Using Geographic Information Systems for Welfare to Work Transportation Planning and Service Delivery

Case Studies

Prepared for:

Transit Cooperative Research Program
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GIS Applications

Introduction

To examine current use of GIS technology for welfare-to-work planning efforts, research was conducted to identify specific applications across the country. Many of these GIS applications involved a planning-related examination of the transit needs and other issues associated with welfare-to work. In addition to planning applications, several trip planners were identified and are presented in this chapter. Trip planners use geographic information to interactively create a trip itinerary, and can help determine ease of transit access to and from selected locations for those persons seeking employment.

Twenty-nine organizations were contacted and asked to describe their particular applications. Most of these organizations did respond, and several of these are included in this analysis.[1] Data from 19 of the identified applications were summarized and are presented as case studies in this chapter. Fourteen of the summarized applications were for planning purposes and five were trip planners. Exhibit 1 presents the identified and completed case studies by geographic location. This chapter presents a summary of how GIS was used to support welfare-to-work planning efforts in 19 locations.

Various GIS functions were used in these applications; some of the most commonly used functions include: geocoding, banding and buffering and thematic mapping. A matrix illustrating the GIS functions used in each case study is presented in Exhibit 2.

Exhibits 3 and 4 illustrate the specific geographic and attribute data which was used to complete each of the 19 application presented in this chapter. As shown, nearly every application used certain basic geographic data such as the local street network, public transit routes and welfare clients.

[1] Responding organizations include the following: Bergen Co. (NJ); Bernalillo Co. Public Works/Transit (NM); Central MA RPC; Chautauqua Co (NY); CWRU Center for Urban Poverty (OH); Delaware Co. Planning Department (PA); Department of Social and Rehabilitative Services (KS); GIS-T Rideshare; KFH Group; LYNX Wages; Multisystems, Inc; METRO (OR); OCTA (CA); SCAG (CA); University of IL Transportation Center; Valley Transit (WI); VOLPE National Transportation Systems Center (MA).

Exhibit 1: Identified and Completed Application Sites

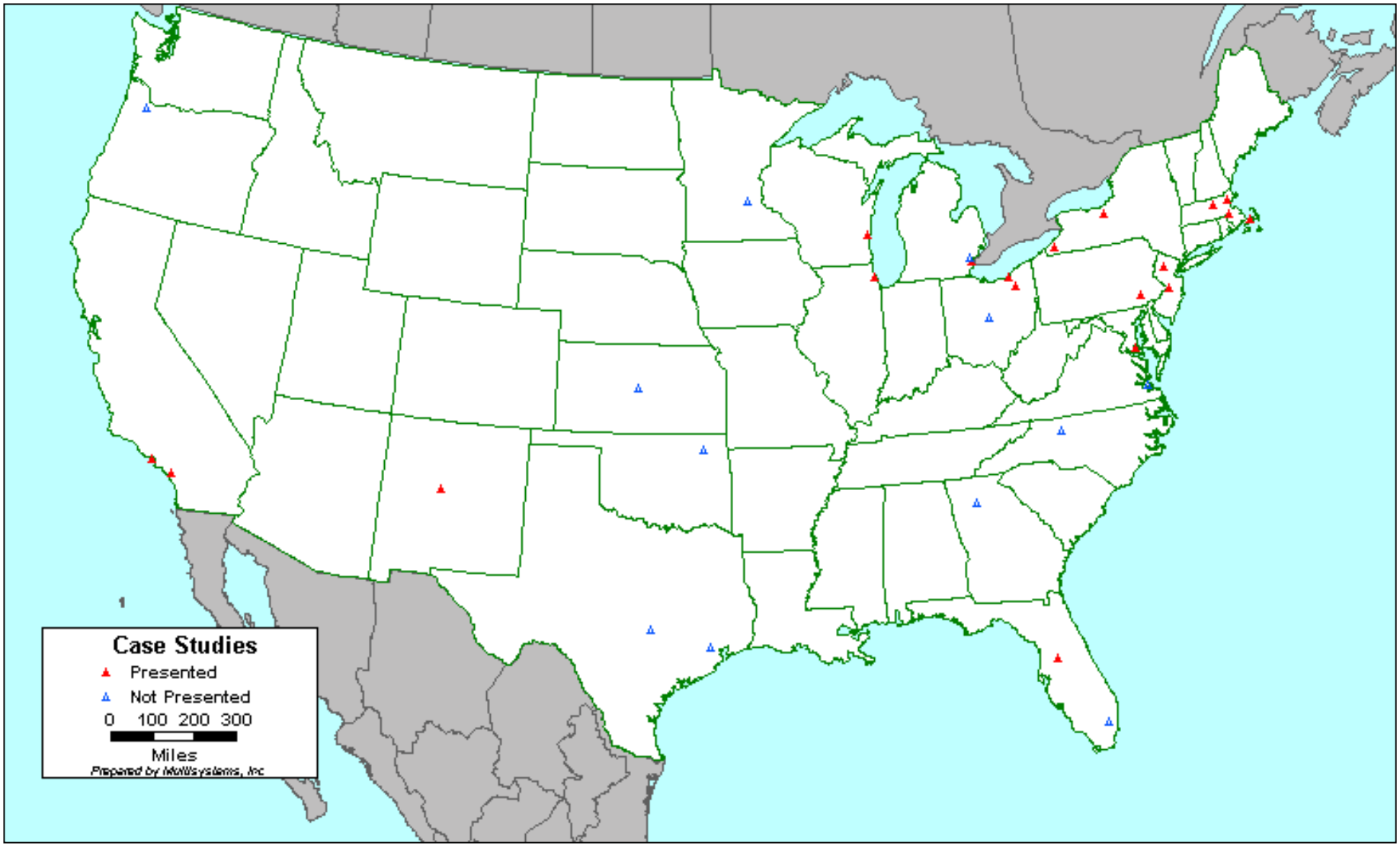


Exhibit 2: GIS Functions Used in Applications

	Planning Applications																Trip Planners		
	Welfare to Work in the Greater Attleboro and Taunton Regional Transit Authority Service Area	*21 Countywide Transportation Plans for New Jersey*	*GIS and Welfare to Work in the City of Boston*	*Cape Cod GIS Welfare to Work Analysis*	*Housing, Transportation and Access to Suburban Jobs by Welfare Recipients in the Cleveland area*	*GIS and Welfare to Work in Milwaukee County*	*Exploring Access to Transit in Orange County*	*Syracuse Restructuring Mobility Action Plan*	*GIS and Welfare to Wrok in the Chicago, IL area*	*Chautauqua County GIS Demonstration Project*	*GIS and Welfare to Work in Albuquerque, NM*	*Delaware County, PA*	*St. Mary's County, MD*	*Akron*	*Bergen County Trip Planner*	*Geomatch Trip Planning Software/LYNX Wages GIS and Welfare to Work*	*Los Angeles TranStar Trip Planner*	*MIDAS CIS Trip Planner*	*Internet Trip Planner for GIS and Welfare to Work in Worcester, MA*
GEOGRAPHIC INFO SYSTEMS FUNCTIONS																			
Geocoding	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Digitizing				✔															
Thematic Mapping	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			✔	✔
Buffering or Banding	✔	✔		✔		✔	✔	✔		✔	✔	✔	✔	✔	✔	✔		✔	✔
Intersecting or Overlaying	✔	✔		✔		✔	✔				✔	✔	✔		✔		✔	✔	✔
Desire Lines / Origin-Destination Flows	✔	✔		✔															
Route System/ Route Line Databases	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Shortest Path Algorithms	✔	✔		✔			✔		✔						✔	✔	✔	✔	✔
Modeling									✔										
Selection Subsets	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Distance Functions			✔		✔										✔	✔	✔	✔	✔

Exhibit 3: Geographic Databases Used in Applications

	Planning Applications																Trip Planners		
	Welfare to Work in the Greater Attleboro and Taunton Regional Transit Authority Service Area	*21 Countywide Transportation Plans for New Jersey*	*GIS and Welfare to Work in the City of Boston*	*Cape Cod GIS Welfare to Work Analysis*	*Housing, Transportation and Access to Suburban Jobs by Welfare Recipients in the Cleveland area*	*GIS and Welfare to Work in Milwaukee County*	*Exploring Access to Transit in Orange County*	*Syracuse Restructuring Mobility Action plan*	*GIS and Welfare to Work in the Chicago, IL area*	*Delaware County, PA*	*Chautauqua County GIS Demonstration Project*	*GIS and Welfare to Work in Albuquerque, NM*	*St. Mary's County, MD*	*Akron*	*Bergen County Trip Planner*	*Geomatch Trip Planning Software/LYNX Wages GIS and Welfare to Work*	*Los Angeles TranStar Trip Planner*	*MIDAS CIS Trip Planner*	*Internet Trip Planner for GIS and Welfare to Work in Worcester, MA*
GEOGRAPHIC DATA																			
Streets and highways	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔	✔
Census polygons(1)	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔			✔
Other polygons, such as Zip Code boundaries and Traffic Analysis Zones	✔		✔	✔	✔			✔	✔		✔					✔			✔
Welfare/TANF clients	✔	✔	✔	✔	✔	✔	✔	✔	✔			✔	✔	✔	✔				
Employment, current overall		✔	✔			✔	✔		✔		✔	✔	✔	✔	✔				
Employment, employers currently seeking employees		✔	✔		✔						✔				✔				
Employment, job openings turned down due to lack of transportation		✔																	
Employment, projected future			✔		✔			✔											
Business Information	✔			✔						✔									
Public transit routes	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Private transit routes		✔		✔										✔			✔		
Transit stops				✔			✔									✔	✔	✔	✔
Childcare, licensed child care providers	✔	✔		✔						✔	✔	✔		✔					
Childcare, family daycare facilities		✔									✔	✔							
Welfare-related locations(2)						✔	✔												
Major travel generators/landmarks		✔		✔			✔		✔							✔	✔	✔	
Land use		✔							✔										
Building permits							✔												
Housing					✔						✔								
User-entered information															✔	✔	✔		
Other										✔	✔				✔				

(1) such as: jurisdictional boundaries, census blocks, block groups, census tracts
(2) such as: welfare agencies, job training sites, corporate partners

Exhibit 4: Attribute Databases Used in Applications

	Planning Applications																Trip Planners		
	Welfare to Work in the Greater Attleboro and Taunton Regional Transit Authority Service Area	*21 Countywide Transportation Plans for New Jersey*	*GIS and Welfare to Work in the City of Boston*	*Cape Cod GIS Welfare to Work Analysis*	*Housing, Transportation and Access to Suburban Jobs by Welfare Recipients in the Cleveland area*	*GIS and Welfare to Work in Milwaukee County*	*Exploring Access to Transit in Orange County*	*Syracuse Restructuring Mobility Action plan*	*GIS and Welfare to Work in the Chicago, IL area*	*Delaware County, PA*	*Chautauqua County GIS Demonstration Project*	*GIS and Welfare to Work in Albuquerque, NM*	*St. Mary's County, MD*	*Akron*	*Bergen County Trip Planner*	*Geomatch Trip Planning Software/LYNX Wages GIS and Welfare to Work*	*Los Angeles TranStar Trip Planner*	*MIDAS CIS Trip Planner*	*Internet Trip Planner for GIS and Welfare to Work in Worcester, MA*
ATTRIBUTE DATA																			
Socioeconomic characteristics based on US Census geography	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
Street and Address Range data	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓
Welfare/TANF client data*	✓	✓		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓				
Childcare-related databases*		✓									✓	✓	✓	✓					
Current employment-related data*		✓	✓		✓	✓			✓		✓	✓	✓	✓	✓				
Future employment-related data*			✓		✓			✓											
Major travel generator/landmark data*								✓		✓							✓	✓	✓
Transit Level of Service data(1)	✓			✓						✓				✓	✓				
Transit Service Area data(2)	✓			✓															
Transit transfer data															✓		✓	✓	✓
Other transit data					✓	✓		✓	✓					✓			✓	✓	✓
Census Transportation Planning Package (CTPP) data		✓			✓			✓											
Other Census Products									✓			✓							

*Data in addition to street address.
(1) such as: service span, average headways,
(2) such as: Area polygons data for transit with contact information

Welfare to Work in Attleboro and Taunton, Massachusetts (GATRA)

Under Massachusetts welfare reform, benefits expired for the first group of recipients on December 1, 1998. The Greater Attleboro Regional Transit Authority (GATRA) prepared for this policy change by using GIS to help plan for increased transit service to places with many entry-level jobs, including shopping facilities and industrial parks, and incorporating its travel training program with the GIS tools needed to help individuals plan work trips.

GATRA used GIS to locate welfare recipients and to determine their proximity to the existing fixed route system. From this analysis it became obvious that the majority of welfare residences, businesses, and child care facilities in Taunton were located in the central city and near major arterials. These patterns can be explained by local zoning ordinances, where many businesses, childcare facilities, multi-family homes and apartments are located along main roads. (See Exhibits 5 through 7.)

GIS was used extensively throughout the project, first to geocode the welfare residences, businesses, child-care facilities, and other useful landmarks. Next, banding of GATRA's fixed route system was performed for ¼ and ½ mile increments. The bands were intersected with the geocoded TANF clients to determine the number of individuals falling within each band (see Exhibit 8). These numbers were compared to the number of clients outside the band, but within GATRA's service area, to figure the ratio of "fixed route served" to "non-fixed route served."

This information was crucial in determining the number of welfare clients able to access GATRA's fixed route transit services. For clients beyond ½ mile of fixed route transit, other transportation options were investigated, including ride-sharing, van pooling and paratransit. In these cases, GIS allowed the production of "trip routing," where a map and driving directions for a particular client's origin and destination could be created. This allowed for further analysis and planning.

Data was also analyzed with respect to selected time-related factors. For example, thematic maps were created based the month individuals would lose their benefits to examine opportunities for ride sharing and routing.

The study examined certain route characteristics by joining the FTA's Level-of-Service (LOS) database (created at the GeoGraphics Lab, at Bridgewater State College, in Massachusetts), with the fixed route structures in GIS. This allowed the user to query a route and receive the scheduling information and the LOS database information (headways, start and end times, peak service, pricing information, etc.) for that particular route. The LOS information allowed the user to interactively examine opportunities to use the fixed route system to transport a welfare recipient to a particular job at a particular time. This also provided the transit agency with important information regarding gaps in service, route transfer points and places where potential new service would be most beneficial.

Another database that was created by the FTA for welfare-to-work, and which was used for this study, is the Transit Service Area and Contact Information database. This database is composed of Minor Civil Divisions (MCDs), or city and town polygons. A separate database, which was created in Microsoft Excel, contains information about transit availability in each town. This allows a person to select a town and find out the transit services available within that town, the type of service available, and transit agency contact information.

There were some challenges associated with this study. For example, the business/job listing database was one of the most difficult databases to create. Due to budget constraints, a Yellow Pages Internet web site (www.bigbook.com) was used to access information about the businesses in Taunton and Attleboro. This information was available free of charge and provided business name, type of business, telephone number, and fax number. There were some limitations to this data, however, including the fact that these businesses do not necessarily have available jobs. The database was used to represent 'potential jobs' and was used to analyze employment locations with respect to transit routes and other geographic locations.

The fixed route bus system (GIS) for GATRA also needed to be updated. The original route system was created at the GeoGraphics Lab in 1994, and several minor adjustments needed to be completed for 1997 representation. The FTA LOS database was also updated using 1997 GATRA paper schedule information.

Exhibit 5: GATRA Fixed Route System and Business Locations in Taunton, MA

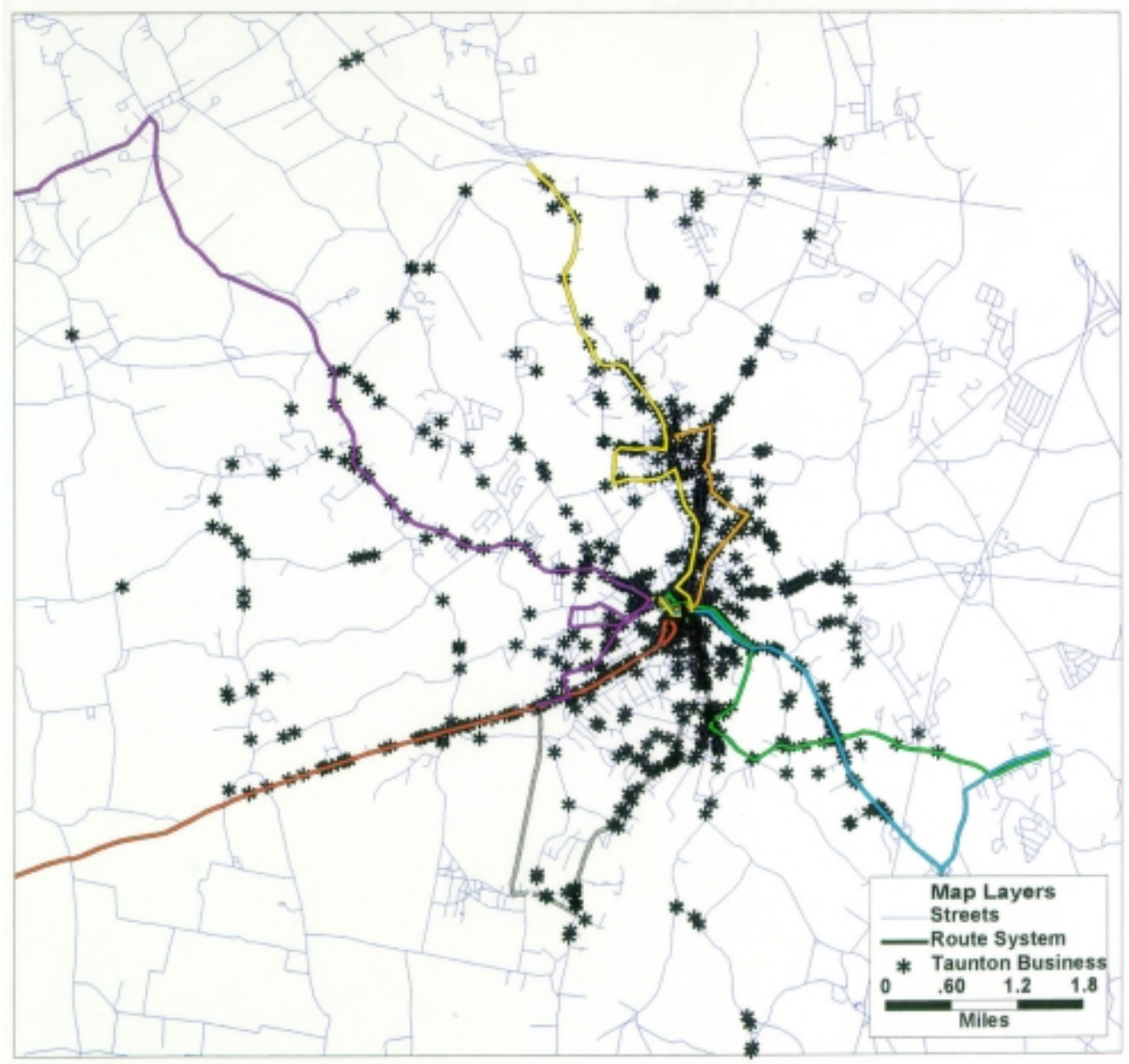


Exhibit 6: GATRA Fixed Route System and Welfare Recipients in Taunton, MA

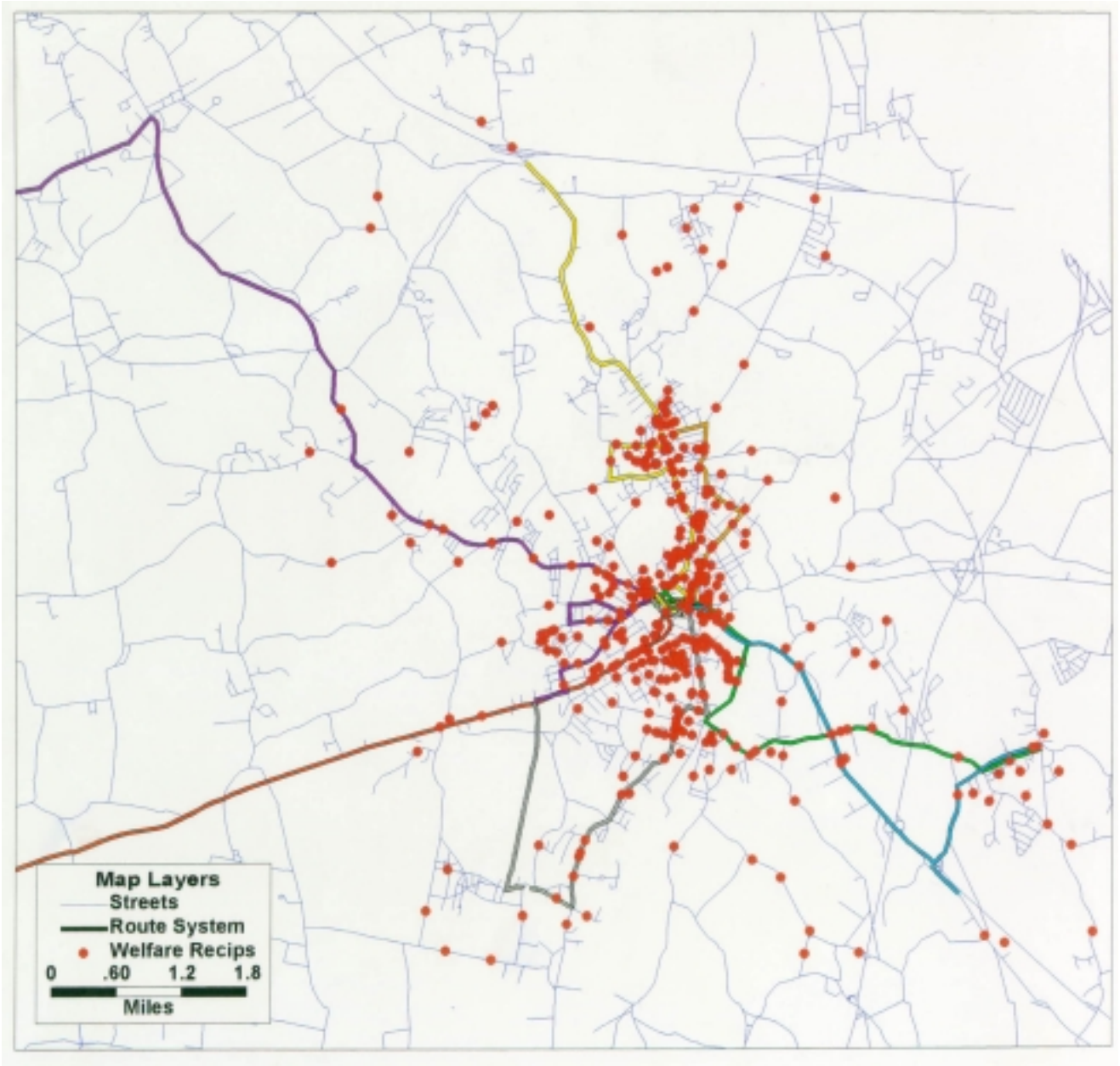


Exhibit 7: GATRA Fixed Route System and Child Care Facilities in Taunton, MA

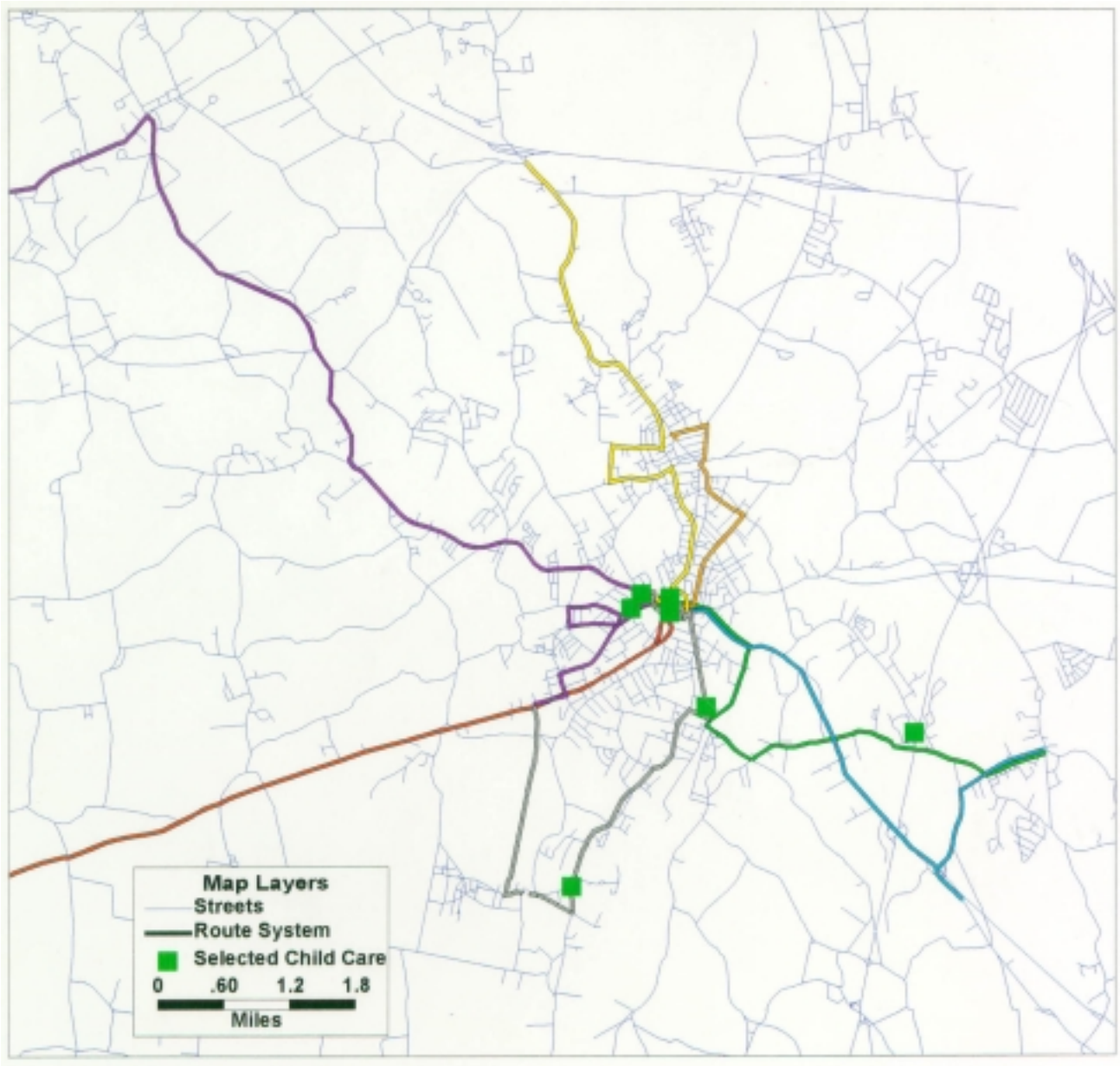
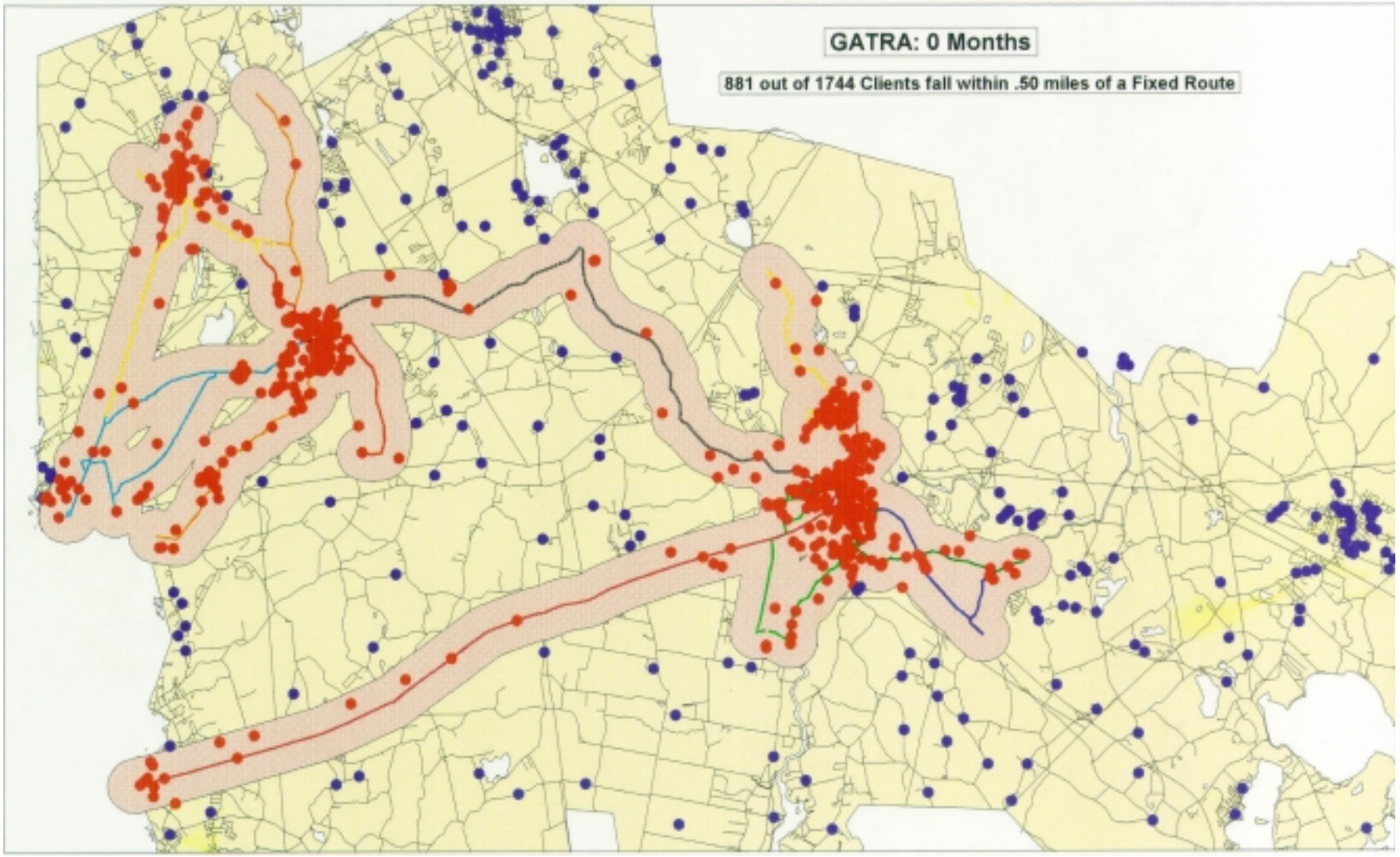


Exhibit 8: GATRA Fixed Route System and Welfare Recipients Within a 1/2 Mile Band



Countywide Transportation Plans in New Jersey

The State of New Jersey recently developed transportation plans for each of its 21 counties. Each plan consisted of various applications, including the following:

- An inventory of travel patterns and existing transit services;
- Demand forecasting; and
- Identification of spatial mismatches between residential locations of welfare recipients and locations of companies who have hired welfare recipients in the past (see Exhibit 9).

GIS was used extensively in developing all 21 plans. Many of the plans used GIS to display various databases in order to visualize the location of welfare recipients, employment sites and transit services. Most plans also included maps displaying transit service information such as headway and service span (see Exhibit 10). Many plans used GIS to identify gaps in transit service coverage (see Exhibit 11), and to identify opportunities for improved transit connections between areas with concentrations of welfare recipients and areas with key employment locations (see Exhibit 12).

Several GIS functions were used to create analysis maps, including the following:

- Welfare client addresses were geocoded to the coinciding block group to identify concentrations of welfare recipients. Density maps were subsequently created which identified the number of welfare clients per square mile.
- The spatial mismatches between welfare recipients and job locations were examined by using the banding function. For example, ¼ and ½ mile bands were created around fixed bus routes. Various geocoded data was subsequently intersected with the bands to determine the number (or percent) of jobs, day care facilities and welfare recipient locations that were within a particular walk-distance of fixed route bus service.
- To illustrate the movement of commuters between counties, desire lines were created and mapped (see Exhibit 13).

Several data-related problems were encountered during the course of this project. One problem dealt with the significant space requirements necessary for storing and distributing all the data required to complete this project. The geographic and attribute data needed to complete this analysis was in excess of 1.5 gigabytes. Backing up information was crucial for an effort this large, so that data would not be lost if it became corrupted.

Data integration among different data sources was another issue. For example, although TransCAD was used for this analysis, some of the data received was in a pure MapInfo format. While TransCAD can read a MapInfo *.mif* file, it is unable to read a pure MapInfo file, such as a *.tab* file. The problem was solved only with the purchase of MapInfo to allow in-house data conversion.

A third problem was the lack of quality employment-related data. The data initially available, collected by the Covered Employment and Wages program of the Bureau of Labor Statistics, commonly referred to as ES-202 data, is collected and aggregated to countywide summaries by industry. Information about specific companies, and data at specific addresses is not distributed. Therefore, ES-202 data was not useful for the welfare-to-work efforts in this project. Another employment database, which was compiled by Rutgers University, contained 63,712 employment locations. Because of concerns regarding the accuracy of this database, it was consequently decided that the client would purchase data from an outside vendor for an approximate price of $40,000.

A fourth problem was the quality of fixed route bus data. NJ Transit supplied data on public and private bus routes, but the information was somewhat outdated. An updated file was in the process of being prepared by NJ Transit staff, but it was not available for use for this project. Bridgewater State's (MA) GeoGraphics Lab, which has created TransCAD route systems for many transit systems, also had not created a route system for NJ Transit at the time of the project. While the public and private data was not perfect, the option of digitize all of New Jersey's fixed bus service was not within the scope or budget of this project. It was therefore decided to use the available fixed bus route information. Certain routes, however, were specially created for specific purposes when needed. For example, all of the NJ Transit fixed bus routes in Cape May County and several routes in Burlington, Mercer, Middlesex, and Somerset Counties were coded into TransCAD and displayed to make certain maps more effective. The Ocean County Transportation routes, which were available from Bridgewater State, were used for Ocean County's plan.

A final issue related to confidentiality concerns. It took several months to get approval to release welfare client information for use in this study. Confidentiality concerns led to a data modification effort, where names and address information were removed from the data. This caused only minor delays, however.

Exhibit 9: Location of Somerset County Welfare Clients, Employers Hiring in the Past, and Street Network

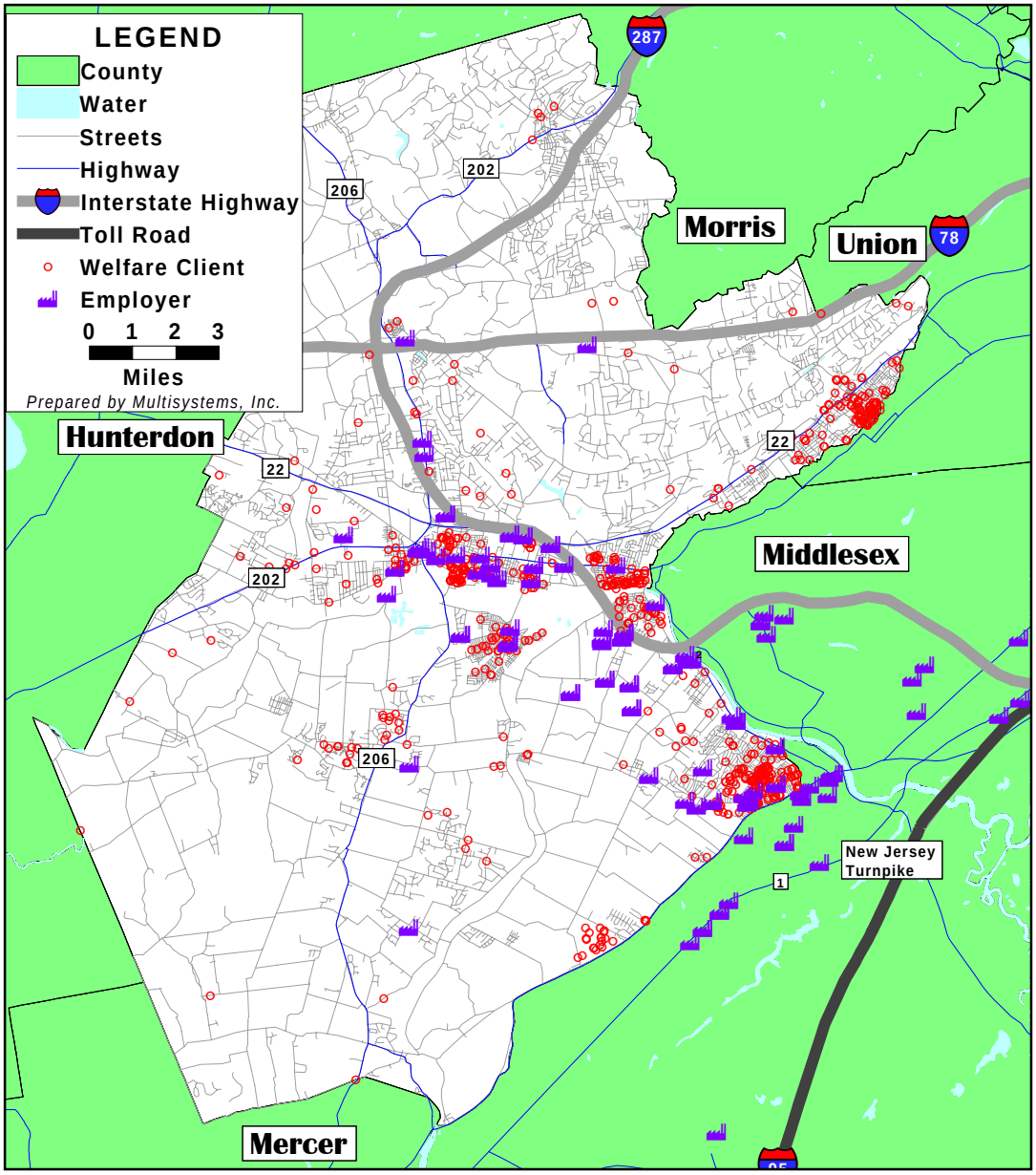


Exhibit 10: NJ Transit Fixed Bus Routes
Weekday Span of Service in Essex County

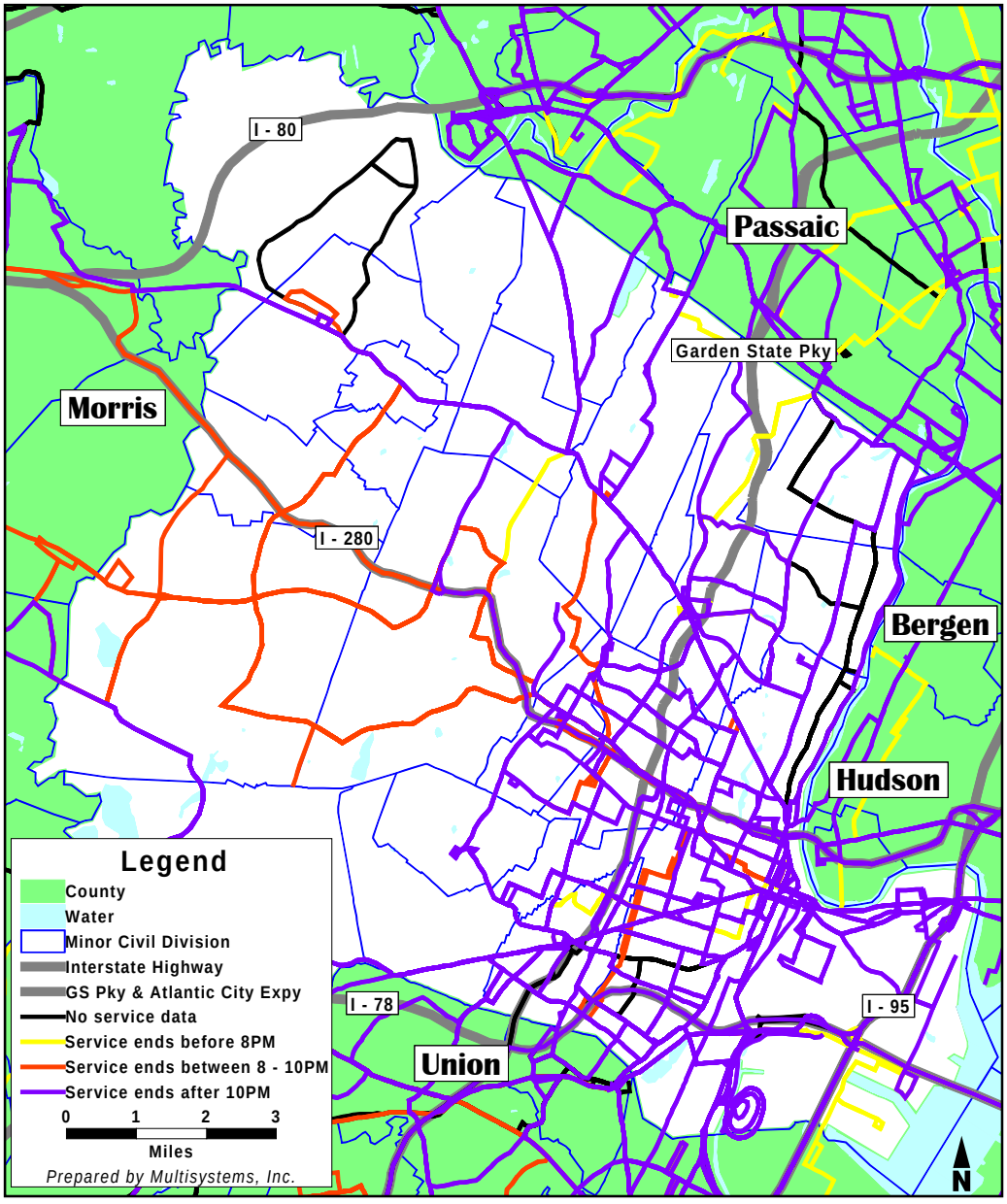


Exhibit 11: Hudson County Welfare Clients Not Living Within 1/4 Mile of a NJ Transit or Private Bus Route

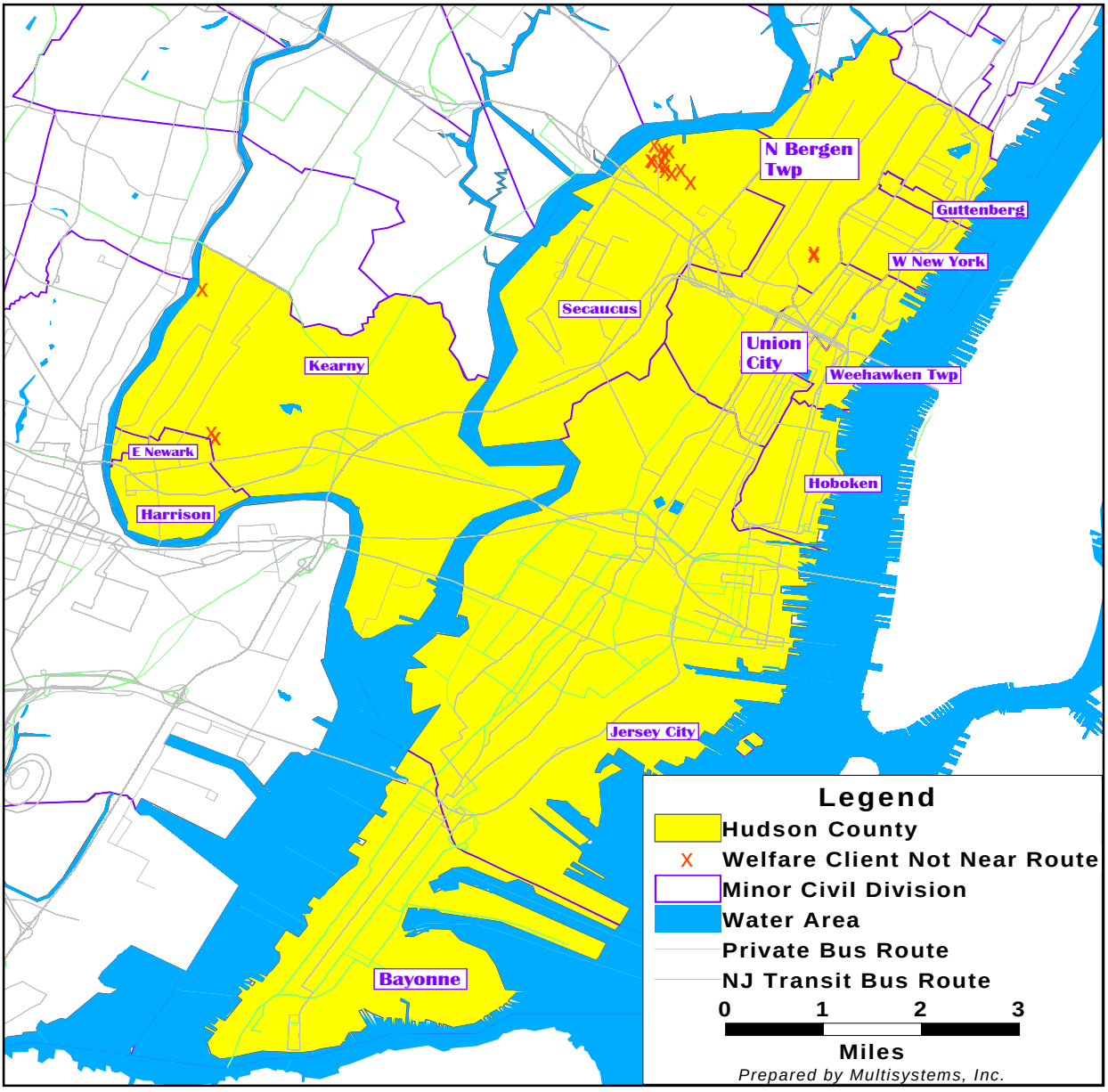


Exhibit 12: Proposed Expansion of Somerset County Transportation's DASH Service

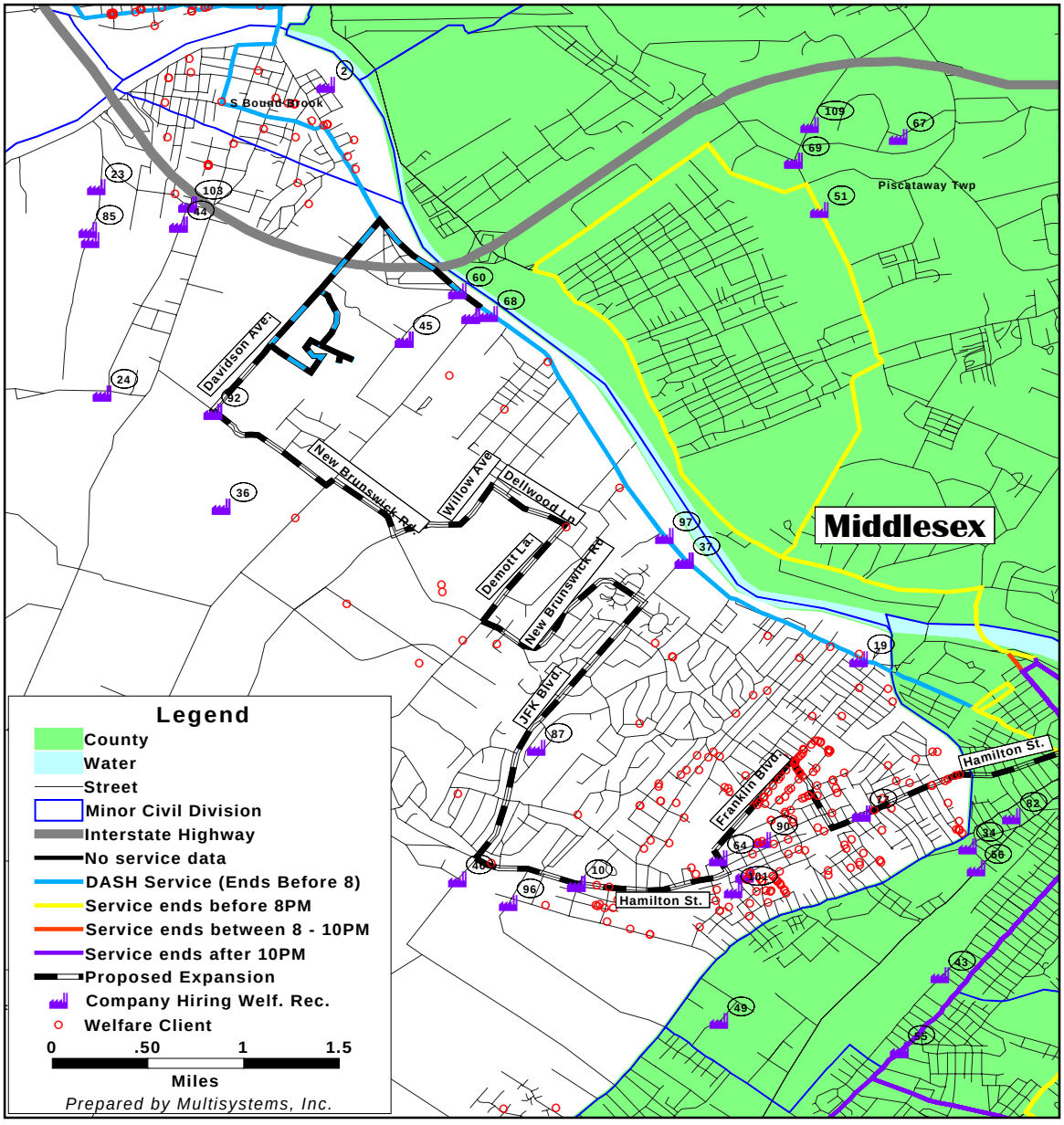
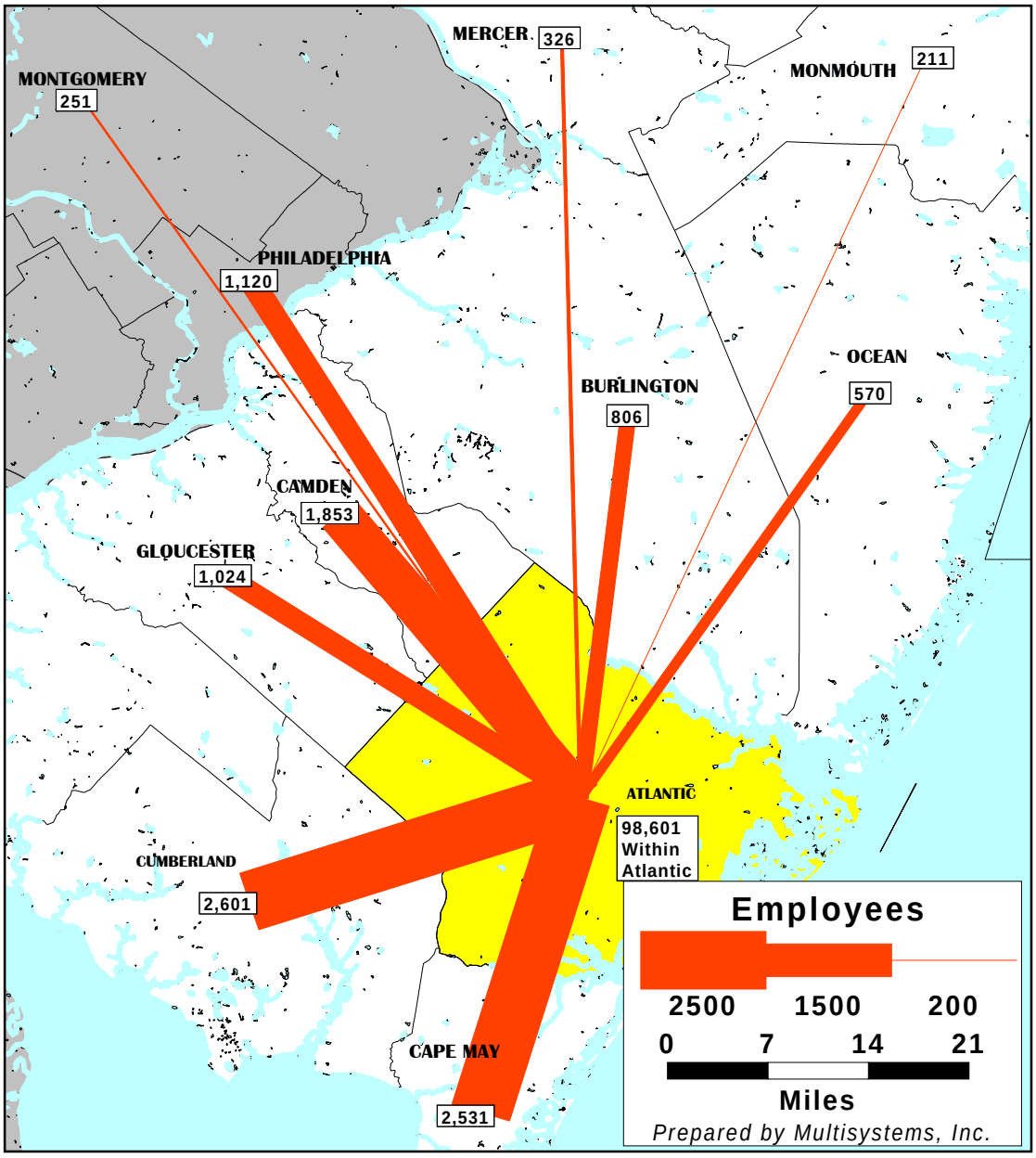


Exhibit 13: Employment Location for Atlantic Co. Residents Showing Flows for 200 or more Employees



GIS and Welfare to Work in Boston, Massachusetts

This study used GIS to assess mobility for welfare recipients living in the city of Boston. Three major objectives of this project included:

- Determination of overall transit access among welfare recipients;
- Estimation of locations where welfare recipients are likely to find work and examination of the proximity of potential employers to transit; and
- Determination of how well Boston's public transportation system serves welfare to work trips.

GIS was initially used to depict the spatial mismatch of recipient residences and those employers likely to hire entry-level workers. This was accomplished by geocoding both the welfare client and employer databases. Further analysis revealed that even among those welfare recipients that do have transit access, many travel needs are not currently being met by the transit network. Many desired destinations remain inaccessible; many trips cannot be made on public transit at certain times of day.

GIS allowed for the visual displays necessary to document the spatial mismatch of client residences and entry-level job locations. It also illustrated the need for service changes to better meet the transit needs of welfare clients. GIS also allowed for thematic mapping of attribute data such as TANF recipients by zip code, employment growth rates, and job code classification data using Standard Industrial Classification (SIC) data. Combinations of databases were used for research and planning efforts. Some of the databases used are illustrated in Exhibits 14 through 16.

This project experienced some data collection difficulties. One major problem was the low welfare recipient geocoding "hit rate" (number of recipient addresses successfully geocoded). The low hit rate was improved after the street and address data were updated. A second problem involved the bus route database. The project encountered delays until recently implemented service changes could be updated in the database. A final problem involved the confidentiality of the welfare client database. It was necessary to obtain permission to use the data.

Exhibit 14: TANF Client Residential Density by Zip Code

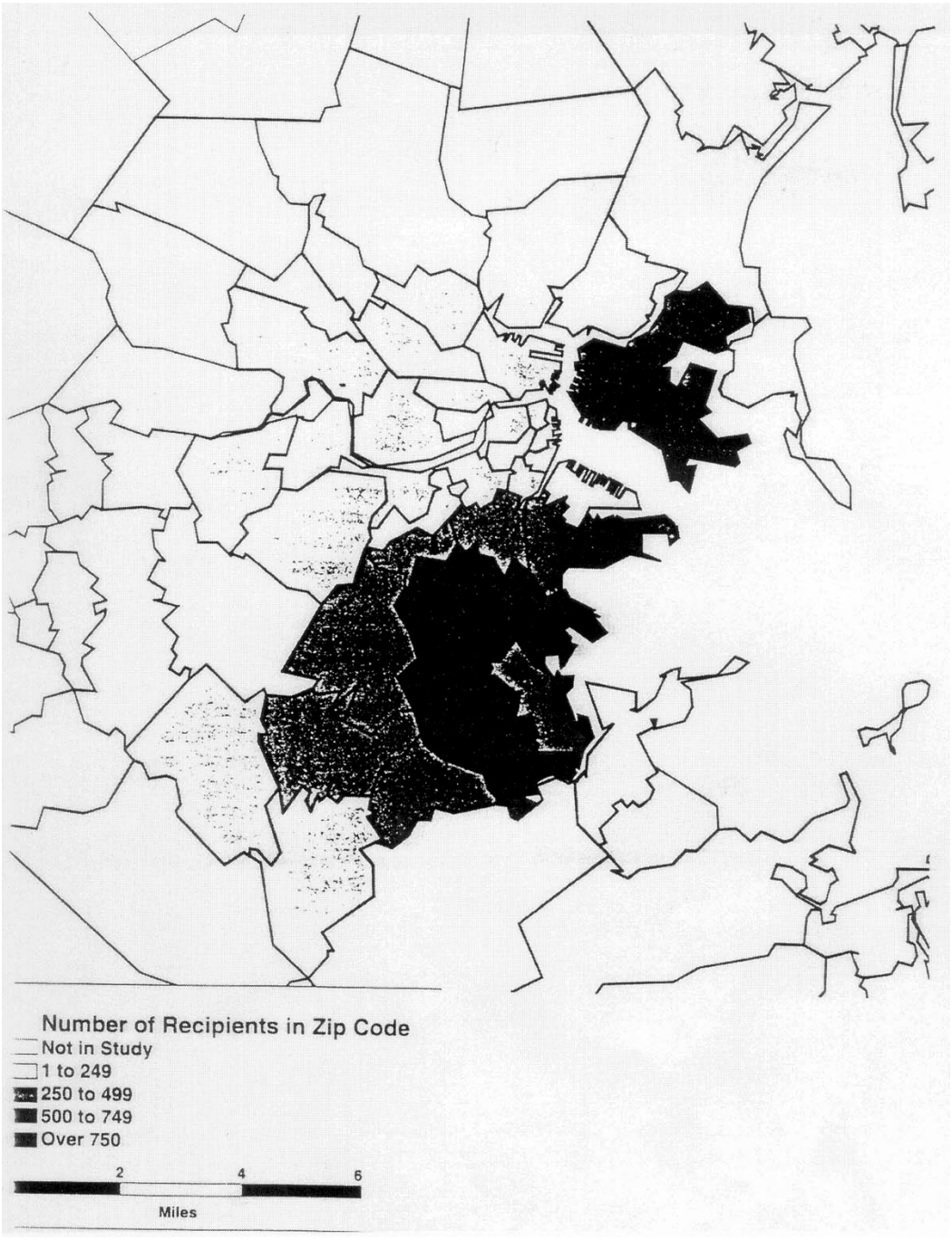


Exhibit 15: Entry-Level Employment Growth by Municipality

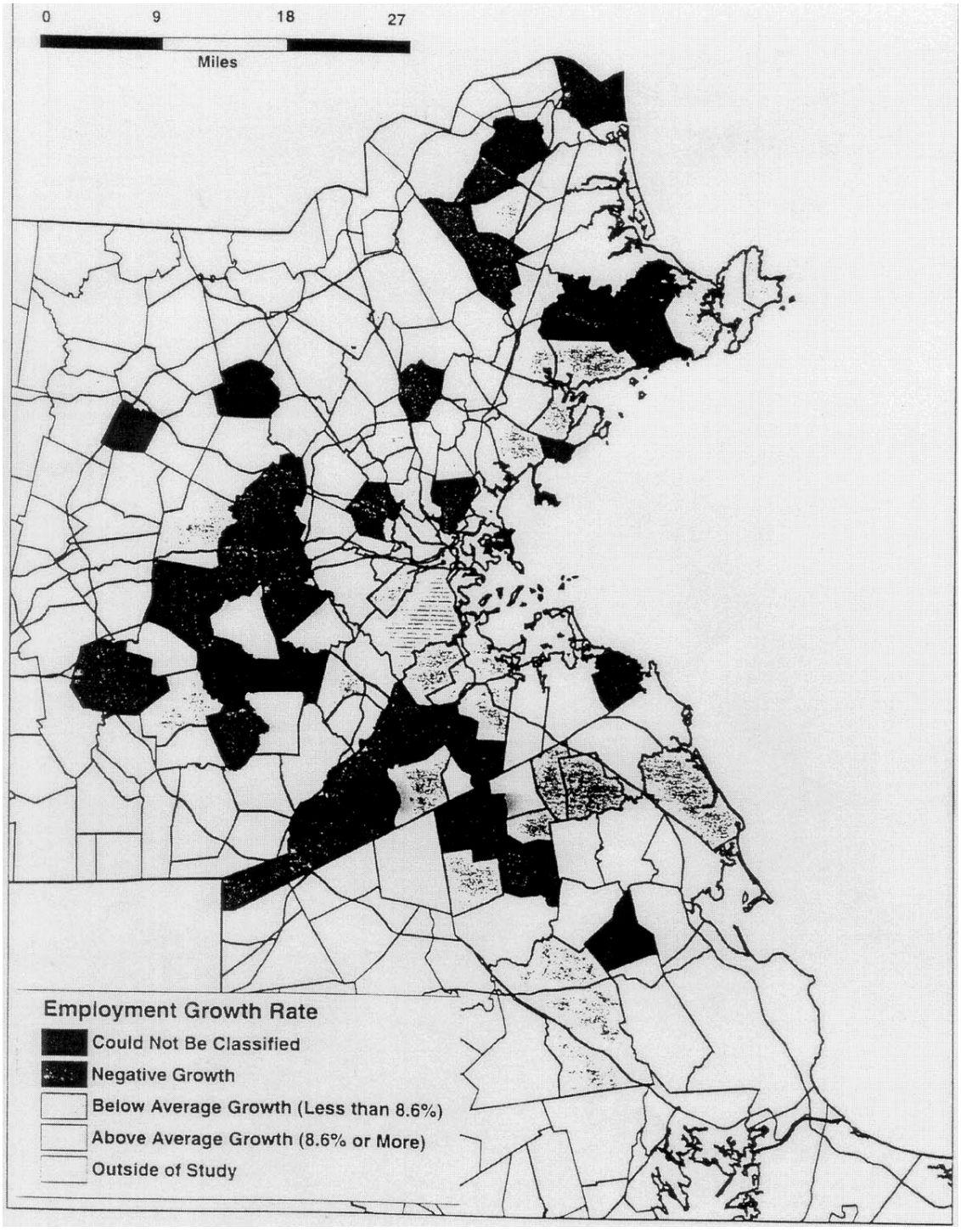
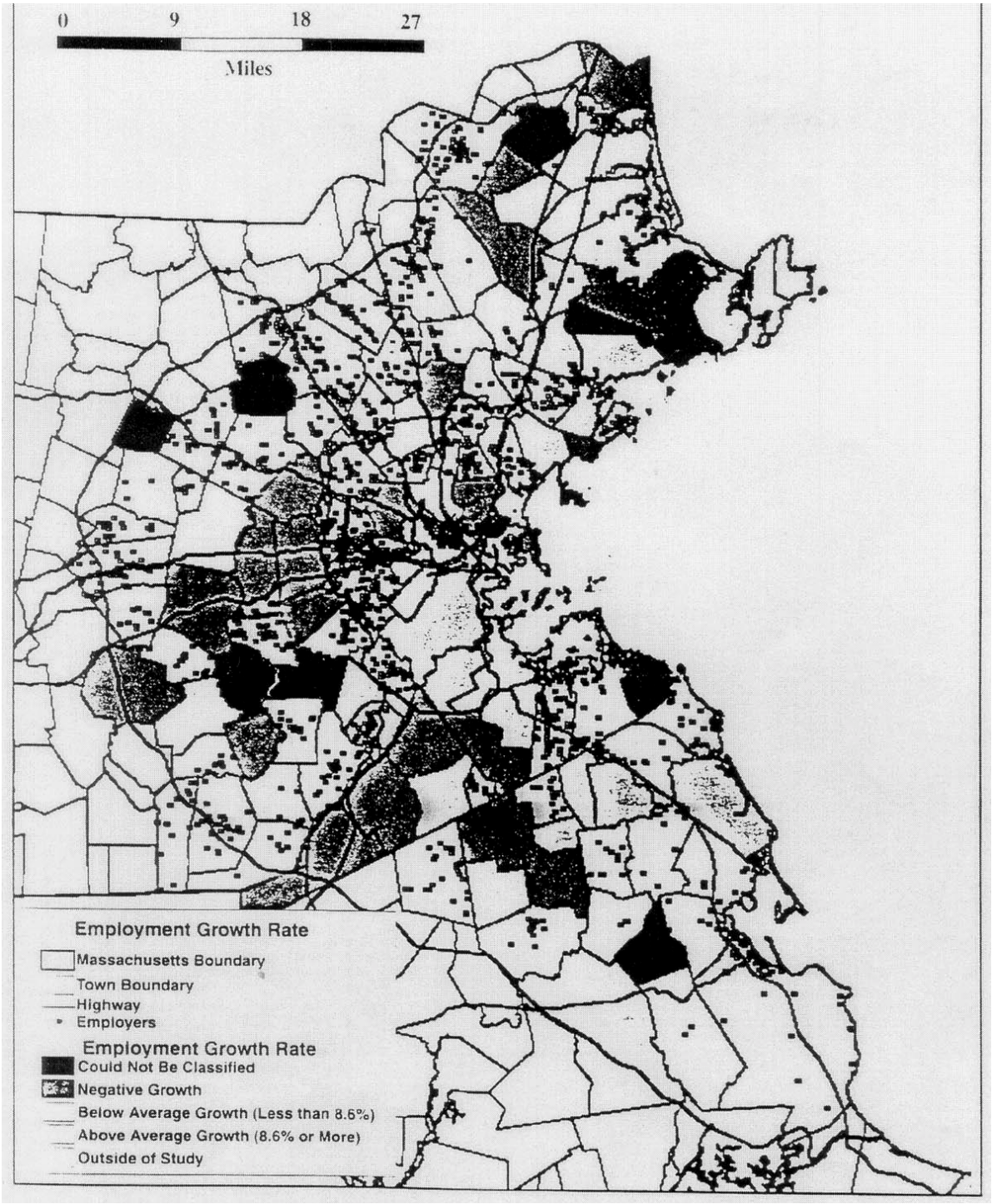


Exhibit 16: Entry-Level Jobs in Boston



Trip Planner: Bergen County, New Jersey

The trip planner developed for Bergen County is an example of how an interactive trip planner can be developed in-house at low cost. The user chooses a home address from a list of coded welfare addresses (new welfare addresses can be added), a work category (such as banking or manufacturing) and a specific work location/company. The trip planner determines which bus route(s) are within ¼ mile of the selected home address, and which are within ¼ mile of the selected work address. The trip planner subsequently displays a map, which shows the path(s) of the appropriate bus route(s). Both NJ Transit routes as well as the private bus providers which operate in Bergen County (there are fewer than 10) are included in the database. Transfer information between all providers is included as well. Detailed route data, including beginning run time, ending run time, and headway information can be viewed. Exhibit 17 illustrates the suggested route itinerary that results from a sample trip origin and destination.

The trip planner was developed as a prototype by the Bergen County Department of Planning and Economic Development. The trip planner was distributed to several county and state agencies including the New Jersey Unemployment Office, New Jersey Office of Employment Services, Bergen County Workforce Center, and Bergen County Board of Social Services. The trip planner was also distributed to other New Jersey counties, as an example of what each county may be able to develop in-house.

One major problem associated with this application is the lack of a formal structure to create and maintain the databases. Partnerships have not been formed to coordinate distribution of updated data to the Bergen County Department of Planning and Economic Development. Databases need to be continuously updated, particularly addresses of welfare clients, and without updated data, the trip planner loses its utility. In fact, the trip planner is not currently used very often and is expected to be used less frequently in the future because the underlying data has not been updated.

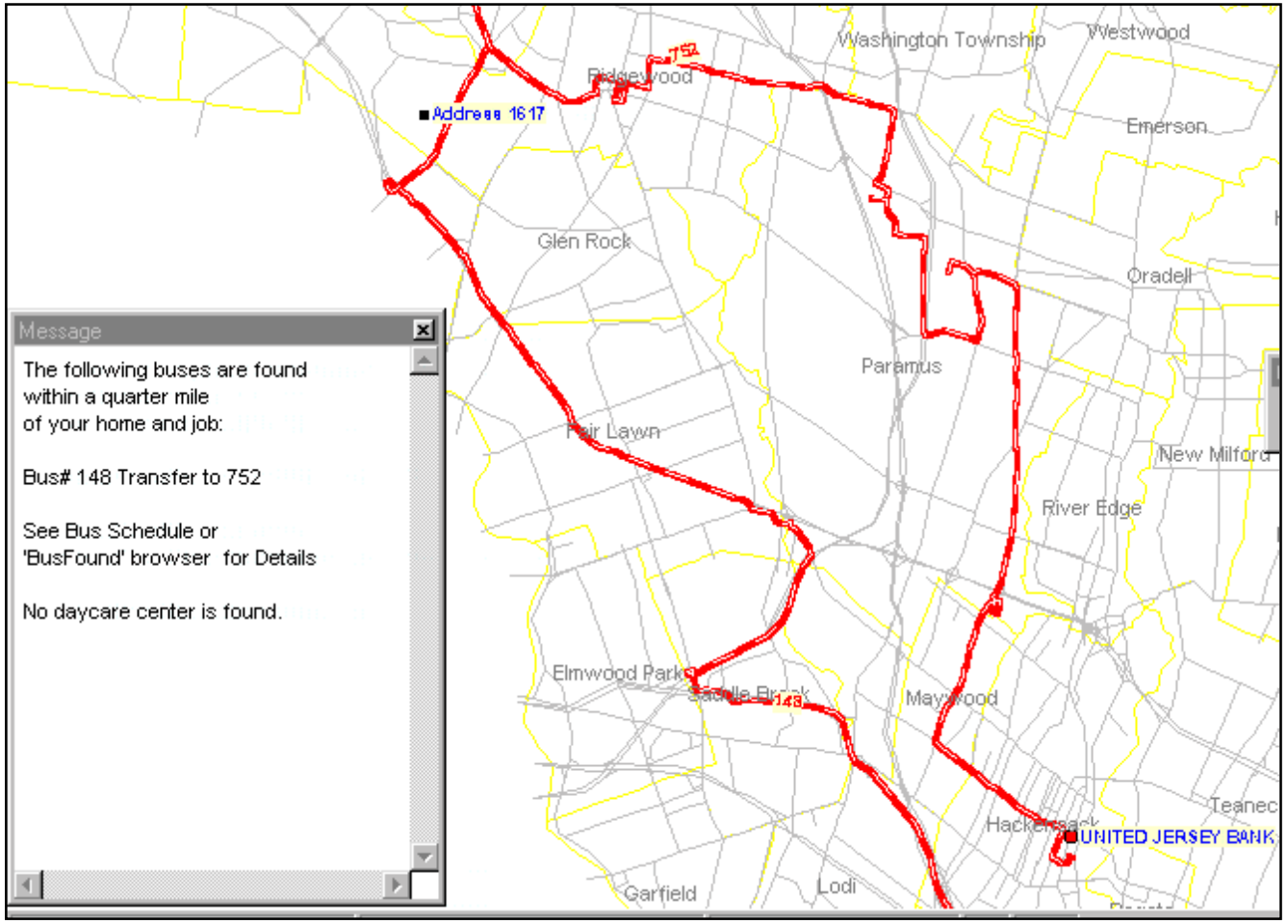
A second issue dealt with the confidential nature of welfare client addresses. This concern was easily solved by simply not distributing client address information except to authorized Bergen County agencies. A second version of the program, using a numbering system, rather than the actual address of welfare clients, was developed for dissemination to outside organizations.

While this trip planner is a low-cost application that can be duplicated in a variety of locations, development and start-up costs were difficult to quantify. The actual programming time required to create the trip planner took one employee only a few weeks to complete. The databases required to run the program, however, were compiled from various sources over the course of many years and most had to be modified before they could be used. Although the quality of data affects the accuracy of the program results, improving or purchasing improved data can be costly.

While the prototype version of the trip planner has been developed and marketed, it was anticipated that agencies interested in using the application would work with the Bergen County Department of Planning and Economic Development by sending data updates, and describing programming changes required to meet their needs. The trip planner would then undergo a front-

end redesign and a “patch” would be issued to users. However, program change requests have yet to be received.

Exhibit 17: Sample Trip Itinerary



Name	Route#	First1	AmHW1	PmHW1	Last1	First2	AmHW2	PmHW2	Last2
148A1	148	6:35a	15		7:25a	5:10p		20	6:20p
752B1	752	5:40a	60	60	6:40p	6:00a	60	60	6:10p

Trip Planner: GIS and Welfare to Work Using Geomatch in Orlando, Florida

The Central Florida Regional Transportation Authority (LYNX) developed a transportation program designed to help welfare recipients seek gainful employment. The program was created in conjunction with Florida's Work And Gain Economic Self-sufficiency (WAGES) program, a welfare program developed in response to national welfare-to-work initiatives.

LYNX uses GIS to provide a WAGES customer with analysis of a particular trip, including a map displaying transportation options available to meet their specific needs. The map is custom-made to cover the spatial areas pertinent to the customer's employment trip (see Exhibits 18 and 19).

Along with the visual map, a computerized travel itinerary provides the customer with the recommended plan of travel. The objective of the spatial analysis is to highlight mobility options that are cost-effective with long term viability. LYNX WAGES GIS does this by locating commuting options for a customer's area and matching them to the best solution within 72 hours of notification. In addition to creating a route, LYNX also has a travel-training component that may be a particularly useful support service for former welfare recipients transitioning into the workforce.

GIS also helps aid coordination efforts by providing information on services such as: existing fixed route bus service, ADA transportation, carpooling and vanpooling options, employer shuttle programs, donor bicycle and car programs, auto maintenance and repair locations, and social service sponsored transportation. LYNX transportation coordinators work with the caseworkers to provide them with the transportation information they need to give customers the best alternatives for their specific trip. LYNX also uses GIS storing capabilities for follow-up analysis to check on the success of the customer's choice trip within two weeks and again at ten weeks.

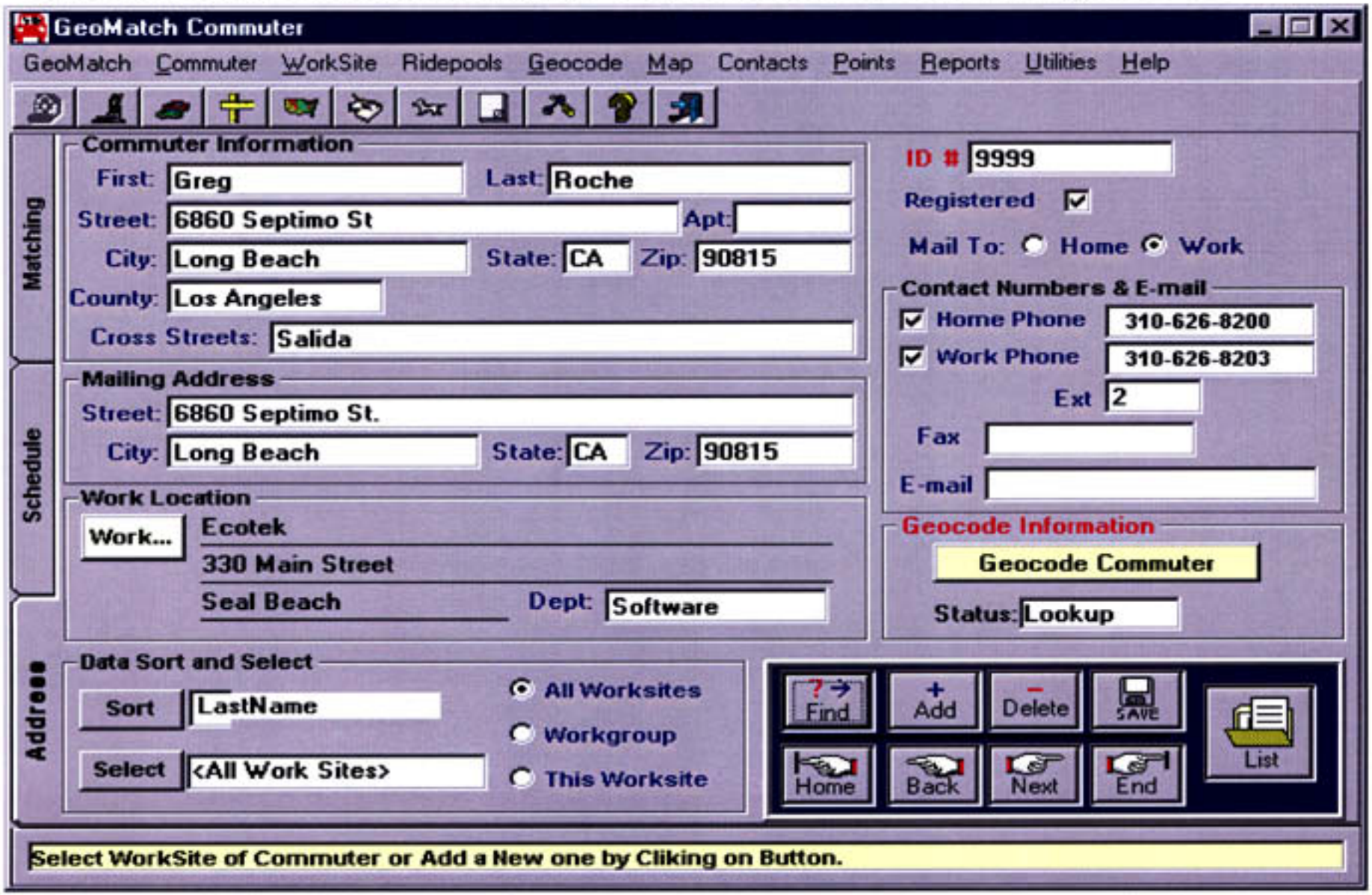
Welfare planning efforts at LYNX have helped create several partnerships including the following:

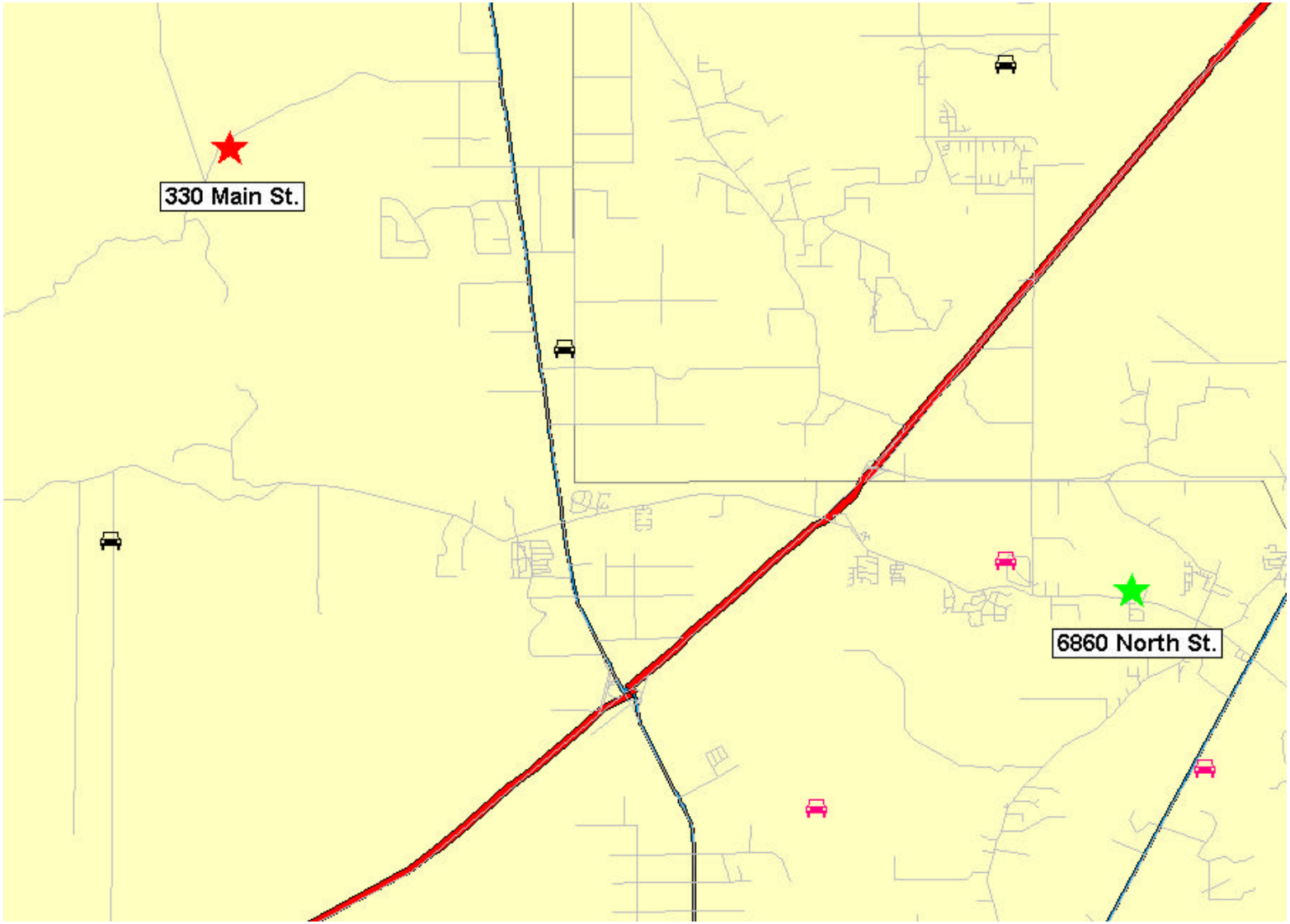
- The WAGES program links caseworkers with participants through trip planning, ridesharing and other activities such as job fairs and community outreach programs.
- The Marriott World Center/Pathways Program, the Orlando Housing Authority and LYNX formed a partnership to provide vanpool routing options for trips made by Pathways employees.
- Lake County Vocational-Technical School System developed a partnership with WAGES participants to train the participants to drive school buses.

LYNX personnel noted that partnerships such as these help improve opportunities to apply for and obtain grant funding. Partnerships also expose certain individuals to the WAGES program. As interest in the program increases, more WAGES coalition offices are necessary.

One of the project's most difficult challenges involved creating ridesharing routes that include an additional stop, such as a stop for childcare. When several intermediate stops are required, it becomes difficult to operate the route in a timely fashion. Obviously, if a single intermediate stop (such as a particular day-care center) can be used by several riders, the route would operate more quickly and would be more convenient for riders. A second concern involved keeping the GIS databases updated. The follow-ups at two and ten weeks were developed to help keep the data current. During the first ten weeks, as former welfare recipients move and change jobs, it becomes important to update client address and job information as well as whether they continue to use the ridesharing route. LYNX is currently in the second year of the WAGES program and the efforts continue with additional grants pending for expanded services.

Exhibit 18 and 19: Sample Displays of the GeoMatch Ridesharing Software




330 Main St.
6860 North St.

Trip Planner: TranStar - Los Angeles, California

The Southern California Council of Governments (SCAG) developed the Internet-based TranStar Trip Planner for the Los Angeles area. The web page indicates how to use public transit between any two points in the Los Angeles metropolitan area (www.scag.ca.gov/transit). Origin and destination locations can be intersections, street addresses or landmarks. The user can indicate the time of day s/he is to depart and/or arrive. The user may also specify the type of itinerary they prefer: optimizing time, minimizing transfers, and shortest walking distance. Also specified is the type of fare they pay (regular, senior, disabled, student, etc.), and whether any special accommodations are required (wheelchair, bicycle, etc.). Exhibit 20 displays the input screens and a sample trip request.

After the user submits the information, TranStar calculates the best transit itinerary, and displays complete trip directions including transfers and fares. Walking access maps and transit schedule information is also provided. Exhibit 21 displays the transit directions that result from the sample trip request.

TranStar is an interactive transit itinerary planning system designed for use by transit information center staff and transit consumers. The system uses GIS capabilities to achieve optimum results, but does not require its users to be familiar with GIS planning software. Instead, it provides a customized graphical interface. TranStar contains its own geographic software to geocode addresses and present map graphics and does not require other third-party GIS software to operate.

TranStar uses third party geographic data such as TIGER Line Files, ETAK, Navtech, or Thomas Brothers map data as a basis for determining the geographic position of transit stops, landmarks, consumer trip origins and destinations, etc. TranStar converts street addresses, street intersections, and external map references into geographic coordinates. TranStar is also able to produce map displays to assist consumers in locating trip origins and destinations as well as transfer locations.

While no partnerships or formal agreements have been established, the TranStar program may be used by any transit user, including welfare clients, caseworkers, job placement personnel, employers and others with Internet access. Workstations have been installed in each of the five county welfare-to-work offices supported by SCAG, plus other agencies supporting the welfare-to-work program. These agencies can either use the Internet function or an established communication link, which provides better performance in the event that the Internet is unavailable or busy. Training is conducted for the agency workstation installations. The direct line hookups provide the agency employee with improved performance as well as extended functional capability for tailoring itineraries for specific client situations.

The trip planner is utilized throughout the Southern California area and is operated under the management of SCAG. In Los Angeles, TranStar is used by five transit agencies, over 80 employers with rideshare programs, and a growing number of welfare-to-work centers to produce real-time transit itineraries. SCAG's rideshare services include telephone ridematching that

includes transit itineraries. The Internet services currently account for 2,500 user accesses per day.

As with any system that incorporates data received from multiple agencies, data entry, standardization and on-going file maintenance has been a challenge. In the Los Angeles service area, several carriers enter and maintain their own route, schedule and fare data, but the majority of transit-related data is entered, maintained, and quality-assured by SCAG. TranStar supports on-line, real-time entry of transit data, placing it into production immediately upon certification of its correctness. In addition, data can be loaded route pattern by route pattern in "batch" mode (which uses a batch command to load all the data at once).

SCAG maintains the geographic database as well as a group of technical support staff to train users of TranStar and another related system called RideStar (for ridesharing). SCAG maintains the computer operating environment for TranStar, performing software upgrades, data backups, systems administration, etc. Training costs are generally paid by the user organizations for both start-up training and training of replacement staff. Classes include information retrieval and data maintenance. The support staff also provides telephone and, if essential, on-site support to resolve user problems. SCAG also contracts to provide data maintenance services.

TranStar was initially developed to match riders for carpools. It was subsequently adapted for use by transit agencies to perform trip planning for the transit call center staff. With increased access to the Internet by transit consumers, TranStar was adapted with a simplified on-line user input form to make transit itineraries, schedules, and walking maps available to prospective bus riders. Since the system was developed to serve a very large service region with over 600 transit routes, on-line multi-user data maintenance and shared agency usage issues pertaining to the size of the databases were addressed in the initial design effort, not as add-on redesign and modification efforts. Costs of developing and maintaining this trip planner are not available for dissemination, but in general, costs to maintain data are based on the size and complexity of the transit network, the source media (electronic versus paper) and completeness of the transit data, and the lead time of transit updates prior to going into effect.

Last year SCAG won a contract to install a trip planner, similar to TranStar, in the New York City metropolitan area. This system is still under development.

Exhibit 20: Sample TranStar Trip Request

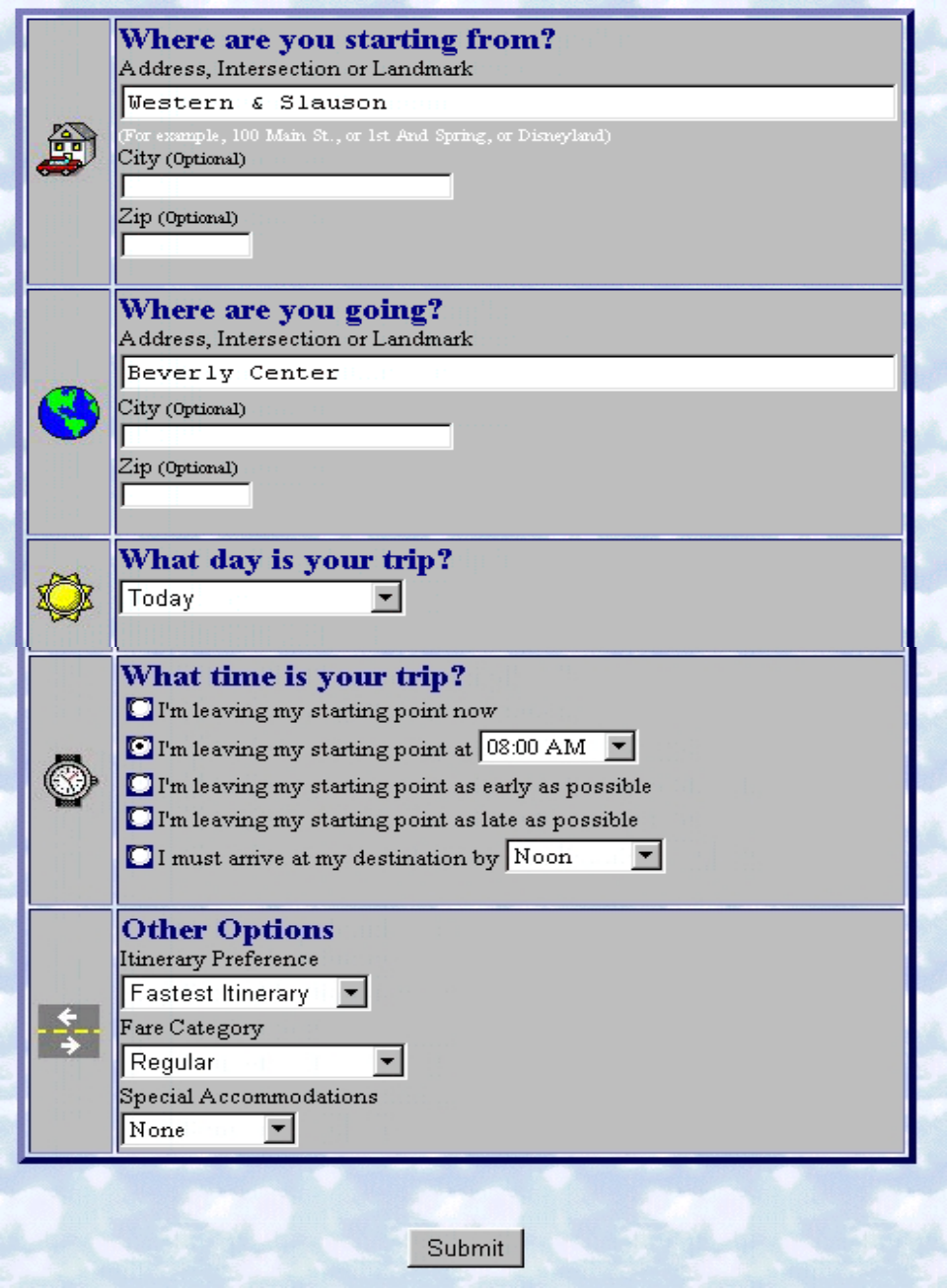
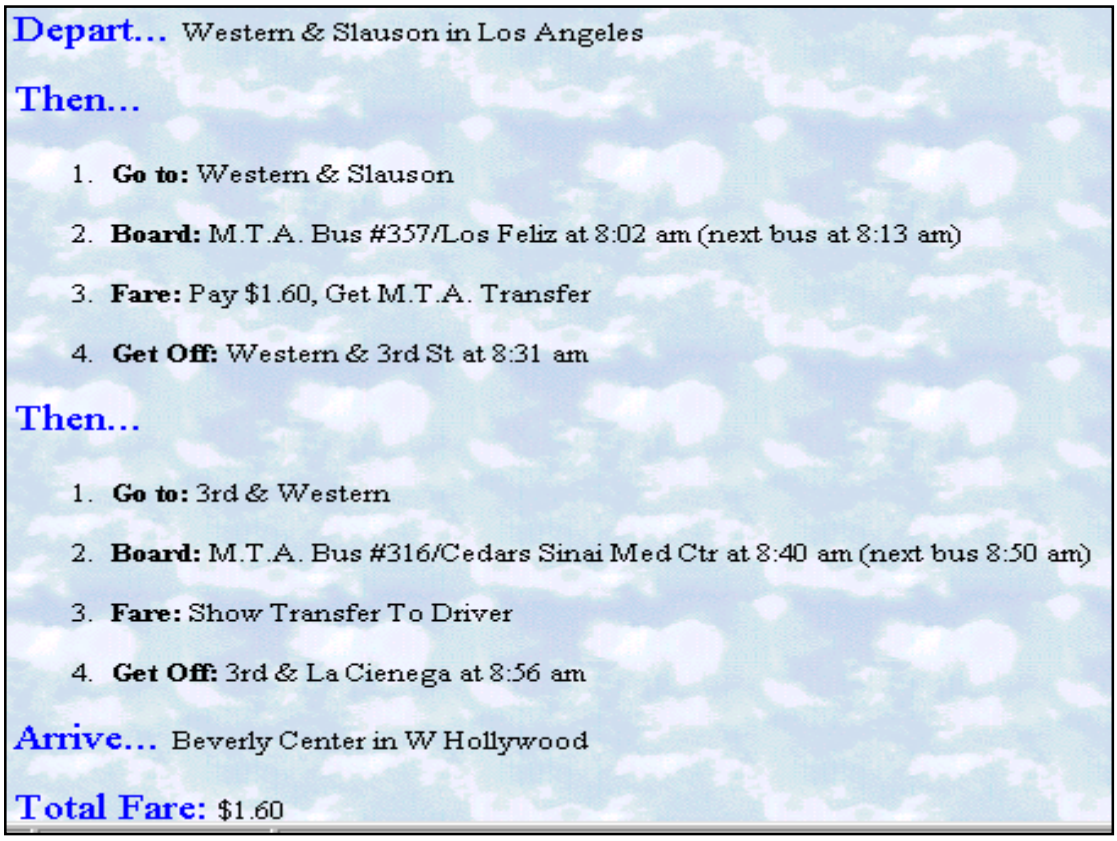
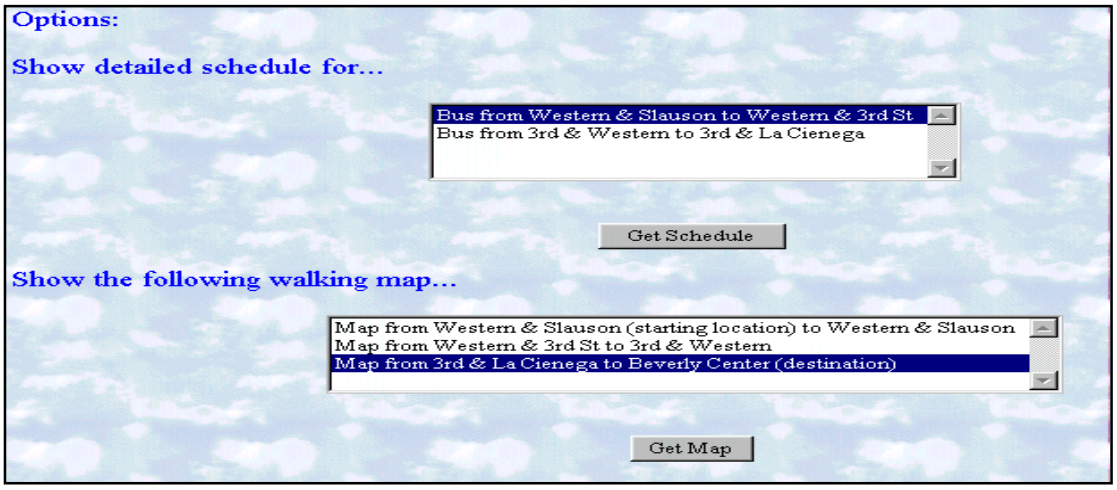


Exhibit 21: TranStar Transit Directions Resulting from Sample Trip Request





Trip Planner: MIDAS-CIS (Detroit Internet Prototype)

This trip planner is a fully automated customer information and trip planning system for public transit. It provides customer service agents with direct access to trip planning for fixed route services. This information is used by agents to respond to service requests initiated by the general public, including welfare recipients, job placement counselors and others. In addition to MIDAS-CIS, there are several other varieties of trip planners. In the Pittsburgh area, "Mini-MIDAS" will be mainly used to determine ADA trip-by-trip eligibility, and includes databases such as curb cuts to help determine whether ADA clients can use fixed-route service. A new application specifically geared toward welfare-to-work planning in the Boston area is currently being developed in cooperation with the Metropolitan Employment Transportation Access Association (METAA). The third version, and the most widely used for general public (including welfare recipients), is the MIDAS-CIS Trip Planner.

MIDAS-CIS has a graphical interface that runs on Microsoft Windows. MIDAS-CIS has been, or is being installed in the following cities: Cleveland, Cincinnati, Fort Lauderdale, Omaha, Pittsburgh and Portsmouth (NH). In these locations, use of MIDAS-CIS is generally limited to transit agency telephone operators. Some of these locations intend to expand the use of MIDAS-CIS to include other organizations, such as welfare offices, or to the general public via the Internet. An Internet version of MIDAS-CIS has been developed, as a prototype, for the Detroit area. In this prototype trip planner, users can interactively look up travel information between any two points in the Detroit metropolitan area. Origin and destination locations can be entered as an address, or by selecting a landmark, either by choosing the desired location from menu windows or by entering the first few characters of the landmark's name and then choosing the desired destination from search results. The user also indicates the time of day and day of week s/he is to depart or arrive. Users can also identify alternative solutions, such as minimum walk time and minimum number of transfers (see Exhibit 22). After the user submits the travel information, trip planning algorithms calculate complete trip directions, including boarding time and stop, payment information, the number of bus stops, and the ride time. A route map is provided (see Exhibit 23).

Some of the most important benefits realized by trip planners such as MIDAS-CIS include cost savings, improved accuracy and better customer service. Telephone reservation agents can learn to use computerized trip planners quickly, and make far fewer mistakes than with manual trip planning methods. Trip planners could be used by welfare recipients or organizations to examine transit access between their home and a particular employment opportunity, or to choose the most accessible job location among several possible opportunities. Users need not be proficient with GIS software. The MIDAS-CIS program converts address information into geographic coordinates, and subsequently calculates the appropriate route path, route schedule and bus stop information to result in the recommended trip itinerary.

The most important databases necessary to run MIDAS-CIS include transit routes, bus stops, streets and landmarks. MIDAS-CIS can run on any street network, but the street network must often be improved to allow input of correct transit routes as well as user addresses. (For example, if the street network is missing links to shopping malls, these links must be added to

the street network for the bus route to travel correctly through the mall area. In addition, the street network must often be updated to include newer neighborhoods or private roads.) The bus stop listing is another vital database. The better the bus stop lists, the better the trip plan. (Otherwise, if bus stops are missing from the database, the trip planner may recommend a completely different itinerary.) Of course MIDAS-CIS must also include the bus route paths and schedule information. These data must also be accurate for the program to work well. Finally, MIDAS-CIS includes landmark information such as hospitals, shopping centers, employment and welfare offices. MIDAS-CIS allows easy user modification of databases. Updating the databases, particularly route schedule and route path information is necessary for accurate trip planning recommendations.

Data accuracy is the biggest obstacle to installing a successful trip planner. Organizations considering the purchase of MIDAS-CIS, or other trip planners, should dedicate personnel to database development. Without dedicated personnel, it is much more difficult and time consuming to improve the data to the point necessary for the trip planner to work efficiently. If an organization is not able to dedicate personnel, it is recommended that they contract with the provider, or another organization, to improve the data.

Exhibit 22: Sample MIDAS Trip Request

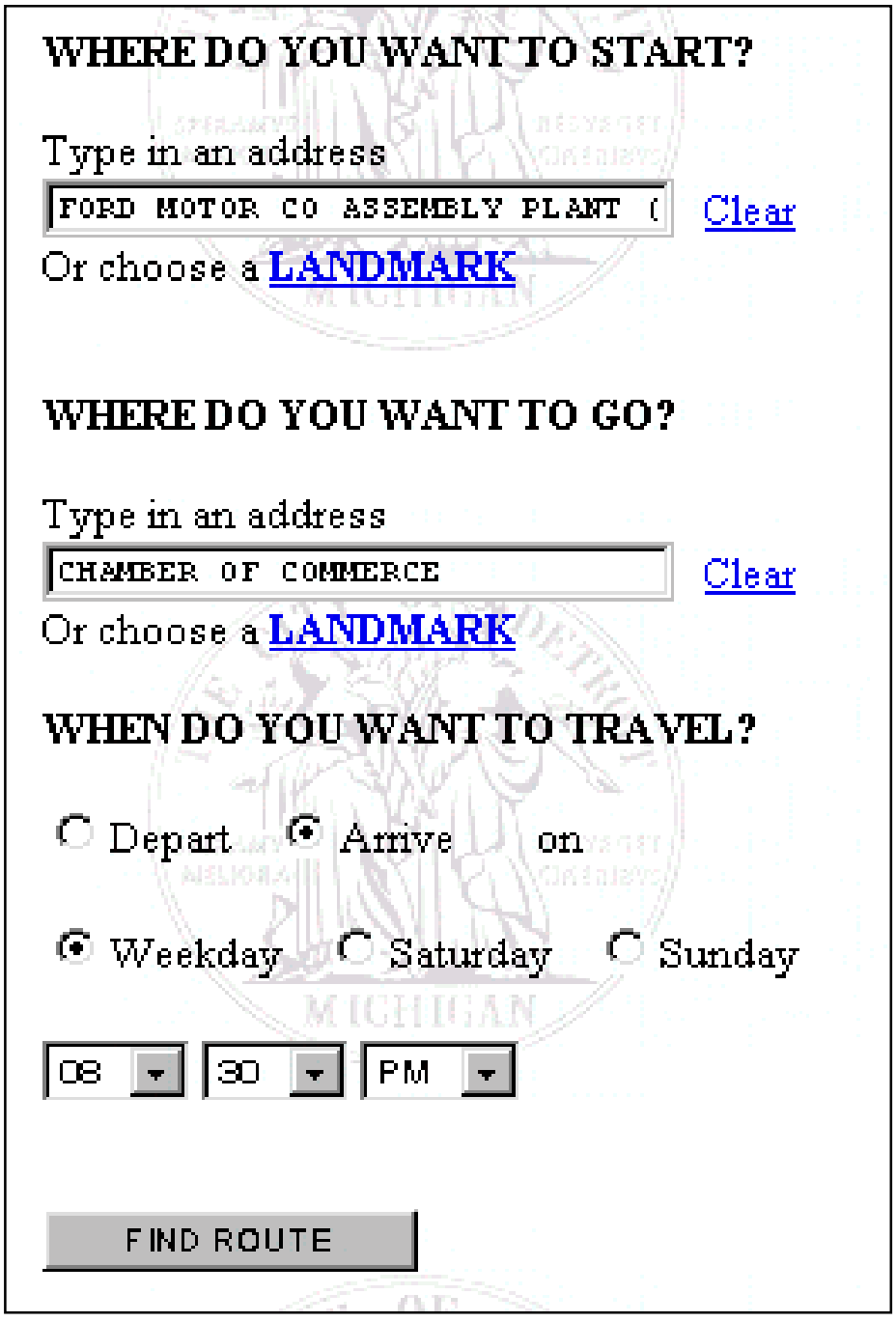
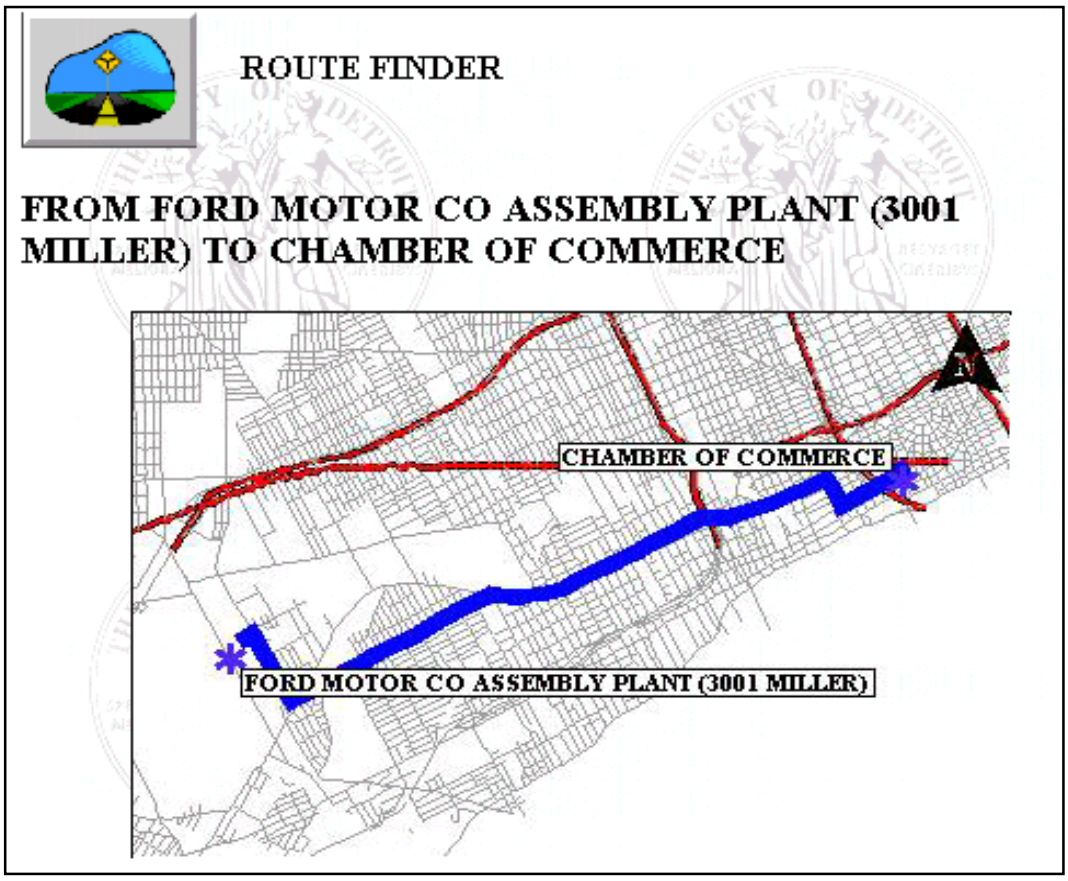


Exhibit 23: MIDAS Map and Transit Directions Resulting from Sample Trip Request




```
Trip time: from 7:24 PM to 8:00 PM
Number of transfers: 0
Walk 6 minutes.

7:29 PM     Board 49 - VERNOR To Alter and Mack at WREN AVE
            Pay fare of $1.25
            Ride for 44 stops (29 minutes)

7:57 PM     Get off at HOWARD ST & 1ST ST
            Walk to destination
```

Welfare to Work Analysis in Cape Cod, Massachusetts (CCRTA)

The Cape Cod Regional Transit Authority (CCRTA) conducted a study to review its fixed-route and paratransit services and identify welfare to work issues. The project focused on transit planning in Hyannis, which is a regional transportation hub. Various transportation modes connect at the town's intermodal center, including fixed route, intercity bus and ferry service. Hyannis also has the highest population density in the region and is served by the largest number of paratransit vehicles.

The study began by identifying where welfare recipients live. (See Exhibit 24.) GIS was then used to examine welfare recipient residences and their proximity to CCRTA's existing fixed routes. GIS illustrated the spatial mismatch between businesses, welfare recipients and support services. While many businesses are located in the Town of Hyannis, welfare recipients and child care facilities were more scattered throughout Barnstable County. GIS was also used to display travel patterns on Cape Cod. With a limited highway network, heavy summer tourism causes severe traffic congestion throughout the Cape (see Exhibit 25).

GIS was used to geocode important data including welfare residences, businesses, child-care facilities, and other useful landmarks. Bands were created for ¼ and ½ mile increments around CCRTA's fixed route system. These bands were then intersected with the geocoded TANF clients to determine the number of individuals within ¼ and ½ mile of a CCRTA bus route (see Exhibit 26). The number of clients served by transit was then compared to the number of clients outside the band but within CCRTA's service area to figure the ratio of "clients served by fixed route " to "clients not served by fixed route." This information was used to determine if fixed route transit was an option for a newly employed welfare client. In the event that the client is beyond ½ mile of fixed route transit, other transportation options were investigated, including coordination with other transit or paratransit services, ride sharing, or van pooling. Furthermore, GIS allows the production of "trip routing" where a map and driving directions for a particular client's origin and destination can be created. This allowed for further analysis and planning.

Data was also analyzed with respect to selected time-related factors. For example, thematic maps were created based on the month that clients would be cut off from welfare benefits. This was used to market and plan for current services and to examine opportunities for ride sharing and routing.

Certain route characteristics were examined by using GIS to join the fixed route geography with the corresponding element of FTA's Level-of-Service (LOS) database (created at the GeoGraphics Lab, at Bridgewater State College, MA). This allowed the user to query a route and receive schedule information (such as start and end times, peak service, pricing information) for that particular route. The LOS information allowed the user to interactively examine opportunities to use the fixed route system to transport a welfare recipient to a particular job at a particular time. This also provided the transit agency with important information regarding gaps in service, route transfer points and places where potential new service would be most beneficial.

Another database used in this project is the FTA's Transit Service Area and Contact Information database. This database incorporates Minor Civil Divisions (MCDs), or city and town polygons. A separate database was created in Microsoft Excel providing the information for each transit agency contained in each polygon. This allows users to select a town and find out the transit services available to that town, along with the type of service available, and contact information of the transit agency.

Many of the challenges which occurred during the course of this project are similar to the challenges experienced in the GATRA study, described earlier in this chapter.

Exhibit 24: Welfare Recipients on Cape Cod, MA

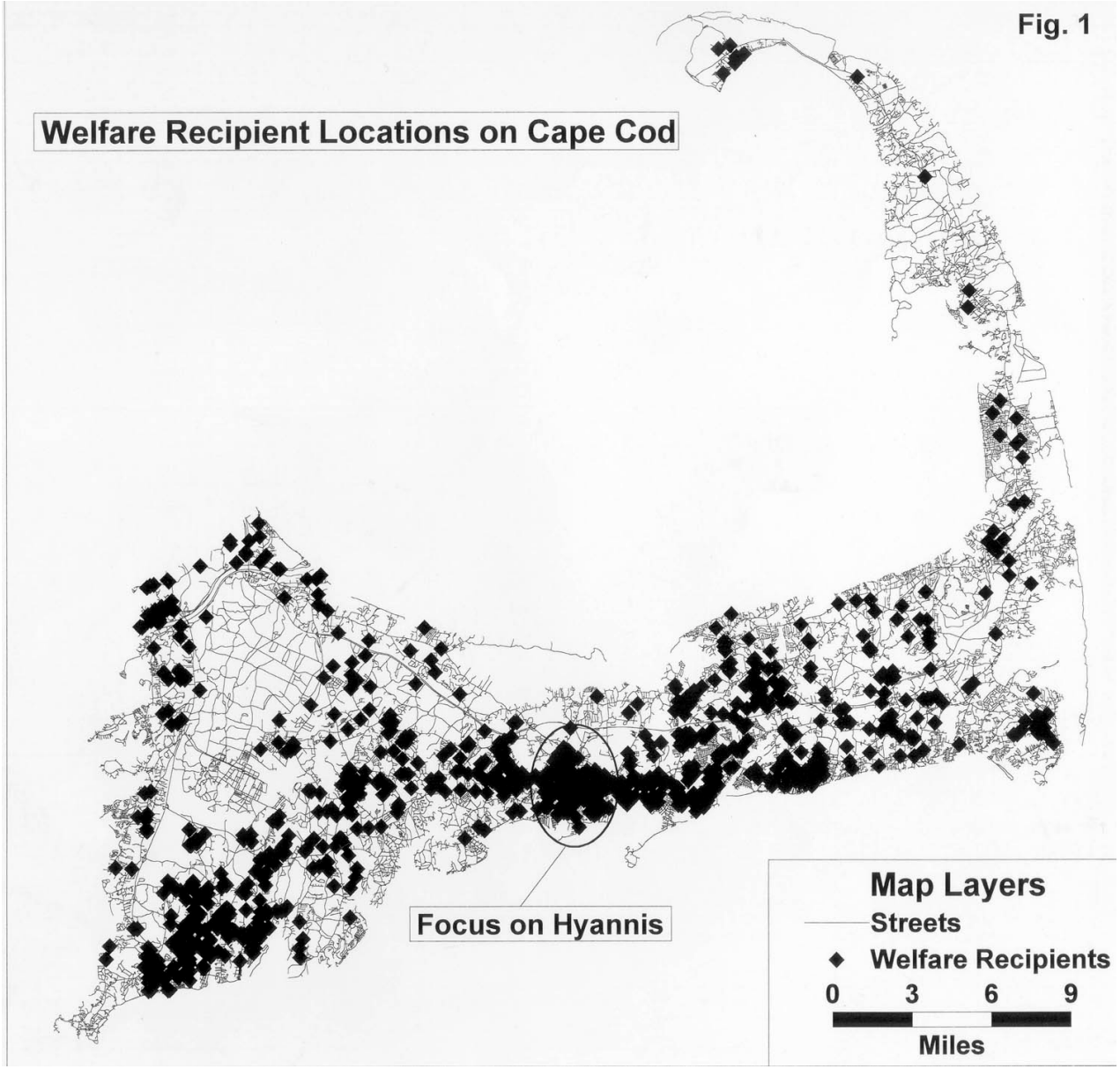


Exhibit 25: Origins of Cape Cod Transit Trips, July 1996

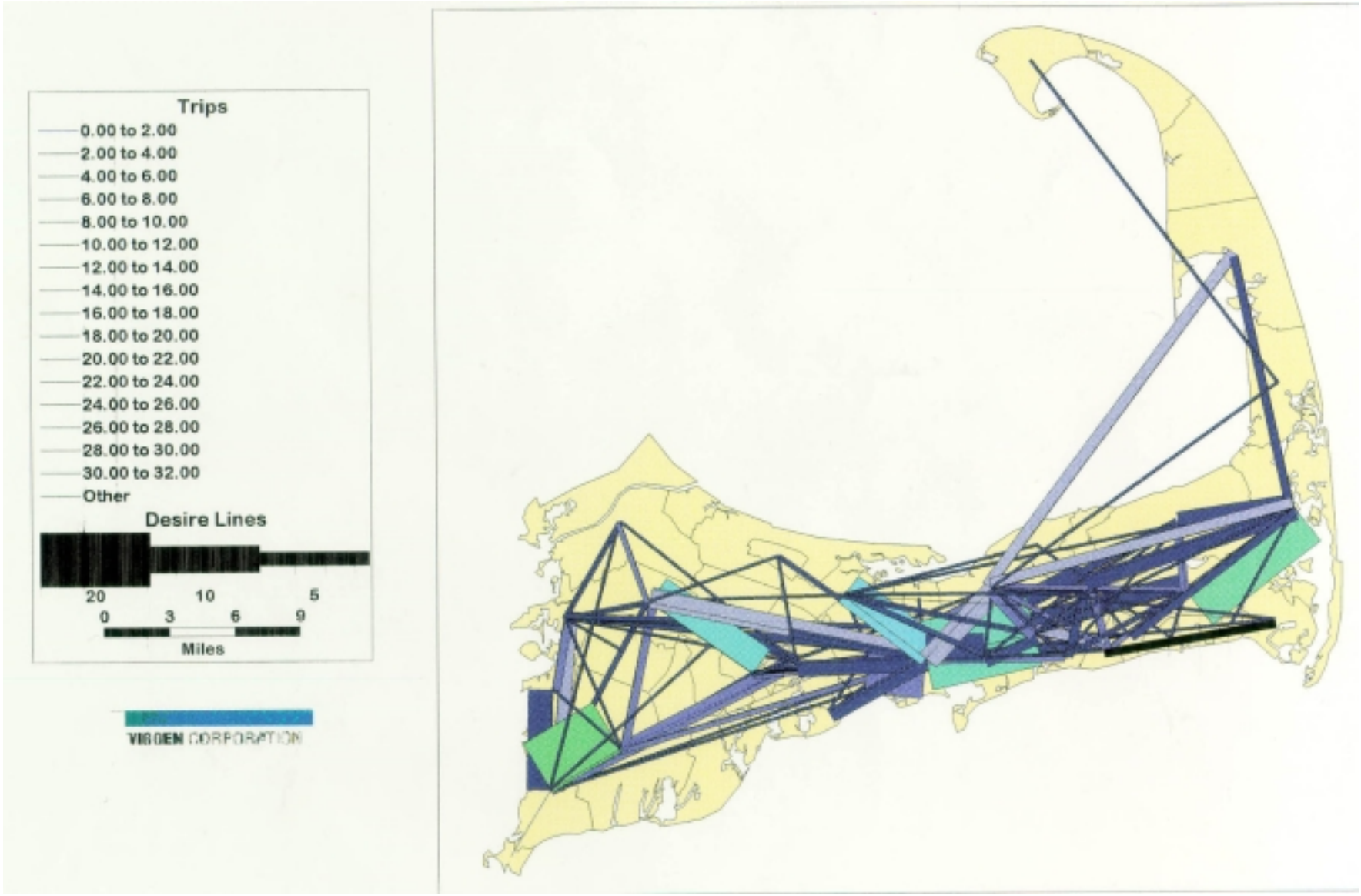
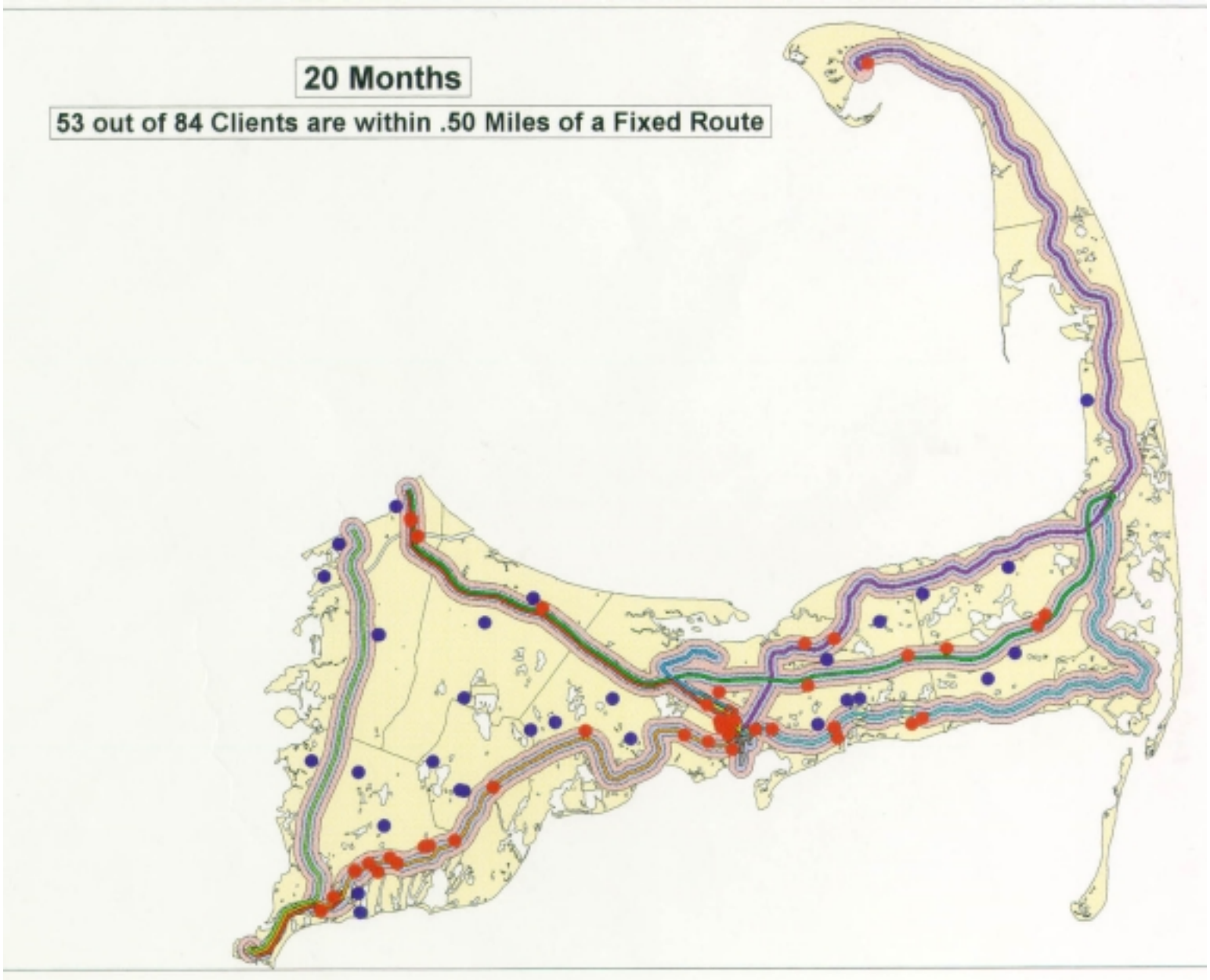


Exhibit 26: Welfare Recipients with .50 Miles of CCRTA Fixed Bus Route



Housing, Transportation and Access to Suburban Jobs by Welfare Recipients in the Cleveland, Ohio, Area

This study examined the spatial mismatch between welfare recipients and likely job openings in the Greater Cleveland area. GIS was used extensively throughout the analysis to display the locations of recipients of Aid for Families with Dependent Children (AFDC), projected annual job openings, affordable housing, and to define public transportation commute zones and times. GIS was also used to analyze data from the Census Transportation Planning Package (CTPP). GIS allowed the visualization of spatial mismatches between AFDC recipients and projected entry-level job openings, and commute times between areas with concentrations of AFDC recipients and suburban job clusters. Exhibit 27 highlights suburban employment clusters and approximates the transit travel time between suburban employment and one particular neighborhood with a concentration of welfare recipient residents.

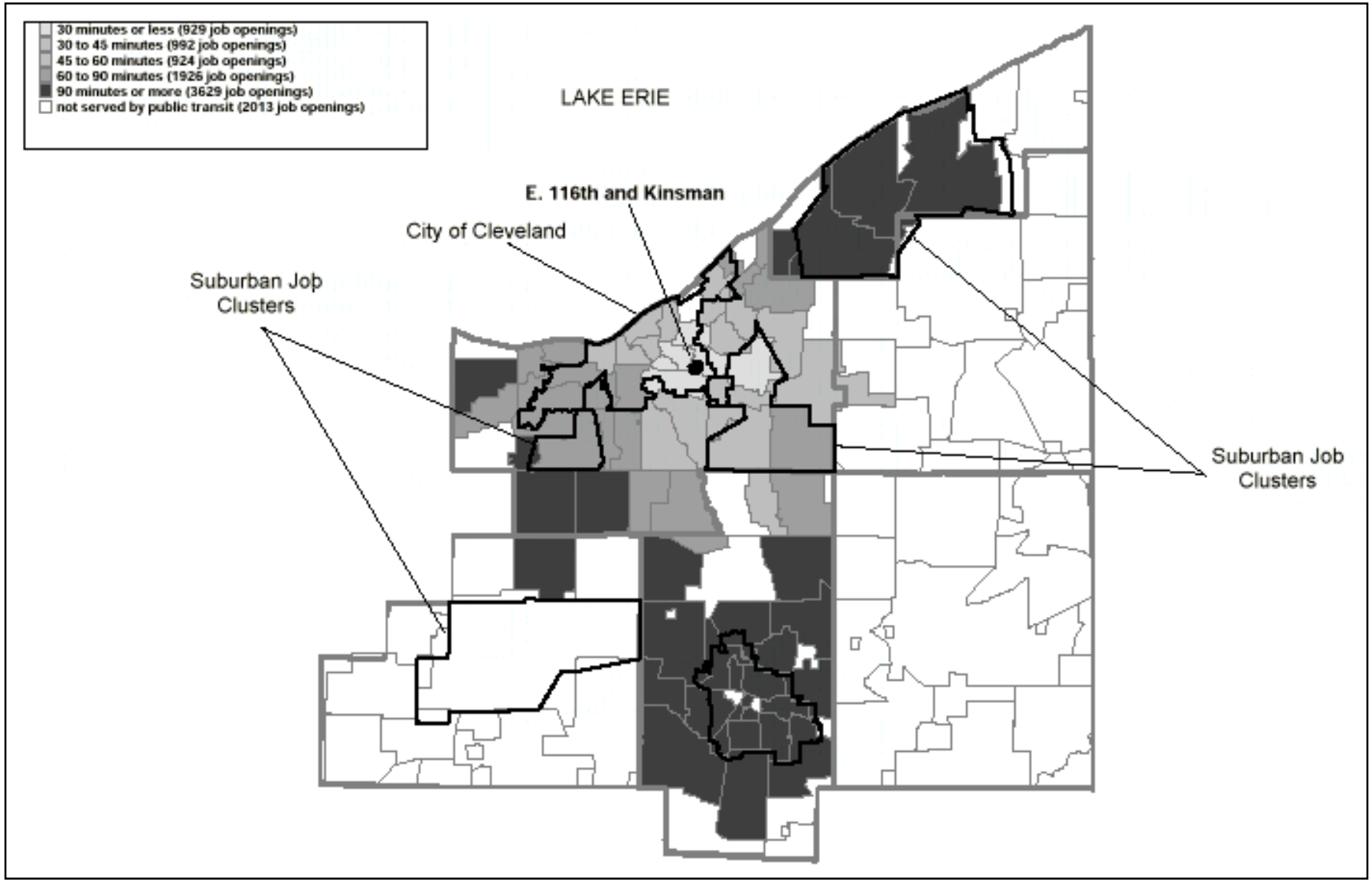
Basic GIS functions were used, such as thematic mapping of demographic characteristics, including shading polygons or varying line thickness. Several GIS applications were used to complete this analysis, including:

- A map showing public transportation commute times from a specific low income area to each zip code was created along with the layer of suburban job clusters. This map clearly shows that most of the suburban jobs have long commute times.
- A map of projected job openings followed a map of welfare recipients to illustrate the spatial mismatch between the two.
- The percent of entry level jobs accessible within various commute times from five selected neighborhoods were compared in tabular form. GIS was used to help determine the various commute time percentages, as displayed in the table. Numbers and percents of entry-level jobs vs. affordable housing units in each county, city or suburban area were compared in tabular form.
- An examination of the potential of individuals entering the labor market to relocate to suburban housing in closer proximity to areas of employment concentration was undertaken. To explore this scenario, GIS was used to identify the ratio of affordable rental housing units to entry-level job openings in a particular area with that same ratio for the entire metropolitan area.
- A comparison of areas of affordable housing with areas of entry-level job openings was completed. This was a comparison of areas with mean contract rent of $300 or less (from census data) with projected entry-level employment openings (from Ohio's ES202 data).
- Feasibility of commuting to entry level jobs from inner city neighborhoods was undertaken by estimating average public transportation commute times to areas of concentrated employment from areas with high concentrations of AFDC clients.
- A comparison of suburban employment centers, commute zones and affordable housing was undertaken using GIS. After showing the spatial mismatch between jobs and affordable housing, public transit schedules were examined for specific trip flows to estimate transit commute times. The estimated travel times from at least one low income zip code to all other zip codes in the study area were estimated and displayed using GIS.

At least four problems relating to the collection and accuracy of the data arose during the course of the project. First, commute times were calculated at peak travel times, when service is most frequent. However, since many welfare recipients commute during non-peak hours, commute times were termed "optimistic." Furthermore, the commute times consider travel and wait times only; they do not include walk time. Second, there were concerns about the geographic accuracy of ES-202 employment data. Because of these concerns, addresses were coded to the zip code level (also see New Jersey description of ES-202 data). Third, commute zones were created to estimate travel time above and below 20 minutes from any particular location. However, the construction of commute zones were necessarily "ad hoc," simply aggregations of TAZs that are approximately 20 minutes from a particular location. Fourth, the census provides contract rent information for occupied units only – vacant units are not included. To use this data, the authors of this paper chose to assume that vacant units represent the normal churning in the rental market; not an unused supply of housing information.

The authors also noted that the results found in Cleveland could not be compared to every city across the country. Data for Cleveland is most comparable to other northern industrial cities. However, since the authors indicated that Cleveland is considered one of the nation's most segregated metropolitan areas, they noted that the location of welfare recipients, housing and jobs may not be comparable to certain other cities.

Exhibit 27: Public Transportation Commute Times for Residents in the Vicinity of E 116th St. and Kinsman Rd. in Cleveland, OH



GIS and Welfare to Work in Milwaukee County, Wisconsin

This application focused on linking welfare clients living in Milwaukee County with entry-level employment opportunities in Milwaukee County and six other counties in southeastern Wisconsin. GIS was used to locate and display recipients of Aid to Families with Dependent Children (AFDC), likely job opportunities and public transportation services available. This analysis was initiated as part of the state's Wisconsin Works (W-2) welfare reform activities.

Several GIS layers and databases were created and used to demonstrate the relationships between AFDC residences, potential jobs, and transit services (see Exhibit 28). The analysis revealed that areas just to the north, west and south of downtown Milwaukee accounted for approximately 50 percent of the region's AFDC recipients, and included a high number of employers. These areas were the focus of transit improvements designed to meet the needs of welfare recipients (see Exhibit 29).

GIS was used to analyze potential transit improvements in the study area. In some areas just outside Milwaukee County, there are a large number of employers but very limited (or no) public transportation services available. In these locations, the cost of service expansions were examined to help identify recommend service alternatives (see Exhibits 30 through 32). Some examples of recommended service improvements included new shuttles or route extensions to serve research/industrial parks, and extended hours to better serve shift workers.

Several GIS functions were used to conduct this analysis, including the following:

- Thematic mapping of demographic characteristics such as income, households and vehicle availability;
- Geocoding of W-2 participants, employment locations, and transit routes; and
- Creation of "transit need" polygons, based on W-2 participant residences and potential employment locations. These polygons were useful in the development of transit improvement options.

As part of the application, a system used to assess the viability of transit was created. This process, summarized in *The Qualitative Service Review of Transit,* asked the question "Is transit an option?" Particular attention was paid to locations with many entry-level jobs. To answer that question, several factors were examined including the following:

- Service coverage;
- Service frequency and span;
- Service availability by day;
- Walking distance to routes;
- Travel time; and
- Service orientation.

Two geocoding difficulties occurred during the course of this project. First, the issue of welfare client confidentiality occurred once again. The solution used here was to display information using scatter diagrams, to represent where clustering occurred. This format, while permitting a visual display, was general enough to maintain confidentiality. Second, less than 80 percent of employers were successfully geocoded.[2] (See Exhibit 33.)

[2] 20,640 employers of the 26,021 total employers (79 percent) were mapped.

Exhibit 28: Milwaukee Area AFDC Residences, Potential Jobs and Transit Service

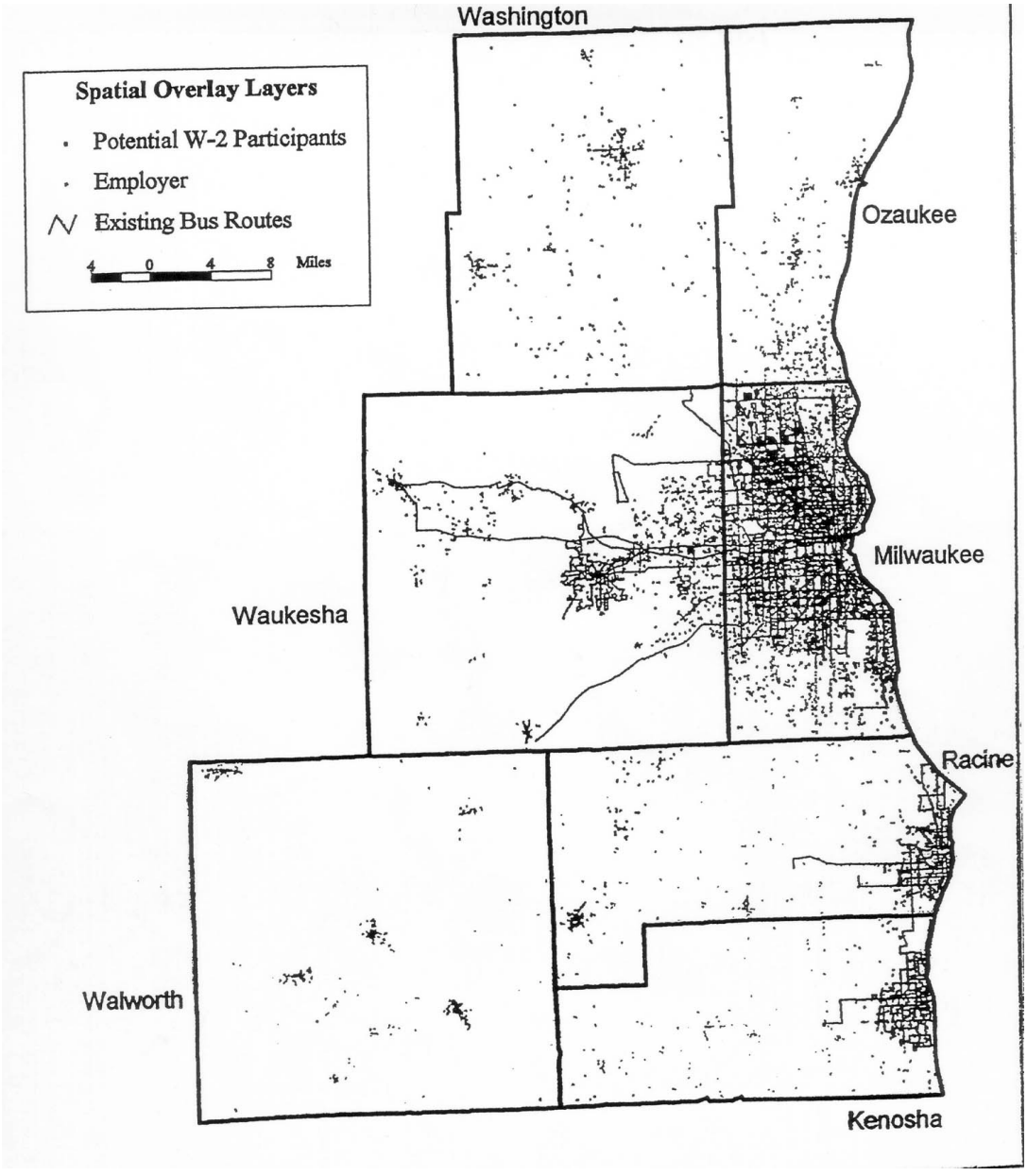


Exhibit 29: Milwaukee Area AFDC Transit Improvement Locations

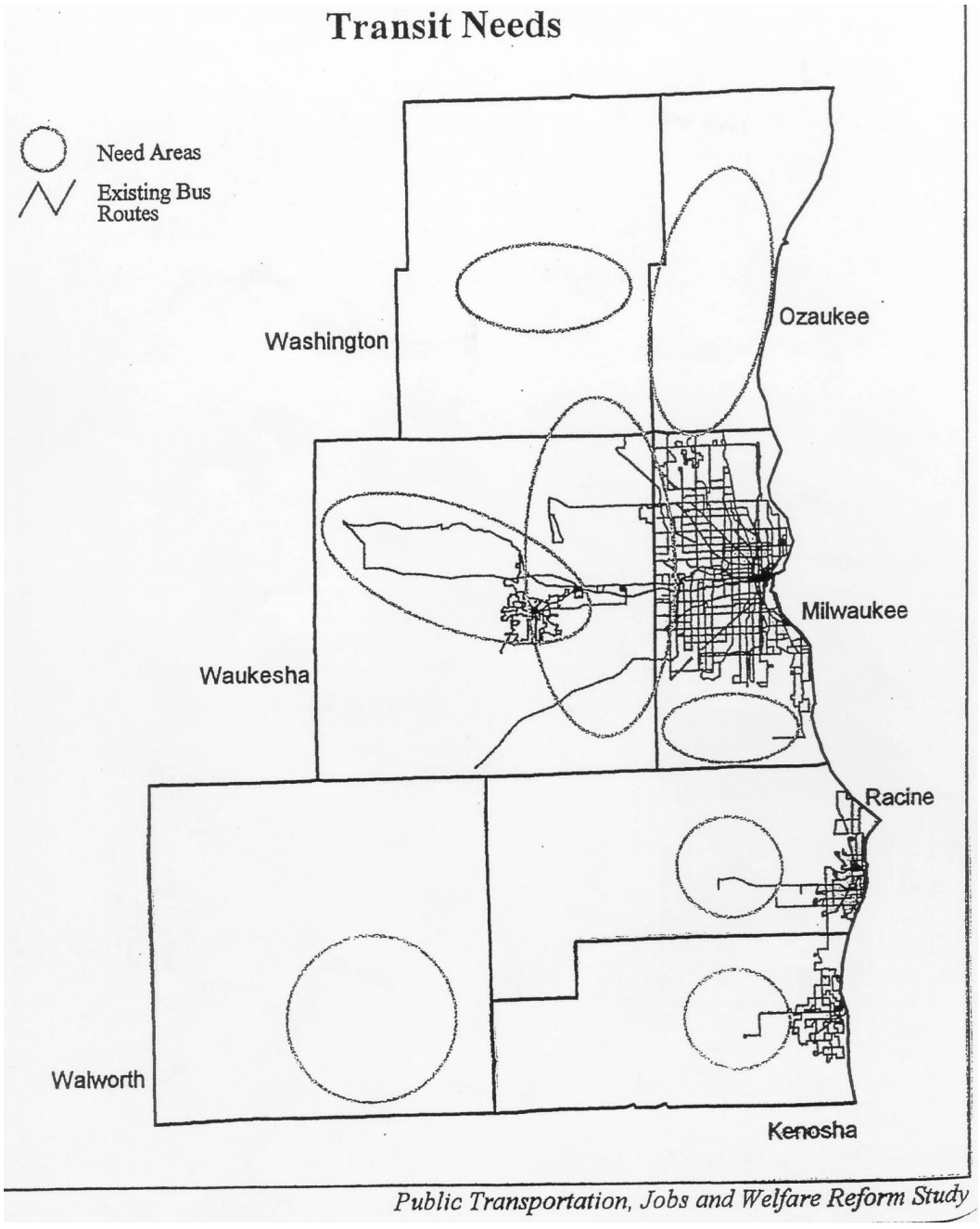


Exhibit 30: Recommended Service Alternatives I

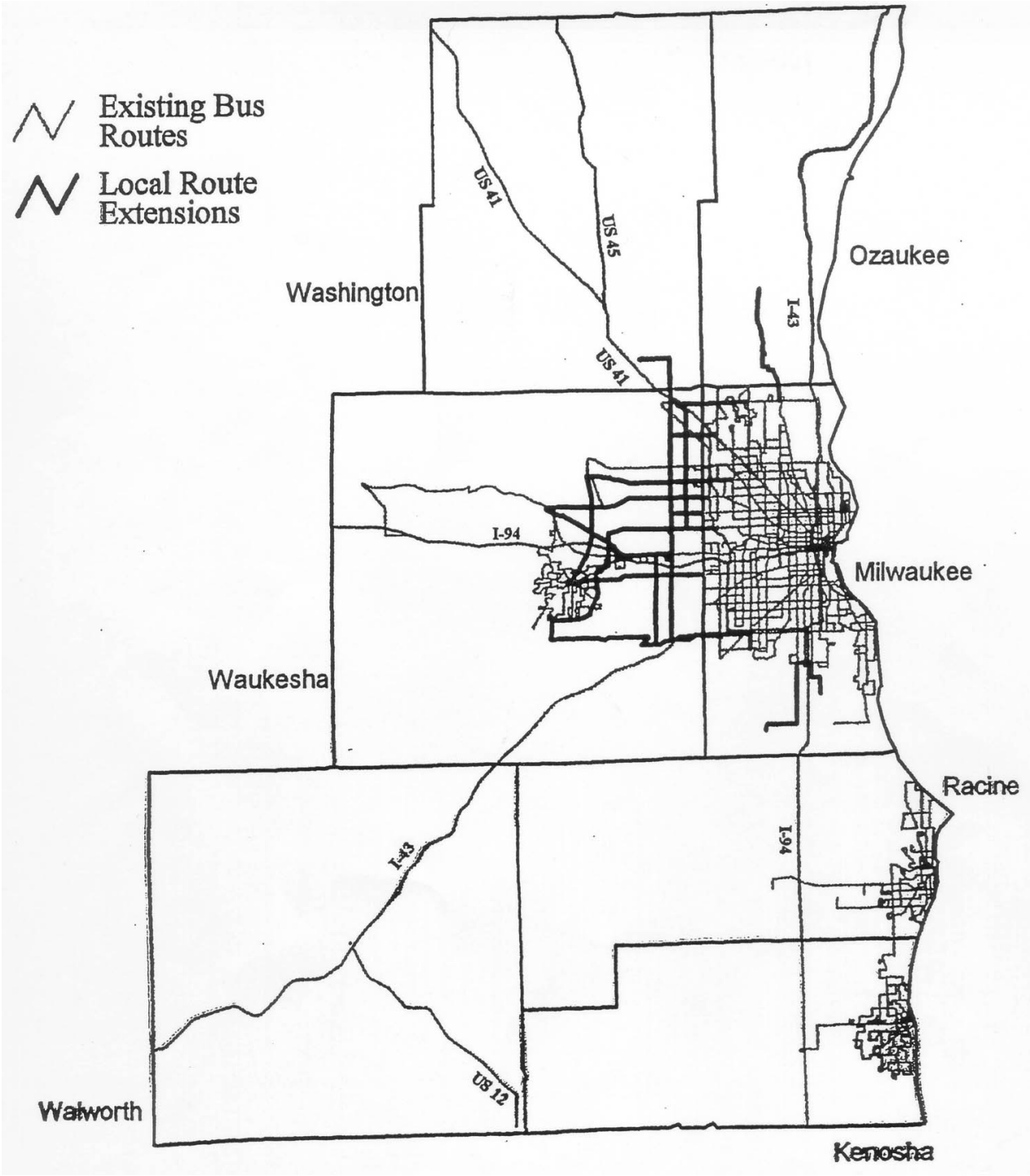


Exhibit 31: Recommended Service Alternatives II

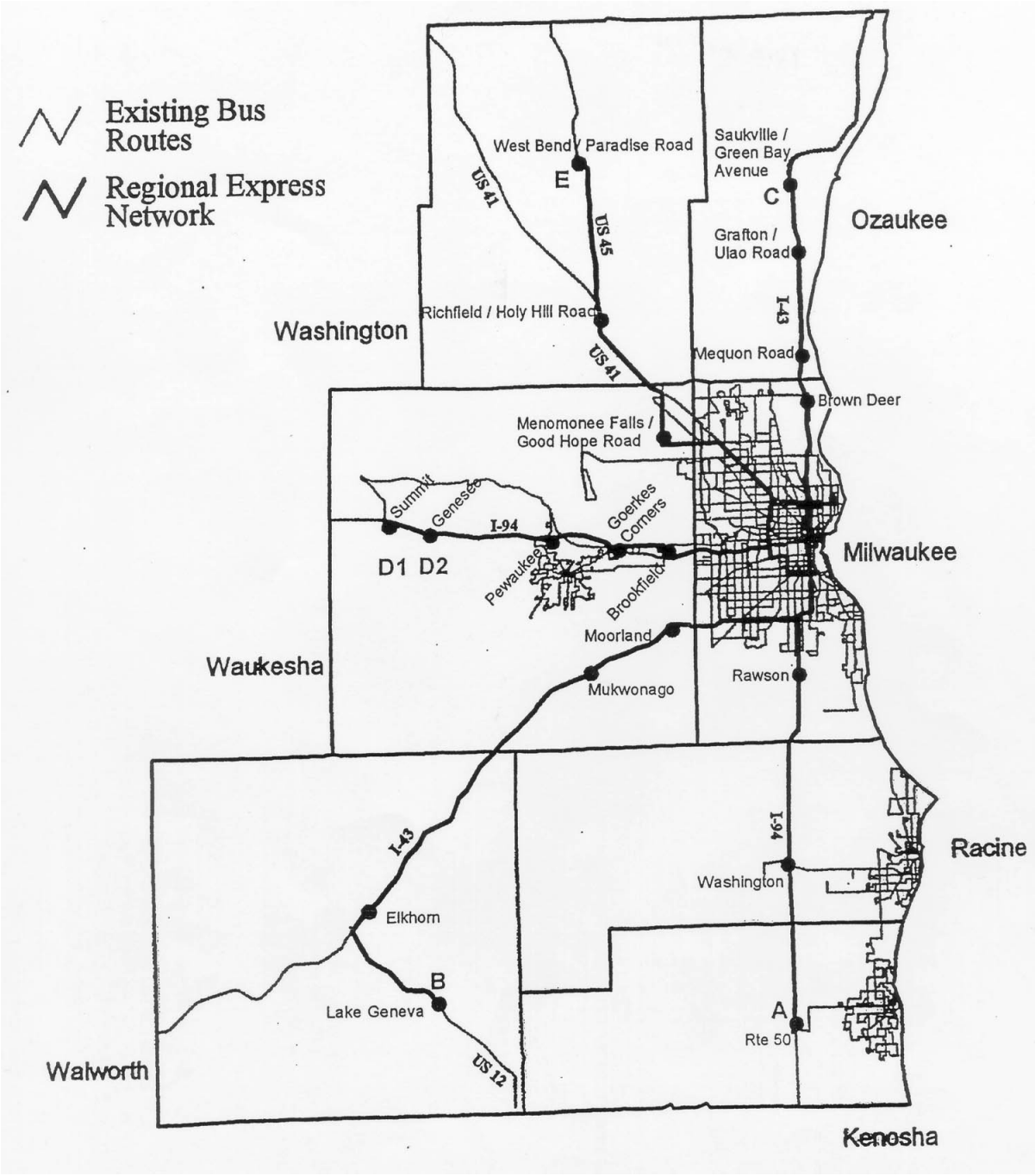


Exhibit 32: Recommended Service Alternatives III

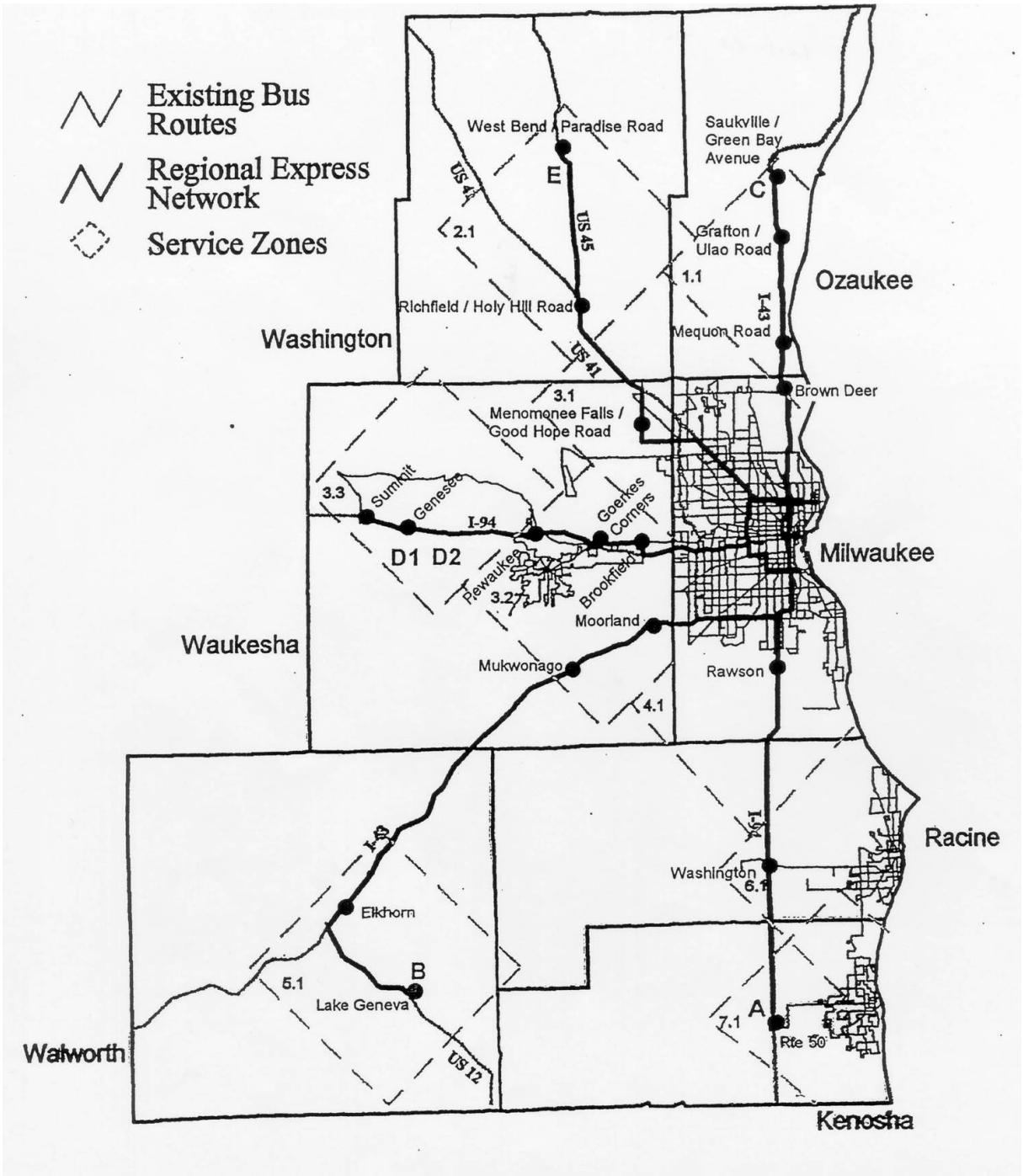
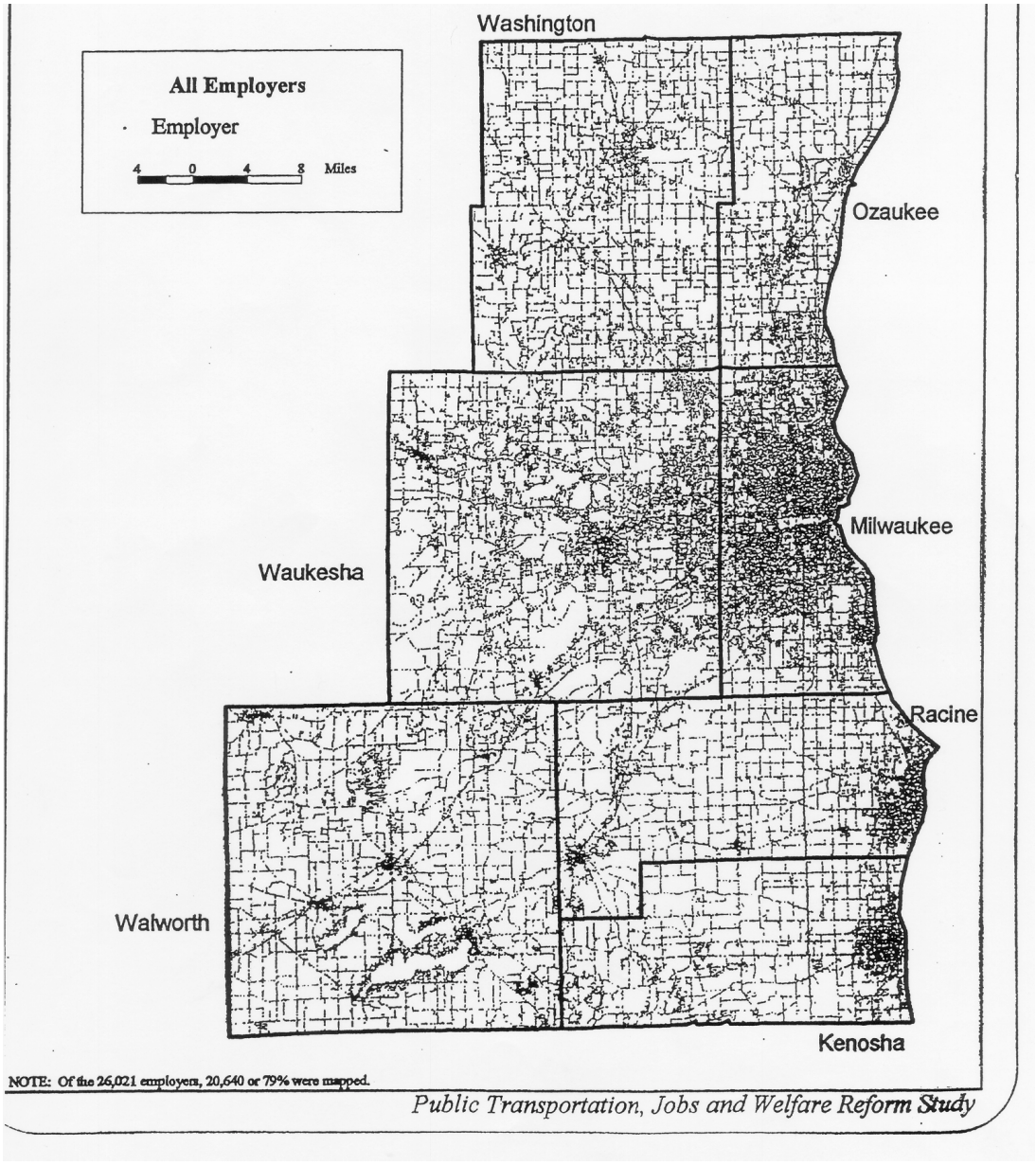


Exhibit 33: Geocoded Employers in the Milwaukee Area



Exploring Access to Transit in Orange County, California

The Orange County Transportation Authority (OCTA) used GIS to evaluate its transit services. The following issues were examined:

- Transit access among welfare clients;
- Proximity of welfare clients to training centers and potential jobs; and
- Transportation links between clients and jobs.

GIS was used to determine the number of welfare clients, job training centers and employment areas within ¼ mile walking distance of transit (see Exhibit 34). GIS programming (scripts) were used to join databases, to overlay layers, to update data attribute tables and to automate GIS procedures. User-friendly GIS, which may include such aids as customized front-end screens and other graphical user interfaces (GUIs), were used to help staff not trained in GIS to use the data effectively.

Geographic layers were presented in combination with other layers for research and planning efforts. For example, OCTA displayed areas with transit accessibility together with welfare client residences; accessible client locations were shown with city boundaries to create summary data by city.

OCTA also used the transit routes and client residences to examine the number of routes available to individual clients during certain time periods. Exhibit 35, demonstrates how OCTA used travel distances to measure the number of clients that live within 3, 5 and 7 miles of particular employment centers.

OCTA utilized several GIS functions during the course of this analysis, including the following:

- Geocoding, which was used to geographically locate welfare client addresses;
- Spatial overlays, which were used to determine which job centers and clients are within ¼ mile of a bus stop; and
- Distance functions, which were used to measure a ¼ mile walking distance from all bus stops.

GIS was useful in examining the number of routes within walk distance of an individual client; and in updating route attribute tables (such as headway). GIS was also used in this project to conclude that 66 percent of Orange County welfare clients live within ¼ mile of a transit route (see Exhibit 36). Furthermore, as shown in Exhibit 37, 63 of the 87 job training centers are with 1/3 mile of transit and all 16 employment centers are served by transit. Finally, approximately 30 percent of clients have more than one route option.

Exhibit 34: Welfare Clients Inside and Outside of 1/4 Mile Transit Band

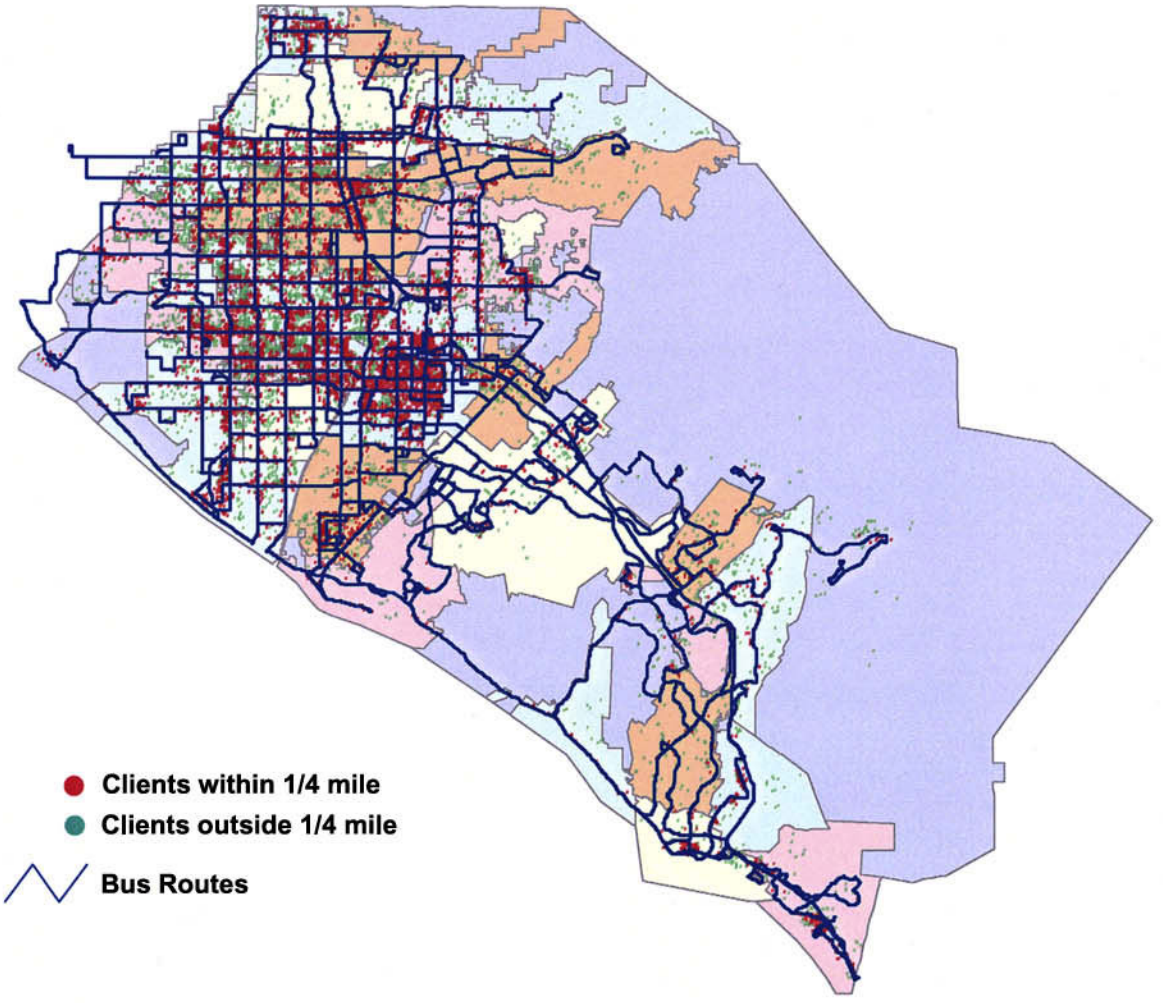


Exhibit 35: The Number of Clients that Live Within 3, 5 and 7 Miles of Particular Employment Centers

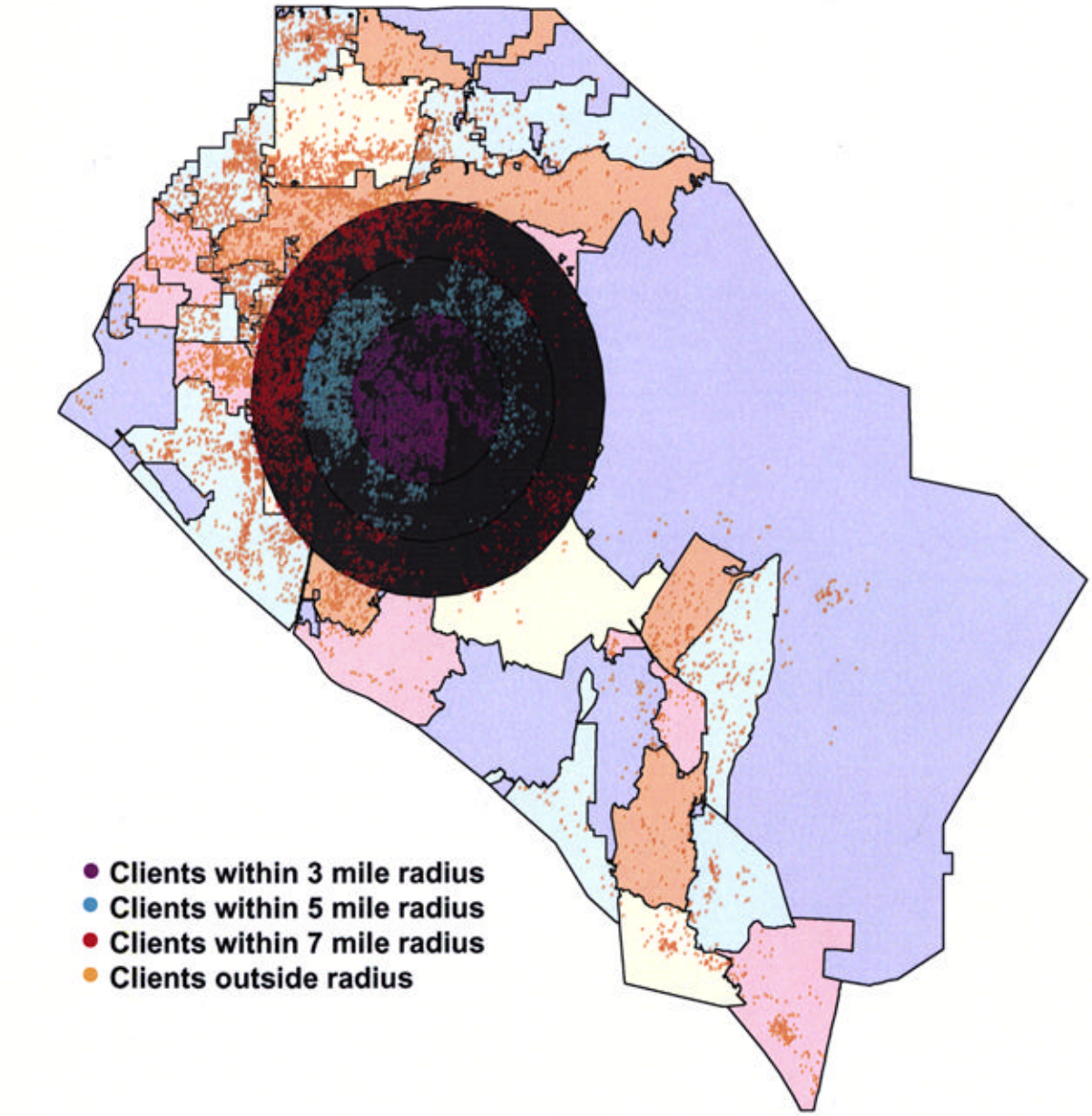


Exhibit 36: Client Access to Transit by Community

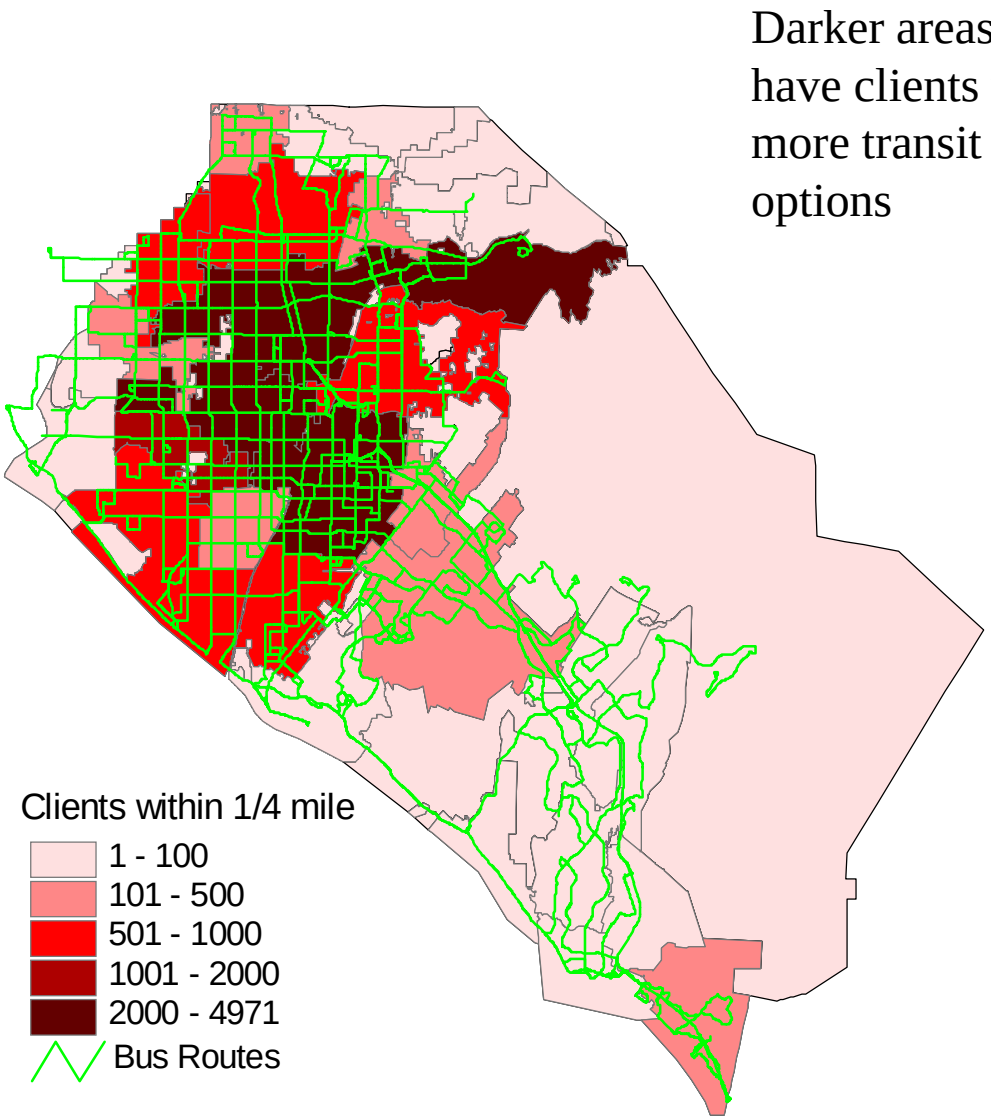
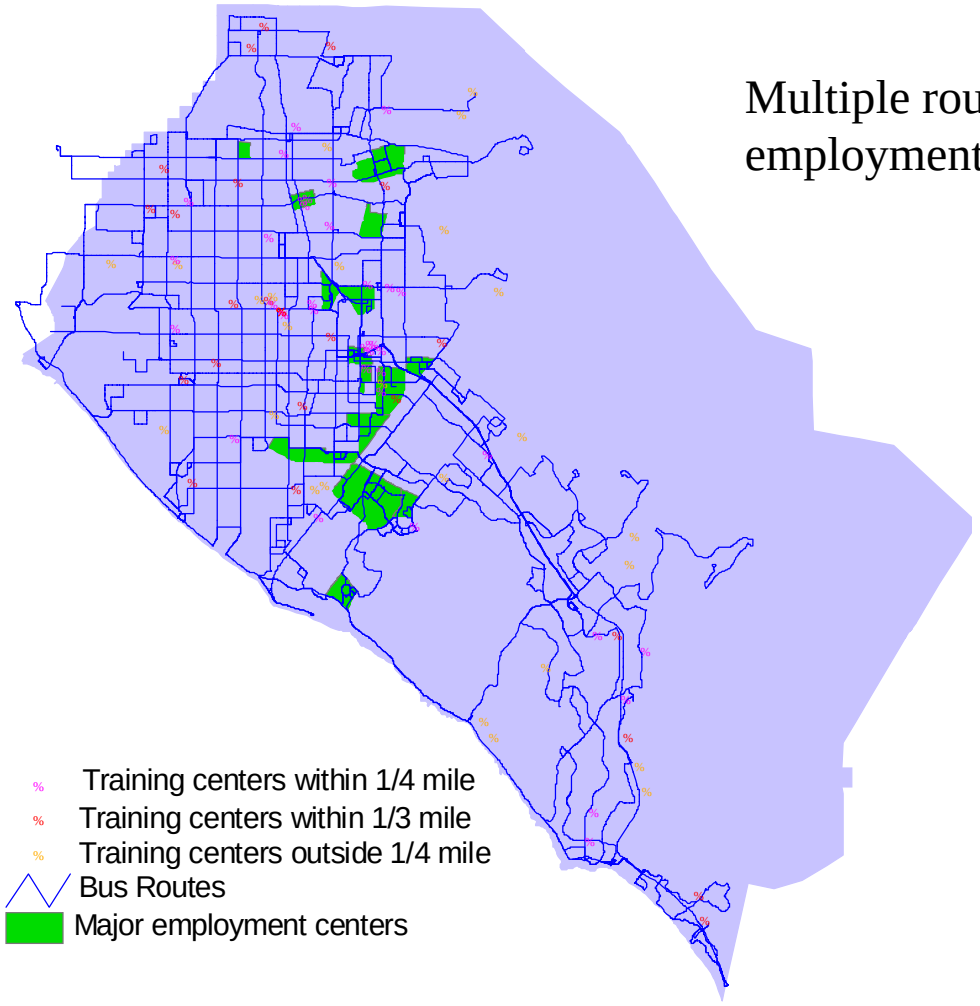


Exhibit 37: Employment Sites with Transit Access



Multiple routes serve employment centers

Restructuring Mobility Action Plan (ReMap) Project in Syracuse, New York

The Central New York Regional Transportation Authority (Centro) is developing a transportation restructuring plan for Onondaga County, which includes Syracuse, New York. The ReMap Plan will include recommendations for improved transit and paratransit services in the county as well as recommendations for improved coordination and a financial plan to support the improvements. One element of the study included an analysis of mobility needs, including the spatial mismatch between welfare recipients and jobs. The study also included an evaluation of the performance and efficiency of existing transportation services.

GIS was used extensively to define areas with mobility needs. Exhibit 38 highlights particular neighborhoods characterized by high demand for transit services. The analysis used 1990 census block-group level demographic characteristics to quantify transit need[3].

GIS was also used to demonstrate and quantify the location of welfare recipients, placement sites and work experience sites, and their proximity to fixed route transit services. GIS was used to identify gaps in transit service coverage by time of day, and to identify opportunities for improved transit connections for weekdays, Saturdays, and Sundays. Exhibit 39 shows how GIS was used to illustrate the transit accessibility of welfare clients, placement sites and work experience sites during the evening period. While over 97 percent of Onondaga County welfare clients and 99 percent of placement and work experience sites are within 1/2 mile of a Centro bus route during peak periods, only 88 percent of welfare clients and 86 percent of placement sites are near a bus route that operates in the evening. Visualization of spatial mismatches and gaps in existing transit service helped to determine instances for using fixed route transit versus other options and modes.

The welfare-to-work analysis completed for this project included the locations of welfare clients, placement sites and work experience sites beyond ¼ and ½ mile of a Centro fixed bus route. GIS was used to locate the distance between specific placement sites or work experience sites and any Centro fixed route. Since transit service varies over time, this analysis was completed for weekdays, weeknights, Saturdays and Sundays. Bands were used to help locate these coverage deficiencies. Bands identified the number or percent of welfare recipients, placement sites and work experience sites within and beyond a walk-distance of a Centro fixed route bus. An inventory of existing transportation displaying all fixed route bus, private carriers bus, rail service and other transportation was provided for the county. Other GIS functions used in the analysis included thematic mapping of demographic characteristics, selections of subsets of data, including selections based on distance, desire lines to illustrate the movement of commuters

[3] Transit need is based on population density, and percentage of seniors, low income households, households with zero vehicles, and persons with mobility limitations within each block group.

between traffic analysis zones and districts, and a districting function to aggregate traffic analysis zones into larger geographic units to facilitate analysis of CTPP data.

There were some data-related delays and concerns that occurred during the course of the project. It took several months to get approval for the release of welfare client information due to confidentiality concerns. Removing name and address information from the data points eased this concern. There was no data available on job opportunities for welfare to work employees. As a proxy, job placement and work experience sites from the past and large employers in the county were used.

Exhibit 38: Summary of Transit Need in Onondaga County

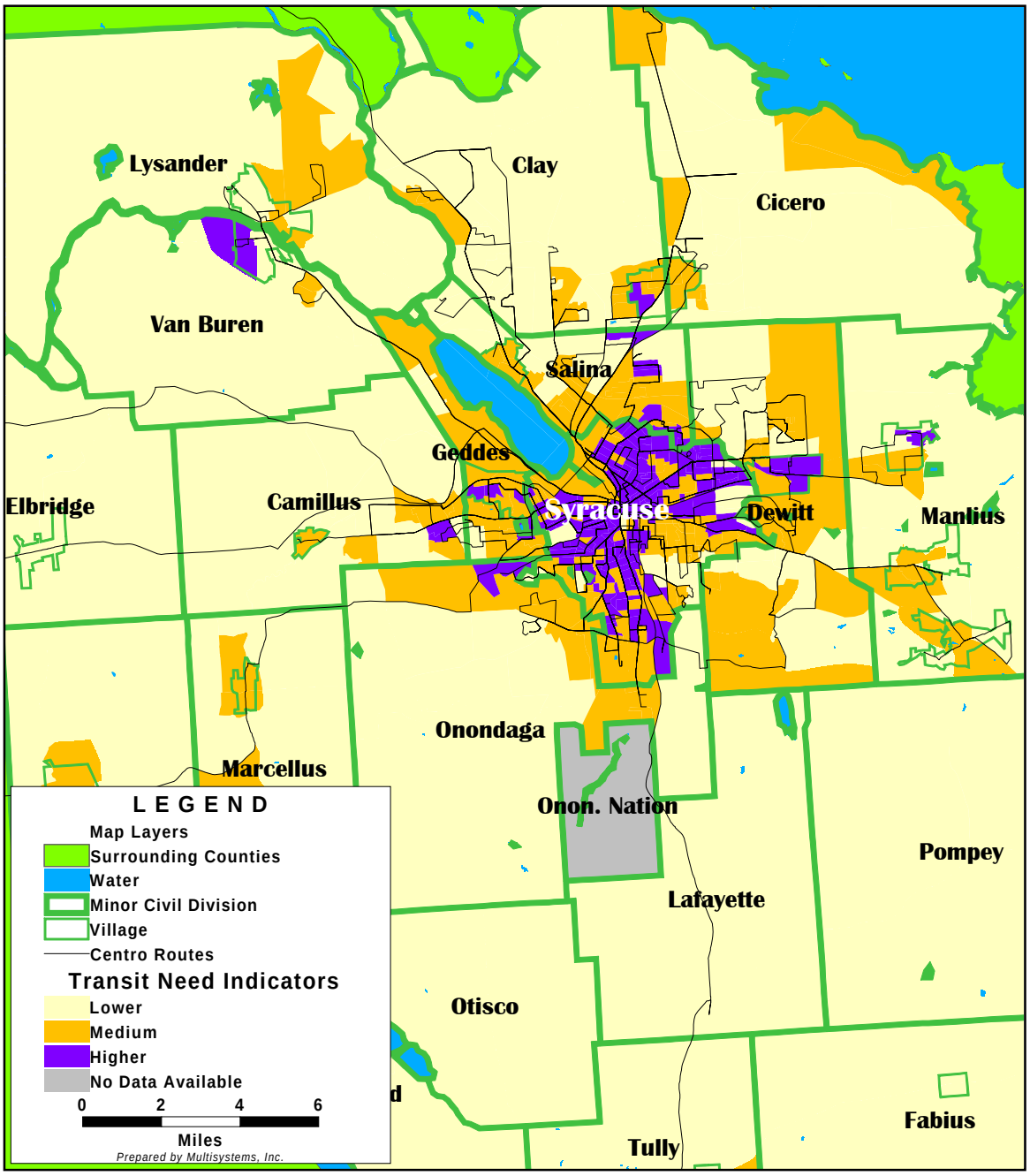
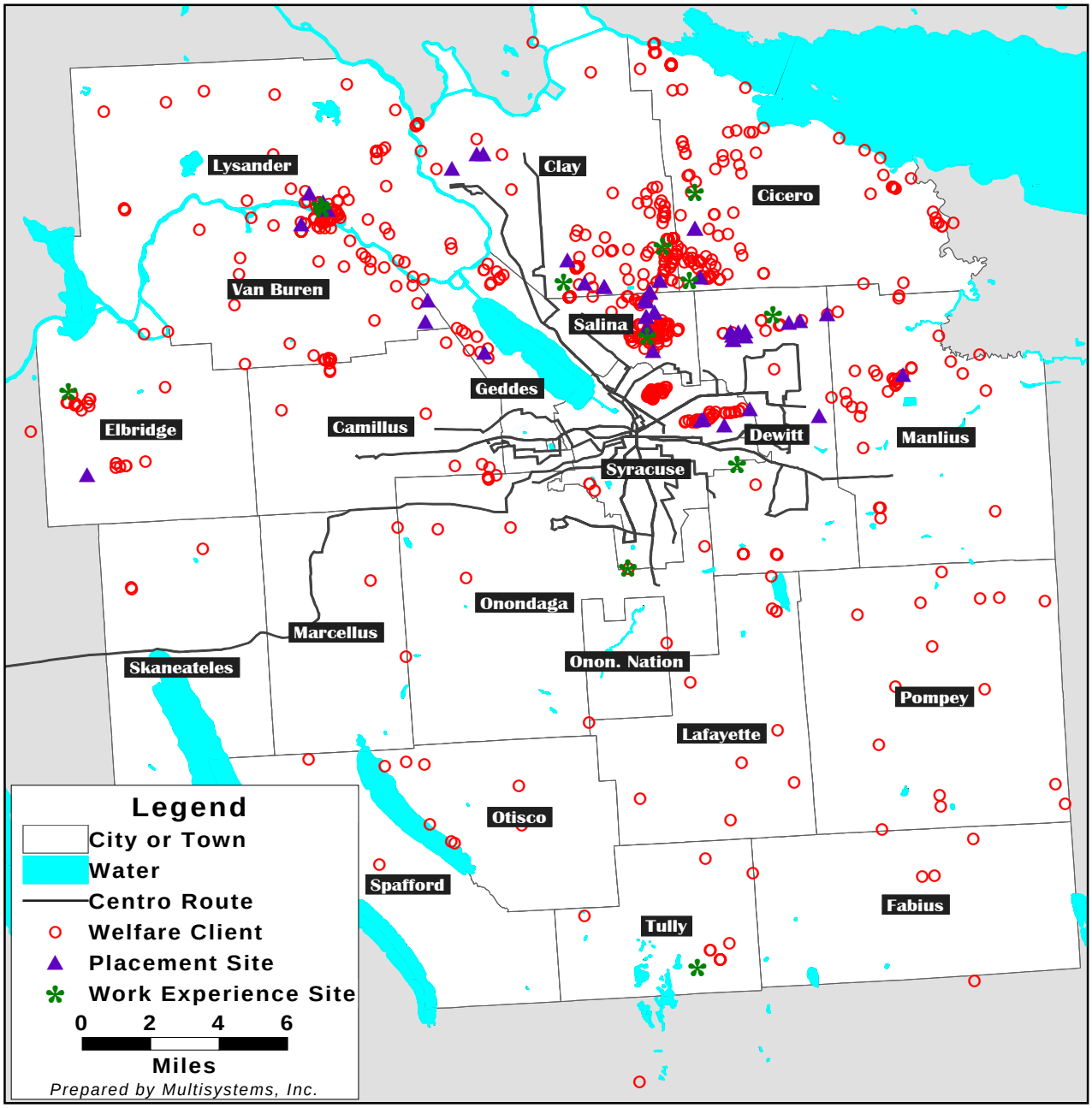


Exhibit 39: Welfare Clients, Placement Sites and Work Experience Sites Beyond 1/2 Mile of an Evening Service CentroBus Route



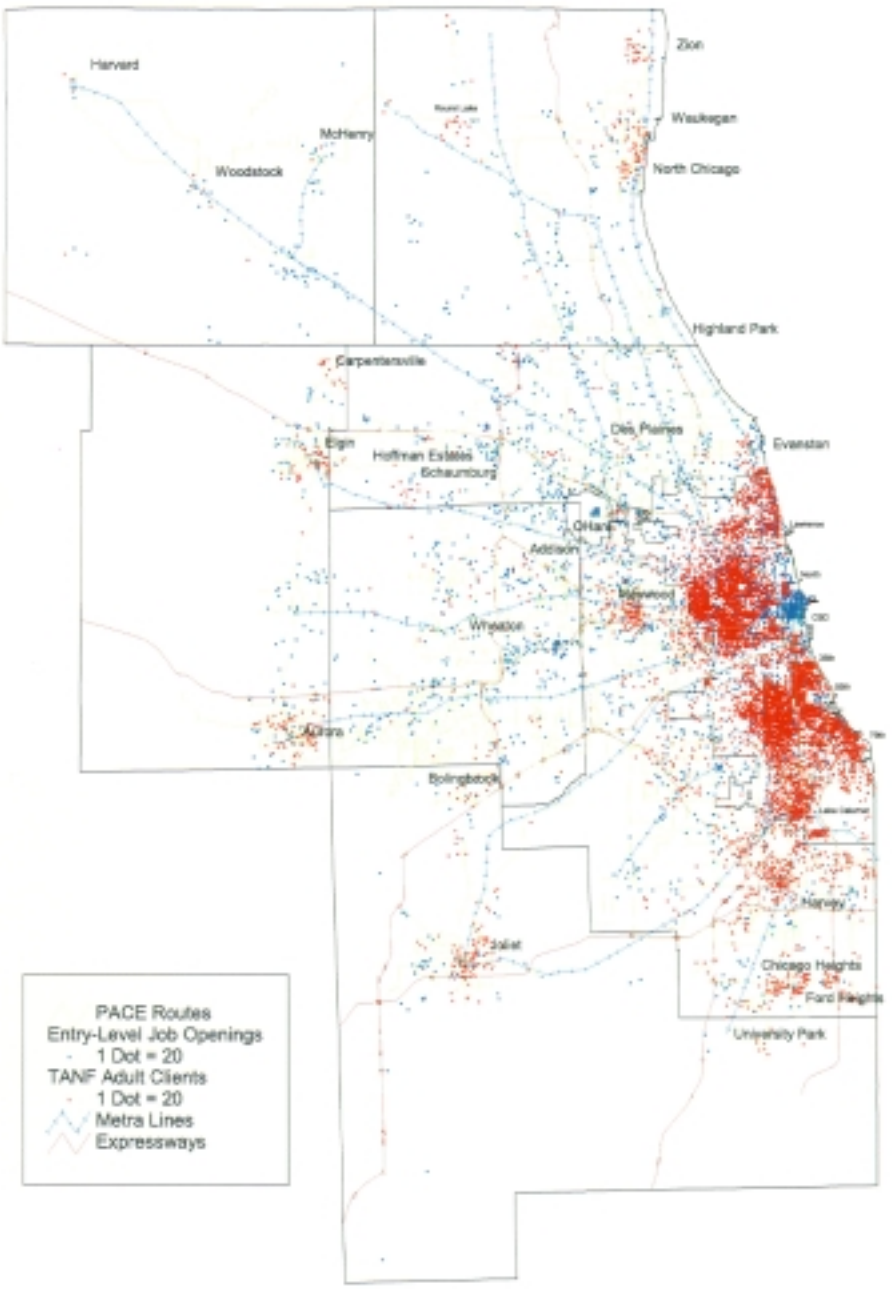
GIS and Welfare to Work in the Chicago, Illinois, Area

The Urban Transportation Center at the University of Illinois at Chicago, in conjunction with Pace Suburban Bus Lines and the Illinois Department of Human Services, collected and analyzed welfare client data in the Chicago area. GIS was used for data management, data analysis and display purposes. This project involved several GIS software systems strictly for mapping purposes and a custom gravity model on a super computer for data processing.

Several GIS layers were collected and mapped, including location of welfare clients living in the six-county Chicago area, entry-level job sites (estimated using employer information from the Illinois Department of Employment Security) and transit travel times. (See Exhibit 40) All the data was analyzed in a gravity model to identify the major street corridors where origins (welfare clients) and destinations (job locations) were clustered. Service modifications and additional need for transit services were determined from this GIS analysis.

Child-care data was not collected nor analyzed during the course of this study, which was considered a limitation. In the future, child-care and job training facilities will be geocoded and added to the analysis. As work will be continuing on this project, there will be a need to frequently update the data in the future.

Exhibit 40: TANF Adult Clients and Entry Level Job Openings



Trip Planner: Internet Based for GIS and Welfare to Work in Worcester, Massachusetts (WRTA)

A trip planner for the Worcester area is under development. The project began with an intensive data collection effort by the Central Massachusetts Regional Planning Commission (CMRPC). Information on welfare recipients, transit routes, employment sites and child-care centers were collected and geocoded. CMRPC staff also collected Worcester Regional Transit Authority (WRTA) bus stop data using Global Positioning Systems (GPS) technology. After the data was collected, it was determined that the data would be maintained in-house (at CMRPC) in hopes of minimizing the cost of purchasing and running a trip planner. Hoping to maximize usage of the trip planner, organizers discussed options including the purchase of an Internet version. It is hoped that the Worcester Internet trip planner, using GIS capabilities, would be used by a wide variety of individuals (case workers, employers, job seekers, etc.) to interactively plan transit trips from an origin to a final destination. The underlying GIS system is still undetermined; however, the organizers have used the Detroit Internet trip planner (described earlier in this chapter) as a possible model approach.

Initially it was perceived that the Internet version might be more cost effective since it required the purchase of only one GIS license, as opposed to site licenses for each desktop. However, the cost of an Internet Service Provider (ISP), which would have to maintain the GIS files on its domain, can become costly. While there were additional fees charged by the ISP and unexpected GIS Internet licensing costs, data and maintenance costs were minimized since the data is to be updated in-house (rather than contracting data maintenance to an outside organization).

Organizers planned to first sell the idea of investing in an Internet trip planner not only to help transition welfare recipients into jobs, but later to expand into other arenas. For example, seniors, persons with disabilities, students, tourists, and the general public would be able to access the trip planner over the Internet on any personal computer or at kiosks located at designated locations throughout WRTA's service area. The trip planner would be user-friendly, requiring minimal GIS and general computer knowledge.

Rural GIS Demonstration Program in Chautauqua County, New York

The Chatauqua Area Rural Transportation System (CARTS), in upstate New York, developed a demonstration program to determine the effectiveness and utility of applying GIS technology to rural transit operations in New York State. GIS analysis was used to display various databases in order to visualize the location of welfare recipients, employment sites and transit services.

Several GIS functions were considered for use in this demonstration. These applications included buffering of bus routes and stops, making basic queries of employment and other data, and selecting sets of data. This analysis included examination of transit access to targeted employers, and calculation of the number of employers and child care centers within a ¼ mile of fixed route bus service.

The demonstration found that 743 out of 817 "mandatory employable" DSS recipients lived within ¼ mile of a fixed bus route, with 74 clients unable to conveniently access the CARTS system. It was also determined that 1,047 out of 1,520 service and retail employers in the county are within ¼ mile of a fixed bus route, but only 69 percent of the total are served by CARTS between 8:00 a.m. and 9:00 a.m. Further analysis needs to be undertaken to ensure that CARTS service times are adequate to get TANF clients to job sites and day care. Employers' hours of operations and shift times need to be documented to see if these times coincide with transit service.

There were several benefits gained from using GIS for this application. The ability to visually locate clients in relation to existing transit allowed caseworkers to recommend service modifications. GIS allowed "what-if" analysis of bus routes; this type of analysis would be difficult to undertake manually. Another benefit of using GIS for this application is the ability to see spatial mismatches of clients to childcare and jobs, and to acknowledge gaps in existing transit services.

Some challenges were uncovered by this demonstration project as well. First, confidentiality of clients was a concern, so social service data needed to be modified by removing the names of welfare clients from the database. Another concern centered around the geographic accuracy and utility of available address data. Some of the addresses were post office boxes or rural route addresses that do not contain house numbers or street addresses and therefore could not be geocoded along the street network. To maintain their value, these addresses were geocoded to the centroid (center) of the zip code in which they fell. This technique, however, generalized the data and prevented certain subsequent analysis of clients (such as whether they live near a bus route). Third, the quality of TIGER street geography became a concern. During the geocoding process, addresses were able to be geocoded t the original census TIGER files only about 50 percent of the time. To improve the "hit rate" of addresses during the geocoding process, a cleaned-up version of the TIGER files (Dynamap 2000) was purchased. About 90 percent of the addresses were located on the Dynamap 2000 street file.

The experiences and findings in Chautauqua can be replicated in other rural areas to validate/improve transit systems, as well as to provide benefits for agencies whose clients use public transit. Each agency that participated benefited by learning more about its data and client locations. The GIS data has also been useful in joint efforts with the Department of Social Services and Welfare-to-Work.

The project resulted in a subsequent study for a countywide GIS based system. The continued success of any GIS requires the dedication of staff and resources to maintain the data and continue to use it for analysis. Possible solutions include enhanced partnering at the local level – each agency would maintain its own data and provide it to a central location to be incorporated into a GIS.

GIS and Welfare to Work in Albuquerque, New Mexico

As welfare changes occurred, planners in Bernalillo County, New Mexico, conducted several surveys to gain a better understanding of the local issues associated with transitioning persons from welfare to work. A transit needs assessment was completed in 1997.

One of the surveys, which was distributed to entry-level employers, gathered information about shift times as well as general concerns about transportation accessibility. Another survey, which was distributed to 500 welfare recipients focusing on transportation needs, included questions about their access to a private vehicle and the importance they place on public transportation to obtaining a job. These studies and surveys were used during follow-up GIS analysis to help plan for welfare-to-work transportation.

GIS was used for the following purposes:

- To display the employment locations, Head Start and day-care sites and welfare recipients;
- To display the residences of persons who did and did not have access to fixed-route transit services provided by SunTran, (the local transit provider); and
- To display the number of clients residing within ¼ mile of a fixed route bus stop.

By mapping data, GIS provided insight that helped to determine transportation needs and helped establish welfare-to-work transportation. For example, pockets of poverty were discovered in places that had been overlooked (and did not appear in older census data). The ability to visualize data highlighted transit problems and opportunities and helped plan for the reallocation of existing resources to improve public transportation services.

There were some challenges associated with this study. For example, it took six months to get approval for the release of welfare client information due to confidentiality concerns. Second, it was time-consuming to contact all the different agencies to gather information. Also, while data from Head Start and senior centers was in good form and easy to geocode, the process of formatting some of the data was cumbersome. Once formatted, however, it took less than a day to geocode 90 percent of the records.

GIS and Welfare to Work in St. Mary's County, Maryland

The St. Mary's County Department of Social Services (DSS) in collaboration with the KFH Group (a consulting firm in Bethesda, Maryland) used GIS mapping software to examine employment opportunities among those persons living within ¼ and ½ mile of a fixed route bus. DSS caseworkers also use GIS to visualize where the majority of their public assistance recipients lived and to locate potential jobs accessible via public transit.

By using GIS, the DSS was able to create a geographic portrait of welfare recipients and available jobs. The following analyses were completed by DSS personnel, who noted that a similar process could be undertaken elsewhere:

- A database of current addresses of welfare recipients was created. The database also contained useful attribute information, such as a coding scheme to identify single teenage mothers.
- Client addresses were geocoded.
- Databases important to welfare reform, such as lists of employment and child-care sites, were created.
- Employment and child-care locations were geocoded.
- A database of transit services, which included routes and service areas, was created.

After data was created, it was used for various planning applications, such as:

- A comparison of the geocoded point data with existing public transportation routes (to identify when transit could be used and where gaps in service existed);
- Analysis of where new transit service should be targeted to meet the needs of welfare recipients; and
- Analysis of the location of day-care and other support services that may become part of the overall trip.

GIS was used to determine that a large percentage of the County's population lived in close proximity to a major employment center that included many large public and private employers. GIS was used to see spatial patterns, which was subsequently used to help design the most effective transit routes. Transit and service hours were extended to meet the needs of the employers and potential employees traveling to the center.

Another application focused on mapping the residences of teenage mothers and the ages of their children. Maps showing the distribution of children by age (such as less than three years old, three to five years old and school-aged children) were created to help tailor appropriate social programs.

Some of the functions used during the course of this study included thematic mapping of demographic characteristics and geocoding of welfare residences, employment sites and child-care locations. Another GIS function used was the creation of customized polygons. A series of

polygons were created ("transit need area database") to represent areas with minimal transit service but where a significant number of welfare residents resided and/or employment opportunities existed. Also, transit routes were banded. Banding (or buffering) routines were performed on the fixed bus routes for ¼ and ½ mile increments. This was used to determine how many people, jobs or child-care facilities fell within the given walk distances of public transportation services. The transit routes were also exported to a line database to be used in a lower-end GIS.

Several data-related issues were encountered during the course of this study. One main problem dealt with the address information provided. Many of the addresses were post office boxes, which will not geocode to an address-ranged street network. Also, the street data was provided by 1990 census data, and was not updated. Addresses in newly developed neighborhoods, therefore, could not be geocoded during the address matching process. Since St. Mary's County is currently implementing a 9-1-1 address system, address matching may be improved in the future.

Welfare to Work in Delaware County, Pennsylvania

The Delaware County Planning Department used GIS as a tool to examine the spatial relationships at the census tract level between areas with concentrations of welfare recipients and areas with concentrations of employment. Corridors that connected concentrations of recipients with concentrations of employment, but were not served by fixed route transit, were identified as transit options for those tracts currently unserved were examined. Maps created in GIS helped assess each route's potential utility by illustrating how well it would serve specific tracts.

GIS was also used to identify relationships between various geographic features. Before the County used a GIS, data was available only in tabular format. The ability to view data graphically provided planners with a different perspective.

The project had a few difficulties. Since a database showing transit coverage of the study area was unavailable, the Planning Department utilized PENNDOT's local road database to create the coverage based on a hard copy map. Also the accuracy of employment centers, major destinations, properties that were difficult to locate, and poor address data were difficulties encountered during the course of this study.

Welfare to Work Transportation Plan, Akron, Ohio

The Ohio Works First (OWF) legislation, signed in 1997, requires individual counties to develop a transportation plan to help transition former welfare clients into the workforce. In compliance of the OWF legislation, the Summit County Department of Human Services (DHS) contracted with the METRO Regional Transit Authority to write the transportation plan. In addition to the DHS and METRO, various agencies were involved in the plan's development, including additional transportation providers, DHS clients, employer focus groups, and other local officials.

One of the first steps in the plan's development was to ascertain the mobility needs of clients receiving public assistance. GIS was used to provide the mapping and technical skills required to complete the plan.

It was recommended that assessing the transportation needs of clients become part of the client intake process. In addition to transportation needs, clients should be assessed for financial and child-care needs, as well as the skills they have to offer. Should it be determined that a transportation need exists (that the client does not have access to reliable personal transportation), a series of transportation alternatives are evaluated. The most logical transportation option is, of course, the public transit system. However, this is not an option for some clients. Therefore, a "menu" is proposed which would operate in a "flowchart" structure. If public transit is not feasible, the options would move to carpooling to vanpooling to subscription service/guaranteed ride and finally to car lease. Car lease would always be the final option.[4] Exhibit 41 illustrates the alternatives that could be available for a client without reliable personal transportation.

The Transportation Plan notes that other areas are affected by transportation, such as job training and day care. The plan notes that welfare reform is not just about changing individual behavior, but about changing institutional requirements.

[4] County of Summit Department of Human Services – Welfare Reform Transportation Plan, Page 8.

Exhibit 41
Chart of Transportation Alternatives

Alternative	Brief Description	Estimated Annual Cost
Free Bus Pass	DHS entered into a contract with METRO to provide free fixed-route transit service to OWF clients on a six-month trial basis. Through 11/98, An average of over 1,100 daily trips taken by those individuals transitioning from welfare to work.	$250,000
Vanpool and Rideshare	Akron Metropolitan Area Transportation Study (AMATS) currently administers a program that uses origin and destination data to help form car and vanpools in a 14-county area of northeast Ohio. It is recommended that Summit County work with AMATS to form vanpools to serve OWF clients.	$140,370
Work & Child-care "Subscription Service"	Door-to-door transportation to serve clients work, child care or training trips. Client would be picked up at a predetermined location at a specific time, and transported directly to work or other activity. Approximately 1,270 clients may be able to use this service yielding over 320,000 annual trips. Several organizations have agreed to work with Summit county to transport OWF clients.	$3,238,000
Transportation Brokerage	Establishment of a single brokerage to facilitate the arrangement of all transportation. The transportation provider would vary, but clients would only have to call a "hotline" number, where a single point of contact would arrange all of their mobility needs.	$70,000 (one time cost)
Guaranteed Ride Home	The "hotline" number described above would allow clients access to transportation in emergency situations, such as a broken-down car, if they have to work overtime, or have to care for a sick child.	$240,000
Car Lease Program	Where mass transit is not feasible, options to help a client obtain an automobile may be considered as the final option. The cost per client of $3,000 makes it the least cost-effective option. The client should save toward the down payment and would be responsible for operating costs	$1,140,000