north to Route I-78. This roadway should be at least four lanes wide from Washington Valley Road to Mt. Horeb Road and than at least five lanes wide from Mt. Horeb Road to Interstate Route I-78. This report does not include the interchange at Route I-78 or the roadway north thereof. Paved shoulders at least six feet wide should be placed along either side of the roadway.

\*Correction of typo

New traffic control signals will be needed at the following intersections along Martinsville-Liberty Corner Road:

The future Office Site Roadway (Intersection 4)

Mountcin Road-Elm Avenue (Intersection 5)

Mt. Horeb Road (Intersection 7)

Traffic signals are not recommended at other locations along this roadway.

If a Skytop Tract site roadway intersects Martinsville-Liberty Corner Road, left turn egress movements should be prohibited from it.

Mt. Horeb Road should be widened to three lanes from Martinsville-Liberty Corner Road to east of the Skytop site roadway. Mt. Horeb Road was not studied east of this point.

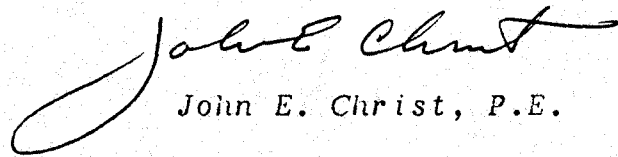
#### CLOSING REMARKS

It should be noted that the extension of Route I-78 to the east from its current terminus at Plainfield Avenue in Berkeley Height should have little effect on the directional flow of traffic in the subject study area. Routes I-78 and Route 22 diverge as they extend westerly from the Plainfield Avenue-Bonnie Burn Road connector. At Martinsville Road-Chimney Rock Road, Routes I-78 and U.S. 22 are over three times as far apart as they are at Plainfield Avenue-Bonnie Burn Road.

The purpose of the December 1983 report was to determine and report on traffic conditions that would be created on Martinsville-Liberty Corner Road by the Timber Tract, the Skytop Tract and the AMG Tract, with or without the potential development of office sites. It was not the purpose of the study to determine more appropriate sites to develop this type of higher density housing so as to spread the traffic load onto two or more different roadways. It would be desirable to conduct such a study if other sites are available, giving a better distribution of traffic load.

CERTIFICATION

I certify that the above is a true representation of my findings.



John E. Christ, P.E.

New Jersey License 13883



RESUME OF JOHN E. CHRIST, P.E. MAY 1984

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West Caldwell, New Jersey 07006

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PROFESSIONAL ENGINEER

Licensed in the State of New Jersey, Certificate #13883.

EDUCATION

Bachelor of Science in Civil Engineering, Rutgers University, June 1958.

Certificate in Traffic Engineering, Yale University Bureau of Highway Traffic, 1959 (Recognized as a Masters Degree in the Traffic Engineering Field).

EXPERIENCE

Senior Engineer-Traffic, New Jersey Division of Motor Vehicles, Bureau of Engineering and Planning, June 1959 to April 1963: Design of traffic control devices such as traffic signals, through streets, channelizations, intersection geometrics, regulatory and warning signs, speed zoning, review of traffic data including volume counts and accident reports.

Principal Engineer-Traffic, Essex County (N.J.) Engineering Department, April 1963 to December 1965.

Traffic Engineer, Essex County Engineering Division, December 1965 to present: Determine the need for and the design of traffic control devices such as traffic signals, intersection and roadway geometrics, channelization, regulatory, warning and guide signs, review of accident data, traffic counts, site plans, subdivision plans, TOPICS analysis, describe aspects of traffic to the public, give expert testimony concerning the County roadway system. Work with other engineers in the department on various roadway projects. Responsible to the County Engineer.

Former Instructor at Rutgers University, University Extension Division, New Brunswick, N.J., 1968 through 1977:

Traffic Regulations: 3yrs., 4 sessions/yr., 2 hrs./session.

Traffic Signals: 5 yrs., 13 sessions/yr., 3 hrs./session.

Intersection Geometrics; 1 yr, 2 sessions/yr., 3 hrs./session.

Traffic Signs and Markings: 2 yrs., 10 sessions/yr., 3 hrs./session.

Lecturer at various traffic seminars given by Rutgers University, Newark College of Engineering, A.A.A., and the New Jersey State Safety Council.

Consulting Professional Engineer, April 1965 to present: Design of driveways and parking facilities for businesses, design of traffic control signals, Traffic Engineering Reports for municipalities, Traffic Engineering Reports to Professional Planners for Master Plans, expert testimony before Planning Boards, Variance Boards, A.B.C. hearings, Magistrates Courts, Superior Court, Chancery Division and Law Division of Superior Court.

#### PROFESSIONAL AFFILIATIONS

Member of the Institute of Transportation Engineers, Past President of the N.Y. and N.J. Metropolitan Section, also Past Vice-President, Secretary and Treasurer.

Supporting Member of the Transportation Research Board, National Academy of Sciences.

Past member of committees to review the State Laws on Traffic and the Manual On Uniform Traffic Control Devices For Streets And Highways.

Listed in the 1980 edition of Who's Who In Engineering, published by the American Association of Engineering Societies.