TRAFFIC IMPACT STUDY
CONNECTICUT AVENUE CORRIDOR
for the
CLEVELAND PARK AND
WOODLEY PARK NEIGHBORHOODS

District of Columbia
Zoning Commission Case 86-26

Prepared by

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I. BACKGROUND

Connecticut Avenue is one of the major transportation facilities in the District of Columbia, traversing Wards 1, 2, and 3. The mid-southern portion of this corridor is of concern in this study.

The avenue is considered to be essentially developed with little change anticipated along its entire length. Connecticut Avenue continues to be one of the city's truly "special streets" with development patterns of a mix of small offices, small specialty retail establishments and medium to high density residential facing the avenue and single family residential behind this or parkland nearby.

The Cleveland Park and Woodley Park neighborhoods (from Tilden Street on the north to Calvert Street on the south) have become quite concerned with the indications of potential growth in their portion of the Connecticut Avenue Corridor. Current zoning, if fully developed, would result in substantial increases in land use density and hence in the generation of additional trips and additional demand for parking. Their concerns as well as other concerns have resulted in a response from the City in the form of a corridor study entitled "Connecticut Avenue Corridor Study" with a preliminary report dated September 1987 from the Office of Planning (OP) with assistance from the Department of Public Works (DPW).

This report prepared at the request of the two neighborhoods has the following objectives:

1. Review the OP study and determine shortcomings (if any), assumptions, and any other elements of the study with which the neighborhoods should be concerned.

2. Conduct independent calculations and analyses for both the OP set of parameters and the likely development potential estimated by the neighborhoods.

3. Identify and describe other transportation concerns not addressed in the OP study, such as:

    a. Pedestrian movements
    b. Parking and Double Parking
    c. Public Transportation
        (1) Metro Rail
        (2) Metro Bus
    d. Special Events
        (1) Zoo
        (2) Hotel Conventions
        (3) Uptown Movie Theatre

4. Document the results of the above and prepare a summary report.

II. GENERAL REVIEW OF CORRIDOR STUDY AND EXISTING SITUATION

The September 1987 corridor study by OP was reviewed and this review is contained in Appendix A. While there is general agreement with most of the OP report there are some shortcomings and areas of disagreement. These are summarized below:

- The OP study did not perform a detailed analysis of the traffic impact of new development on the street network.

- The OP/DPW study did not use the most recent and most widely acceptable intersection capacity/level of service methodology (The FHWA developed HCM software).

- Some TSM measures were either vague or not well explained. For example, "Turn Restrictions" for Porter and Connecticut - NB currently has No Left Turn and southbound has a large and significant left turn with a separate left turn lane in the AM peak. It is not clear what turn restrictions would improve the Level of Service (LOS) nor how these movement demands would be handled, if prohibited. Also, "Remove W/B Parking on Cathedral - it is already removed for some distance east of Connecticut to provide an exclusive right turn. It appears that the effect of TSM on LOS may be overstated.

- Evenings/weekends were not addressed. While double parking and loading/unloading are problems during the mid-day, much more serious and significant problems occur during evening and weekends - as

discussed in Section IV. For example, immediately after the PM peak, parking and double parking in the vicinity of the Uptown Theatre frequently reduces the capacity for high volume "Shoulder Peak" movements resulting in congestion.

- The trip generation rates in the OP report reflect extremely optimistic modal split (for transit) for office and retail trips.

- The methodology used by OP/DPW substantially underestimates the internal traffic growth because it considers only average growth rates in each of four zones and does not distribute new trips generated in adjacent areas (zones).

- The OP/DPW report does not agree with an earlier study (the Reno Road Study) which included Connecticut Avenue.

Special Considerations

The land uses in the Tilden Street to Calvert Street area of Connecticut Avenue present some special factors, which are further discussed in Section IV. Among these are:

1. Uptown movie theatre - one of the largest in the region with over 2,000 seats. Both parking and circulation (and double-parking) as well as pedestrian problems occur in Cleveland Park due to evening performances (and sometimes weekend matinees).

2. Sheraton Washington and Omni-Shoreham hotels. During conventions and especially these with large exhibitors, the parking and

circulation situation creates real problems, not only for Connecticut Avenue, but also for wide areas of Woodley Park.

3. National Zoo. The peak day in 1987 was some 25,000 visitors and this number is growing. The PM peak hour will be affected by the growth, especially during summer months. Both parking and access to the zoo are very serious problems now. Only 714 parking spaces are now provided for visitors.

4. Metro-Rail Stations. The Cleveland Park and Woodley Park/Zoo Stations handle substantial volumes of traffic. Some parking problems are associated with the stations.

5. Metro-Bus Routes. The two rail stations are major nodes for the bus system and major east-west routes such as Porter and Cleveland/Calvert provide a vital continuity to the bus network which could be jeopardized if additional congestion develops at these locations.

III. COMPARATIVE ANALYSIS

Because of the importance of the potential traffic impacts of new development along the Connecticut Avenue corridor, a detailed study was performed at the square level of analysis. Results of this detailed analysis have then been compared to the OP/DPW results.

a. Future Land Uses

Projected land use to the year 2000 was obtained for each potentially developable (redevelopable) square in the area from Tilden to Calvert. The OP/DPW study identified the "most likely developable scenario by parcel and aggregated by square. The Cleveland Park Historical Society and the Woodley Park Community Association also developed estimates of redevelopment by square for each land use. The net result is 2 future scenarios. In order to make a proper comparison between these two scenarios, the traditional land use, trip generation, trip distribution and trip assignment process was utilized. Exhibit 1 shows the additional development allowed (square footage or units) for each land use category, by square.

The first scenario is identified as the OP/DPW alternative and reflects the square footage of building for office and retail land uses, dwelling units for residential and rooms for hotel land uses. The second scenario represents the same type of land use information, by square, considered probable by the neighborhood associations.

B. Trip Generation

The OP/DPW trip generation rates shown earlier were used in this analysis even though the rates are substantially lower than I have encounted in any other study. The lower rates reflect a high public transit modal split which

EXHIBIT 1 LAND USE AND TRIP GENERATION REDEVELOPMENT TO YEAR 2000

DWF TRIP RATES: 1.4 0.1 0.21 1.3 0.18 0.13 1 1.6 0.12 0.23 0.24 0.11 0.1 0.15 0.25 0.05

	OFFICE					RETAIL					RESIDENTIAL					HOTEL					TOTAL TRIPS			
		TRIPS					TRIPS					TRIPS					TRIPS							
		AM		PM			AM		PM			AM		PM			AM		PM			AM		PM	
SQUARE	SQ FT	IN	OUT	IN	OUT	SQ FT	IN	OUT	IN	OUT	UNITS	IN	OUT	IN	OUT	ROOMS	IN	OUT	IN	OUT	IN	OUT	IN	OUT
2202 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	10,000	14	1	2	13	4,400	1	1	4	7	16	2	4	4	2	0	0	0	0	0	17	5	10	22
2203 (1)	23,511	33	2	5	31	23,511	4	3	24	38	40	5	9	10	4	0	0	0	0	0	42	15	38	73
(2)	23,511	33	2	5	31	23,511	4	3	24	38	40	5	9	10	4	0	0	0	0	0	42	15	38	73
2204 (1)	137,519	193	14	29	179	45,838	8	6	46	73	0	0	0	0	0	28	3	4	7	1	204	24	82	254
(2)	137,519	193	14	29	179	45,838	8	6	46	73	0	0	0	0	0	28	3	4	7	1	204	24	82	254
2068 (1)	39,113	55	4	8	51	39,113	7	5	39	63	70	8	16	17	8	0	0	0	0	0	70	25	64	121
(2)	49,405	69	5	10	64	49,405	9	6	49	79	74	9	17	18	8	0	0	0	0	0	87	28	78	151
2069 (1)	58,533	82	6	12	76	58,533	11	8	59	94	85	10	20	20	9	0	0	0	0	0	103	33	91	179
(2)	42,186	59	4	9	55	42,186	8	5	42	67	132	16	30	32	15	0	0	0	0	0	82	40	83	137
2083 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	40,934	57	4	9	53	40,934	7	5	41	65	37	4	9	9	4	0	0	0	0	0	69	18	58	123
2082 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	24,822	35	2	5	32	24,822	4	3	25	40	22	3	5	5	2	0	0	0	0	0	42	11	35	74
2222 (1)	46,325	65	5	10	60	46,325	8	6	46	74	80	10	18	19	9	0	0	0	0	0	83	29	75	143
(2)	78,200	109	8	16	102	78,200	14	10	78	125	70	8	16	17	8	0	0	0	0	0	132	34	111	234
2218 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	119,281	167	12	25	155	119,281	21	16	119	191	153	18	35	37	17	0	0	0	0	0	207	63	181	363

(1) DPW Estimated
(2) Neighborhood Data

is too optimistic for office and retail land uses but certainly possible for new residential land use with the metro-rail stations in place. Although an ITE modified (to reflect excellent public transit assessibility) trip rate table was developed with slightly higher rates, it was decided to adopt the DPW rates for the analysis, which results in conservative impact estimates. This is also shown in Exhibit 1.

C. Trip Distribution

Ideally, trip ends are distributed to and from a specific land area (parcel or zone) on the basis of relative demand or desire to satisfy the trip purpose among other potential zones. However, the detailed information to accomplish this is rarely available. Discussions with the Washington Metropolitan Council of Governments disclosed that trip distribution demand date are not readily available - the 1980 census has work trip demand information, but would require computer runs and two to three weeks to produce. Thus, a method traditionally used for traffic impact studies was adopted; distribution was based on relative distribution of traffic volumes at nearby intersections. This resulted in the majority of the trips going north or south. The final trip distribution tables are shown as percentages in Exhibits 2 thru 5, for each square and land use category.

Applying these percentages to the additional trips (from Exhibit 1) resulted in the trips by land use and total trips of all land uses combined (Exhibit 6). The trips for individual land uses are included in Appendix B.

D. Trip Assignment

This process entails the determination of which facilities will be used by the future trips which will be distributed to and from each specific parcel

TRIP DISTRIBUTION % - OFFICE

	AM								PM							
	IN				Out				In				Out			
Square	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W
2068	70	20	5	5	25	65	5	5	25	65	5	5	70	20	5	5
2069	70	20	5	5	25	65	5	5	25	65	5	5	70	20	5	5
2083	70	20	5	5	25	65	5	5	25	65	5	5	70	20	5	5
2082	70	20	5	5	25	65	5	5	25	65	5	5	70	20	5	5
2222	70	20	5	5	25	65	5	5	25	65	5	5	70	20	5	5
2218	70	20	5	5	25	65	5	5	25	65	5	5	70	20	5	5
2202	50	18	20	12	60	20	10	10	60	20	10	10	50	18	20	12
2203	50	18	20	12	60	20	10	10	60	20	10	10	50	18	20	12
2204	50	18	20	12	60	20	10	10	60	20	10	10	50	18	20	12

EXHIBIT 2

TRIP DISTRIBUTION % - RETAIL

	AM								PM							
	IN				Out				In				Out			
Square	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W
2028	70	20	5	5	30	60	5	5	30	60	5	5	40	40	10	10
2069	70	20	5	5	30	60	5	5	30	60	5	5	40	40	10	10
2083	70	20	5	5	30	60	5	5	30	60	5	5	40	40	10	10
2082	70	20	5	5	30	60	5	5	30	60	5	5	40	40	10	10
2222	70	20	5	5	30	60	5	5	30	60	5	5	40	40	10	10
2218	70	20	5	5	30	60	5	5	30	60	5	5	40	40	10	10
2202	60	20	10	10	20	60	10	10	30	40	15	15	35	35	15	15
2203	60	20	10	10	20	60	10	10	30	40	15	15	35	35	15	15
2204	60	20	10	10	20	60	10	10	30	40	15	15	35	35	15	15

EXHIBIT 3

TRIP DISTRIBUTION % - RESIDENTIAL

	AM								PM							
	IN				Out				In				Out			
Square	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W
2068	20	30	5	5	30	60	5	5	30	60	5	5	60	30	5	5
2069	20	30	5	5	30	60	5	5	30	60	5	5	60	30	5	5
2083	20	30	5	5	30	60	5	5	30	60	5	5	60	30	5	5
2082	20	30	5	5	30	60	5	5	30	60	5	5	60	30	5	5
2222	20	30	5	5	30	60	5	5	30	60	5	5	60	30	5	5
2218	20	30	5	5	30	60	5	5	30	60	5	5	60	30	5	5
2202	60	20	10	10	30	60	5	5	20	60	10	10	30	50	10	10
2203	60	20	10	10	30	60	5	5	20	60	10	10	30	50	10	10
2204	60	20	10	10	30	60	5	5	20	60	10	10	30	50	10	10

EXHIBIT 4

TRIP DISTRIBUTION % - HOTEL

	AM								PM							
	IN				Out				In				Out			
Square	N	S	E	W	N	S	E	W	N	S	E	W	N	S	E	W
2028	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2069	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2083	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2082	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2222	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2218	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2202	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2203	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5
2204	20	70	5	5	20	70	5	5	20	70	5	5	20	70	5	5

EXHIBIT 5

EXHIBIT 6 TRIP DISTRIBUTION: ADDITIONAL (REDEVELOPMENT) TRIPS-BY SQUARE AND DIRECTION, ALL LAND USE CATEGORIES

DWP

SQUARE	TOTAL	AM, IN				AM, OUT					PM, IN					PM, OUT				
		N	S	E	W	TOTAL	N	S	E	W	TOTAL	N	S	E	W	TOTAL	N	S	E	W	TOTAL
2202 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	9	3	3	2	17	2	3	0	0	5	3	4	1	1	10	9	6	4	3	22
2203 (1)	22	8	7	5	42	5	8	1	1	15	12	16	5	5	38	30	21	12	10	73
(2)	22	8	7	5	42	5	8	1	1	15	12	16	5	5	38	30	21	12	10	73
2204 (1)	102	38	39	24	204	10	9	2	2	24	32	29	10	10	82	115	59	47	33	254
(2)	102	38	39	24	204	10	9	2	2	24	32	29	10	10	82	115	59	47	33	254
2068 (1)	48	15	4	4	70	7	15	1	1	25	19	39	3	3	64	65	38	9	9	121
(2)	60	18	4	4	87	8	17	1	1	28	23	47	4	4	78	81	47	12	12	151
2069 (1)	71	22	5	5	103	10	20	2	2	33	27	55	5	5	91	96	55	14	14	179
(2)	56	18	4	4	82	12	24	2	2	40	24	50	4	4	83	74	42	10	10	137
2083 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	48	14	3	3	69	5	11	1	1	18	17	35	3	3	58	66	38	9	9	123
2082 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	29	9	2	2	42	3	7	1	1	11	10	21	2	2	35	40	23	6	6	74
2222 (1)	57	18	4	4	83	8	18	1	1	29	22	46	4	4	75	77	44	11	11	143
(2)	92	27	7	7	132	10	21	2	2	34	33	68	6	6	111	126	73	18	18	234
2218 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	143	43	10	10	207	18	38	3	3	63	53	110	9	9	181	195	112	28	28	363

(1) DPW Estimated
(2) Neighborhood Data

(or analysis zone, or square, in this case). The northbound trips were assigned to northbound Connecticut Avenue and would show up in the future traffic volumes through the next intersection north of the square being analyzed. Similarly, trips going south were assigned to southbound Connecticut. Trips to the east and west were assigned to the nearest East-West street, or to the next adjacent East-West Street where left turns prohibitions prevent a movement to go east or west at the nearest intersection. The results of the traffic assignment of future trips must be added to the base condition.

The initial base condition was determined to be the 1986 turning movements at five intersections selected for analysis, which are:

Connecticut Avenue and (1) Calvert St.
(2) Cathedral Avenue
(3) Macomb St.
(4) Porter St.
(5) Tilden St.

To this initial base is added the natural traffic growth which was taken as one percent per year to the year 2000, $[1.01]^{14}$ - falling between the one percent of 70% through traffic and two percent of 70% through traffic indication in the OP/DPW report. The base conditions are shown as Exhibit 7 (AM Peak hour) and Exhibit 8 (PM Peak hour).

Adding the trips assigned through each of the five intersections yielded the total traffic for the year 2000. These values are shown on Exhibits 9 through 12 for the AM peak and PM peak respectively for the two scenarios:

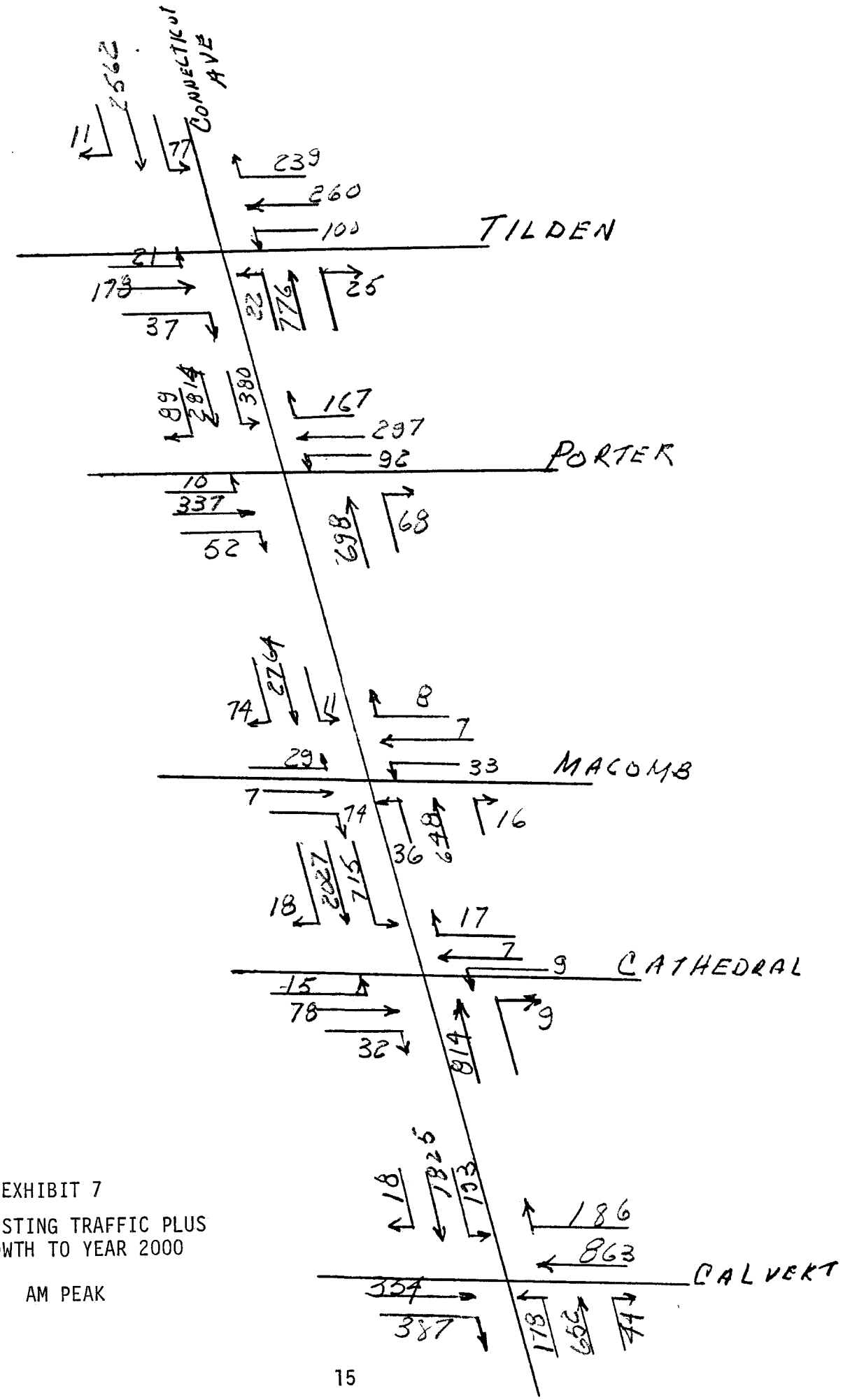

EXHIBIT 7

BASE: EXISTING TRAFFIC PLUS
1%/YR. GROWTH TO YEAR 2000

AM PEAK

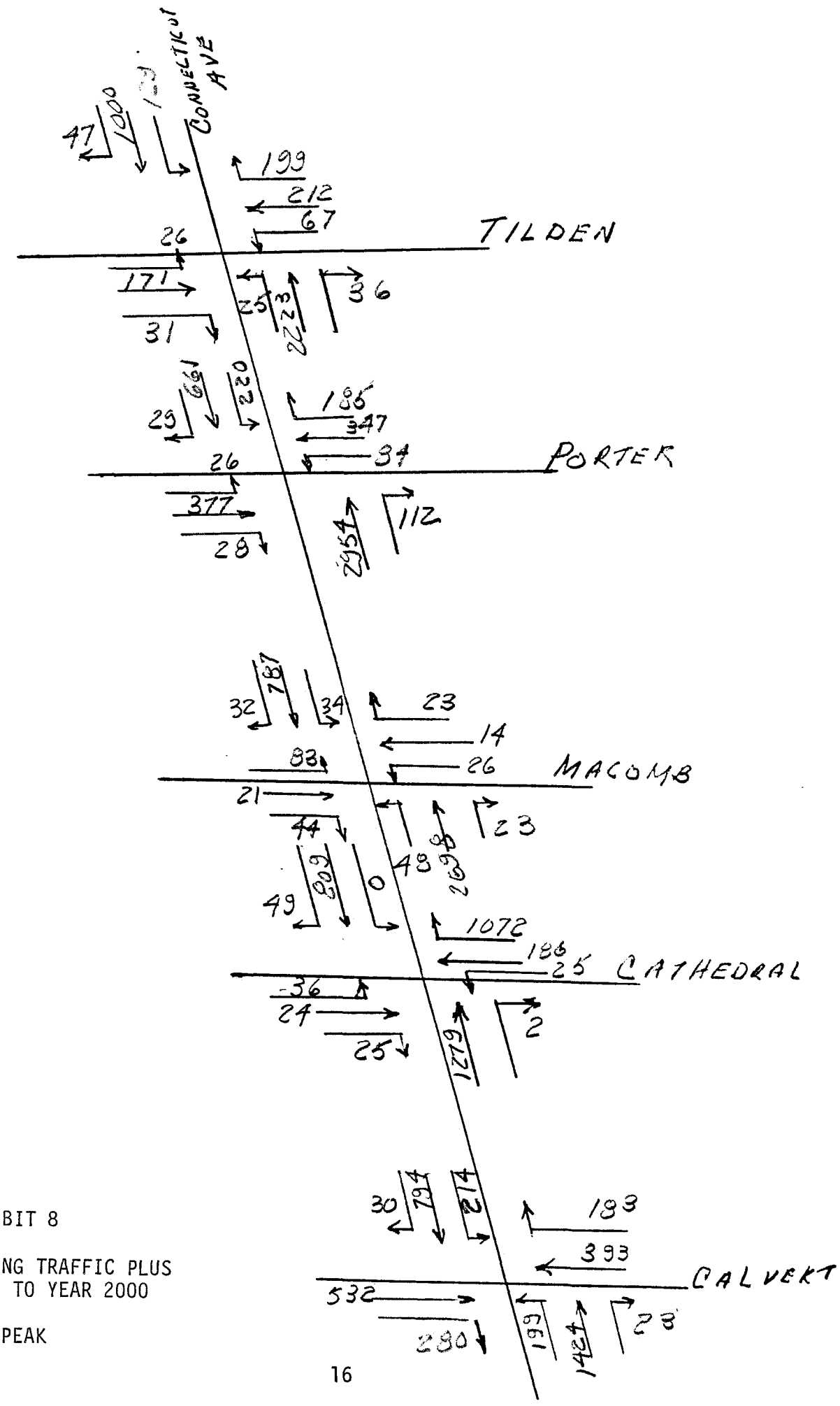

EXHIBIT 8

BASE: EXISTING TRAFFIC PLUS
1%/YR. GROWTH TO YEAR 2000

PM PEAK

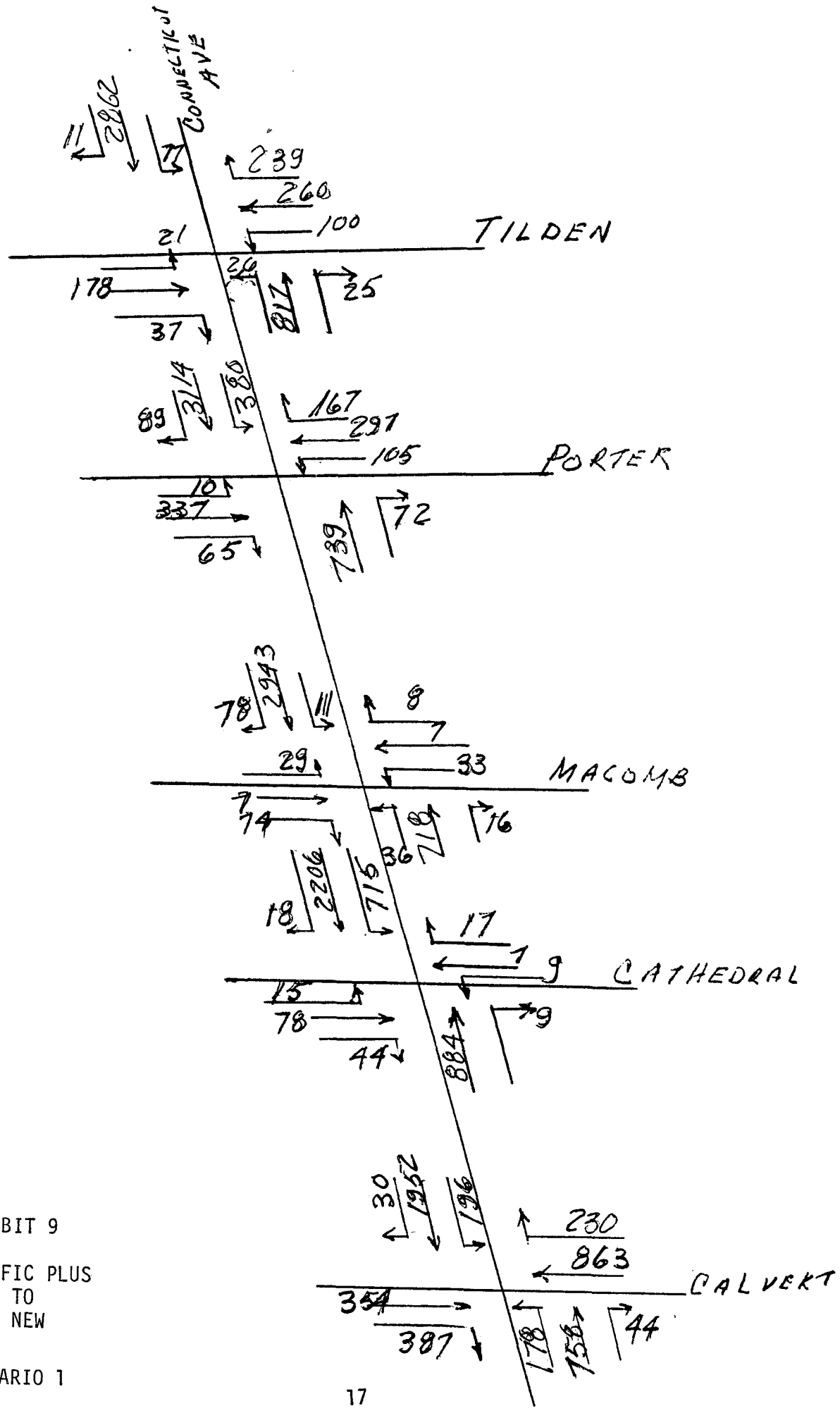

EXHIBIT 9

EXISTING TRAFFIC PLUS
1%/YR. GROWTH TO
YR. 2000 PLUS NEW
DEVELOPMENT

SCENARIO 1

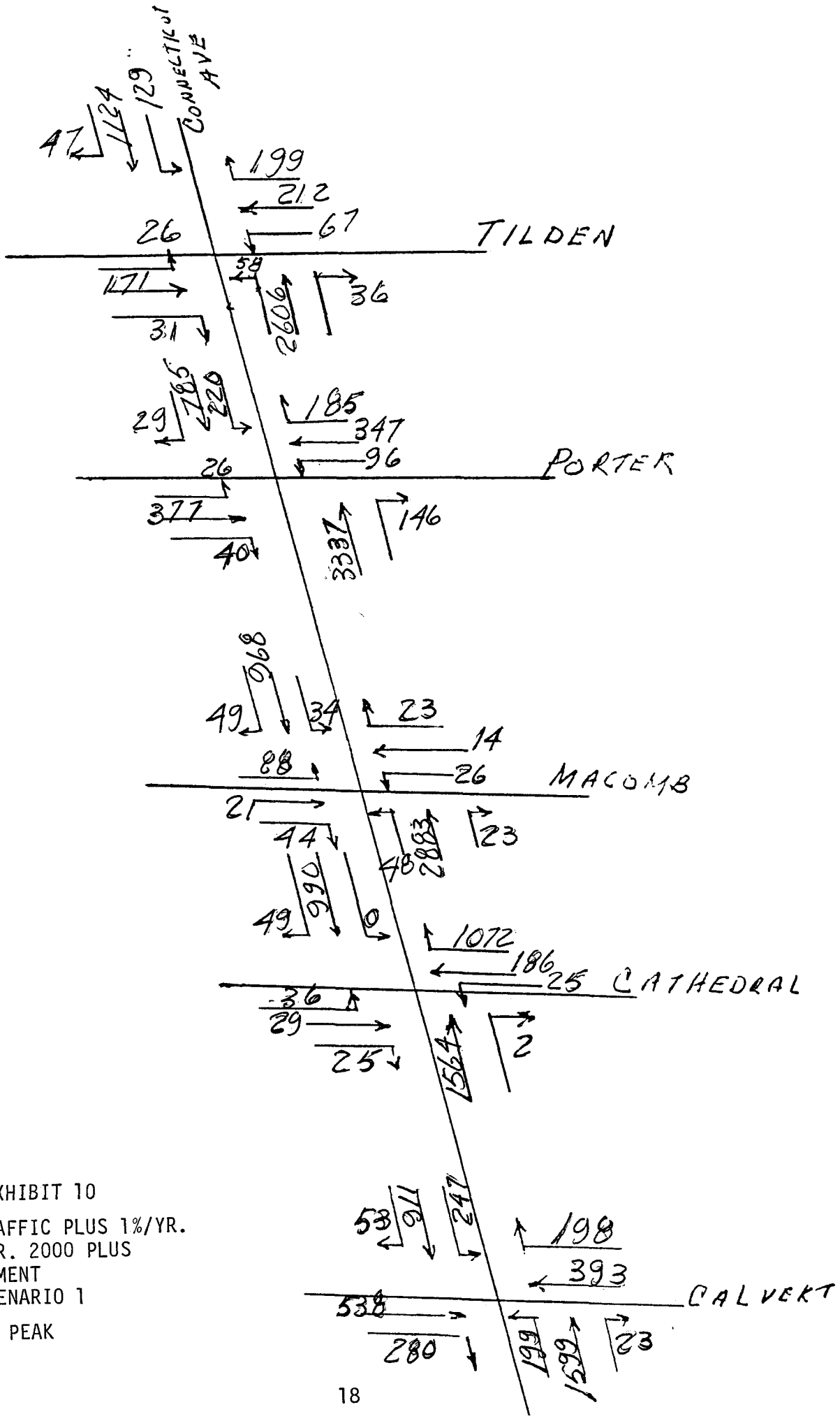

EXHIBIT 10

EXISTING TRAFFIC PLUS 1%/YR.
GROWTH TO YR. 2000 PLUS
NEW DEVELOPMENT
SCENARIO 1

PM PEAK

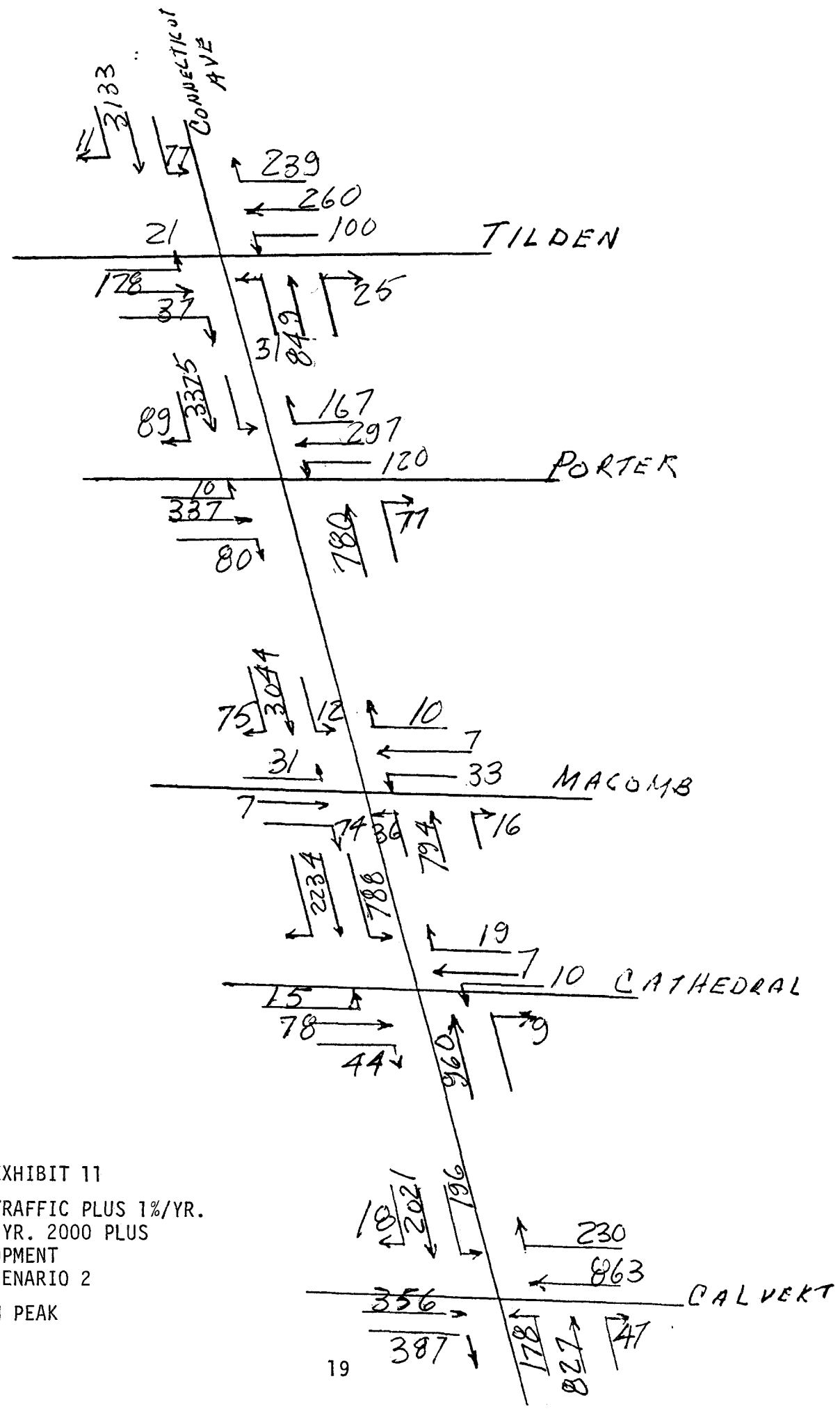

EXHIBIT 11

EXISTING TRAFFIC PLUS 1%/YR.
GROWTH TO YR. 2000 PLUS
NEW DEVELOPMENT
SCENARIO 2

AM PEAK

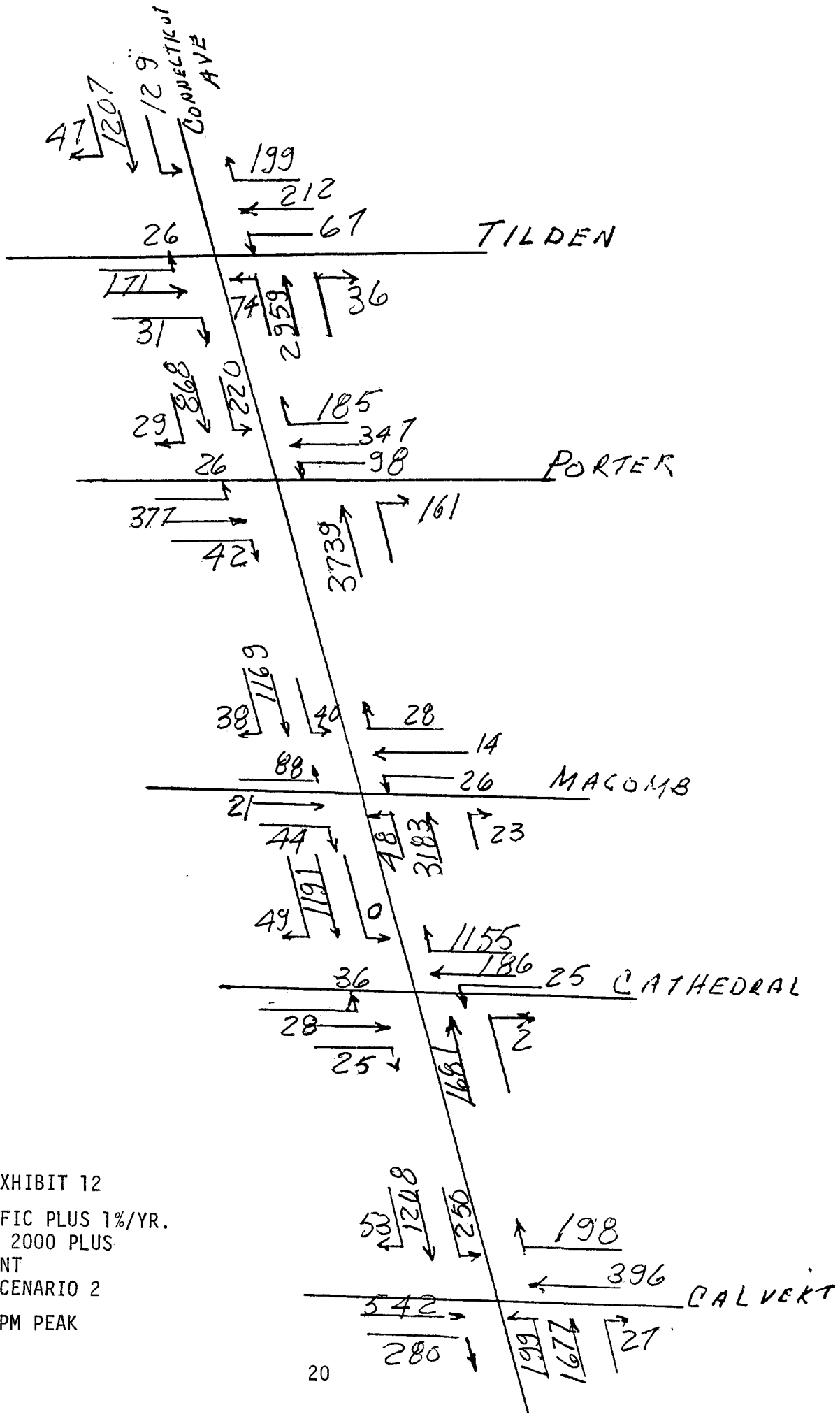

EXHIBIT 12

EXISTING TRAFFIC PLUS 1%/YR.
GROWTH TO YR. 2000 PLUS
NEW DEVELOPMENT
SCENARIO 2

PM PEAK

1) DPW redevelopment estimates

2) Neighborhood redevelopment estimates

E. Capacity and Level of Service

The last analysis step in a traffic impact study is that of capacity and level of service. There are different analysis procedures for determining the capacity and level of service (LOS) for intersections. Three methods have been used for this study. They are:

1. Critical Lane Volume (CLV) Analysis - This procedure is widely used in the Washington-Baltimore region by almost all public agencies, especially at the planning and development level. It involves determining the most critical lane volume of each approach and summing the most critical eastbound or westbound and the most critical northbound or southbound. This procedure is summarized in Appendix C, and the worksheets are included in the same appendix.

2. Highway Capacity Manual (HCM) - Chapter 9, signalized intersections utilizes the CLV concepts but determines LOS by average stopped delay per vehicle. This proceudre is quite involved and requires the use of micro-computer software. The procedure is documented in the HCM Manual (Transportation Research Board, Special Report 209). The micro-computer software for this analysis was developed by and is supported by the Federal Highway Administration. Selected computer print-outs (Capacity and LOS Results) are included in Appendix D.

3. EZ-POSIT - a computerized procedure developed at the University of Kansas based on the Interim Materials on Highway Capacity (Transportation Research Board Circular 212). The procedure also follows the critical lane volume concepts. It was the method used by DPW in the preliminary report.

Capacity and LOS analyses were conducted for the AM and PM peak periods and for three conditions: (1) Existing; (2) Scenario 1; (3) Scenario 2. Levels of service and denoted by letters A to F, and are defined in both Appendices A and C. Briefly;

LOS A = Free Flow LOS B = Free/Stable Flow

LOS C = Stable Flow LOS D = Heavy/Stable Flow

LOS E = Very Heavy - At Capacity - on Verge of Unstable flow

LOS F = Failure/Breakdown

LOS C and D are generally acceptable - D in high density areas (such as DC). LOS E is not acceptable because it is unstable.

The results of these analyses are shown on Exhibits 13 through 15. Exhibit 13 compares the three methods (AM and PM peak) for all 5 intersections using existing traffic. As can be seen the EZ-POSIT procedure shows a good LOS for all 5 intersections whereas the HCM method indicates a poor LOS at both Cathedral and Porter during both the AM and PM peaks and at Calvert St. during the AM peak. The CLV method shows poor operation at Cathedral and Porter during the PM peak.

Comparison of the results for scenario 1 is shown on Exhibit 14. The DPW analysis shows only Macomb to be operating well (LOS C or better) during the AM peak and Porter to be operating at an LOS of D during the PM peak. The HCM method shows all intersections to fail during the PM peak and all except Macomb (LOS D) to fail during the AM peak. The CLV method indicated an LOS of "F" for Porter (AM and PM) and Cathedral (PM), an LOS of D for Cathedral (AM), and and LOS of E for Calvert (AM).

Street		DPW EZPOSIT	FHWA HCM Method					
			EB	WB	NB	SB	Overall Intersect.	CLV Method
Calvert	(AM)	C	B	D	C	E	D	C
	(PM)	B	B	B	C	C	C	B
Cathedral	(AM)	B	C	B	D	D	D	B
	(PM)	C	F	F	B	B	D	D
Macomb	(AM)	A	C	C	B	B	B	A
	(PM)	B	C	C	B	C	B	A
Porter	(AM)	C	C	C	B	F	E	C
	(PM)	C	C	D	E	E	E	D
Tilden	(AM)	D	C	C	C	B	C	B
	(PM)	C	C	C	D	C	C	A

EXHIBIT 13: LEVEL OF SERVICE COMPARISONS - EXISTING TRAFFIC

Scenario 1

Street		DPW EZPOSIT	FHWA HCM Method EB	WB	NB	SB	Overall Intersect.	CLV Method
Calvert	(AM)	E	C	F	E	*	*	E
	(PM)	C	C	C	*	*	*	C
Cathedral	(AM)	E	C	B	F	*	*	D
	(PM)	B	F	*	A	B	*	F
Macomb	(AM)	B	C	C	C	E	D	B
	(PM)	C	C	C	*	F	*	B
Porter	(AM)	D	C	D	B	*	*	F
	(PM)	E	C	D	*	*	*	F
Tilden	(AM)	D	C	D	D	*	*	C
	(PM)	C	C	C	*	F	*	C

EXHIBIT 14 - LEVEL OF SERVICE COMPARISONS - FUTURE TRAFFIC SCENARIO 1

* Indicates that in the "Capacity Analysis" step (module 4) of the analysis, the volume to capacity (V/C) ratio [demand vs. ability to handle it] was greater than 1.2. When this occurs, the calculation of average stopped delay per vehicle (seconds) is meaningless and the program generates an *.

Scenario 2

Street		DPW EZPOSIT	FHWA HCM Method EB	WB	NB	SB	Overall Intersect.	CLV Method
Calvert	(AM)	E	C	F	F	*	*	E
	(PM)	C	C	C	*	*	*	D
Cathedral	(AM)	E	C	B	*	*	*	E
	(PM)	C	F	*	A	B	*	F
Macomb	(AM)	C	C	C	D	F	F	B
	(PM)	C	C	C	F	F	*	C
Porter	(AM)	E	C	E	B	*	*	F
	(PM)	E	C	F	*	*	*	F
Tilden	(AM)	D	C	E	E	*	*	D
	(PM)	D	C	C	*	*	*	D

EXHIBIT 15. LEVEL OF SERVICE COMPARISONS - FUTURE TRAFFIC, SCENARIO 2

* Indicates that in the "Capacity Analysis" step (module 4) of the analysis, the volume to capacity (V/C) ratio [demand vs. ability to handle it] was greater than 1.2. When this occurs, the calculation of average stopped delay per vehicle (seconds) is meaningless and the program generates an *.

The scenario 2 results (Exhibit 15) show LOS "E" for the DPW method for Calvert, (AM), Cathedral (AM), and Porter (AM and PM). The HCM analysis shows all intersections failing for both AM and PM. The CLV method shows an LOS "F" for Cathedral (PM) and Porter (AM and PM) an LOS "E" for Calvert (AM) and Cathedral (AM) and an LOS of D for Tilden (AM and PM).

Summary - The intersection of Connecticut and Porter operates at an unacceptable LOS for both scenarios during both peak hours using the HCM or CLV method. The intersection of Connecticut and Cathedral also operates at LOS F during the PM peak using the HCM or CLV method. The Calvert intersection operates at F (HCM method or E (CLV method)) during the AM peak. During the same time periods, the same intersections operate of LOS "E", using the DPW method.

These three intersections will have operating problems with future land redevelopment in Woodley Park and Cleveland Park. The detailed consideration of this potential redevelopment, by square and tracing the new trips through the street network shows that these two neighborhoods would be seriously impacted by future redevelopment.

F. Comparison of the Analysis Methods

The EZ-POSIT computer program is primarily a signal optimization program and is not normally used for intersection capacity analysis.

The HCM software for signalized intersections is based on the national Highway Capacity Manual. The software was developed by the Federal Highway Administration and several thousand copies have been distributed. It is very widely used and is the most comprehensive method available for intersection capacity analysis.

The CLV technique has been utilized in the Washington-Baltimore region (as well as elsewhere) for about 12 years. It is well understood and accepted by almost all public agencies as a good method which yields reasonable results that reflect the conditions actually existing in the field.

Either the HCM or the CLV analysis procedures should be utilized for this planning level of analysis for a complete corridor. This is especially true, because of the availability of good input data, including, intersection geometry, parking, bus volumes, pedestrian volumes and vehicle turning movements.

Both of these methods identify a real and potential problem at three of these intersections (of the 5 studied). Not all intersections were included in this analysis, because of time and financial constraints. For example, Woodley Road and 24th Street were omitted even though they operate poorly during certain periods. With the operational level of service of at least 3 intersections found to be unacceptable by two of the capacity analysis procedures and in doubt by the third, the traffic impact of new development in these two neighborhoods is significant and unacceptable.

IV. OTHER TRANSPORTATION CONSIDERATIONS

A. Parking

This is a serious problem in this part of the city. The problem is not consistent from one area to another. For example, in Woodley Park the major problems include spillover parking from activities at the two hotels and includes double parking as well as very large trucks loading and unloading exhibits, limousines cruising for certain type of events, etc. Also some Metro-rail patrons are seeking parking in the neighborhood. In Cleveland Park it also includes some Metro-rail parking but, in addition, involves a lack of parking for commercial (primarily retail) establishments on Connecticut Avenue. The Uptown Theatre is a prime example of both parking spillover into the neighborhood, double parking and drop off/pick up. Convention buses are not allowed to park off-street for loading and unloading at the Shoreham Hotel and this adds significantly to a parking/loading and unloading problem on Calvert Street.

B. Loading and Unloading - There are specific problems on Connecticut as well as on 24th Street in Woodley Park. Loading and unloading during the peak hours creates capacity reduction by blocked lanes. Loading and unloading in alleys also results in serious problems because the alleys in this area are all sub-standard (15 ft. wide vs. a minimum standard of 20 ft.). Two specific examples are the alley west of Connecticut between Ordway and Porter which is frequently blocked by a truck for a relatively long time period. The second example is an "L" shaped alley east of Connecticut between Woodley Place and Woodley Road; Problems include blockage, backing up of trucks, property damage

and illegal parking of cars (mostly patrons of one of the several restaurants).

C. Hotel Functions/Special Events

The two major convention hotels (Sheraton Washington and Omni Shoreham) create some special problems for the Woodley Park neighborhood. They are listed, with a brief explanation below:*

1. Large intercity buses associated with conventions at the Shoreham - They are not allowed to enter the main driveway or to load and unload at the main entrance. This results in parking/loading and unloading and a serious pedestrian safety problem along Calvert Street.

2. Duke Ellington Bridge - The bridge has structural limitations and vehicles are not allowed to park/stand on the bridge. A major bike route exists with reserved bicycle lanes on the bridge and the heavy flows and traffic back-ups create serious bicycle - vehicle safety conflicts. During major events at the hotels, back-up on this bridge tends to occur. A D.C. police officer must be permanently assigned to the "Hotel Area" to handle this and other hotel related problems.

* Most of these problems were either identified by or confined by Capt. Mike Manglitz from the D.C. Police Dept. in the Woodley Park area.

3. Very large convention/exhibit space at the Sheraton - This presents special problems of scheduling the loading and unloading (an example is the October U.S. Army Association convention, with many extremely large exhibits). The problem is compounded because the principal loading dock at the Sheraton is near high density apartments which front on 29th Street but back up to hotel property.

4. Large "Blacktie" type affairs - Some of these hotel activities involve many dozen diplomatic vehicles and limousines double parking, crossing and blocking streets in the neighborhood. A two-week meeting of the World Bank and International Monetary Fund has overflow crowds and is exactly this type of affair.

5. Parking demand is often greater than the capacity of the two hotel garages, which causes spillover into the neighborhood. In fact, the Shoreham is currently in non-compliance with the city's parking requirements because of the closing of significant sections of their underground garage.

6. Hotel expansion - Thre are continuous attempts to expand the hotel use/square footage in this area. Although current zoning does not allow <u>any</u> additional or new hotel use in this square, continuous monitoring by the neighborhood is required. For example, the use of loading dock space for convention exhibits, clearly expands the <u>actual</u> square frontage generating trips.

D. National Zoo

This is a real treasure, both to the nearby neighborhoods and the region as well as to millions of visitors from all over the nation and the world. However, this huge trip generator presents some additional transportation problems, which were not addressed in the OP corridor study. They are listed and briefly described below:

1. Parking - A study of parking and circulation at the zoo was conducted recently* This showed that on peak zoo days the demand for parking far exceeds the supply. The number of visitors is continuing to increase, reaching a new peak of over 25,000 per day in the spring of 1987. This compares with only 714 available visitor spaces. Thus all of the problems associated with lack of parking will continue to become worse, because one of the zoo expansion plans will reduce the available parking. Queuing and delays on Connecticut causing both congestion and safety concerns will become worse.

2. Use of Metro-rail - While increased usage of Metro-rail by zoo visitors helps with parking, it creates huge volumes of pedestrians in the corridor. For example, the width of the pedestrian crossing across Connecticut is to be increased to 100 ft.

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* "Access Circulation and Parking at the National Zoological Park," EDAW, Greenhorne & O'Mara, Inc., 1985.

3. Zoo Expansion Plans - There are plans by the zoo for expansion of activities which will generate additional trips and the need for more parking. This will increase both congestion and parking spill-over into the neighborhood.

4. Internal Access - The access from Connecticut Avenue to the zoo is barely adequate and can begin to cause delays and congestion on Connecticut Avenue as vehicles trying to turn into the zoo entrance begin to back-up.

5. The Director of Security for the zoo and the DPW have agreed to implement the following measures.

   a. Removal of parking on the East side of Connecticut South to the pedestrian entrance and north to the vehicular entrance - on weedends! The very time when the neighborhood needs all the parking it can obtain.

   b. Expand the width of the pedestrian crossing across Connecticut to 100 ft. to accommodate the huge pedestrian flows.

E. Metro-Rail Stations

The existence of two metro rail stations in this area are a real asset to the neighborhoods, handling thousands of visitors to the zoo and some hotel trips. However, any deterioration in the level of service on the streets. Serving the stations would make this mode a less attractive option. There are no kiss and ride (drop-off/pick-up) provisions at either the Cleveland Park or

Woodley Park/Zoo Stations. Some drop-off/pick-up activity now holds up traffic adding to congestion.

F. Metro-Bus Service

Even with metro rail, good metro-bus service is very important to this corridor simply because not all trip ends (begin) at another rail station. Also very meaningful east-west service is provide by metrobuses on Porter and Calvert Streets. Increased congestion at the Connecticut Avenue intersections with these streets will result in poorer bus service.

G. Rock Creek Parkway Access

Major access to and from the northern end of Rock Creek Parkway utilizes 24th Street on the west and Cathedral Street on the east of Connecticut. At the intersection of these two streets with Connecticut Avenue, as well as along Catheral, some problems exist.

1. Cathedral Avenue - This is primarily a residential street and the huge volumes (about 1,000 vehicles now in the PM Peak) exiting from Rock Creek Parkway and traveling Cathedral to Connecticut go past many homes. Also, the very significant PM Peak right turning volume from Cathedral to northbound Connecticut cause this intersection to operate at a current level of service of D.

2. 24th Street - Traffic in the AM Peak trying to use the parkway by turning right from Connecticut to 24th Street create long queues from the signal at Calvert. It has been observed that this queuing:

a. Sometimes backs up past the intersection with Woodley Rd., reducing the southbound movement on Connecticut Avenue by one lane - a significant reduction in capacity.

b. Vehicles (about 5% of the volume) were observed making turns around the channelizing island at 24th and Connecticut after realizing there was a long queue. This creates a real pedestrian hazard, because pedestrians would not be expecting this illegal maneuver.

V. SUMMARY/CONCLUSIONS

The transportation/traffic impact of redevelopment of some parcels in the Cleveland Park and Woodley Park neighborhoods is not well measured by the aggregate analysis shown in the OP/DPW corridor study report. A more detailed analysis of modified land use (redevelopment) in these two neighborhoods, by square, as reported in this paper, shows that the traffic impact on at least 3 intersections is indeed significant.

Conclusions.

- Our analysis shows that three intersections will not operate at an acceptable LOS in the year 2000 with projected redevelopment*

  + Connecticut/Porter
  + Connecticut/Cathedral
  + Connecticut/Calvert

- A more detailed analysis of the traffic impact was definitely warranted and should have been performed by the city. However, the very extensive problems that exist now coupled with our analysis results show that very limited new development should be allowed in these neighborhoods.

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* LOS E is not generally acceptable by any public agency; nor is it acceptable by the public, as evidenced by drivers seeking alternative routes, often through neighborhood residential streets.