WiFi Deployment Selection using ArcIMS

by

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Abstract:

SBC Communications Inc. is a Fortune 500 company whose subsidiaries, operating under the SBC brand, provide a full range of voice, data, networking, e-business, directory publishing and advertising, and related services to businesses, consumers and other telecommunications providers. The increased interest in the latest technology has led SBC into the Wireless Networking, otherwise known as the WiFi provider business. To assist with the SBC deployment of WiFi Hot Spots, an ArcIMS application was created to support the alliance with a retail chain store in the Midwest states where SBC serves. The application gives the user the power to visualize telecommunications boundary data along with current SBC DSL customers, Wireless Networking customers, and Store Locations. The application enables the user to spatially analyze whether or not the alliance would be a good strategic business decision for SBC. This paper presents an overview of the application and the data processing methodology used to support the application.

Background and History:

SBC holds a 60 percent ownership interest in Cingular Wireless serving more than 24 million wireless customers. With over 169,000 employees, SBC operates in 31 States, has 54.6 million access lines and 17 million long distance lines in service. In 2003, SBC had a Net Income of $8.5 Billion. SBC companies provide high-speed DSL Internet access lines to more American consumers than any other provider and are among the nation's leading providers of Internet services with nearly 4 million in service. During the first quarter of 2004, SBC began offering Dish Network satellite service.

GIS has been integrated throughout all the businesses at SBC including Network, Marketing and Information Technology. The Marketing GIS group is composed of 5 individuals and use the ESRI suite of products. The department is utilized for various tasks and information concerning our customers, competition and increasing the sales revenue for the corporation.

One of the most recent requests the Marketing group has been involved with has been related to the advances in Wireless Fidelity Technology, or otherwise known as WiFi. WiFi offers Net access at speeds up to 11 megabits per second within zones of 100 to 300 feet from a transmitter. These zones are called hot spots where a customer can gain wireless access to the Internet from a devices such as a PC or PDA. Customers usually

pay an hourly, daily or monthly connection fee of $19.95 which grants them unlimited access to the Internet at any location serviced by a WiFi provider. WiFi providers typically sign contracts with existing establishments to deploy a WiFi Hot Spot at their location. In March, SBC announced WiFi will be deployed to over 3,000 UPS Stores. In early June of this year, SBC partnered with Wayport Inc. to establish WiFi hot spots at McDonald's restaurants. By June 14th, the company had deployed a total of 1,251 WiFi hot spot locations.

Project Goal:

Identifying appropriate locations for the deployment of WiFi Hot Spots was conducted with the assistance of GIS. Like other providers, WiFi Hot Spots have been typically deployed in businesses where the general public has access such as in cafés, hotels or bookstores.

During the summer of 2003, SBC was working with a chain of stores and trying to determine if the location would be a profitable business venture for SBC. Senior management knew the basic facts but did not know how it related to the current SBC network. This analysis was conducted by the Marketing GIS group. It was assumed people will be willing to travel within to 5 miles to shop and use the WiFi network.

The following questions were asked by the WiFi team:

- "Are the residents in the area likely to use WiFi outside of their home"?
- "Where are the Current SBC DSL customers?"
- "How Convenient are the locations to travelers and existing SBC customers?"
- "What are the demographics of the residents within the Store L ocations?"

Project Design:

The tools used for the analysis included ESRI ArcGIS 8.3, ArcIMS 4.0.1, and Claritas iMARK with Convergence Audit Survey Profiles. Several sources of data were used in the analysis. Streets, zip codes, and wire centers were provided by GDT. Businesses locations were provided by Claritas Business Facts and the SBC DSL and wireless networking customer data was internally sourced.

The store locations were identified and a shape file was created from Claritas' Business Facts data. Using ArcGIS 8.3, the data was assembled and a 5 Mile Buffer was created from the store locations using the Geoprocessing Wizard in ArcGIS. Using the 5 Mile Buffer Radius, the shape file was imported into the Claritas iMARK application and demographics were calculated based on the layer. Index scores were created for the following profiles and appended to the Store Locations and 5 Mile Buffer shape files.

- Has PDA
- Has 2+ computers
- Has broadband
- Brings work laptop home
- Has wireless phone
- Has Internet through wireless phone
- 2002 Population
- Percent Pop Growth Estimated 2002 to Projected 2007
- 2002 Households
- Percent Household Growth Estimated 2002 to Projected 2007
- 2002 Estimated Average Household Income
- 2002 Estimated Average Age

A list was obtained of all SBC Consumer and Business DSL customers as well as customers of the 2Wire Wireless home networking product. It was assumed customers which had wireless at home are likely to use a WiFi Hot Spot. The raw customer data was assembled and geo-coded using Mapmarker.

The SBC data was selected spatially from within each 5 Mile Buffer and the totals were calculated for each Layer. Of the 154 stores 125 stores were identified as being within SBC's territory using GDT's wire center boundaries. The Claritas Zip Code demographic data was joined to the GDT Zip Code data and displayed in a color ramp according to their propensity to use WiFi. (see Figure 1) This data was provided to the WiFi team in an Excel table for their analysis.

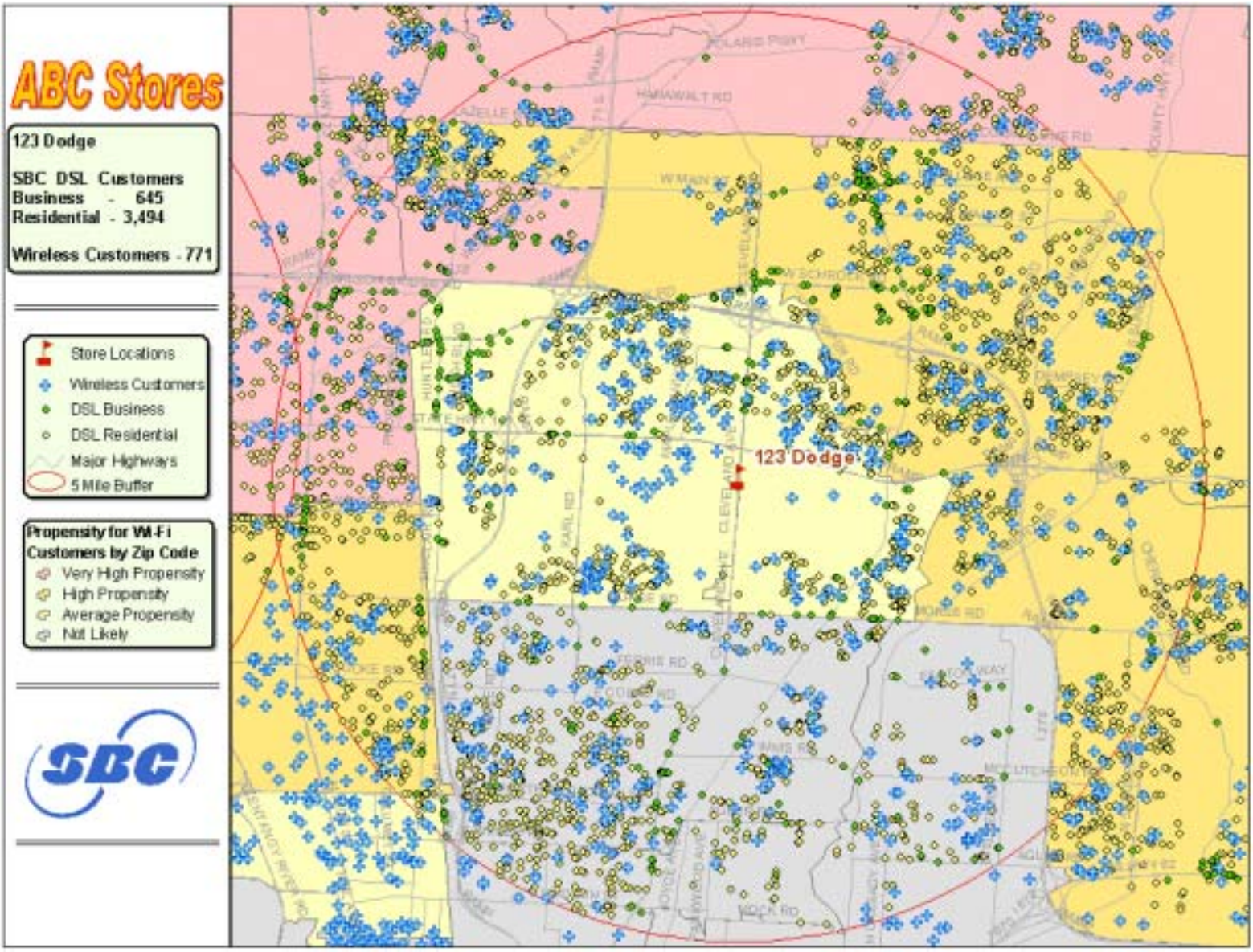

Figure 1: ArcGIS map

Using Claritas's iMARK application and Convergence Audit Survey Profiles, zip codes were ranked by their propensity to use WiFi outside of home or work. An index score was also calculated by zip code.

Additional reports (Figures 2-3) and graphs (Figures 4-5) were created based on the spatial and demographic information. The data was calculated based on the 5 mile radiuses of each store location. An index score of 100 is average and anything higher than 100 indicates there is a higher propensity to own or use the product. The information was provided to the WiFi team for further analysis of the business case.

Selected Profile Indices for 5 mile Radii around stores

Black Text - not within 5 Miles of a SBC Wire Center

Store ID	City	State	Has PDA	Has 2+ computers	Has broadband	Brings work laptop home	Has wireless phone	Has Internet through wireless phone
1	**Adrian**	**MI**	**68**	**85**	**77**	**75**	**93**	**91**
2	Ann Arbor	MI	161	132	141	168	111	100
3	Ann Arbor	MI	177	145	146	190	117	97
4	Auburn Hills	MI	122	118	122	129	108	109
5	Battle Creek	MI	76	86	91	76	93	99
6	Battle Creek	MI	80	92	94	83	95	97
7	Bay City	MI	70	85	87	71	93	92
8	Bay City	MI	66	80	84	65	91	91
9	Belleville	MI	111	109	115	114	105	103
10	Benton Harbor	MI	79	84	88	75	94	106

Figure 2: Sample of Claritas Profiled Indices

Selected Demographics for 5 mile Radii around stores

Black Text - not within 5 Miles of a SBC Wire Center

Store ID	City	State	2002 Pop	Percent Pop Growth Estimated 2002 to Proj 2007	2002 HH's	Percent HH Growth Estimated 2002 to Proj 2007	2002 Estimated Average HH Income	2002 Estimated Average Age
1	**Adrian**	**MI**	**37,195**	**2.60%**	**12,956**	**5.28%**	**50,718**	**37**
2	Ann Arbor	MI	139,568	6.27%	55,519	8.08%	80,839	33
3	Ann Arbor	MI	56,080	5.21%	23,692	6.64%	92,442	36
4	Auburn Hills	MI	122,673	3.93%	45,130	5.58%	76,035	34
5	Battle Creek	MI	69,754	-0.49%	28,068	0.13%	49,868	37
6	Battle Creek	MI	56,869	-0.23%	22,728	0.56%	53,998	37
7	Bay City	MI	70,787	-1.54%	29,223	0.50%	52,619	39
8	Bay City	MI	63,058	-1.46%	26,079	0.40%	49,398	39
9	Belleville	MI	78,725	2.93%	31,483	4.60%	63,892	34
10	Benton Harbor	MI	53,274	-0.16%	21,050	1.10%	53,448	37

Figure 3: Sample of Claritas Demographic Data

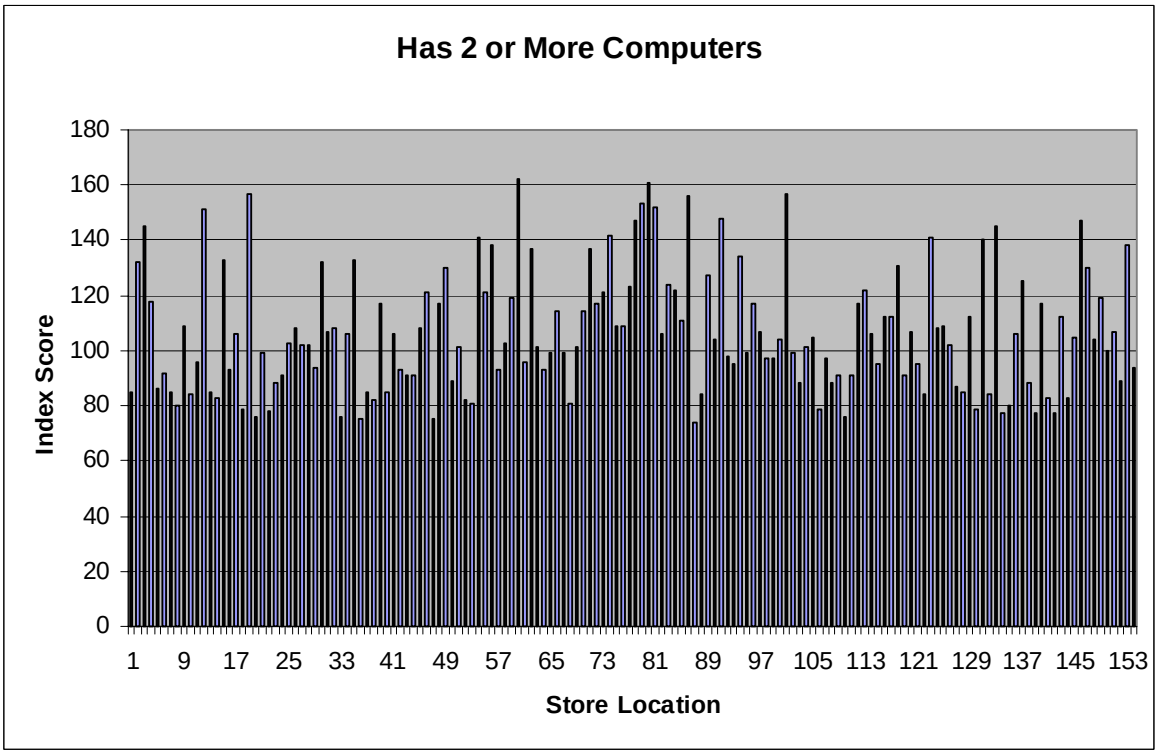

Figure 4: Index within 5 miles of Store Location

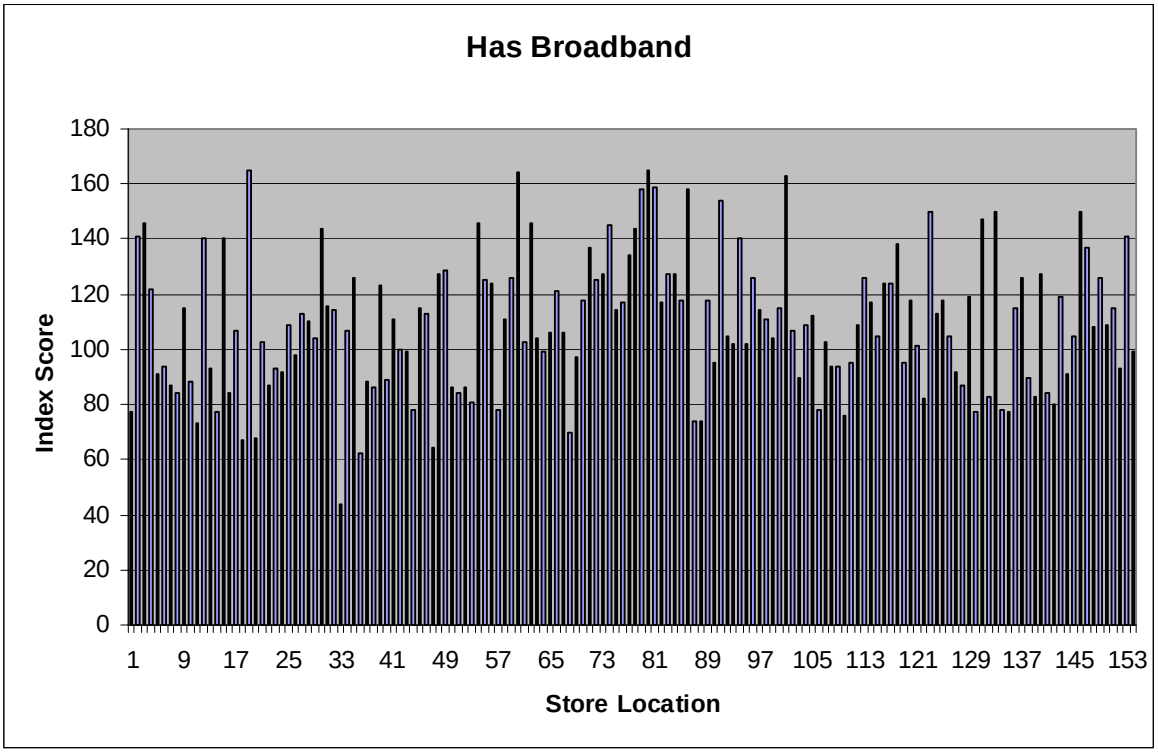

Figure 5: Index within 5 miles of Store Location

An ArcIMS application was then created to provide users the ability to see the stores in relation to existing customers and the propensity to use WiFi by zip code. The application was used by the WiFi team to conduct their own analysis and it gave them the ability to query the data. The team also used the application to build their own maps for presentations purposes.

An overview map provided the client with the ability to see where the stores were located in relation to other stores and if they were in or near SBC territory. (Figure 6) With the use of the application, the client could customize the map with various layers available. (Figure 7). Zooming in closer to the locations provides more detail about the locations and ability to query and see the results of the selected features. (Figure 8)

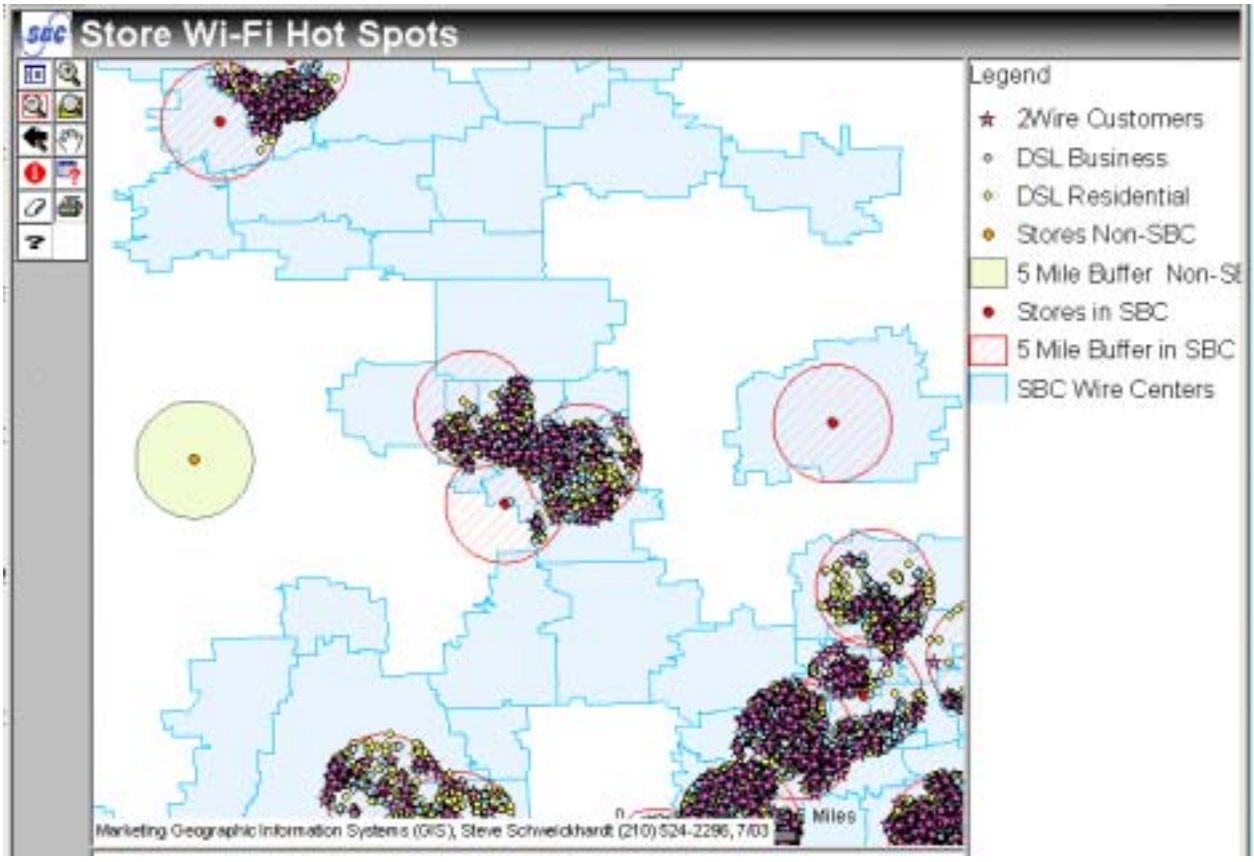

Figure 6: Area view of multiple store locations.

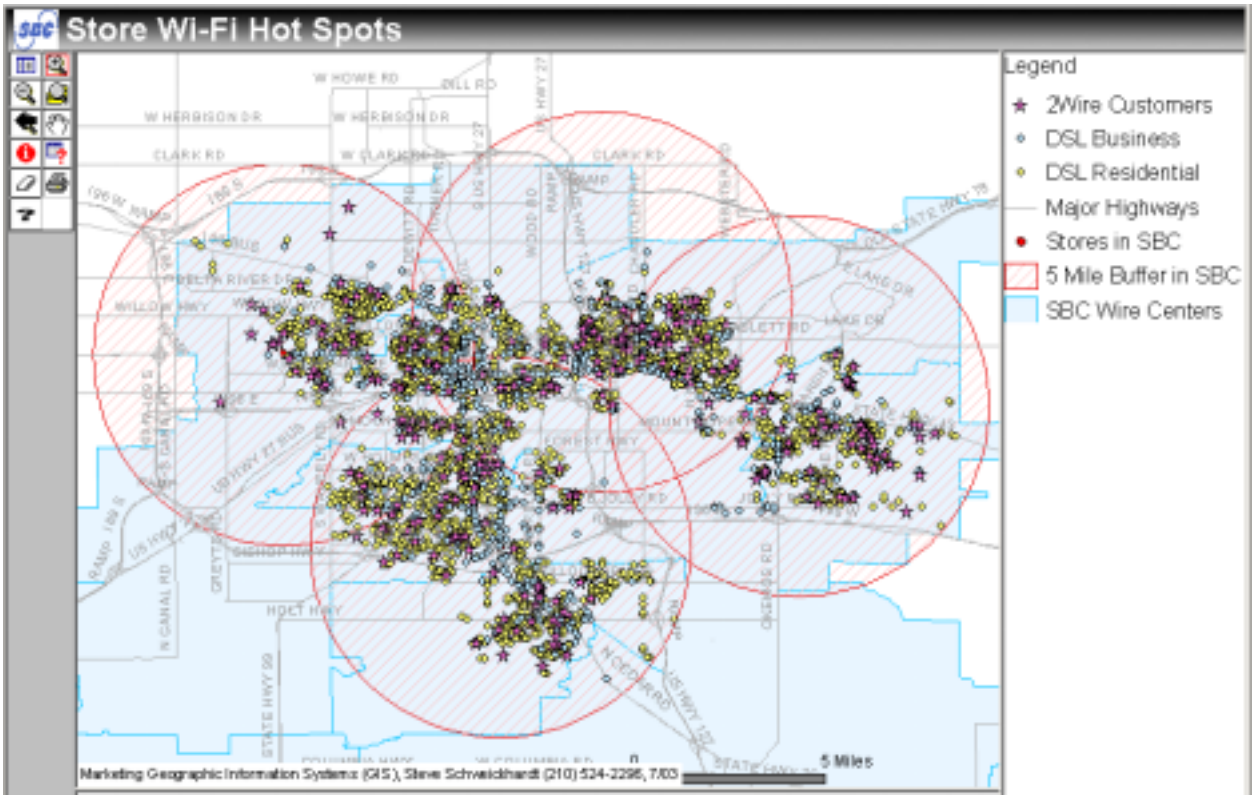

Figure 7: Close view of store location.

Query/Selection Results - Microsoft Internet Explorer provided by SBC Services

Stores in SBC

City	State	SBC BUS DSL	SBC RES DSL	Store ID	Has PDA	Has 2+ computers	Has broadband	Brings work laptop home	Has wireless phone	Has Internet through wireless phone	2002 Population	Percent Pop Growth Estimated 2002 to Proj 2007	2002 HH's	Percent HH Growth Estimated 2002 to Proj 2007	2002 Estimated Average HH Income	2002 Estimated Average Age	Number of 2 Wire Customers
Burton	MICHIGAN	275	845	13	76	85	93	73	94	106	153529	-0.01	62213	0	51325	35	70

5 Mile Buffer in SBC

Rec	Address	City	State	SBC BUS DSL	SBC RES DSL	Number of 2 Wire Customers
1		Burton	MICHIGAN	275	845	70

Figure 8: Data available on each store using the Identify tool

Results:

The application was a success and used by the clients during their analysis of the Business opportunity. It provided them with information that supported their model of where to deploy WiFi Hot Spots. The clients were very impressed by the powers of GIS. SBC was committed to signing a contract with the chain of stores but on the day of signing, the company had released information about their financial troubles. The company experienced a large downsizing and the contract was never signed due to lack of funds from the other party. This was a disappointment to the WiFi group but much was learned from the experience and also exposed GIS to another department within SBC. Since this project, the Marketing GIS group has become more instrumental with the WiFi initiatives of SBC such as the UPS stores deployment and McDonald's contract with Wayport Inc.

Quote from satisfied customer:

> ***"I just had a look at the maps on strategic stores you have made with GIS and "fantastic" is not a big enough word for it. GIS is a godly tool.***
>
> ***Your job is outstanding. With this in our hands the client will wonder why they didn't think about us before!"***

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