

Technical Memorandum:

Relationship Between Employment by
Standard Industrial Classification Code and Employment by
Land Use Type

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INTRODUCTION

The relationship between land use categories (office, retail, industrial and other) and the Standard Industrial Classification (SIC) system helps produce employment data by land use types for the Transportation Planning Board (TPB) travel forecasting and trip generation models. Enhancing this relationship requires examining employment by SIC code and then developing an equivalence between SIC codes and land use types by allocating the appropriate number of employees by industry into general land use categories. This evaluation of allocating industry employment to land use categories focuses on the procedures developed in the Washington region. The purpose of this examination is to develop a method to enhance the current method utilized to allocate employment to land use for trip generation and forecasting purposes.

METHODOLOGY

This analysis focuses on a review of an existing procedure by the Maryland-National Capital Park and Planning Commission (M-NCPPC) in Montgomery County to allocate employment by SIC to land use categories.¹

¹The land use categories are the four generalized types employed in the Transportation Integrated Modeling System (TRIMS), the most commonly employed travel forecasting demand model used by TPB.

The M-NCPPC allocation procedure was reviewed and a technique developed and tested by the Council of Governments. To validate the equivalence/allocation procedure, field checks of selected small areas (COG/TPB analysis zones) were performed to compare existing data and the accuracy of the results of the equivalence/allocation procedure. The field checks evaluated the existing land use with the allocated land use.

STANDARD INDUSTRIAL CLASSIFICATION SYSTEM

The Standard Industrial Classification (SIC) was developed for use in the classification of establishments by type of activity in which they are engaged; for purposes of facilitating the collection, tabulation, presentation, and analysis of data relating to establishments; and for promoting uniformity and comparability in the presentation of statistical data collected by various agencies of the United States Government, State agencies, trade associations, and private research organizations. The Standard Industrial Classification for establishments differs from a classification for enterprises or companies.

The Standard Industrial Classification is intended to cover the entire field of economic activities: agriculture, forestry, fishing, hunting, and trapping; mining; construction; manufacturing; transportation, communication, electric, gas, and sanitary services; wholesale and retail trade; finance, insurance, and real estate; personal, business, repairs, and other services; and public administration.²

²U.S., Executive Office of the President Office of Management and Budget, Statistical Policy Division, Standard Industrial Classification Manual, 1972 (Washington, D.C.: U.S. Government Printing Office, 1972), p.9.

The SIC system uses a hierarchical process in which an industry and its activities are identified according to the level of industrial detail considered most appropriate. The two-digit SIC is the primary unit of conversion between SIC and land use. Where the two-digit code does not provide an obvious relation to land use, three and four-digit SIC industries are used.

It should be noted that the SIC classification attempts to distinguish separate activities performed at a single establishment. This separation is not for distinguishing land use type; rather it is to distinguish activities such as production and administrative offices at the same location. Both activities could take place in either an office or an industrial structure, but multiple SIC code employment is reported under separate activities.

TABLE 1

PERCENTAGE OF
EMPLOYMENT BY LAND USE CATEGORY

INDUSTRY	SIC	OFFICE	RETAIL	INDUSTRIAL	OTHER
Agriculture	01-73	--	--	--	100%
Veterinary	074-075	--	10%	--	90
Farms, Landscaping	076-078	--	--	--	100
Forestry	08	--	--	--	100
Fishing	09	--	--	--	100
Mining	10-12	--	--	100%	--
Oil & Gas	131-132	--	--	100	--
Oil & Gas Wells	138	--	--	--	100
Mining	14	--	--	100	--
Construction	15-17	--	--	--	100
Manufacturing	201-274	--	--	100	--
Commercial Printing	275	--	50	50	--
All other MFG.	276-399	--	--	100	--
Railroads	40-41	5%	--	95	--
Motor Freight	42	5	--	95	--
U.S. Postal Svc.	43	--	20	--	80
Other Transport.	44-47	--	--	--	100
Communication	48	100	--	--	--
Utilities	49	--	--	--	100
Wholesale Trade	50-51	10	--	80	10
Retail Trade	52-59	--	100	--	--
Banking & Credit	60-61	50	50	--	--
Securities	62	75	25	--	--
Insurance	63-64	95	5	--	--
Real Estate/Investment	65-67	100	--	--	--
Hotels	70	--	70	30	--
Laundries	721	--	--	--	100
Photo, Beauty, Shoe Repair	722-725	--	100	--	--
Funeral	726	10	--	40	50
Misc. Services	729	20	80	--	--
Advertising	731	100	--	--	--
Credit Reportg.	732	100	--	--	--
Direct mail	7331	100	--	--	--
Blueprints, etc.	7332-7339	--	30	70	--
Bldg. Svcs, Computer	734-737	100	--	--	--
Research Labs	7391	30	--	30	--
Mgt., P.R., Detectives	7392-7393	100	--	--	--
Equipment Rental	7394	30	10	60	--
Photo Labs	7395-7397	30	10	60	--
Misc. Bus. Svcs.	7399	80	20	--	--
Auto Repairs	75	--	100	--	--
Misc. Repairs	76	--	100	--	--
Motion Pictures	78	20	--	20	60
Amusement Svc.	79	10	--	--	90
Doctors	801-804	70	30	--	--
Nursg. Homes, Hospitals	805-806	--	100	--	--
Medical Labs	807	--	--	--	100
Other Health	808-809	50	50	--	--
Legal Svcs.	81	100	--	--	--
Educational Sv.	82	10	--	--	90
Social Svcs.	83	40	60	--	--
Museums	84	50	20	--	30
Membership Orgns.	86	100	--	--	--
Private Households	88	--	--	--	100
Engineers, etc.	891-893	100	--	--	--
Misc. Servives	899	95	--	5	--

Continued

Table 1 Continued

PERCENTAGE OF
EMPLOYMENT BY LAND USE CATEGORY

INDUSTRY	SIC	OFFICE	RETAIL	INDUSTRIAL	OTHER
Fed Gov't	*	90%	--	5%	5%
St. & Local	*	45	--	10	45
"Other"	*	40	30	5	15
Military	*	40	--	20	40

* These industry categories are used in COG's Regional Employment Census and differ from those of the **SIC Manual**.

TABLE 2

DIVISION ALLOCATION

INDUSTRY DIVISION **	L A N D U S E			
	OFFICE	RETAIL	INDUSTRIAL	OTHER
Agri/Mining/Construction/ Manufacture	20%	10%	70%	--
Trans/Comm/Utilities	65	--	35	--
Wholesale Trade	2	13	85	--
Retail Trade	5	95	--	--
F.I.R.E.	85	15	--	--
Services	60	15	5	20%
Federal *	90	--	5	5
S & L Gov't *	45	--	10	45
(Military) *	40	--	20	40
Other *	40	20	20	20

* These industry categories are used in COG's Regional Employment Census and differ from those of the **SIC Manual**.

** The division is the primary activity in which establishments are categorized based on product production, revenues generated or value of sales. In the case of the government category employment or payroll is the measure for classifying establishments in the government division.

LAND USE CATEGORIES

The land use categories for which a relationship is necessary for trip generation purposes are office, industrial, retail and other. Each of the four categories represents a type of use which generates different intensity of tripmaking. The "office" category includes all general office, administrative and service functions which do not require production or distribution activity. The "industrial" category includes production, distribution (non-retail) and manufacturing activities including warehousing and storage. The "retail" land use includes all personal and business sales and service activities which are not wholesale in nature. (A dry cleaning plant would be industrial, but an outlet/plant combination at the outlet location would be categorized as a retail land use facility.) The "other" category includes facilities such as gymnasiums, churches, construction yards, hospital/special health facilities including nursing home and military facilities.

SIC-LAND USE EQUIVALENCE OR ALLOCATION PROCESS

The Montgomery County Planning Board of the Maryland-National Capital Park and Planning Commission, Research Division, has developed a percentage allocation process to determine employment by land use from the SIC system. The M-NCPPC process allocates a percentage of an industry's employment at the two, three and four-digit SIC level to the four (4) land use categories.

Using the M-NCPPC-Montgomery County allocation method, the Council of Governments has developed a relationship between SIC employment and land use. A

refined allocation method was developed based on a review of each industry classification to the four-digit level. Using the T.R.I.M.S. land use activity definitions, as reported in Appendix A (attached), the allocation was refined. See Table 1 for the allocation of employment by SIC to land use.

FIELD CHECK OF EMPLOYMENT ALLOCATIONS

Selection of Areas

To determine the validity of the allocation of employment by SIC to the four land use types, employment data were extracted for groups of specific COG/TPB analysis zones. The percentage of employment for these zones by land use type was determined using the "Division (SIC) Allocation" method (see Table 2). Field checks of the five areas were performed to validate the allocation methods.

The five areas were selected in order to focus on sampling of varying concentrations of land uses, employment densities and type of development. There were no specific criteria used to selecte locations for the field test. However, a variety locations were chosen each with a particular concentration of activity and density. In addition, sites selected for the field test include rural, suburban and urban centers, and some areas that are transit oriented. The Fair Oaks area in Fairfax County is a employment growth area which has rural land uses as well as a regional shopping mall. The Ballston-Clarendon location is one in which the density is higher and is focused around Metrail stations. The new downtown site is a high density office activity center. The selection of the Rockville Pike corridor was made because of the large number of retail es-

tablissements and the mixture of retail, office and service businesses. The New Carrollton-Ardwick Ardmere site represents a concentration of industrial businesses. The five areas are defined by the following COG/TPB analysis zones:

1. Fair Oaks (Fairfax County)
COG/TPB Zones: 574D,566B,574C,574B
2. Ballston/Clarendon (Arlington County)
COG/TPB Zones: 325M,325N,325J,325K
3. New Downtown (District of Columbia)
COG/TPB Zones: 022B,003A
4. Rockville Pike (South Rockville) (Montgomery County)
COG/TPB Zones: 153E,153F,153H,153K
5. New Carrollton-Ardwick Ardmere (Prince George's County)
COG/TPB Zones: 245A,245B,246S,246V

(See Figures 2 through 5 for Map of Selected Areas in Appendix B.)

ANALYSIS

Table 3 reflects the distribution of employment by land use based on the allocation of jobs by major industrial division classifications to the four land use types. After the field checks were performed, an assessment of the relative merits of allocating employment data to land use by the detailed SIC code and by larger industry divisions was performed. Table 4 presents this comparison for the five areas used in the field checks.

TABLE 3 a/
EMPLOYMENT ALLOCATED TO LAND USE FOR FIELD TEST AREAS

AREA	1980 EMPLOYMENT TOTAL		EMPLOYMENT BY LAND USE							
	NO.	%	OFFICE		RETAIL		INDUSTRIAL		OTHER	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
1. Fair Oaks	1,646	100	686	41	185	11	286	17	489	31
2. Ballston/ Clarendon	6,326	100	4,187	55	810	11	739	10	590	8
3. New Down- town	38,064	100	25,310	66	5,228	14	3,461	9	4,065	11
4. Rockville Pike	2,058	100	1,052	51	294	14	376	18	336	16
5. New Carroll- ton/Ardwick/ Ardmore	7,758	100	1,923	25	2,796	45	2,292	30	207	3

a/ Employment by land use in this table is based on the the industry division allocation method.

TABLE 4

PERCENTAGE OF EMPLOYMENT IN SELECTED STUDY AREAS
BY ALLOCATION METHOD AND SITE EVALUATION

LAND USE TYPE	DIVISION SIC a/ ALLOCATION (1980 REC)	DETAILED SIC b/ ALLOCATION (1980 REC)	SITE EVALUATION c/ ALLOCATION (1985 Site Work)
New Downtown:			
Office	66%	79%	91%
Retail	14	11	7
Industrial	9	3	0.5
Other	11%	7%	1.5%
Ballston-Clarendon:			
Office	55%	59%	64%
Retail	11	18	20
Industrial	10	5	3
Other	8%	18%	13%
Fair Oaks:			
Office	41%	51%	32%
Retail	11	31	24
Industrial	17	13	11
Other	31%	5%	33%
Rockville Pike:			
Office	51%	41%	30%
Retail	14	42	44
Industrial	18	4	17
Other	16%	13%	9%
Ardwick/Ardmore--New Carrollton:			
Office	25%	9%	10%
Retail	45	16	10
Industrial	30	72	80
Other	3%	3%	(less than .05%)

a/ This percentage of employment by land use is based on employment allocated to land use by major **industry division** (Table 2)

b/ The percentage of employment by land use is based on employment allocated to land use by detailed **SIC employment** (Table 1)

c/ This estimate is based on a **visual analysis** of land use activity in study areas.

Based on the distribution of land use by site evaluation, the allocation of employment by detailed SIC codes appears to be a more accurate method than using only industry divisions to allocate employment to land use.

CONCLUSION

- Based on the site evaluations of the five study areas and on comparing both the SIC division and detailed SIC allocation methods, it appears that using an allocation based on the detailed SIC codes provides a closer relationship to land use. This is based on the site evaluation data (see Table 4).
- There is still some discrepancy between the SIC code employment and the actual building types; however, this appears to occur in areas of highly specialized uses such as industrial parks or retail strips. In such areas, when employment data is allocated to land use types, adjustments should be encouraged to reflect the concentration of land use activity.

Appendix A

Description of Land Activities

Households

Single Family (including detached, semi-detached, triple-attached and row, plus individual mobile homes)

Multi-Family (two or more dwellings in a single building, including apartments and residential hotels)

Mobile Home Parks or Courts

Group Quarters

Institutions

Dormitories

Rooming Houses

Other - Places where people do not have separate living arrangements.

Offices

Commercial Offices

Professional and Trade Associations

Institutional Offices

Federal Government Offices

State and Local Government Offices

Foreign Governments and International Organizations, including Embassies, Chanceries, etc.

Other Offices

Retail

Stores

Retail (Continued)

Shopping Centers

Gas Stations, Auto Repair, Automobile Dealers, and Auto and Truck
Rentals

Repair Services

Personal Services

Eating and Drinking

Medical and Dental Clinics, Centers, and Laboratory Services

Other Consumer Services

Industrial

Manufacturing and Processing

Research and Testing

Wholesale, Warehousing, and Storage

Contract Construction

Other Industrial

Electric, Gas, Water, Sewage and Other Utilities

Solid Waste Disposal

Telephone, Telegraph, Radio and Television Communications

Railroad, Rail Rapid Transit, Bus, Streetcar, Taxi, Motor Freight and

Other Transportation

Street and Highway Rights of Way

Automobile Parking

Air

Marine

Other

Nursery, Elementary, Secondary, and Commercial Schools
Colleges and Universities
Churches, Synagogues, and Other Places of Worship
Agriculture, Agriculture Related Activities
Forestry Activities and Related Services
Mining Activities and Related Services
Permanent Conservation Areas
Other Resource Production and Extraction
Undeveloped and Unused Land Area
Water Areas
Vacant Floor Area
Under Construction
Under Demolition
Cemeteries
Hospitals, Nursing Homes, Other Health Facilities (except Clinics)
Police, Fire and Rescue Stations
Correctional Institutions
Military Installations
Welfare and Charitable Services
Post Offices
Other Public Services
Civic, Social, and Fraternal Associations
Libraries
Permanent Exhibitions, including Museums, Art Galleries, Monuments,
Planetaria, Aquariums, and Urban Historic Sites

Places of Public Assembly, including Theaters, Stadiums, Auditoriums,
and Exhibition Halls

Indoor Recreation, including Recreation Centers, Indoor Swimming,
Gymnasiums, Ice and Roller Skating Rinks, Bowling, and Penny Arcades

Outdoor Amusements, including Fairgrounds, Race Tracks, Go-Cart Tracks,
Miniature Golf, Golf Driving Ranges, and Amusement Parks

Private Outdoor Recreation, including Tennis, Swimming, Country Clubs,
and Yachting Clubs, limited to members and guests

Commercial Outdoor Recreation, including Resorts, Riding Academies,
Ski Runs, Organized Camps, and Marinas

Public Golf Courses

Play lots, Playgrounds, and Playfields

Parks - leisure and ornamental

Parks - General Recreation, including individual Camping and Picnicking,
as well as area for the preservation and enjoyment of nature,
including Zoos, Botanical Gardens, Arboretums, and National Parks

Outdoor Courts and Pools open to the public (Tennis, Basketball, Swim-
ming, etc.)

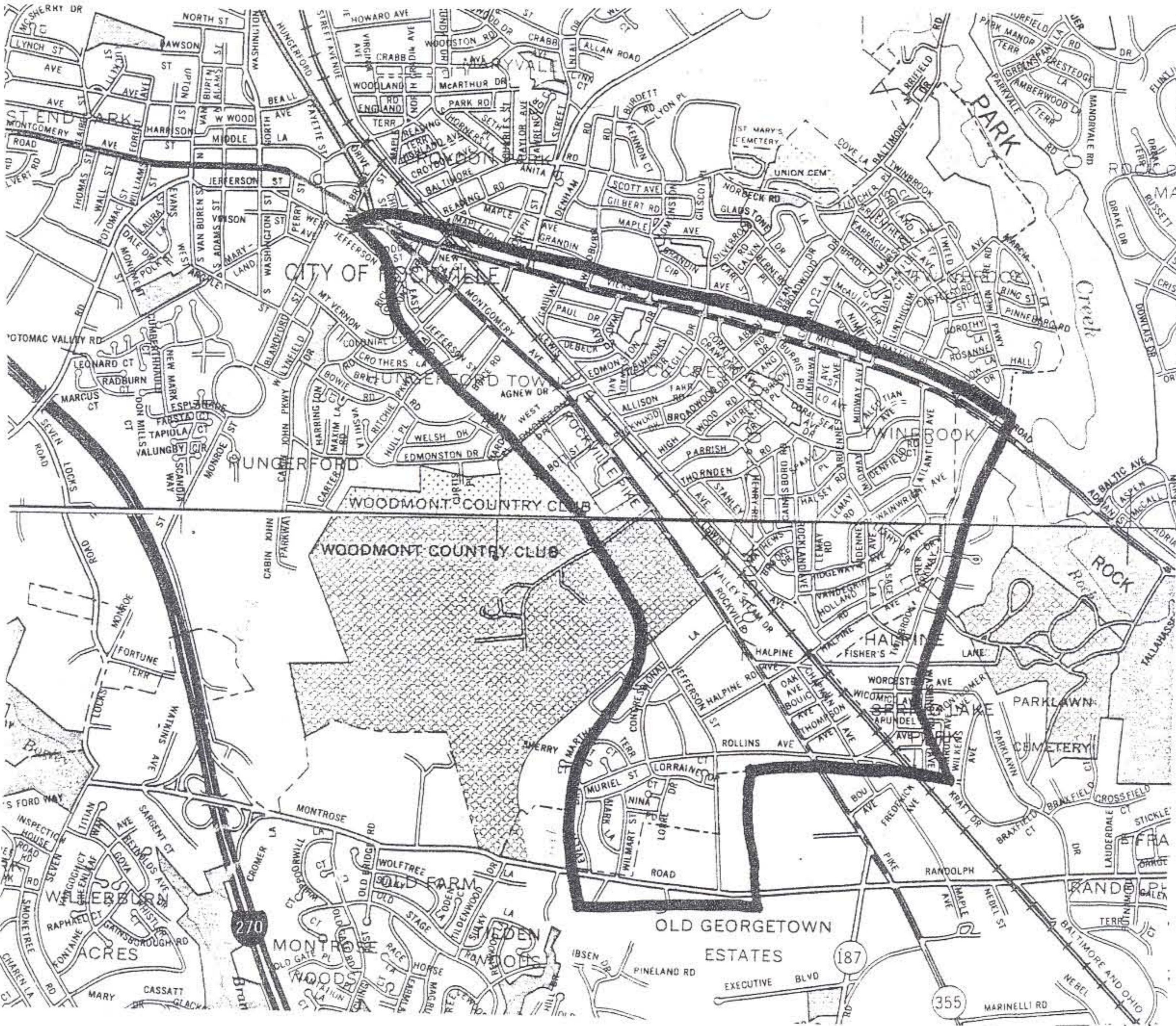
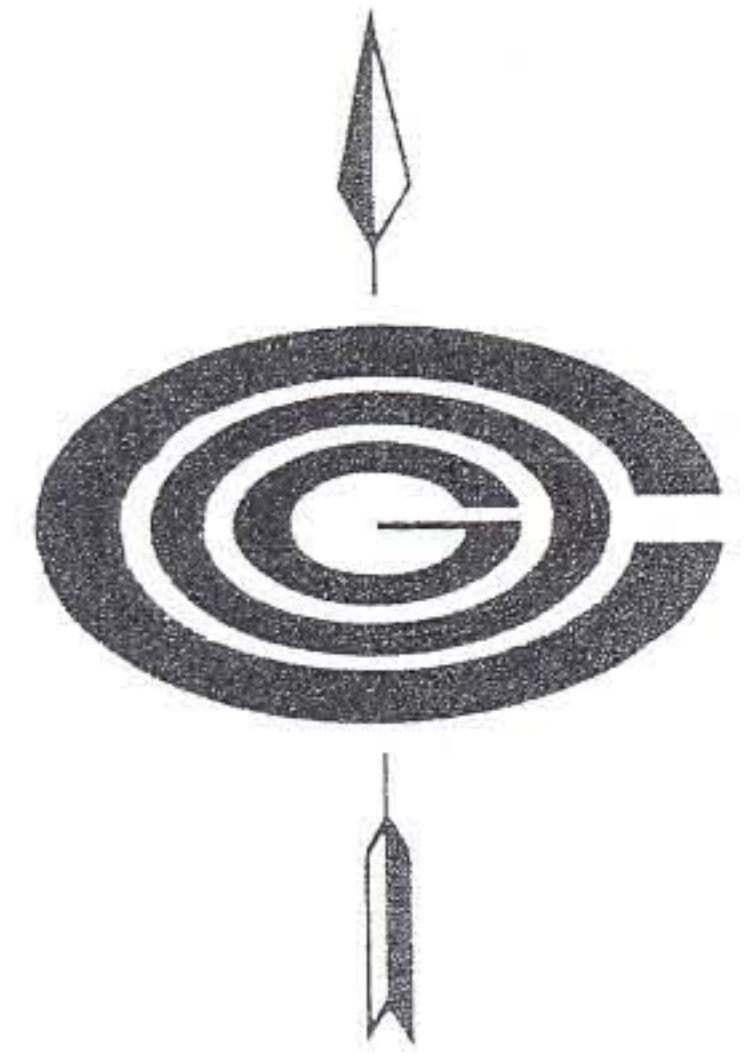
Other Parks

APPENDIX B

FIELD TEST SITES

(Figures 2-5)

FIGURE 2



Rockville Pike/South Rockville (Montgomery County)
COG/TPB Analysis Zones 153e, 153f, 153h and 153k

REFERENCE FACTOR 1:36,000
SCALE 1" = 3000'

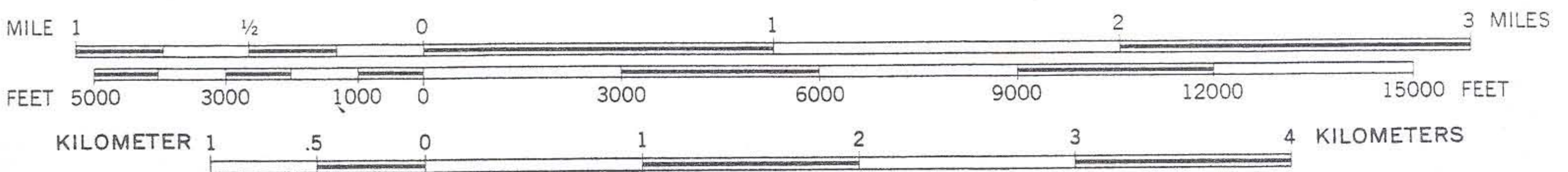
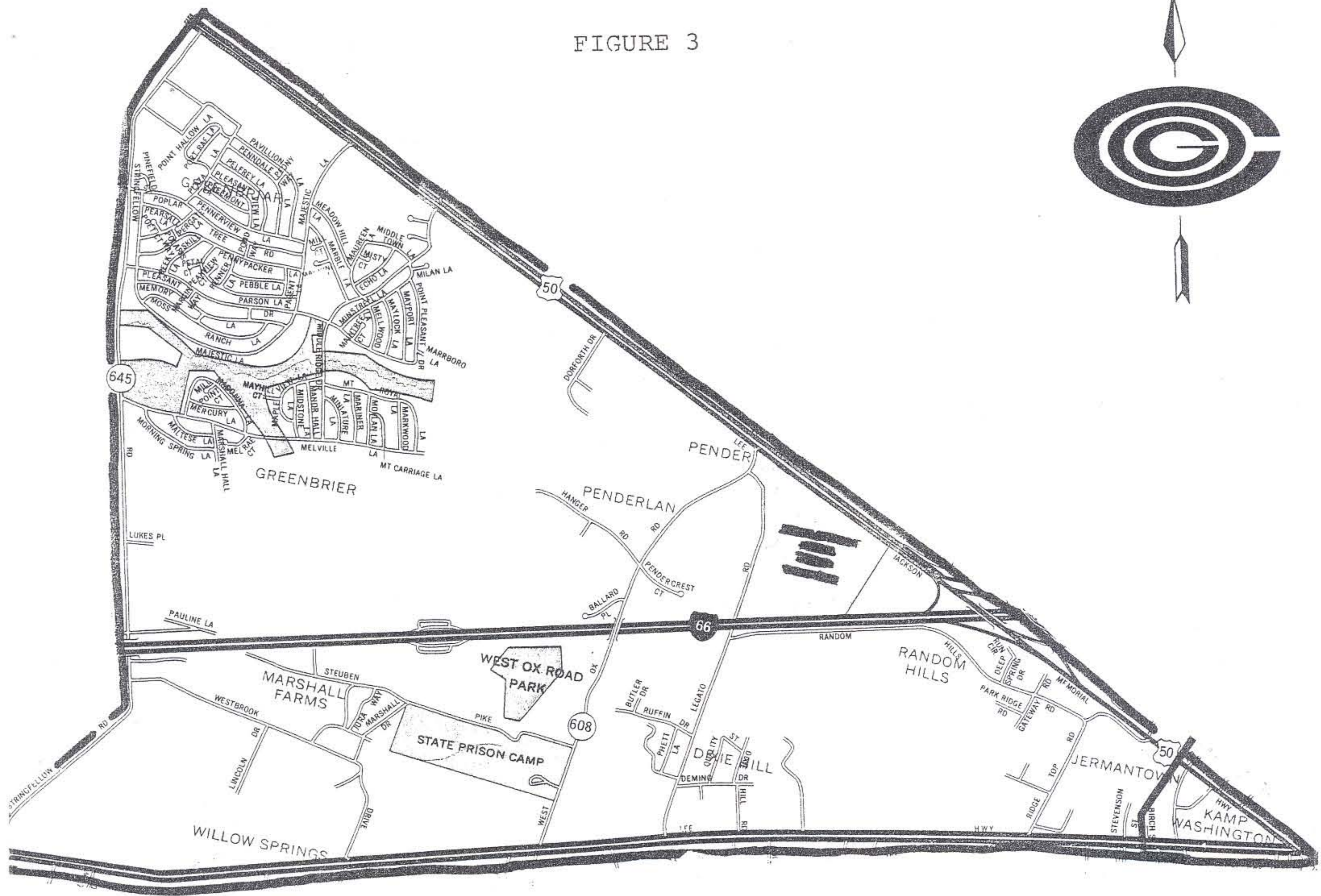


FIGURE 3



Fair Oaks (Fairfax County)
COG/TPB Analysis zones 566b,
574b, 574c and 574d

REFERENCE FACTOR 1:36,000
SCALE 1" = 3000'

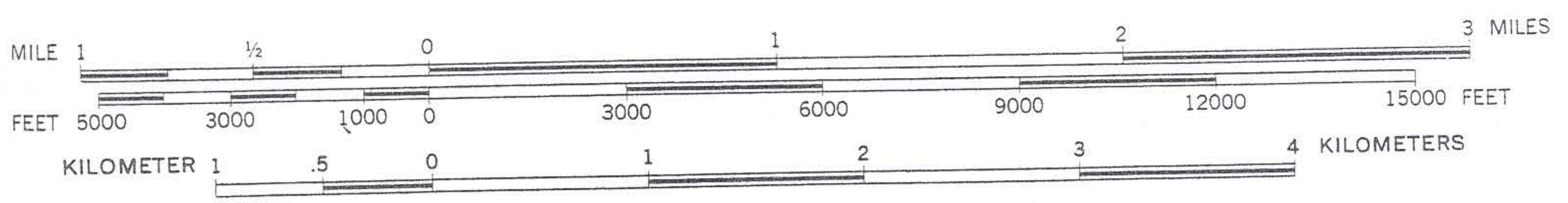
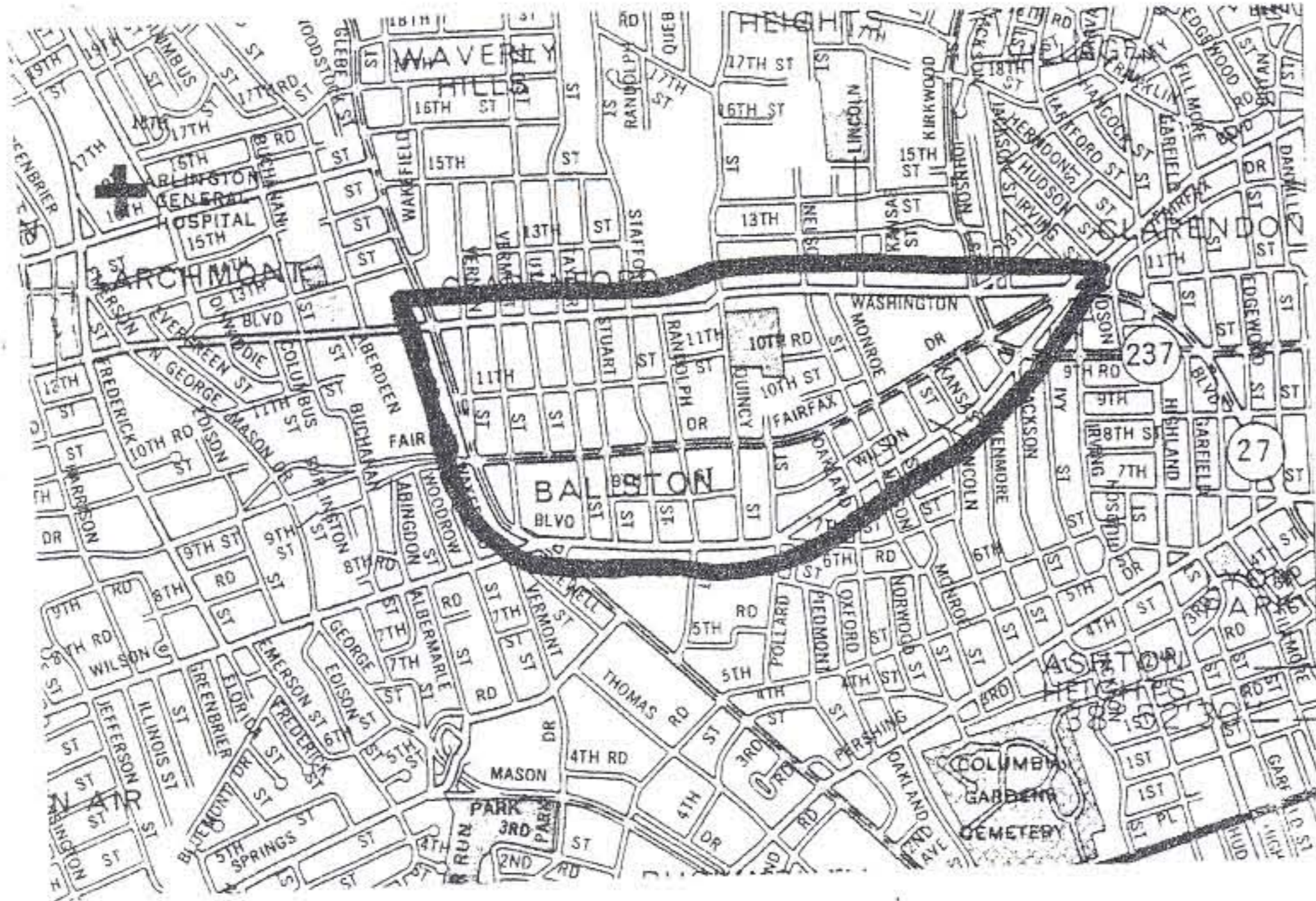
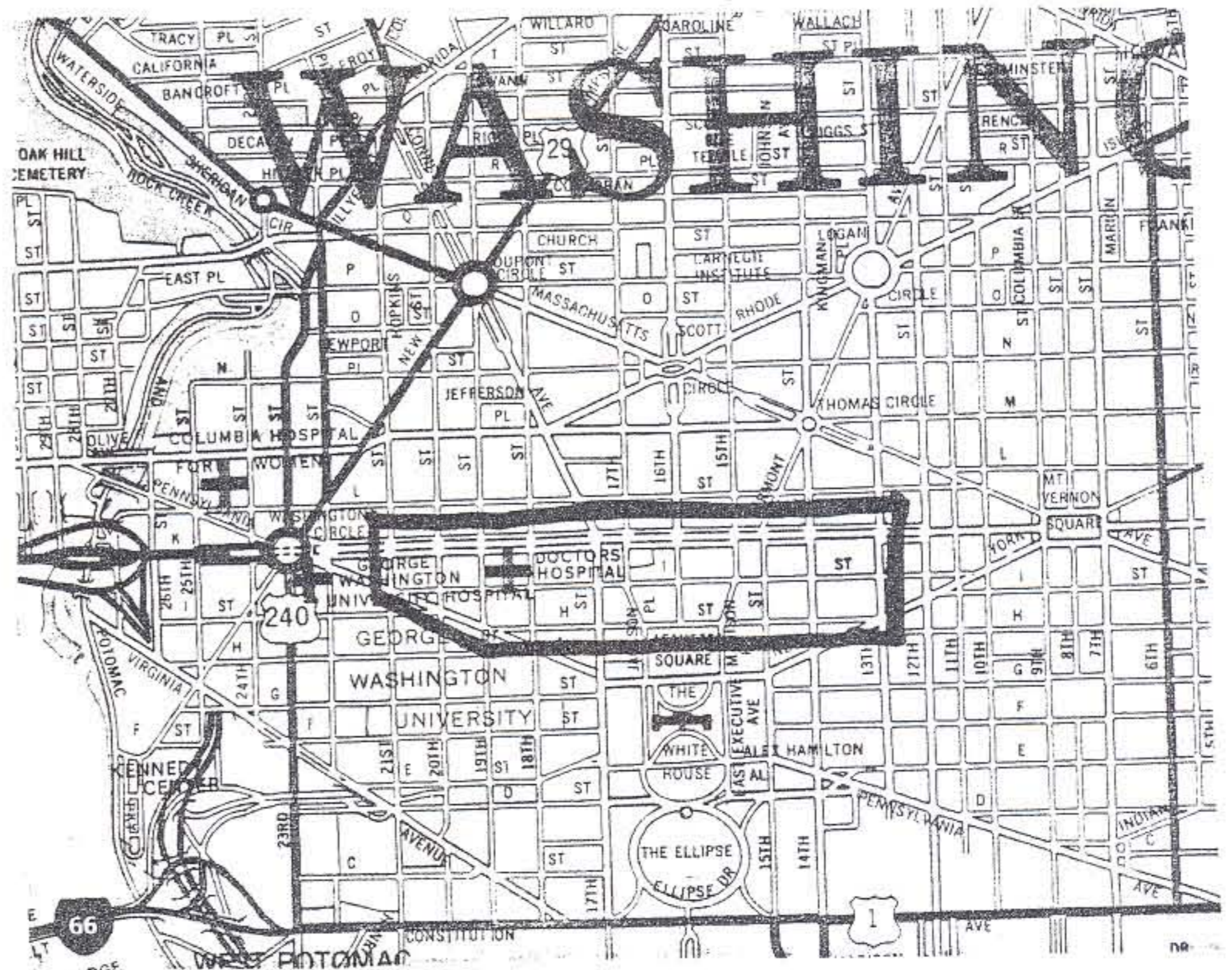


FIGURE 4



Ballston-Clarendon (Arlington County)
COG/TPB Analysis Zones
325j, 325k, 325m and 325n

New Downtown- K Street Area
(District of Columbia)
COG/TPB Analysis Zones
002b and 003a



REFERENCE FACTOR 1:36,000
SCALE 1" = 3000'

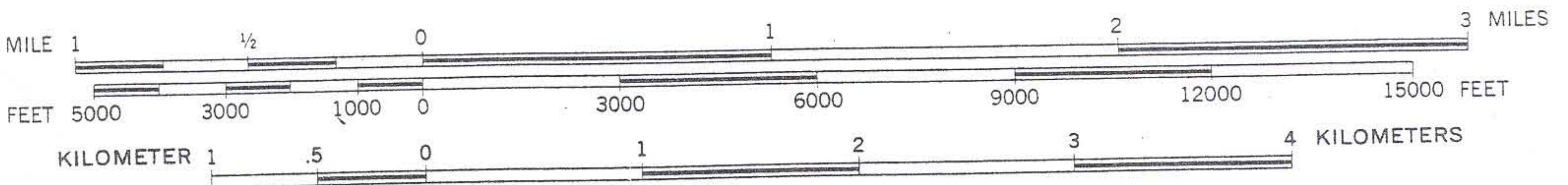
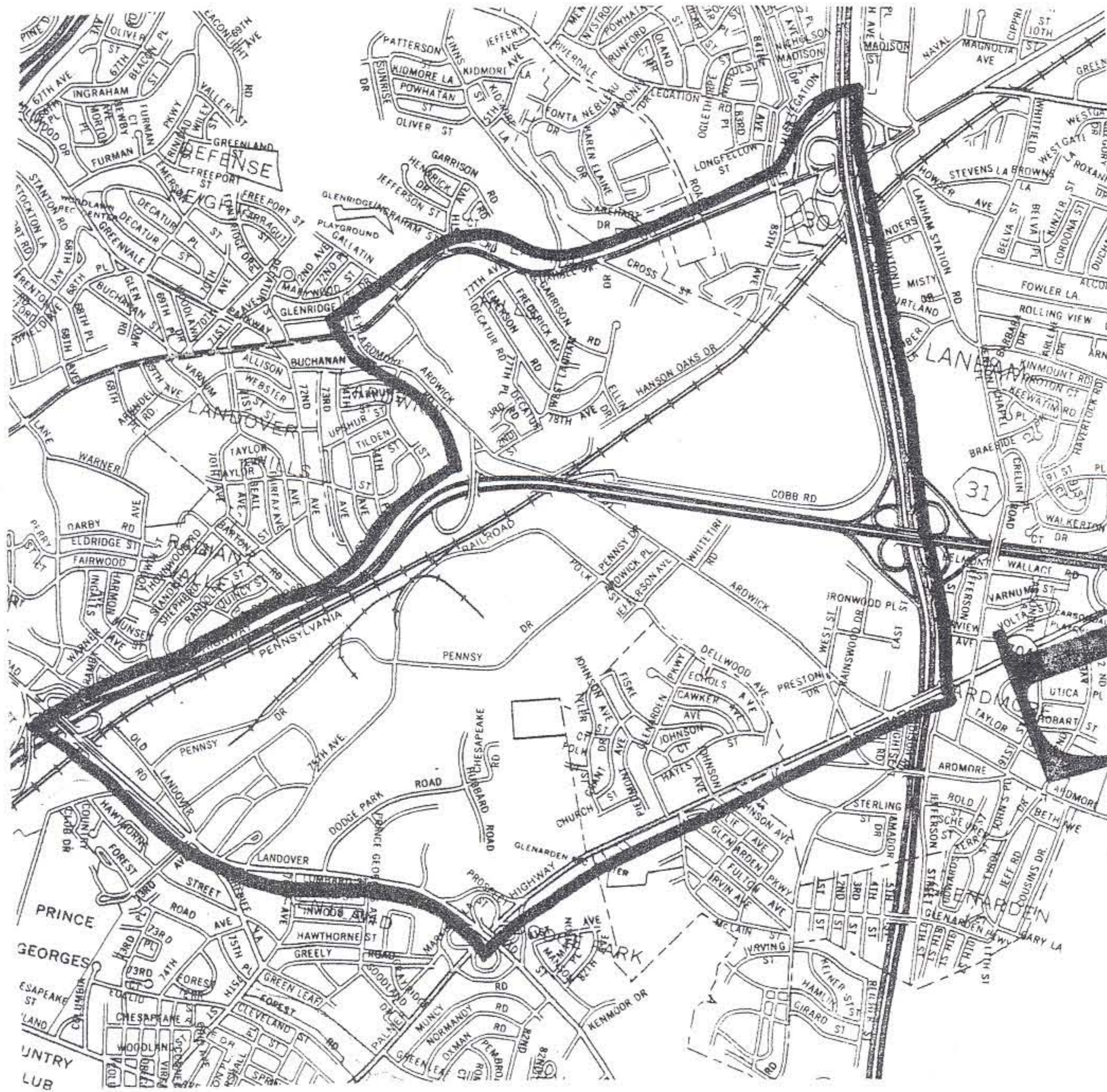


FIGURE 5



New Carrollton-Ardwick-Ardmore (Prince George's County)
COG/TPB Analysis Zones 245a, 245b, 246s and 246v

REFERENCE FACTOR 1:36,000
SCALE 1" = 3000'

