

1993



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**REDESIGNING LIBRARY SERVICE AREAS
FOR THE STATE OF DELAWARE**

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CONTENTS

	Page
List of Tables	iv
List of Figures	v
List of Appendix Figures	vi
BACKGROUND.....	1
ALTERNATIVES	4
THE SERVICE AREAS	11
OBSERVATIONS	19
APPENDIX	21

LIST OF TABLES

Table	Page
1. Fiscal Year 1993 Library Standards Funds.....	3
2. Characteristics of the New Service Areas.....	16

LIST OF FIGURES

Figure	Page
1. Dover Area with Underlying Blocks	13
2. 1993 Library Service Areas	14
3. 1993 Library Service Areas and Highway Network.....	15
4. 1993 Library Service Area Population Density.....	17
5. 1993 Library Service Areas and Modified Grids	18

BACKGROUND

Section 6602(a) of Chapter 66 of Title 29 of 64 Delaware Laws permits the Delaware Division of Libraries to contract with "any public library, including privately incorporated public libraries or public library systems." The purpose of these contracts is to "encourage the maintenance and development of proper standards, including personnel standards, hours of operation, library materials, collection standards, and interlibrary resources sharing." In addition, this section provides for the "development of a statewide public library service."

In Section 6604, the library receiving a contract from the Division of Libraries "must meet, or provide evidence of attempting to meet, minimum standards of operations as established by the Division, and approved by the Council." In addition, the Division is required to "establish and publish the procedure under which public libraries and public library systems may be eligible to contract with the State and may require reports" as provided in Section 6605.

When a library agrees to provide services to the State, they are essentially agreeing to maintain current acceptable standards, or to make progress toward the Division's standards. Those services are provided by a three factor formula that includes locally generated funds, population served, and geographic area served. While there are specific amounts associated with each factor (\$.02 for each local dollar, \$.30 per person, and \$10 per square mile), Section 6603 allows the State to provide as little (including none) or as much as it sees fit. The only requirement is that any amounts provided be distributed proportionately to the formula calculations. The end result of this allocation process is shown in Table 1.

There are several features of the current funding and allocation scheme there are worth mentioning. First, these contract services overall amount to about \$.14 for every locally generated dollar. There are however three cases, namely the New Castle City, Smyrna, and Harrington where the ratio exceeds \$.20 to the dollar. This is important in that any change in the population or service area will have a disproportionate affect on those libraries. The second point illustrated in Table 1 is that total funding over the past three

fiscal years has remained essentially unchanged and in real terms has declined. This, of course, also reflects the meager increase in total State revenues during the recession. These real declines coupled with similar difficulties faced by local governments has put pressure on library services in the same way all other government services have been pressed.

Earlier it was noted that the Division can contract with libraries or library systems. As a result there are entries for each county in Table 1 that reflect formula funding only for local expenditures. These are funds expended by the three county librarians in managing and cooperating with their county system libraries.

Finally, there are two other geographic features shown in Table 1. The City of Wilmington and the City of Dover libraries are the only two libraries where the area and population served are coincident with the their incorporated boundaries. In contrast, the bookmobiles in Kent and Sussex Counties are left to claim the unincorporated areas not claimed by any other library.

The Division of Libraries with the approval of the Council on Libraries is given the sole authority for determining the population and the square miles of area served. In prior years, this determination has largely been left for the libraries in each county to decide among themselves. This has been a very difficult process and ultimately, is more properly in the domain of the Division.

In the balance of this paper, the process and methodology of creating those service areas will be described. The reader should be sensitive to the fact that the solution chosen is one of many potential solutions. When others solutions are considered and discarded, the reasoning behind this choice will be discussed.

Table 1
Fiscal Year 1993 Library Standards Funds

LIBRARY/SYSTEM	Area Sq. Miles	FY91 Population	FY91 Local	FY93 Formula	FY93 Pro-Rated	FY93 Total	FY92 Total	FY91 Total
NEW CASTLE COUNTY			Expenditures	Allocation	Share	Allocation	Allocation	Allocation
Appoquinimink	94.6	7,609	\$60,156	\$4,432	\$6,329	\$10,761	\$10,361	\$10,209
Corbit-Calloway	94.6	7,609	\$75,769	\$4,744	\$6,775	\$11,519	\$10,411	\$10,499
Delaware City	27.1	8,877	\$59,419	\$4,122	\$5,886	\$10,008	\$9,597	\$10,126
New Castle County	0.0	0	\$356,105	\$7,122	\$10,170	\$17,292	\$15,514	\$14,376
Claymont	4.4	20,006	\$152,185	\$9,090	\$12,981	\$22,071	\$21,388	\$22,944
Concord Pike	26.7	60,428	\$567,923	\$29,753	\$42,488	\$72,241	\$71,682	\$74,026
Hockessin	41.8	31,310	\$177,295	\$13,357	\$19,074	\$32,431	\$31,338	\$30,624
Kirkwood Highway	36.6	90,646	\$480,790	\$37,176	\$53,088	\$90,264	\$87,246	\$94,818
Newark	67.2	94,171	\$563,875	\$40,201	\$57,408	\$97,609	\$93,471	\$100,567
New Castle Public	24.1	46,404	\$183,971	\$17,841	\$25,477	\$43,318	\$42,204	\$43,349
Wilmington	11.1	71,526	\$1,564,694	\$52,863	\$75,490	\$128,353	\$127,184	\$135,969
Total	428.2	438,586	\$4,242,182	\$220,701	\$315,166	\$535,867	\$520,396	\$547,507
KENT COUNTY								
Dover	21.0	27,630	\$497,764	\$18,454	\$26,353	\$44,807	\$40,781	\$38,762
Harrington	160.5	17,267	\$30,558	\$7,396	\$10,562	\$17,958	\$17,270	\$17,410
Kent County	0.0	0	\$75,661	\$1,513	\$2,161	\$3,674	\$40,239	\$33,800
Bookmobile	230.3	44,440	\$50,959	\$16,654	\$23,782	\$40,436	\$0	\$0
Smyrna	124.9	17,788	\$24,537	\$7,076	\$10,105	\$17,181	\$17,552	\$16,013
Total	536.7	107,125	\$679,479	\$51,093	\$72,963	\$124,056	\$115,842	\$105,985
SUSSEX COUNTY								
Bridgeville	54.0	3,573	\$56,000	\$2,732	\$3,901	\$6,633	\$6,316	\$7,945
Delmar	47.0	4,817	\$43,798	\$2,791	\$3,986	\$6,777	\$6,980	\$8,033
Frankford	64.0	5,680	\$45,386	\$3,252	\$4,644	\$7,896	\$7,185	\$7,603
Georgetown	64.0	8,208	\$58,579	\$4,274	\$6,103	\$10,377	\$9,829	\$10,539
Laurel	97.0	10,056	\$103,575	\$6,059	\$8,652	\$14,711	\$14,114	\$15,098
Lewes	55.0	9,261	\$70,299	\$4,734	\$6,760	\$11,494	\$11,183	\$12,815
Milford	153.1	20,449	\$118,066	\$10,027	\$14,319	\$24,346	\$22,787	\$24,465
Millsboro	64.0	7,518	\$42,447	\$3,744	\$5,347	\$9,091	\$8,662	\$7,042
Rehoboth Beach	55.0	7,318	\$66,925	\$4,084	\$5,832	\$9,916	\$9,628	\$11,878
Seaford	64.0	18,490	\$112,509	\$8,437	\$12,048	\$20,485	\$20,001	\$23,933
Selbyville	64.0	5,253	\$56,780	\$3,352	\$4,787	\$8,139	\$7,574	\$8,587
Sussex County	0.0	0	\$223,936	\$4,479	\$6,396	\$10,875	\$9,923	\$8,550
South Coastal	64.0	4,840	\$48,565	\$3,063	\$4,374	\$7,437	\$7,173	\$7,840
Greenwood	54.0	3,085	\$58,244	\$2,631	\$3,757	\$6,388	\$5,734	\$6,269
Milton	55.0	7,425	\$69,899	\$4,176	\$5,963	\$10,139	\$9,639	\$9,969
Bookmobile	59.0	4,484	\$46,871	\$2,872	\$4,101	\$6,973	\$6,714	\$8,942
Total	1013.1	120,457	\$1,221,879	\$70,707	\$100,970	\$171,677	\$163,442	\$179,508
STATE TOTALS	1978.0	666,168	\$6,143,540	\$342,501	\$489,099	\$831,600	\$799,680	\$833,000

Source: Delaware Division of Libraries

ALTERNATIVES

Measurement Issues.

Before the work described here began, we undertook an extensive literature search. Unfortunately, although not unexpectedly, there was nothing of substance found in either journals that cover the area or books. Government periodicals were searched as well without result. The national library organizations were also contacted, but were silent on constructing service areas.

The fact that we were unable to uncover specific references to this was hardly surprising. This task is more akin to developing franchise areas in sales marketing studies. Ultimately, they are all spatially based and depend on the characteristics of the consumers in the market.

Section 6602(b)(2) and section 6602(b)(3) of Chapter 66 of Title 29 of 64 Delaware Laws provides for the distribution of library standards funding using the population served and the size, in square miles, of the area served. Since there is no further definition of the term *population served* or *service area* in 64 Delaware Laws, the Division with the approval of the Council on Libraries is free to be as restrictive or expansive as it chooses. The definition chosen is crucial because there are many potential definitions. Here are several that the Council must consider.

Population. If one asks a reasonable person what the population of a typical area is, they would respond with the number of people who currently reside in that area year round. According to the U.S. Bureau of Census the population of Delaware was 666,168 in 1990. To arrive at that figure they had to carefully define what they were counting. This is described below:

"Each person included in the census was to be counted at his or her usual residence -- the place where he or she lives and sleeps most of the time or considers to be his or her usual home. If a person has no usual residence, the person was to be counted where he or she was staying on April 1, 1990.

Persons temporarily away from their usual residence, whether in the United States or overseas, on a vacation or on a business trip, were counted at their usual residence. Persons who occupied more than one residence during the year were counted at the one they considered to be their usual residence.

Persons who moved on or near Census Day were counted at the place they considered to be their usual residence."

If we chose to use Census information in determining the base amount of services to be purchased from the contracting libraries then we mean the population that resides within the service area of each library year round.

Are there legitimate alternatives that would more clearly represent the *population served*? There are at least three that have merit. First, there are the non-resident property owners, primarily in the beach areas, who pay taxes and are served by the area libraries during at least part of the year. Many may, in fact, be in residence the majority of weeks in the year because of off-season, week-end visits. If we consider these users or potential users then population served should be that population residing within the service area of each library weighted by the proportion of the year that they live there; e.g. the full-time equivalent resident population.

The second alternative measure of population considers not only the place of residence but also the place of work. While the Sussex beach area population changes dramatically during the summer time, the City of Wilmington changes dramatically during normal working hours. Nearly 60,000 people complete their journey to work inside the city limits of Wilmington. This undoubtedly has an impact on the amount and type of traffic in that library area. If this population is served, the definition should include the full-time equivalent population working or residing within the service area of the library.

These data required by these definitions are more difficult to obtain. While databases contain information on seasonally occupied housing units, little is known about the occupants of those units. A number of assumptions would have to be made to calculate a full-time equivalent resident population. Similarly, estimates of work-hours population would require information on the person's residence library service area as well as the work-place library service area in order to properly allocate the population. This will require data from the 1990 Census transportation planning package. That data will be available soon, but will be reported by traffic zones rather than by census blocks. Once again, significant assumptions would be required to allocate the appropriate shares.

There is a third potential definition for population served and that is the number of persons who visit the library within some specified period of time. This uses the definition

of population served literally. This measure would include both the non-residents and the part-year residents and would exclude that portion of the population (approximately 35% according to surveys) who will not use any library during the year. Further, this definition would help to reinforce patterns that are already in existence which may, or may not be the goal of the Division or the Council.

While the measurement of population served has been arbitrarily set at the census population, there is no specific guidance in the statutes to suggest one definition over another. There are, however, implications for choosing one over the others. Using the strict resident population tends to overestimate the current need in an area for two reasons. First, the temporal demand (work/beach) is shifted elsewhere. Second, the special collection and special services demand is shifted as well. In other words, not all libraries are created equal, but then again neither are shopping malls. From the perspective of the Clean Air Act, policy-makers would like to keep the services close to home. On the other hand, it is not cost-effective to create identical collections and services everywhere.

If the goal of the statute is to encourage adherence to basic standards and not necessarily to the development of the state of the art library that we would all like, then *community libraries*, i.e. those located near its patrons are the most desirable. However, the statute clearly supports interlibrary sharing and the development of statewide public library service that imply larger or regional libraries. On balance it is probably better to use the less complex and more easily understood measure that tends to support the primary goal of the statute, full-time, resident population.

Service Area. If all shopping malls were identical and the journey begins from home, the most likely destination is the mall closest to the residence. For most circumstances the consideration is time rather than distance. If we introduce variation in the mix of services and products provided at the mall, the decision becomes more complex. The closest mall is not necessarily the choice, in fact it may never be the choice if the particular product or service is not sold there. Still the consumer will generally choose the closest one from among that set of malls that do offer the product or service. Travel time is a powerful decision making variable.

If we substitute libraries for shopping malls in the argument, it is difficult to see how the argument could change. If all libraries were equal the informed citizen would opt for the closest one. If libraries are different, the citizen will select the one that is closest and has the

2. Multiple libraries within a fixed distance. This solution relaxes the requirement that each census block (and its households/persons) must belong to one and only one library. Library service areas are allowed to overlap. It also takes into account the fact that potential users may fall within the scope of more than one library. This behavior will likely increase as the distance from any given library increases.

The service area is defined as the collection of census blocks that are within 6 miles of a library. Census blocks that are within more than one library service area will share the population of those blocks and the square area of those blocks in proportion to the census block's distance from each library. All population in the residual blocks are assigned to the county librarian/bookmobile.

3. Multiple libraries within a variable distance. This solution adds another layer of complexity to the definition of a service area but is more robust. All libraries are not created equal and users are unlikely to treat them equally in their patronage. After the calculations under option 2 are complete, a service area population can be produced and the circulation per population can be calculated. If the calculated value is above the county average the service area will be expanded. If the value is below the average the service area will be compressed.

The service area is defined as the collection of census blocks that are within a *variable* distance of the library. Census blocks that are within more than one library service area will share the population of those blocks and the square area of those blocks in proportion to the census block's distance from each library. All population in the residual blocks are assigned to the county librarian/bookmobile. In order to partially adjust for the use of libraries near the place of employment and additional traffic generated because of the size or extent of the collection, the service area of each library will increase or decrease until the circulation per person in the service area is equalized across each county.

After a significant amount of deliberation, the sub-committee of the Council on Libraries responsible for weighing all the options made a recommendation. They decided that the option providing for a "home" or "community" library for all Delaware residents was the best alternative to use when designing the new areas. That "community" library was defined as the one that was located closest to their home. The distance measure chosen for determining the nearest library was the aerial distance between the residence and the library.

That distance was set at six miles. While travel time and road distance are intuitively more appealing than aerial distance, the increase in complexity makes both options unattractive.

THE SERVICE AREAS

Methodology.

The process of building the service areas was straightforward once the underlying assumptions were specified. First, the latitude and longitude of each library in the State was determined. There were several variations in determining the list of libraries. Estimates were done with and without the new Elsmere library. The Wilmington library was represented as a single library and with its two branches. Bookmobile stops were considered as a residual and as small localized libraries at each stop. In the final analysis the Elsmere library and all three Wilmington branches were included. The bookmobiles were carried as the residual population as explained earlier.

The second step involved calculating the latitude and longitude of the geographic center for each of the 15,569 census blocks. An example of the census blocks in the Dover Library Service Area is found in Figure 1. This figure clearly illustrates the high degree of detail that is present at that level of geography. The detail will vary according to the degree of urbanization.

Using specially developed software and these two databases, each census block was assigned a library code based on the decision rules explained in the previous section. This new database was imported into the geographic information system (GIS) by attaching the new database to the map feature for each census block. Using the GIS union function, the census blocks were aggregated by combining all the blocks with a common library code into a single entity. The resulting map is shown in Figure 2. The Dover area illustrates the shape of a nearly unconstrained service area. This is in direct contrast with the Newark area which is heavily constrained in the east. The libraries in western Sussex County also exhibit this behavior, but on the north-south axis.

The map of service areas (Figure 2) is then overlaid on the major highways in Delaware to give some geographic perspective. That map is shown in Figure 3. A series of maps showing the service areas overlaid on Census Tracts are found in the Appendix.

Once the new layer, called Library Zones, is in the GIS, we can measure the resulting population and square miles. The area of each service area is a direct calculation of the area of an irregular polygon. The population is calculated by aggregating the population

from the census blocks that (in the GIS) are under the boundaries of the Library Zones. The results of both of those calculations along with two other attributes calculated in the first phase are displayed in Table 2. The population density map found in Figure 4 shows how the 1990 population is distributed within the proposed service areas.

Two primary issues remain. The first is the method of evaluating the structure presented in this paper. The second is the method of updating the formula as time passes and population grows and shifts.

This structure clearly must be evaluated, but it must be done with data that is measured consistently for all libraries. On many occasions, there were intense discussions on the use of existing data, the lack of standardization state-wide, and alternative measures for deciding service areas. The current statute provides for reporting by the contractor libraries. If the Division so chooses, each library could be required to report certain user information periodically. As a test case, an evaluation should be conducted on the new service areas. This evaluation will require each library to record the name and address of each user (on paper or in magnetic form) during a one to three month period depending on the volume of users. These records should be processed to eliminate duplicate entries and then should be geocoded to the census block. The proportion falling inside the service area can be used as a test statistic. From this data one should be able to validate the existence of the community library/regional library dichotomy.

The update problem is somewhat more complicated. First there is no attempt to project or even measure current population at the census block level for intercensal periods. It is too expensive to collect and too hazardous to project. There however is projection work being done for DELDOT at a very disaggregated level, using the modified grid. There are more than 2000 modified grids in the State. Modified grids are for the most part aggregations of Census blocks. Using the modified grid projections and annual estimates of population at that level of disaggregation and a geographic information system of the type used in this project, estimates of the current library areas populations can be obtained. The formula can then be adjusted to take into account changes in population. The area covered would remain the same until new areas were formed in 2000. A map of the new service areas overlaid on the modified grids is found in Figure 5.

Figure 1

Dover Area with Underlying Blocks

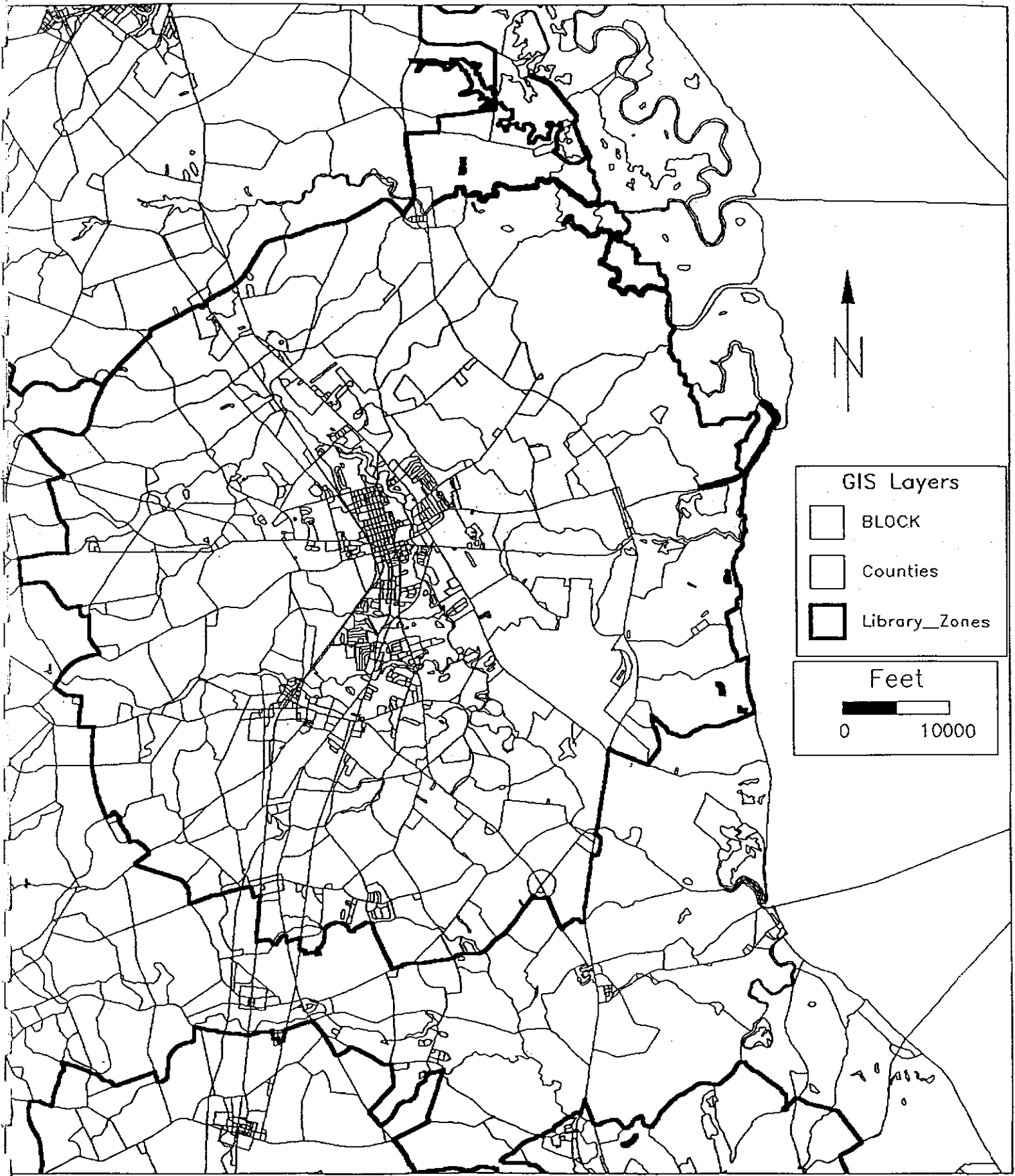


Figure 2
1993 Library Service Areas

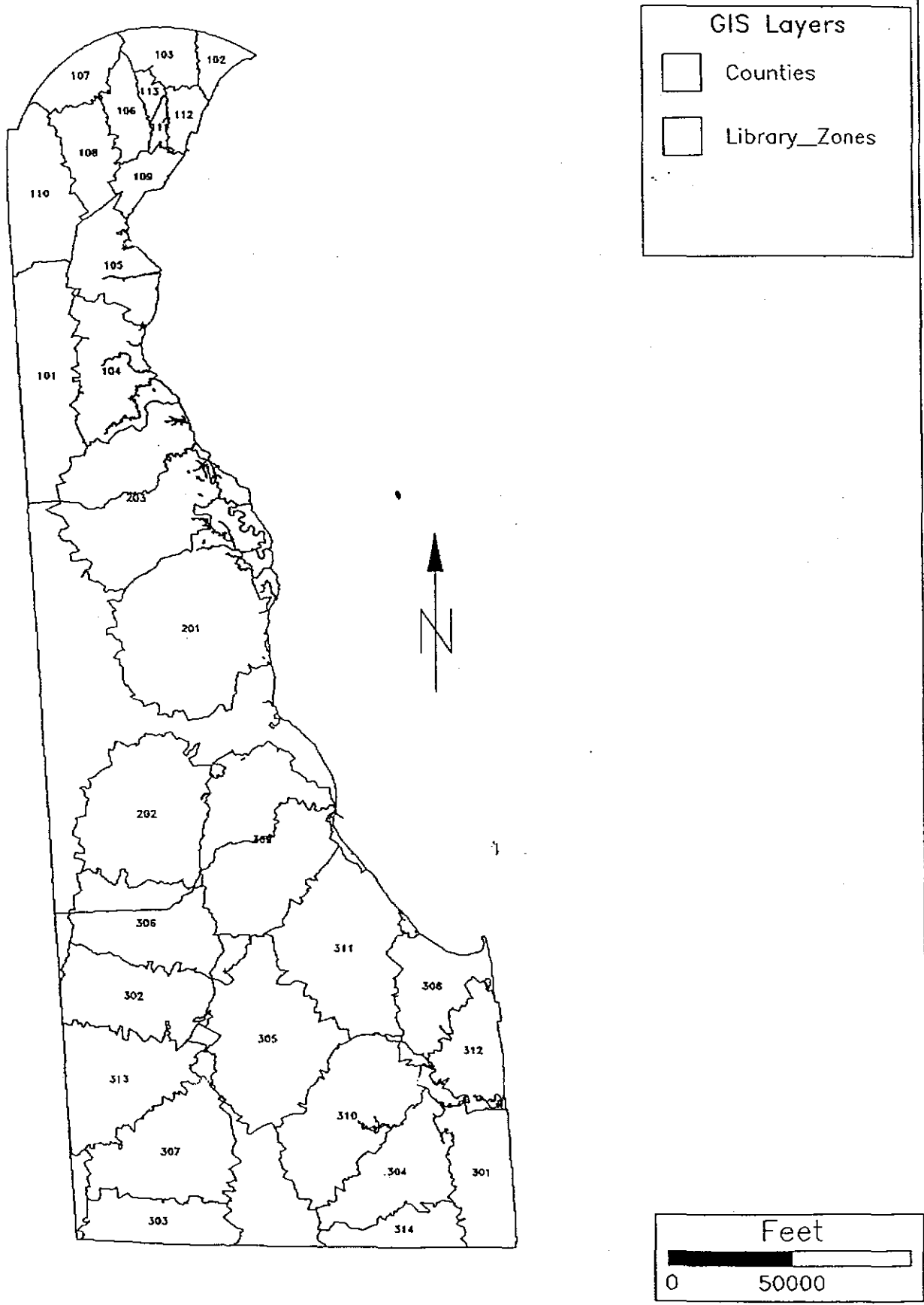


Figure 3

1993 Library Service Areas and Highway Network

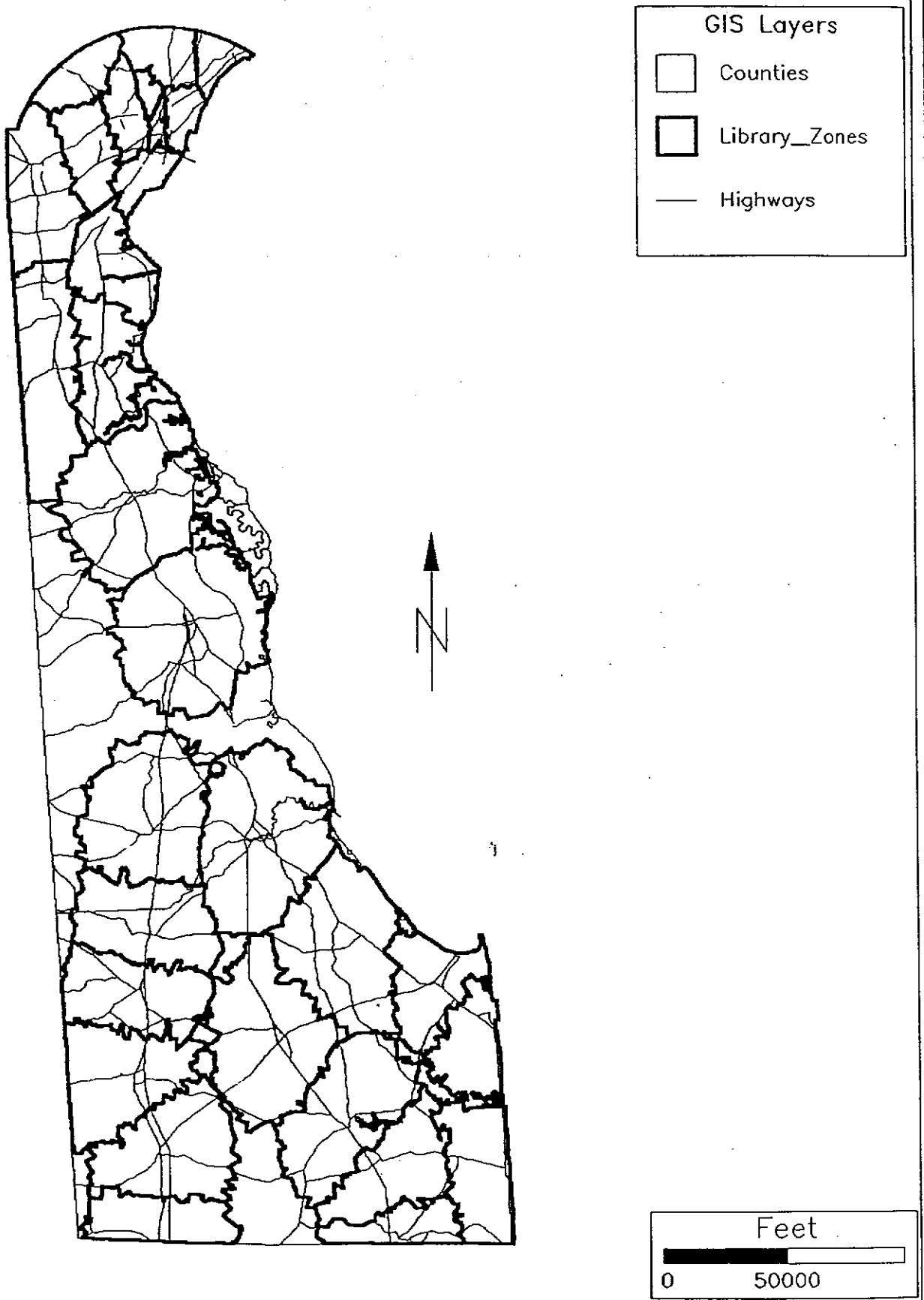


Table 2
Characteristics of the New Service Areas

Map ID	Library	Population Served	Area Sq.Miles	Average Distance	Maximum Distance
NEW CASTLE COUNTY					
101	Appoquinimink	8,602	76.88	2.51	8.61
102	Claymont	42,702	12.11	1.28	3.21
103	Concord Pike	30,687	23.34	1.47	4.08
104	Corbit Calloway	4,687	57.71	2.61	7.71
105	Delaware City	8,029	42.64	3.23	5.91
106	Elsmere	37,009	20.44	1.19	3.81
107	Hockessin	21,872	23.40	1.77	4.61
108	Kirkwood Highway	73,609	31.05	2.07	4.71
109	New Castle	35,726	16.09	1.97	4.07
110	Newark	80,987	55.79	2.34	6.52
111	Wilmington: La Biblioteca	26,448	4.44	0.64	2.33
112	Wilmington: Central	47,337	12.57	1.15	3.16
113	Wilmington: Woodlawn	20,047	5.40	0.64	2.50
	Total	437,742	381.84	1.65	8.60
KENT COUNTY					
201	Dover	60,786	129.36	2.44	5.99
202	Harrington	11,294	100.06	2.91	5.99
203	Smyrna	17,045	120.05	2.11	5.93
299	Bookmobile	18,374	220.76	7.16	12.40
	Total	107,499	570.23	3.34	12.40
SUSSEX COUNTY					
301	South Coastal	6,519	54.94	3.22	5.94
302	Bridgeville	5,148	64.69	2.55	5.95
303	Delmar	4,096	41.55	2.29	5.91
304	Frankford	6,720	59.62	2.84	5.95
305	Georgetown	9,266	99.90	2.21	5.99
306	Greenwood	4,121	71.01	2.65	5.99
307	Laurel	10,354	78.68	1.84	5.96
308	Lewes	9,180	48.67	2.26	5.96
309	Milford	18,112	117.60	2.31	5.99
310	Millsboro	9,077	87.45	2.63	5.98
311	Milton	6,970	99.44	2.72	5.86
312	Rehoboth Beach	6,993	41.04	2.39	5.98
313	Seaford	16,935	72.14	1.87	5.71
314	Selbyville	3,125	28.21	1.74	5.98
399	Bookmobile	4,311	82.44	6.65	9.44
	Total	120,927	1047.37	2.49	9.44
STATE Total		666,168	1999.44	2.08	12.40

Source: Center for Applied Demography and Survey Research

Figure 4

1993 Library Service Area Population Density

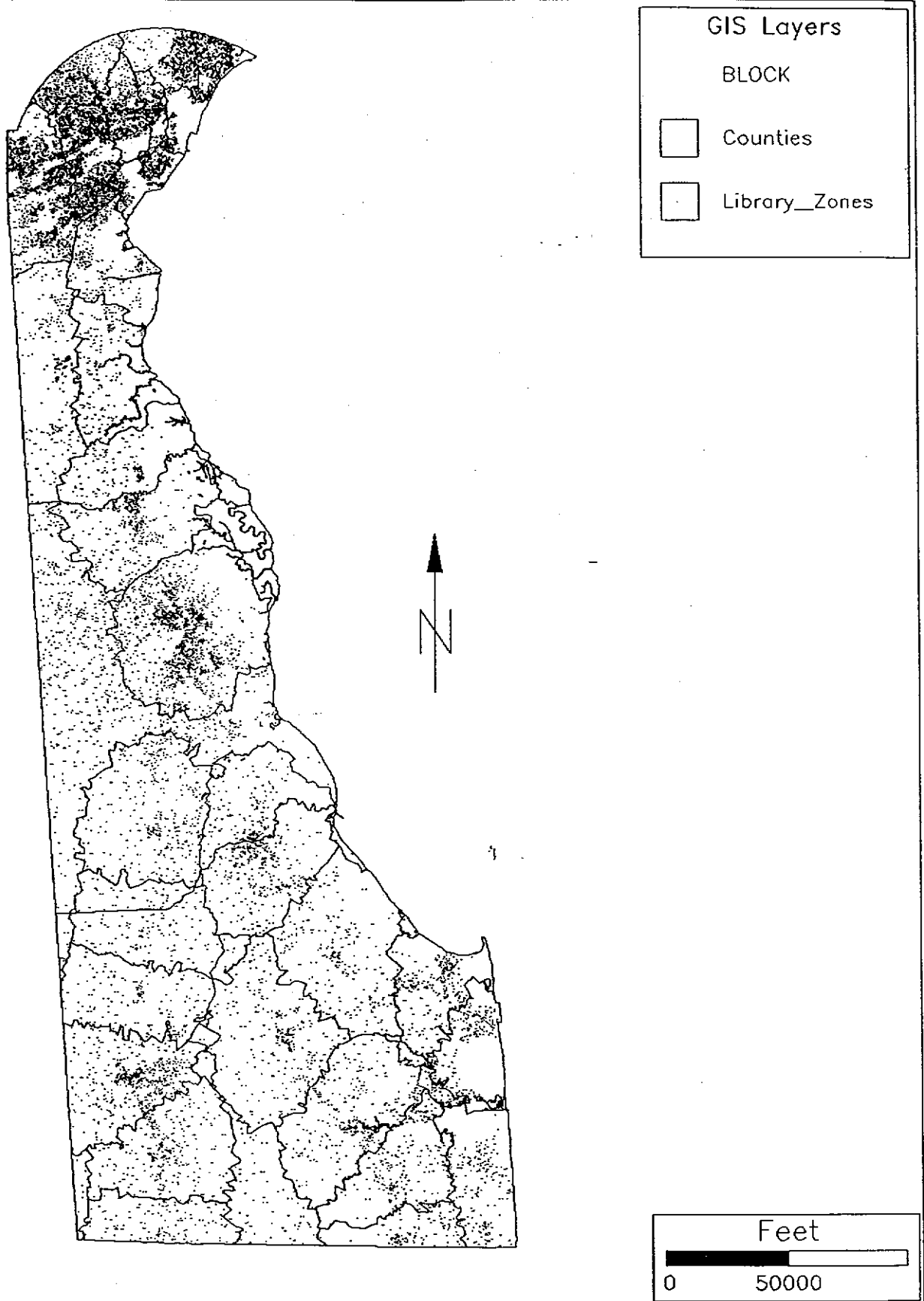
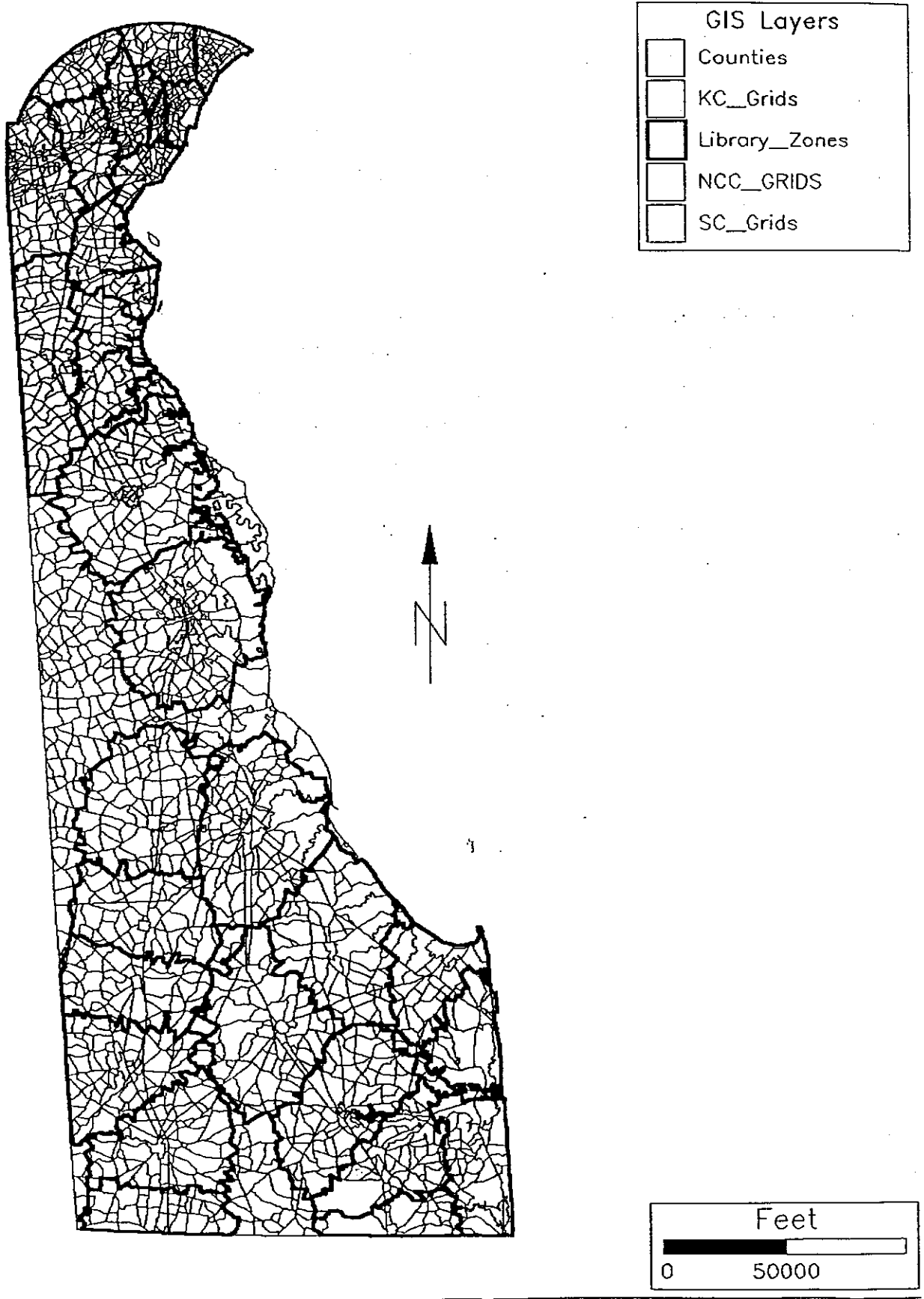


Figure 5

1993 Library Service Areas and Modified Grids



OBSERVATIONS

1. Any process that involves change is usually painful and this process is no exception. There are clearly winners and losers, at least in the narrow perspective. The better measure is the degree to which the new solution meets the goals and objectives of the Division and the Delaware Council on Libraries. At the very least, and perhaps for the first time, a truly objective, state-wide measure was used.

2. The fact that there are winners and losers as a result of changes to legislated formulas is not new. The question is how should it be handled. In other formulas, the General Assembly has tried to limit the loss that a recipient can experience in a single year to a floor of 95% of the preceding year. This permits time to find alternative funding. This will be particular important to those libraries who were disproportionately supported by State funds and suffered a loss in the realignment.

3. There are also some real questions on governance raised by the structure of libraries in Delaware. The New Castle County Department of Libraries has five branches under its jurisdiction and provides county funds for the rest, yet the funds for those libraries pass through directly to the individual libraries without any recognition of the source of local funds. Since the Division of Libraries can contract for services from the New Castle County Department of Libraries, one must wonder if there is not a better way of finding the best use of the State's scarce resources. This situation also applies in Sussex County and will apply in Kent, if the County decides to build libraries as well. The statute seems to envision the development of a more highly integrated system than currently exists and yet its not clear the statute contributes to that outcome. It would seem there are many possibilities for cooperative agreements, specialization, and standardized community library collections and services.

4. The formula itself may need to be reexamined. As it stands now, 58% of the funds are based on population served, 36% depends on the amount of local spending, and 6% is based on the area served. Since the population served and the amount of local expenditures are both measures of relative size, the effect of the standards money is to reinforce the current pattern of expenditures. This may be appropriate, but it does raise the question as to how effective the standards are going to be in raising libraries in the less densely populated areas to the Division's standards.

5. There seems to be a perception that the standards funds are more like a grant or revenue sharing as opposed to a contract for services. There may be some merit in trying to more directly tie these funds to particular projects at each library without altering the formula or the amount of funds flowing. The Division might find the entire program more effective in the "development of statewide library service" by encouraging individual libraries to focus specifically on areas that need improvement. It is reasonable to expect that "regional" libraries would develop in areas quite differently from those with more narrow scope of observations.

6. The Division and the contracting libraries may wish to engage in a programmatic effort to learn what the average citizen in general and library users in general think about the services they are receiving. While surveys of library use tend to greatly overestimate the true use of the service at any given point in time, the relative change in attitudes about services can be quite useful. Such information can help in the design of services that might encourage more minorities, lower income persons, and less educated citizens to expand their use of services. It may also suggest alternative ways of delivering services such as the "store front" operations employed in delivering other government services.

APPENDIX

Figure A-1

Sussex County Library Service Areas with Census Tracts

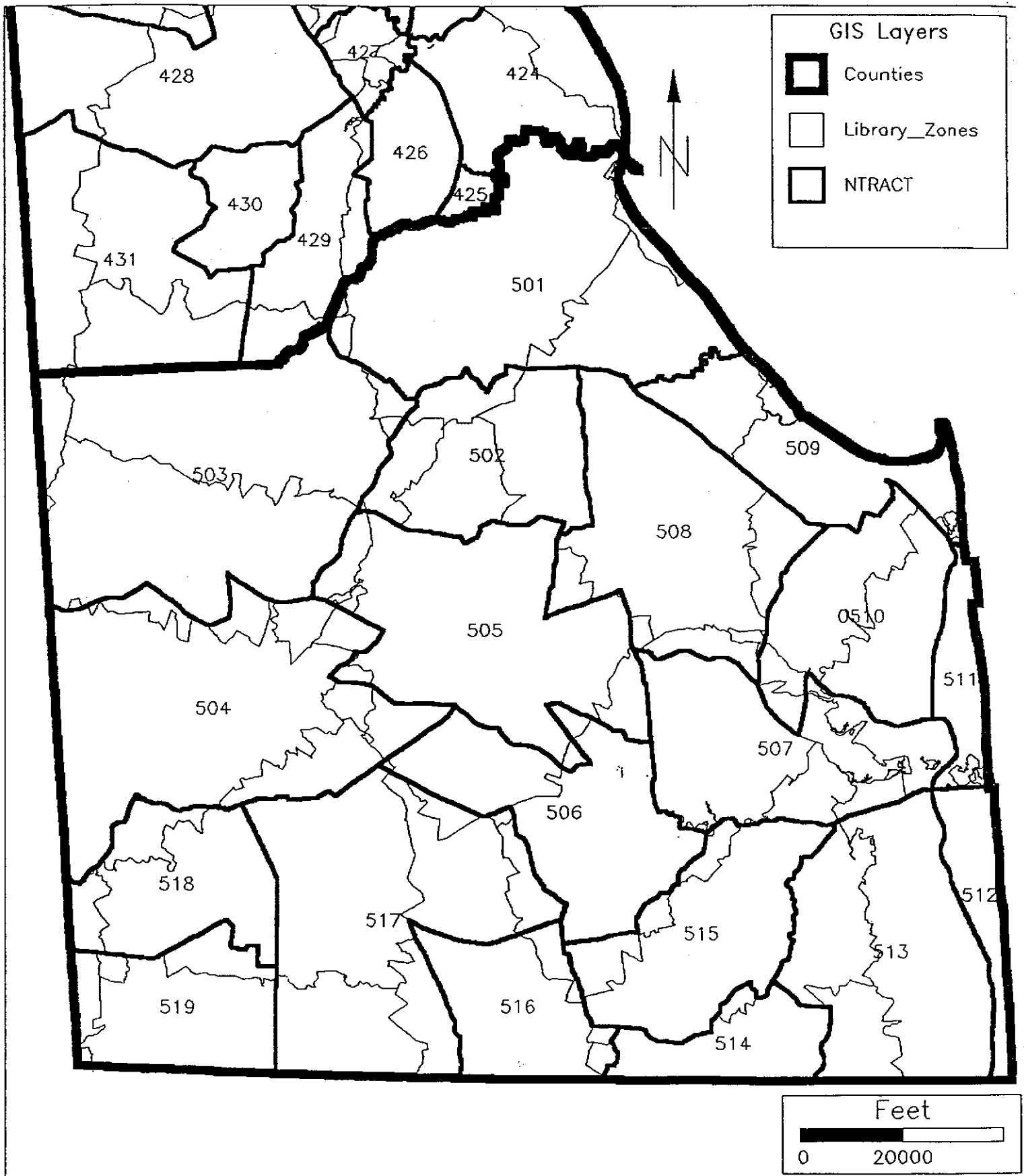


Figure A-2

Kent County Library Service Areas with Census Tracts

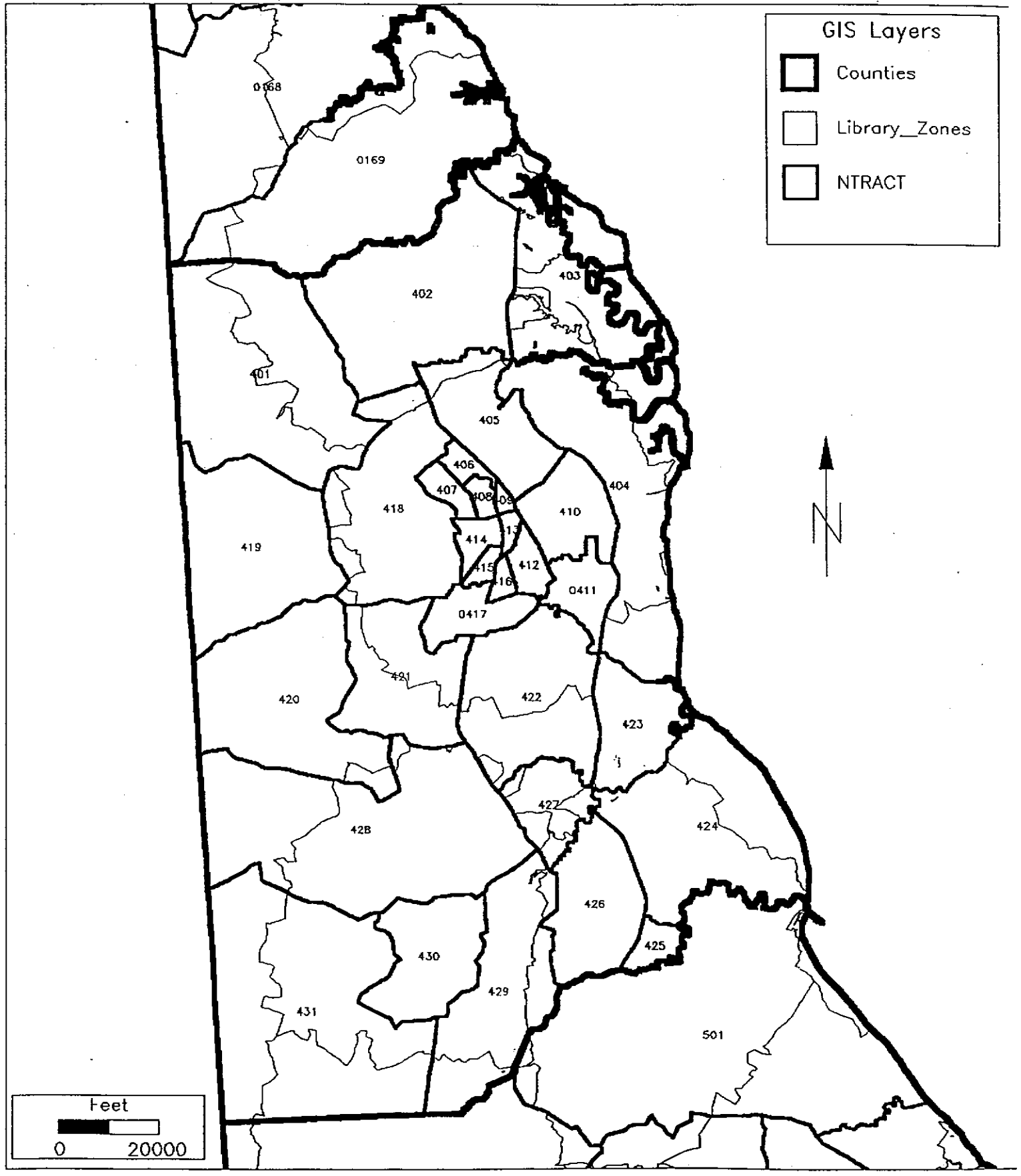


Figure A-3

New Castle County Library Service Areas with Census Tracts

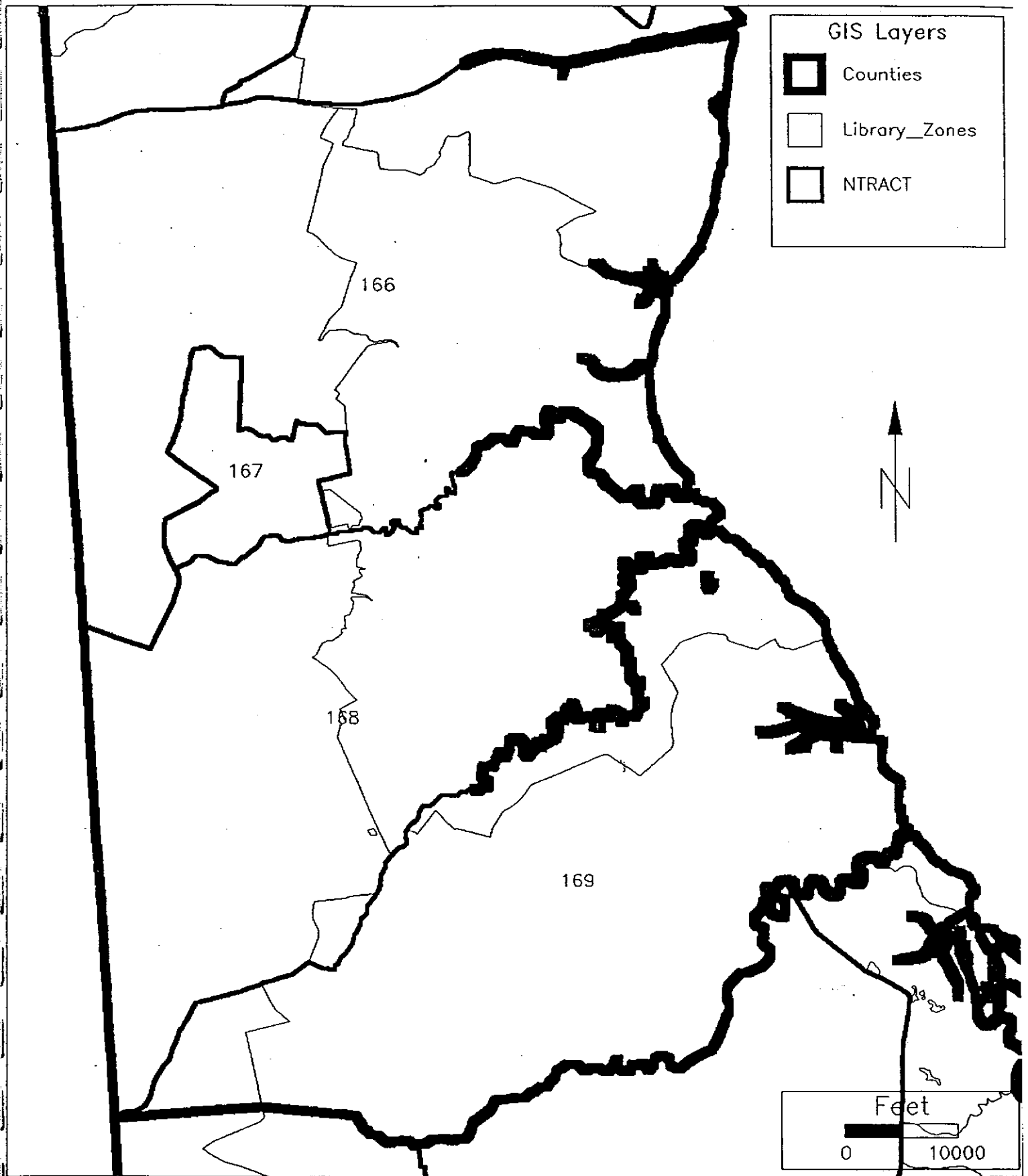


Figure A-3(cont.)

New Castle County Library Service Areas with Census Tracts

GIS Layers

- Counties
- Library_Zones
- NTRACT

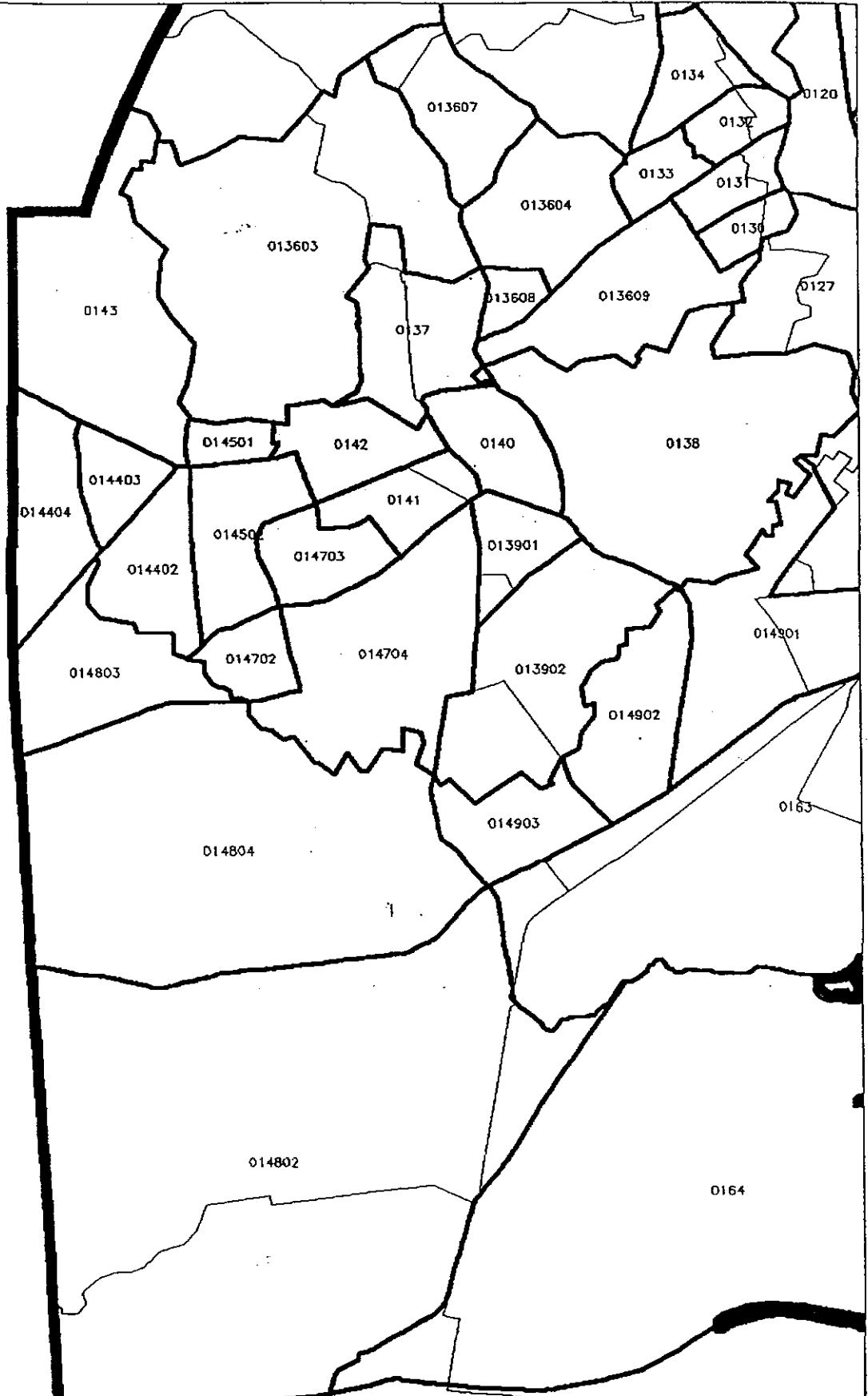
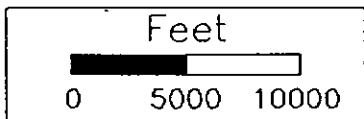


Figure A-3(cont.)

New Castle County Library Service Areas with Census Tracts

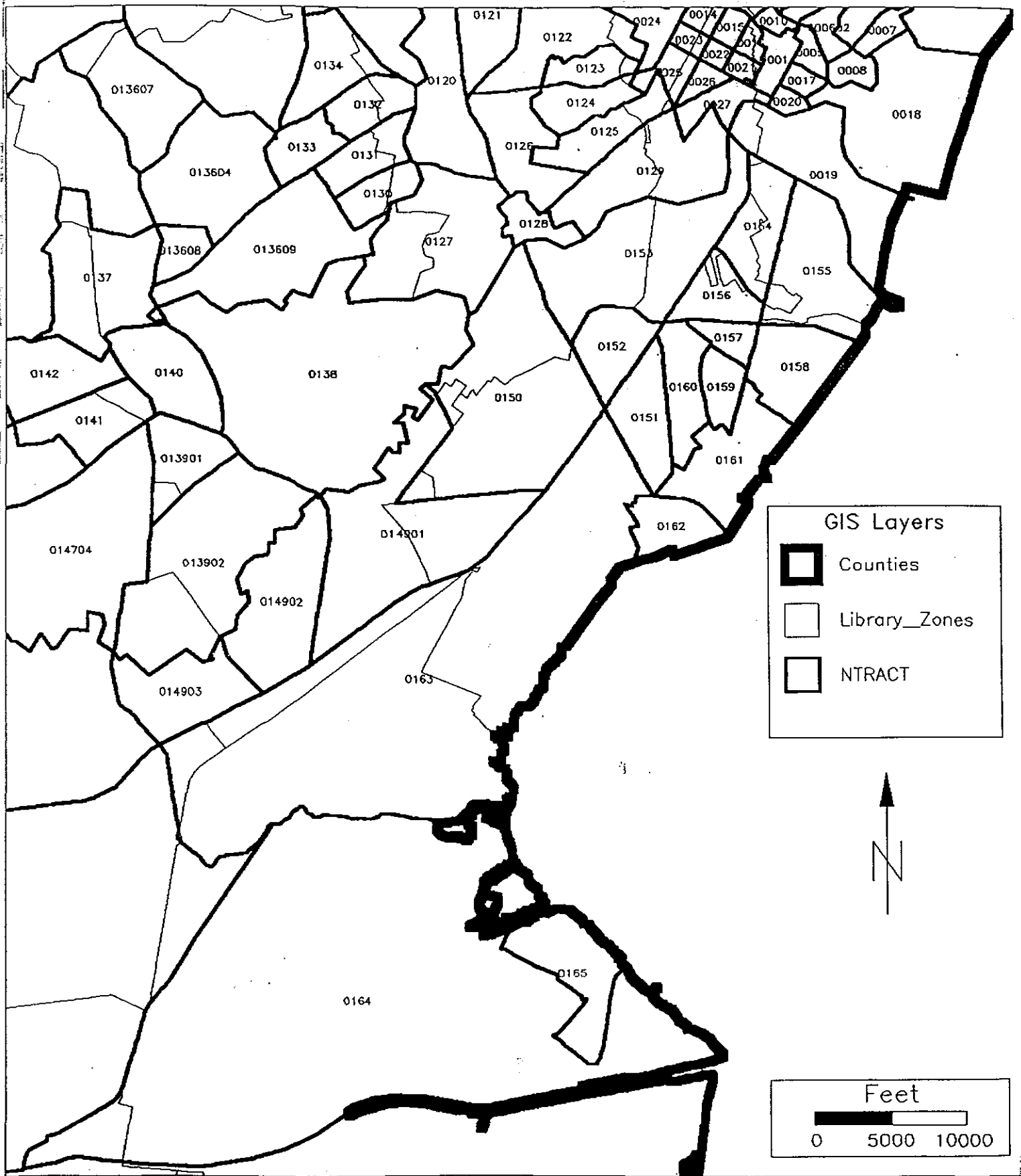


Figure A-3(cont.)

New Castle County Library Service Areas with Census Tracts

GIS Layers




-  Counties
-  Library_Zones
-  NTRACT



Figure A-3(cont.)

New Castle County Library Service Areas with Census Tracts

