A 21st Century Plan for Connectivity

The City of Lansing, Michigan Comprehensive Telecommunications Plan

Prepared for the City of Lansing by Michigan State University, 2008

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Executive Summary

Within the United States, the number of wireless telephone subscribers has expanded to the current level of approximately 215 million (Kim, 2007). Evidently, as cellular phone use flourished, the supporting infrastructure's necessity has been established and is likely to prevail in the future. However, the industry's rapid growth has exceeded many local governments' capacity to respond to the cellular phone towers' impacts and, therefore, properly site and regulate them. Consequently, several localities have imposed hasty and reactionary regulations when confronted by residents, who express concern over the aesthetic and potential human health effects associated with towers (Kim, 2007). Because these conflicts often lead to expensive legal battles, local governments should strive to balance the wireless service demand and the residents' misgivings. Unfortunately, most local governments, including the City of Lansing, Michigan, are not equipped with an ordinance that specifically addresses cellular phone tower siting.

Therefore, in order to achieve this balance and comply with federal laws, a locality must reevaluate its current tower siting policies and, if necessary, establish new policies. This will require local governments to consider all grievances regarding the planning and development of new towers, and compromise with the wireless providers. For Lansing, and many other communities, reviewing and amending the local zoning ordinance is essential for satisfying the wireless industry and resident demands, and eliminating court challenges as well.

If the City demonstrates that it can fulfill most industry needs while maintaining the community's aesthetic character and health through a smooth tower siting process, its lease agreements may become more competitive against those from private firms. This may encourage the wireless carriers to locate their towers on public property, which would allow

Lansing to accomplish its coverage goals, and acquire the tower revenues. By doing this, Lansing may redirect its economic fate and offer the connected, high-tech lifestyle that today's cities require.

This Comprehensive Telecommunications Plan is intended to guide Lansing in preparing an innovative tower siting policy, which will address public concerns and complement City objectives. It will also refer to other localities' wireless placement policies in order to suggest effective methods for combating current obstacles. Through this process, Lansing may implement a sustainable strategy that fosters an adequate cellular phone service provision and preserves the community's quality of life. Ultimately, the Plan may enable Lansing to transition into the 21st Century with a connected infrastructure that may attract talented workers and knowledge-based industries, and bring prosperity to the area.

1. Introduction: Project Overview

1.1 Problem Description

While cellular phone towers may provide cities with opportunities for revenue generation, their placement often inspires significant controversy. In the City of Lansing, Michigan, tower projects are greeted with NIMBY (Not In My Backyard) reactions from the residents and approval from the City, which views the towers as a potentially profitable venture. Lansing initially planned to locate cellular phone towers on public land, including School District property, and acquire the revenues produced. However, the increased cellular phone service demand and the loss of School District support over time have enabled private developers to cash in on the demand for new towers. This process has led to a number of controversial land use proposals and costly legal battles, which have contributed to Lansing's present cellular service insufficiencies.

1.2 The Objective

Ideally, the City would like to implement a new cellular phone tower policy which would provide full wireless coverage to consumers, while channeling the potential revenues back to Lansing and protecting neighborhood character. This study is designed to assist the City in its endeavor by creating a Comprehensive Telecommunications Plan to facilitate cellular phone tower siting. The Plan analyzes Lansing's current tower placement challenges and offers strategies for accommodating the greater wireless service demand, and becoming more competitive against the private sector. At the same time, the Plan's recommendations will be consistent with federal and city regulations, and complement public interests regarding aesthetics, health concerns, and tower placement externalities.

1.3 Methodology

In order to accomplish its objective, the Plan first outlines cellular phone towers' general impacts and controversies through a literature review and case studies. Then, it narrows its focus and derives a basis for enhancing wireless coverage services in the Lansing study area by referring to the City's historical background and applicable demographic trends. By doing this, the Plan may legitimize Lansing's need for additional cellular phone towers and other technological advancements, which could encourage change and growth within the City. Additionally, the Plan delves into how new cellular phone towers will impact Lansing as far as infrastructural requirements, community safety, and present coverage. It provides maps of existing tower sites and coverage gaps in order to define areas for improvement, which may also justify future tower projects. Moreover, this Plan addresses the residents' concerns over tower aesthetics and health risks, and specifies procedures and regulations that cellular phone towers must adhere to. From this foundation, the Plan suggests recommended actions for the City to implement in order to reduce current impediments in the siting process. Even though Lansing is not responsible for determining where new cellular phone towers will be located, this Plan offers strategies and a Proposed Model Wireless Telecommunications Ordinance that will allow Lansing to balance conflicting interests, and make tower siting on public land more attractive. This may enable the City's tower siting policy to provide a mutual gain for the wireless industry and the community.

2. Cellular Phone Towers across the Country

2.1 The Towers' Rise in Dominance

According to a tower construction company's estimates, the number of cellular phone towers is expected to climb from 175,000 to 260,000 by 2010, which represents a forty-eight percent increase (Steel in the Air, Inc., 2006). Evidently, cellular phones and their accompanying towers have simultaneously transformed the American lifestyle and landscape. This cellular network proliferation occurred in three geographical growth stages known as the cellular land rush, the rural invasion, and mass appeal. During the first stage, the towers were primarily constructed in urban areas. Soon after, the demand for cellular phones spread beyond business uses, and towers began to line major roadways and encroach upon rural areas. By the third stage, the cellular telephone service demand became universal, and towers worked their way into virtually every community (Wikle, 2002).

2.2 The Controversy

As towers make their inevitable appearance in residential areas across the country, considerable tension has grown between the residents and cellular phone companies. While the residents necessitate consistent cellular phone service, they do not want large and potentially harmful towers placed in their line of sight. On the other hand, service providers endeavor to supply full coverage across the nation. Because the Telecommunications Act of 1996 mandates coverage for cellular phone companies, communities cannot forbid towers entirely. The Act stipulates that, "'local zoning ordinances can be enforced, but restricts the authority of local communities to impose outright bans on cellular equipment'" (Wikle, 2002). Communities may have some leverage, however, over the exact location and appearance of the towers. Section 704 of the Act asserts that the federal government is not permitted to "'limit or affect the authority of

a State or local government or instrumentality thereof over decisions regarding the placement, construction, and modification of personal wireless service facilities'" (O'Neill, 1999). The Act also states that localities "'shall not unreasonably discriminate among providers of functionally equivalent services,'" and "'shall not prohibit or have the effect of prohibiting the provision of personal wireless services.'" In addition, it prohibits the regulation of facilities "'on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the [FCC's] regulations concerning such emissions'" (Foster and Carrel, 1999). Unsurprisingly, numerous cases in which tower companies have fought against local municipalities in defense of these rights have appeared in court.

Regarding unreasonable discrimination, courts have generally become more reluctant to determine that a zoning authority's decision unreasonably discriminated among providers who offer functionally equivalent services. For example, in the *AT&T Wireless PCS, Inc. v. City Council of Virginia Beach* case, the court ruled that the local government's preference for tower placement in commercial, rather than residential zones was not unreasonably discriminatory (Foster and Carrel, 1999). For the prohibition of the provision of service condition, most courts have upheld that service has been prohibited "only by a general ban on cellular facilities by a town, or a policy having that effect, and therefore continue to dismiss most prohibition claims" (Foster and Carrel, 1999). Furthermore, courts refer to the Federal Communications Commission's (FCC) amended standard for acceptable radiofrequency emissions. Several cases exist in which communities have tried, and failed, to deny cellular phone tower locations based upon the potential negative health effects.

2.3 Literature Review

In response to these legal cases, many scholars have explored strategies for appeasing local residents when siting cellular phone tower projects. For example, setback requirements, if too large, may act to prohibit towers in an area and, therefore, should be based upon the towers' defined fall-down radii. An article published in the *Wireless Review* suggested that, "carriers should develop relationships with the local government and provide information about reasonable restrictions…If you arm the community with reliable information about towers and their characteristics in given environments; you may be successful in rewriting setback requirements…" (Boney, 1998). Additionally, the article discounts the property-value argument because citizens must show actual evidence of their allegations when the case reaches the appeals level. It recommends approaching this issue by emphasizing that the towers bring value-added services, such as wireless 911 capabilities, to the community, and by considering techniques to reduce the towers' visual impact. Moreover, the residents' health concerns may be addressed through education and the community officials' proactive role in assuring the community on "the merits of the wireless communications industry" (Boney, 1998).

Similarly, in the March 1999 edition of the *William and Mary Law Review*, Kevil O'Neill outlined nine criteria which would allow a zoning board to make decisions that are unlikely to be challenged in court and, at the same time, raise each individual application's prospects for gaining approval. An overview of his suggestions follows:

Getting Started:

Localities should examine existing ordinances and state laws to see how wireless providers and facilities fit into the existing legal framework and make adjustments. Also, localities should map existing wireless facilities and identify the best remaining locations, including consideration for preexisting structures.

Defining a Locality's Placement Philosophy:

Since more towers are inevitable, localities could potentially benefit by supporting more facilities with less power to temper citizen backlash. O'Neill states that, "localities with a detailed facility plan will also be more likely to withstand court challenges when they deny applications that do not comply with their master plans" (O'Neill, 1999).

Meeting the "Substantial Evidence" Standard:

Zoning boards should request five important pieces of evidence during a facility application process. They include: proof that the site has sufficient power for the proposed facility, is physically capable of holding the facility, and its historical pedigree does not prevent or discourage placement. Also, a demonstration of how the facility fits into the providers' long-term service plan and documents verifying that the radiofrequency emissions meet federal guidelines are essential.

The Co-location Requirement:

Co-location may benefit providers by decreasing the costs of expanding their service as well as the localities by minimizing the aesthetic impact of new wireless infrastructure. However, zoning boards should recognize that co-location is not possible in every instance, and it can also pose competitive problems. O'Neill advocates that, "localities could entice wireless providers by using their local master plans to identify co-location sites and make the co-location zoning approval process easier," and by requiring the providers to demonstrate that they have made a concerted effort to collocate prior to applying for a new site.

Defining Setbacks and Fall Zones:

In defining setbacks, the locality should make minimal provisions so as to not make wireless siting too difficult. Additionally, the setbacks should not be created with the sole intent of denying a facility.

Making Decisions that Supply "Substantial Evidence:"

Based upon previous court cases, localities would be wise to incorporate these guidelines into zoning board procedures: inform members about the reasons for denying an application, state each member's reason for an application denial, include rationale in an official record and submit it within thirty days of the decision. Also, the community must acknowledge that aesthetic concerns alone are not grounds for denying a facility, realize that board members are not usually considered experts to testify and refute expert testimony, and recognize that there is a burden of proof on the board to show that they had substantial evidence to back their denial. Finally, they must be able to point to specific evidence that led to the denial, and avoid changing the zoning process rules for "applications that are on file or pending before the board," and inventing "novel" justifications for its denials.

Processing the Application within a Reasonable Period of Time:

Zoning changes to local ordinances and master plans should be made in less than ninety days, as providers might challenge it if it takes too long. Localities should also set a maximum time limit, sixty days is recommended, for considering and processing applications.

Equal Treatment for All Providers:

According to O'Neill, the Telecommunications Act has an explicit test for this: "A locality cannot deny new providers' access to the community simply because the locality already has existing wireless technologies." Courts have yet to accept a community's argument on this issue.

Defining Height Restrictions:

In setting height restrictions for wireless facilities, the community should be consistent with guidelines for other tall structures. O'Neill asserts that, "it would make sense for a locality to have different requirements for heights in different zones… Inside each zone, the locality must be able to show the height restrictions will not affect the provider adversely."

2.4 Examples of Tower Siting Projects in Other Communities

2.41 Community Opposition

Siting cellular phone towers has been a continued source of debate for communities across the country. Disgruntled property owners in cities such as St. Petersburg, Florida, and Washington, D.C., seem to have had little luck opposing the towers. In St. Petersburg, residents were divided between those who thought the tower would be either dangerous or unsightly, and those who wanted the tower in order to improve cellular reception and reduce dropped calls

(Swider, 2006). Conversely, in Washington, D.C., residents in a neighborhood with home values averaging around $700,000 appeared to be united around their perception of the tower as being a form of "visual harassment" (Wiggins, 2007). Similar concerns surrounded a controversial tower location within a Boston cemetery adjacent to a residential neighborhood. While residents claimed that the location was inappropriate, the planning board's clerk referred to the Telecommunications Act of 1996 and stated that the community would have to accept the towers (Silva, 2006). In North Andover, Massachusetts, a year-long dispute between the local community and a wireless provider ended with the Zoning Board of Appeal's approval of the variance necessary to allow six antennas to be added to an existing neighborhood tower in order to improve local coverage. Eventually, the matter was taken to federal court. Among the reasons for requiring the variance, it was noted that denying a company access to an existing tower would be "unfair competition and an act of discrimination" (Tuohy, 2006).

2.42 Siting on School Property

Likewise, tower placement on school property has been met with mixed reviews. In Arlington, Massachusetts, the School Committee eagerly embraced the prospect of locating towers on school property, which would result in $10,000 to $30,000 worth of revenue per year for each cellular phone company. On the other hand, parents in Fairfax County, Virginia, created a Protect Our Schools coalition in response to the towers potential health concerns (Beecher, 2006). In Washington, D.C, parents vehemently opposed a cellular phone tower that had been constructed at an elementary school based upon student health concerns. The school already had a tower on a smokestack, which brought in annual revenue of $27,000, and the new tower would generate an additional $33,600 each year. Although the tower will remain, the residents have requested better communication with the community for these decisions (Murphy, 2006).

In general, these examples demonstrate that cellular phone providers usually attain the service they desire and will place towers in communities accordingly. Rather than postponing the inevitable, communities without a Comprehensive Telecommunications Plan, such as Lansing, Michigan, would benefit from a policy that would ensure a smooth facility siting process in order to avoid a service provision delay to residents while maintaining the neighborhood character.

3. The Lansing Study Area

3.1 City History

The City of Lansing is located within the tri-county region, which encompasses Ingham, Eaton, and Clinton counties, in south central Michigan. Lansing was founded during the 1840's, when families arrived in the area to claim the land they had purchased in what turned out to be a settlement that existed only on paper. Despite their disillusionment, many of the settlers remained in the largely wilderness community and named it after their home in Lansing, New York. A few years later, the City replaced Detroit as Michigan's state capital. Along with its role as the seat of state government, Lansing has become a manufacturing center that produces motor vehicles, motor-vehicle parts, printed materials, and metal goods. The present-day City covers a land area of just over thirty-five square miles with a mean elevation of about 828 feet (Microsoft Encarta, 2004). The study area for this project comprises the entire city whose boundaries are identified in **Figure 1**.

Figure 1: City of Lansing Study Area

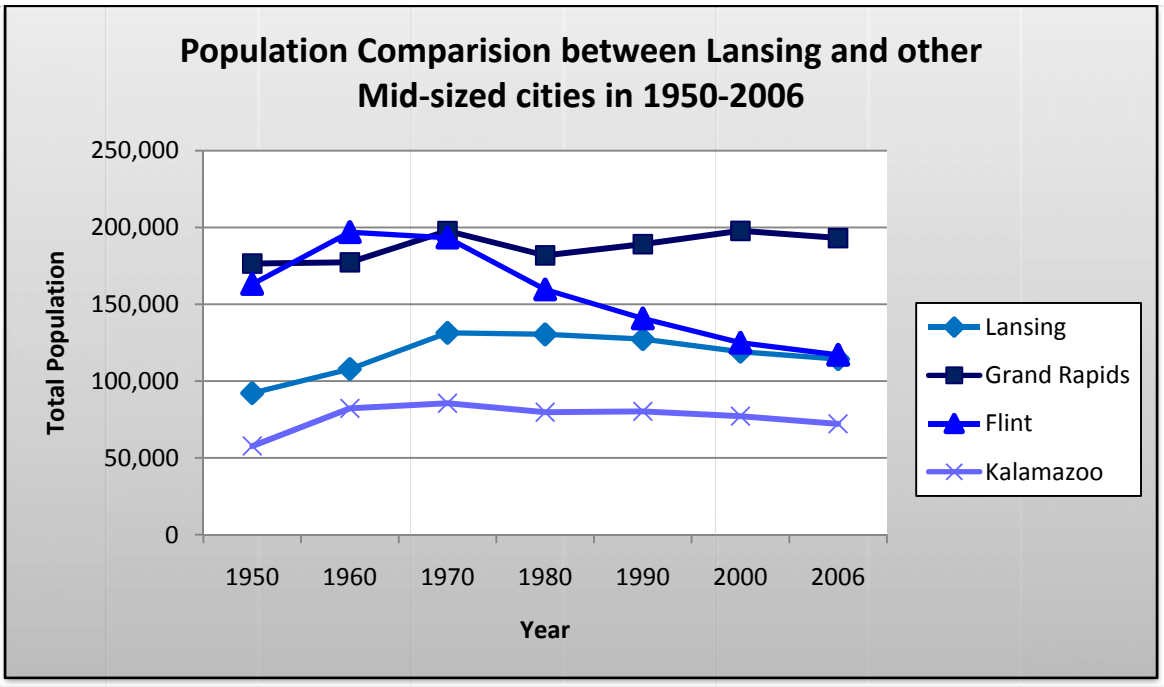
Source: (Physics and Astronomy Department, MSU, 2008)

Four major highways, which include the US-127 and Interstates 96, 496, and 69, run through this area along with other major commercial corridors, such as Saginaw Highway (M-43), Martin Luther King Highway (M-99), Grand River Avenue (Bus. 96), Michigan Avenue, Cedar Street (Bus. 96), and Pennsylvania Avenue.

3.2 Population Demographics

Lansing is characterized as a mid-sized city based upon its 110,990 member population in 2006 (US Census Bureau, 2006). **Figure 2** illustrates that, for the most part, the City's population has been hovering between 100,000 and 150,000 residents from 1950 to 2006.

Figure 2: City Population Trends

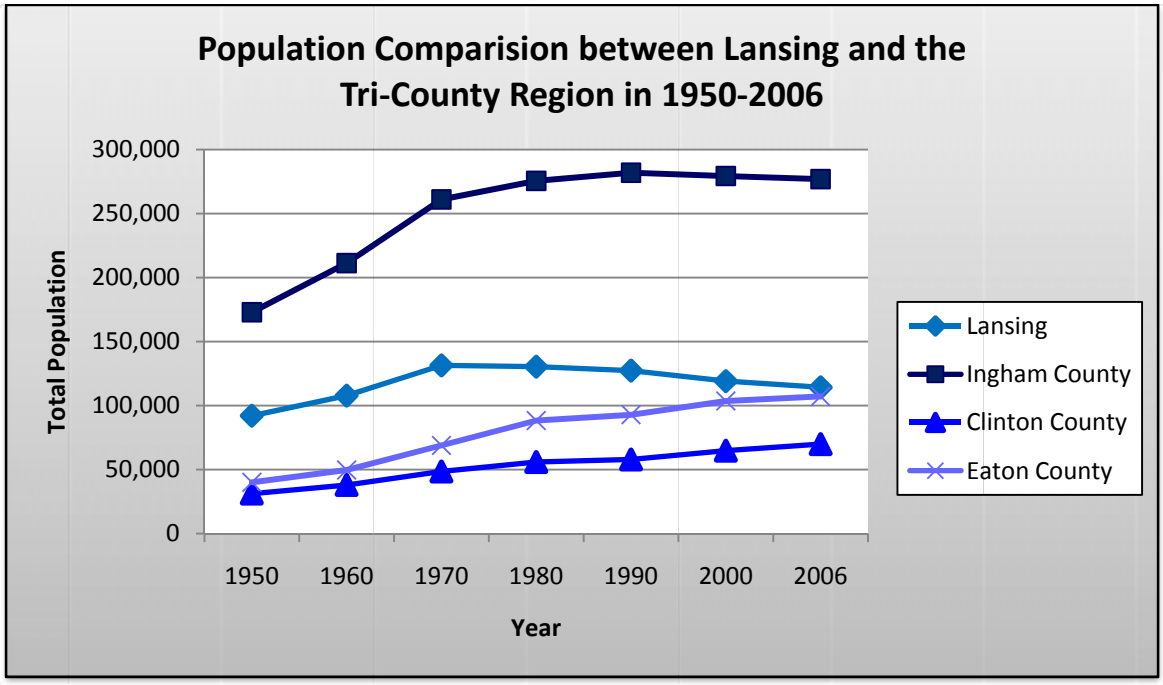


(Source: US Census Bureau, 2006)

Unfortunately, Lansing has been experiencing a declining population trend for the past thirty years. The City also appears to be growing at a much slower rate than the surrounding tri-county

area. **Figure 3** reveals that although Lansing's population is declining, Eaton and Clinton counties are steadily expanding while Ingham County seems to be sustaining its previous growth.

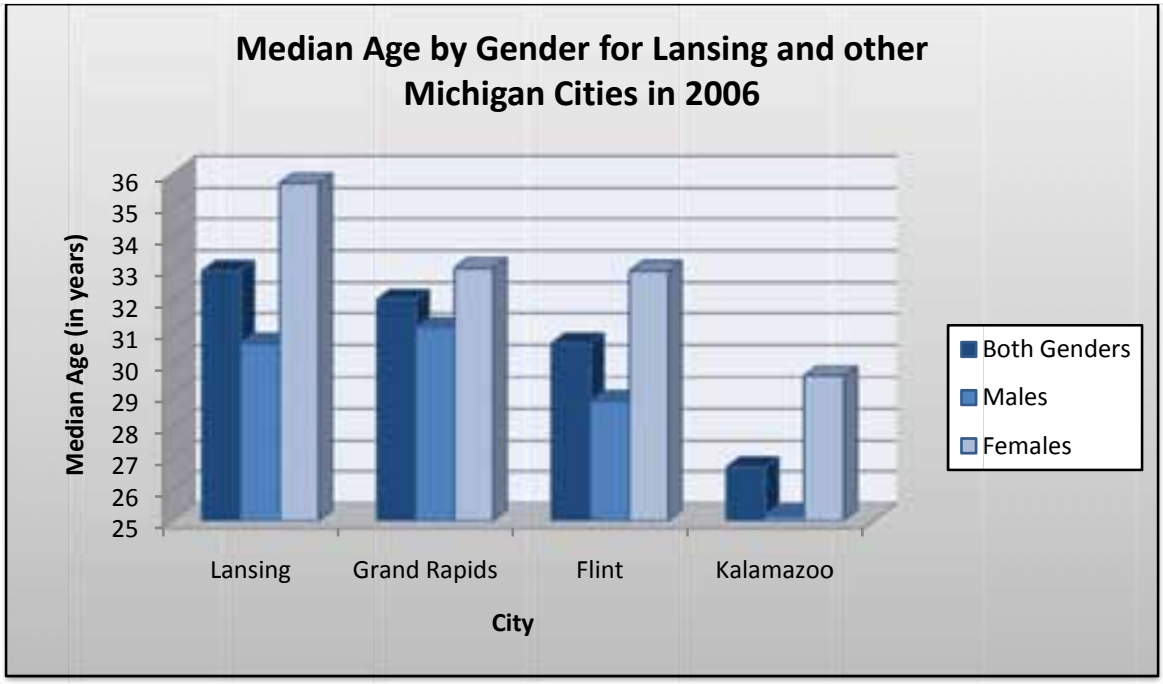
Figure 3: Regional Population Trends



Source: (US Census Bureau, 2006)

Furthermore, the population appears to be growing older with a median age of 32.9 compared to 31.4 during 2000. In fact, **Figure 4** demonstrates that Lansing's population in 2006 ranked the oldest among three other comparable mid-sized cities in Michigan.

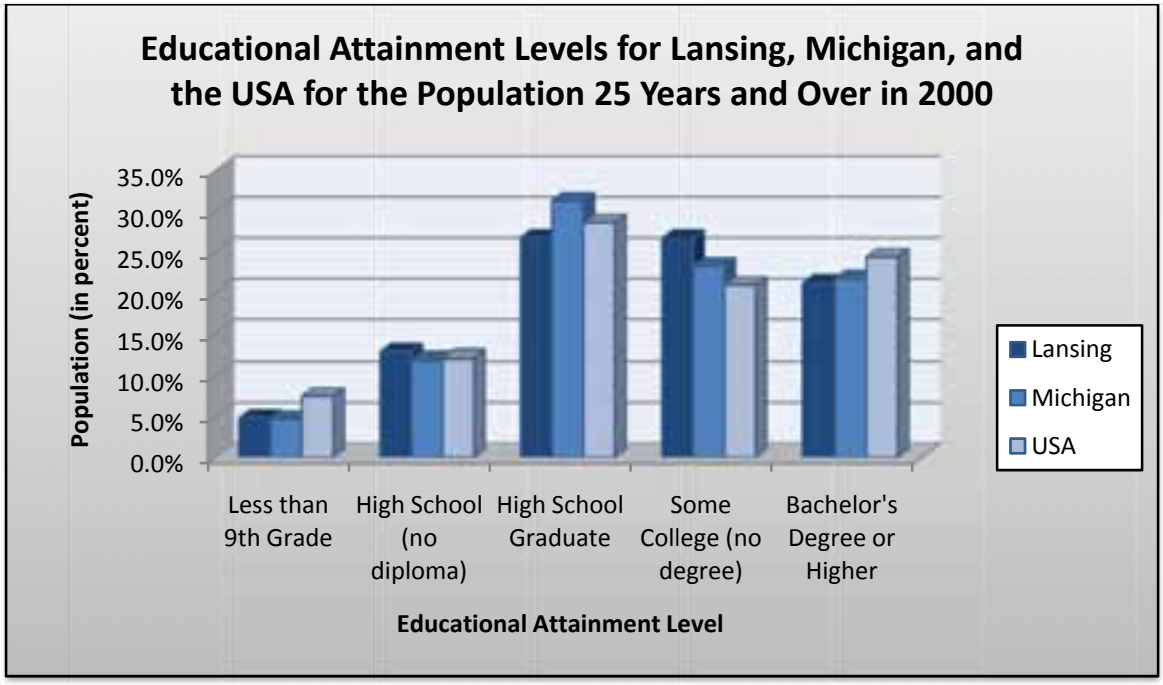
Figure 4: Median Age by Gender Comparison



Source: (US Census Bureau, 2006)

Lansing residents also seem to be relatively well-educated. **Figure 5** indicates that when compared to the state and national levels, Lansing had the highest percentage of individuals with at least some form of high school education, but no diploma. Likewise, Lansing also claimed the greatest percentage of individuals who had attended college, but had not earned a degree. However, the City's number of college graduates who had received a Bachelor's Degree or higher was lower than the state and national levels. This pattern has persisted since 2000 and is likely to be contributing to the City's seven percent unemployment level and soaring poverty rate of 27.9 percent in 2006. In contrast, 13.3 percent of individuals are below the poverty level within the nation (US Census Bureau, 2006).

Figure 5: Educational Attainment Level Comparison



Source: (US Census Bureau, 2000)

Consequently, Lansing's declining and aging population combined with the absence of rewarding employment opportunities may discourage many young people from residing within the City. Because of this, Lansing appears to have reached a critical point in defining its future. With the wrong moves, the City's economic state will continue to suffer from the declining manufacturing industry and the loss of jobs, investment, and talented people within it. In order to reverse this trend and restore the City, officials must implement a plan which will allow Lansing to surge into the new millennium with new jobs for a changing economy and an influx of interested investors and talented individuals. Currently, Lansing is taking many steps in the right direction, and this Comprehensive Telecommunications Plan is an integral component within the overall strategy to achieve economic, environmental, and social prosperity.

4. Technology and the Future

4.1 Cellular Phone Tower Infrastructure

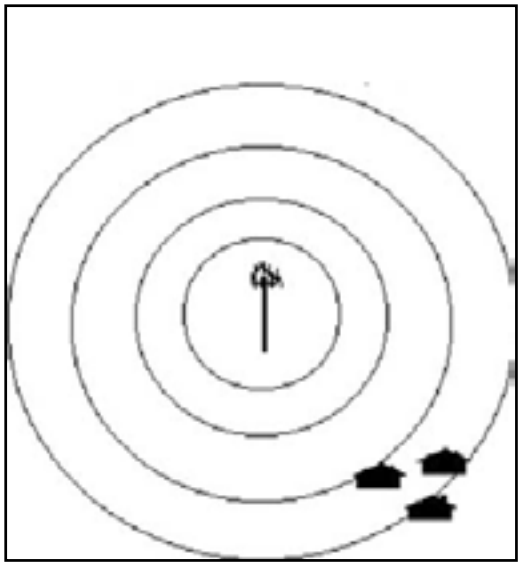
Telecommunications, including cellular phones and wireless internet, can no longer be shirked as a passing fad. These technologies have rapidly become essential to business, government, and citizen activities by connecting people both locally, and across the globe. Today's sought-after businesses and talent rely on a dependable wireless communication network to maximize productivity and maintain a high quality of life. Because of this, telecommunication infrastructure may be as vital to a community as the road and electric infrastructure from past decades. Therefore, the same necessity placed in road construction and maintenance must also be dedicated to completing and improving our "information superhighways."

As the demand for cellular phone service rises in Lansing, the number of towers required will also grow in order to accommodate this need. Because urban areas contain many tall structures, towers are often constructed on buildings rather than at ground-level. On the other hand, suburban and rural areas tend to lack structures that are suitable for tower placement and must allocate land parcels for these projects. New towers are built in areas where more extensive wireless coverage is needed, and wireless carriers may place their antennae on the towers. Each of the antennae, or transmitters, on a tower provides coverage to the surrounding area, which is known as a cell.

When a cellular phone user makes a call, a signal is sent from the phone's antenna to the base station antenna. The base station assigns the signal to an available radiofrequency channel which transmits and receives signals in order to transfer voice information to the base station. The voice signals are sent to a switching center that transfers the call to its destination (American

Cancer Society, 2006). **Figure 6** illustrates that the tower transmits signals in radial measurements. Typical coverage areas are approximately two miles, but may vary depending on a number of factors, such as: the type of signal used, the transmitter's radiated power, the transmitter's size, the array panel setup, and local geographical or regulatory factors and weather conditions.

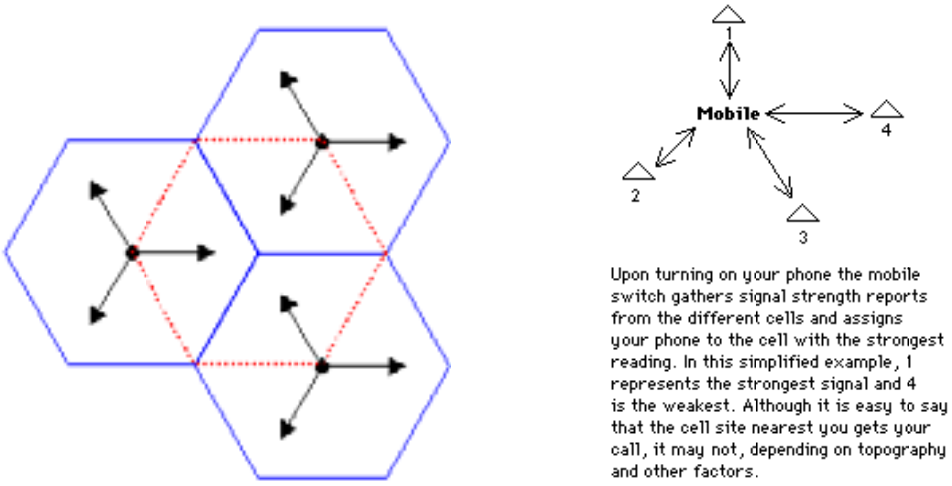
Figure 6: Cellular Phone Tower Signal Transmission



Source: (Mukherjee, 60)

The coverage cells may be partitioned into two or more zones. The inner zone requires lower power levels to achieve the desired coverage and signal strength than the outer zone. Each coverage cell is combined with other cells to form a larger network, as depicted in **Figure 7**. The cellular network consists of fixed and wired gateways, which are known as base stations.

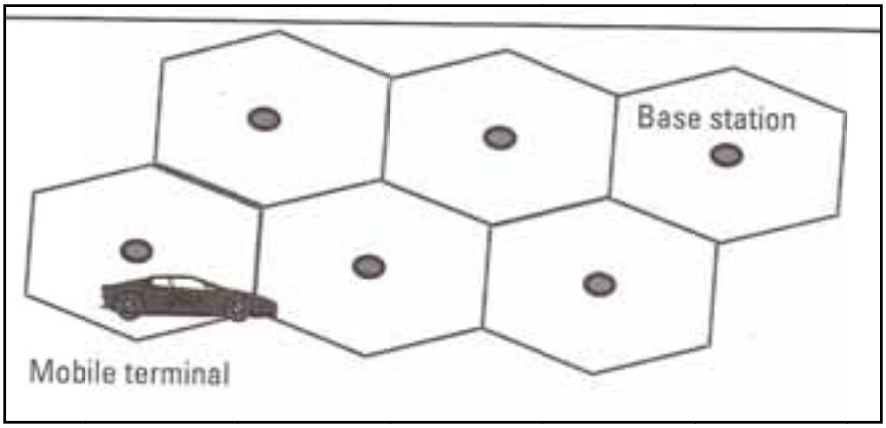
Figure 7: The Cellular Network



Source: (privateline.com)

A mobile terminal within the networks connects to, and communicates with, the nearest base station within its communication radius. **Figure 8** demonstrates that as a mobile phone travels from one base station's range to another, a handoff occurs from the old base station to the new one. This allows the phone to experience seamless communication throughout the network. A network's cells must overlap enough to facilitate handovers without creating interference problems with other sites.

Figure 8: The Base Station Handoff



Source: (Mukherjee, 3)

The Base Transceiver Station (BTS) stores the equipment that enables wireless communication between user equipment (UE) and the network.

Figure 9: A Base Transceiver Station

A typical BTS, as shown in **Figure 9**, generally has the following units:

- TRX – Transceiver
  - Transmission & Reception of Signals
- PA – Power Amplifier
  - Amplifies signal from DRX (Driver Receiver) / TRX for transmission through antennae
- Combiner
  - For reduction in number of antennae used
- Duplexer
  - Separating sending / receiving signals
- Antennae(s)
- Alarm Extension System
  - Collecting working status alarms from various units
- Control Function
  - Configurations, status changes, software upgrades, through control

Source: (Steel in the Air, 2008)

Cellular phone towers may occur in a variety of forms such as: lattice, monopole, guyed, stealth, tank mount, rooftop, and signage. For example, lattice towers, commonly referred to as self-support towers, offer the most flexibility and are often used in heavy loading conditions. They are generally three-sided with triangular bases, and may be as high as 300 feet (Steel in the Air, 2008).

Figure 10: Lattice Towers

Source: (Steel in the Air, 2008)

Monopole towers are single-tube towers. They require one foundation and do not often exceed 200 feet. The antennas are mounted on the tower exterior (Steel in the Air, 2008).

Figure 11: Monopole Towers

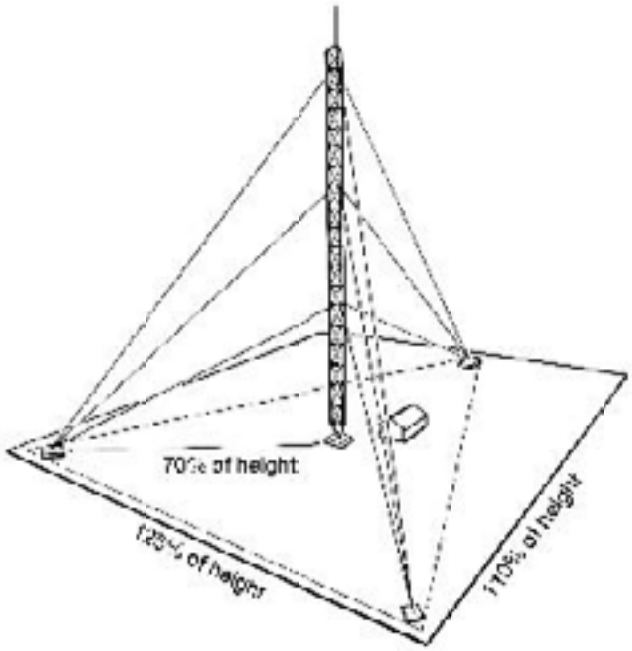
Source: (nuddtowers.com) and (engend.com)

A guyed tower has a straight single-poled appearance that is similar to a monopole, but it is supported by cables that anchor it to the ground. Although these towers are the most cost-

effective to build, they require more land for the cables to support their upright position. For taller towers around 300 feet or higher, it is significantly cheaper to construct a guyed tower.

Figure 12: Guyed Towers

Source: (Steel in the Air, 2008)



Source: (monsterfm.com)

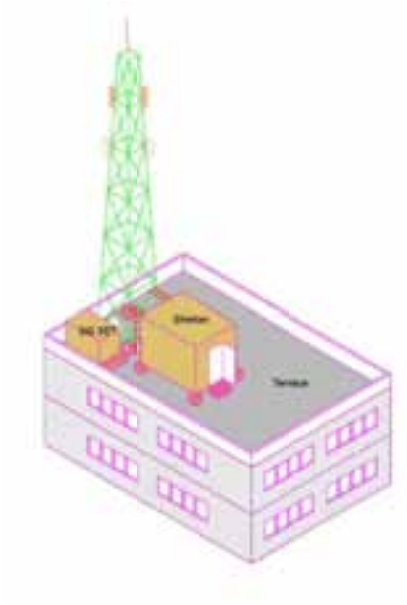
Some communities have constructed stealth towers, which often require additional material to disguise their appearance. While these tower designs tend to be more expensive than the others, they frequently offer a lower user capacity.

Figure 13: A Stealth Tower Disguised as a Cross

Source: (Steel in the Air, 2008)

Moreover, wireless antennas may also be placed on water towers, rooftops, and signs. Each of these designs is represented in **Figure 14**.

Figure 14: A Tank Mount, Rooftop Tower, and Signage Tower



Sources: (waymarking.com), (gtlinfra.com), (picasweb, 2007)

It is imperative that communities implement tower designs that coincide with the neighborhood character. For Lansing, building towers that the residents consider to be visually appealing may shift the focus away from aesthetics and allow the City to improve its telecommunications infrastructure. By doing this, Lansing may be able to enhance its residents' lives by not only drawing people and businesses back to the community, but also raising the public safety standard.

4.2 Cellular Phone Towers and Community Safety

Recently, cellular phone networks have become increasingly valuable tools for search and rescue teams as they attempt to locate people who are stranded in remote locations. In fact, a *Consumer Reports* survey revealed that approximately twenty-nine percent of those who purchased a cell phone during 2006 claimed they did so for emergencies (Reardon, 2006). While navigation technologies such as global positioning systems, or GPS, may allow users to identify their current locations, their usefulness may be limited during a crisis situation. This deficiency has been confirmed by Kiyoshi Hamai, who is a director at Mio Technology, a company which sells portable navigation devices that utilize GPS technology. Hamai acknowledges that, "'Navigation tools may help someone if they need to understand where they are to get to safety, but in order for someone to find you, you really need a device, like a cell phone, that can provide two-way communication'" (Reardon, 2006). Even when a cellular phone is not in use, the handsets attempt to communicate or "shake hands" with a nearby tower every thirty seconds in order to register their location. Companies maintain records of the handshakes, which include when the contact was made and the signal strength used, and some of the location information may be retained in call detail records. These records are typically stored for twenty-four hour periods. Consequently, when someone is reported missing, this data may be accessed to

determine the cellular phone's approximate location. By following the series of towers that the phone has contacted or pinged, authorities may track the user's general movement if he is still within range. Search and rescue teams may also refer to the last recorded location in the event that the phone goes out of range and loses its signal (Reardon, 2006).

Additionally, call data records, which contain information on the phone's initiated or received calls and text messages are even more beneficial when locating a lost user. For example, when James Kim and his family were stranded for over a week in the Oregon wilderness, a cellular phone tower briefly connected with one of the family's phones despite the adverse weather conditions and poor cellular phone coverage. Although the connection was lost before the family could call for help, it lasted long enough to send a text message notification which was recorded in the call data records. This enabled the engineers and rescue teams to locate the Kim's stranded car (Reardon, 2006). Furthermore, federal agencies have capitalized on the text message technologies by launching the national Wireless AMBER Alerts Initiative. This program was established through a voluntary partnership between the wireless industry, the United States Department of Justice, and the National Center for Missing and Exploited Children (NCMEC). It was intended to aid law enforcement agencies in the search for, and return of abducted children (The Wireless Foundation, 2006). Through this system, when an abducted child under eighteen years of age is reported to the local law enforcement agency, an AMBER Alert may be issued if the case complies with recommended criteria. Soon after, NCMEC receives the case information to format the alert message. They send the message electronically to Syniverse, who then forwards it to the wireless carriers participating in the Wireless AMBER Alerts Initiative. Finally, the carriers send the AMBER alert, in the form of a text message, to subscribers who have chosen to receive the notices (The Wireless Foundation, 2006). Because

cellular phones are a medium through which public safety may be improved, it is essential that Lansing's cellular phone tower plan provides full coverage throughout the City.

4.3 Lansing's Towers and Coverage Gaps

Lansing currently has approximately fifty cellular phone towers which include a variety of styles and sizes. Some of these towers are depicted in the photographs below.

Figure 15: A Monopole Tower located at 125 South Clippert St. The Tower is 60.7 feet at ground-level, and is owned and managed by AAT Communications Corporation.

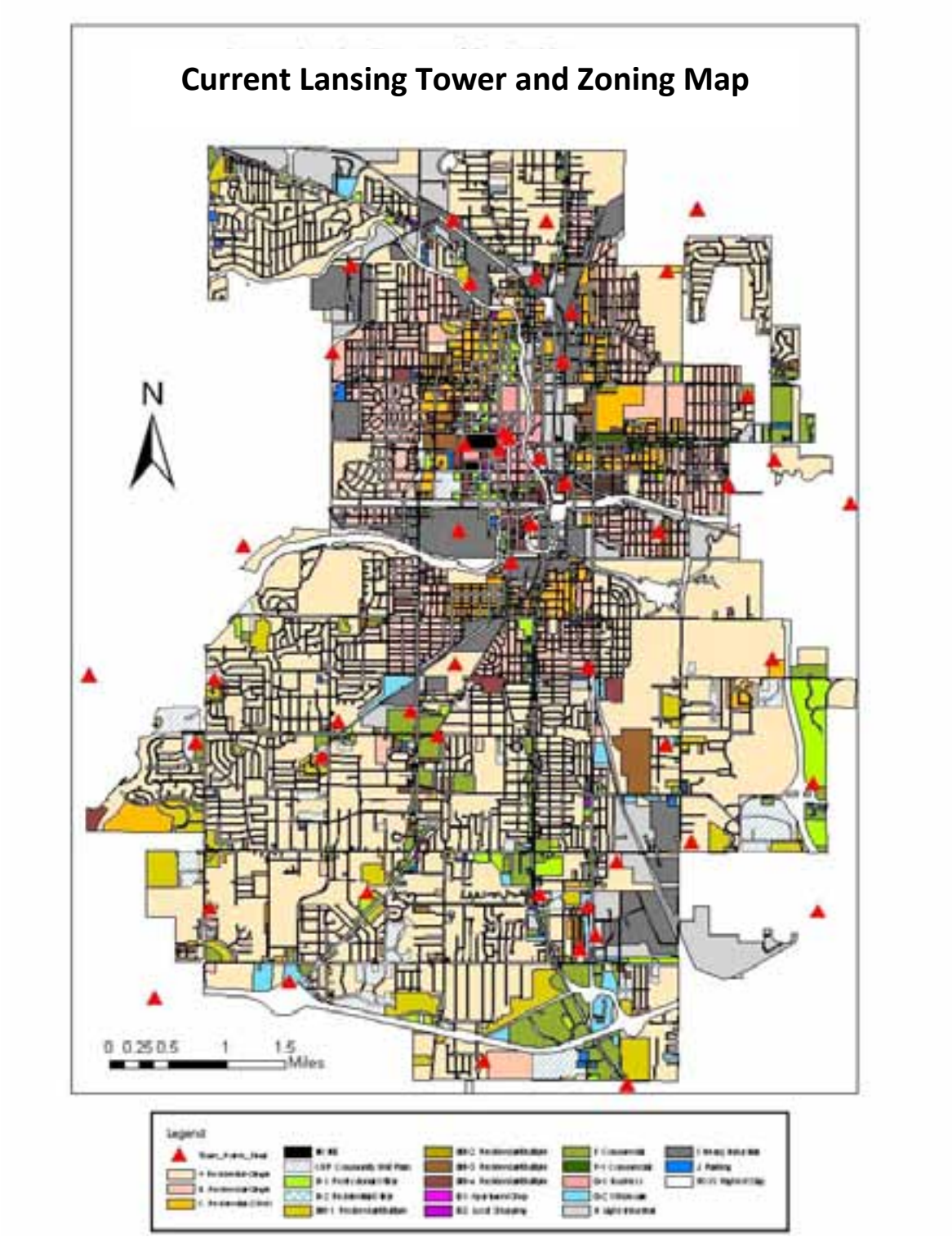
Figure 16: A Lattice Tower located at 817 Holmes Road. The Tower is 92 feet at ground-level, and is owned by the City of Lansing.

Figure 17: A Rooftop Lattice Tower located at 530 W. Allegan St. The Tower is 100 feet above ground-level, and is owned and managed by SBA Communications.

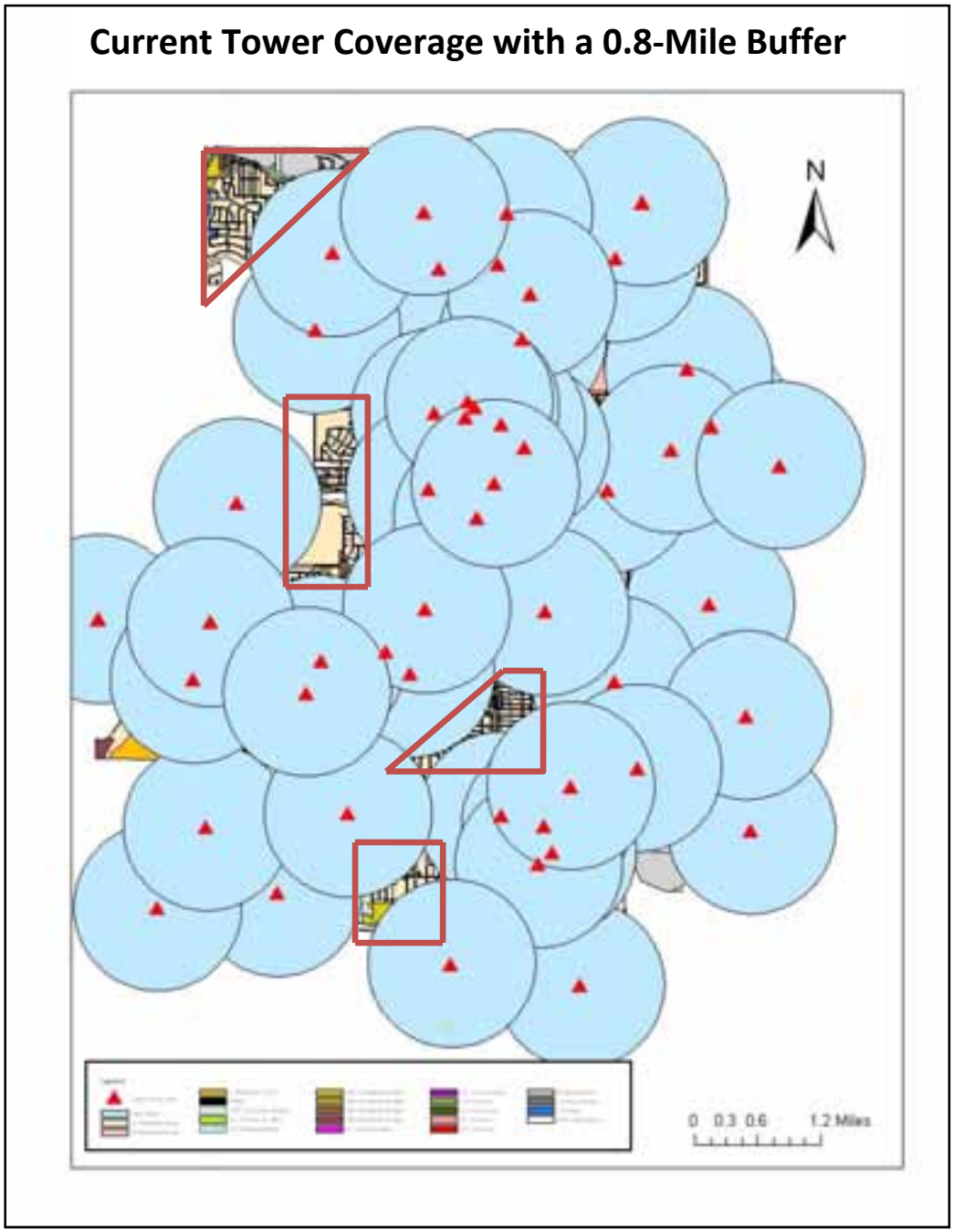
Figure 18: Guyed Towers located at 600 W. Cavanaugh Rd. The Towers are 62.5 feet above ground-level, and are owned and managed by MAC Donald Broadcasting Company.

In addition, the current Lansing Tower and Zoning Map reveals that, for the most part, the towers have been placed in commercial and industrial zones. However, some towers were

constructed in residential areas. While the towers appear to be highly concentrated within the northern half of the City, they are much less dense in the southern half.

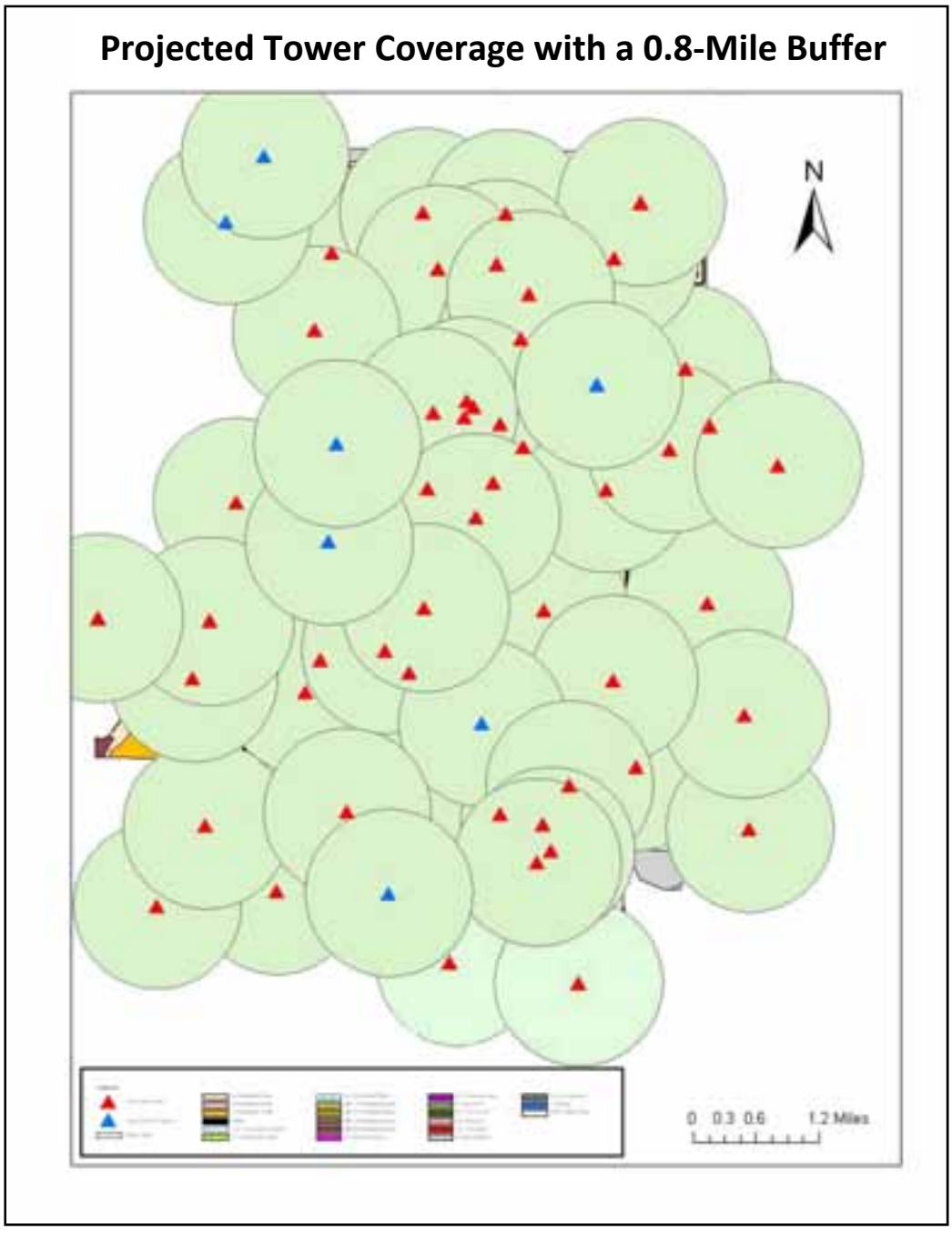


Due to the fact that towers in urban areas typically have a two-mile coverage range, if each one is assumed to have a 0.8-mile radius, then significant coverage gaps would occur in Lansing's northwest, west, and southern regions. These gaps are depicted in the Current Tower Coverage Map below.



This map shows approximate coverage. Coverage maps from individual providers are unavailable.

In order to fill these gaps, about seven new towers must be constructed. The new towers are illustrated in blue below.



However, this number may vary depending on tower capacities. For example, an area may have adequate coverage, but insufficient service if the capacity is too low. Because of this, additional towers may be necessary to improve cellular phone services throughout the City. Despite this fact, many residents have attempted to thwart new tower projects by raising concerns over community aesthetics and health.

5. The Public Resistance

5.1 Aesthetics

For many Lansing residents, cellular phones have revolutionized human communication by serving as a medium through which individuals may share information at virtually any given time or place. However, this technological convenience is accompanied by tower and antenna structures which often draw NIMBY responses from adjacent neighborhoods. A common community objection is that cellular phone towers will depreciate home values because they are aesthetically displeasing. For example, in the *City of Lansing v. T-Mobile* case, City Council denied the Special Use Permit for a tower that the Planning Board had approved. The Council's decision was based, in part, on aesthetics (Memo, Re: SLU-2-2007). In response to this concern, the wireless industry has developed a variety of innovative strategies to obscure and, in some cases, even eliminate cellular phone tower sites from view.

Many of the cellular service providers are capable of concealing a tower by installing the antennas within more visually appealing structures, such as: faux pine trees, palm trees, fiberglass Socorro cacti, flagpoles, and streetlights. Each of these design concepts is displayed in the photographs on the following page.

Figure 22: A Cell Pine located in North Hollywood, California
Source: (Kramer, 2007)

Figure 23: A Monopalm with Hidden Antennas located in Palm Desert, California
Source: (Kramer, 2007)

Figure 24: A Cellular Cactus located in Fountain Hills, Arizona
Source: (Kramer, 2007)

Figure 25: Streetlight Towers located in Thousand Oaks, California
Source: (Kramer, 2007)

Figure 26: Flagpole Towers located in Scottsdale, Arizona
Source: (Kramer, 2007)

Unfortunately, these camouflage techniques greatly expand construction costs beyond those required for a typical monopole tower. In fact, it is not uncommon for a stealth installation to cost as much as $300,000 (Steel in the Air, 2004). However, the added cost may benefit the applicant if an aesthetically pleasing design gains community support and significantly reduces the cellular phone tower review and approval process. The shortened approval cycle may also generate additional revenues which could offset higher camouflaging costs.

Currently, many communities are implementing new, or modifying existing wireless ordinances in order to encourage carriers to pursue low-impact tower sites. Because of this, community parks, schools, fire stations, water tanks, and other government property within residential zones may be ideal locations for new stealth towers. These land parcels are likely to contain potentially useful structures, including rooftops, flagpoles, light standards, and hose towers which may facilitate tower construction (Kramer, 2004). For example, cellular antennas could be hidden in fiberglass covers and incorporated at the top of streetlights in residential areas. Additionally, the power equipment typically housed in small buildings near

the tower may be buried underground in parks and open-spaces to maintain neighborhood character. Within the commercial district, antennas that are frequently attached to the sides or tops of various structures could be placed in matching building additions or inside plastic signs instead. If the cellular phone carriers are unable to accommodate this request, the antennas may be mounted on buildings and concealed with covers that complement the building's façade. Similarly, the exposed antenna cables could be included in the façade-mimicking process in order for commercial projects to become less visible (Kramer, 2004). Along with aesthetics, the towers' possible health hazards constitute an even greater source of resistance from many cellular phone tower critics.

5.2 Health Concerns

Figure 27: A Caution Sign Posted on the Fence surrounding a Tower Compact Area in Lansing.

Public concern over the potential human health risks associated with the radiofrequency (RF) emissions released from cellular phone towers is another primary source of tower placement opposition in Lansing. Because RF has the ability to heat body tissues, it has been suggested that cellular phone towers may produce dangerous effects, such as cancer varieties and

birth defects, and those who reside near the towers are being subjected to involuntary exposures. However, the FCC asserts that not enough evidence exists to support this outcome, and the Telecommunications Act of 1996 prevents a community from rejecting a cellular phone tower based upon health concerns (Wireless Consumer Alliance, 2004). Although high levels of radiofrequency waves may warm tissues, a substantial volume of scientific research indicates that the towers' exposure levels are inadequate for yielding cancer and other health conditions.

According to the American Cancer Society, cellular phone towers are unlikely to pose health risks due to the emitted radio waves' energy capacities, and the towers' structural design. Cellular phone towers operate at the radiofrequency portion of the electromagnetic spectrum, which is separated into ionizing and non-ionizing radiation. Ionizing radiation consists of short wavelengths, such as x-rays, gamma rays, and ultraviolet light, which have enough power to knock electrons off their orbits. These bands are capable of causing permanent damage at the cellular level in the form of cancers and genetic mutations. Conversely, non-ionizing radiation, such as radio, microwave, and infrared light, consist of longer wavelengths that may have less power (Levitt, 1998). During a cellular phone call, signals are transmitted to and from the base station, which emits radio waves into the environment where they may be exposed to people. Unlike x-rays and gamma rays, radio waves do not possess enough energy to break the bonds that hold molecules, such as DNA, in cells together, or penetrate body tissues (American Cancer Society, 2006). This is due to the fact that electromagnetic energy is stored in "packages," or photons. The amount of photon energy depends directly upon the frequency, which gradually decreases as one travels down the electromagnetic spectrum. While x-rays contain approximately 1,000 eV (electron volts) of energy, a cellular phone tower's radio waves possess only about one millionth of an eV, which is not enough to alter molecules within the body

(American Cancer Society, 2006). Furthermore, radio wave wavelengths are approximately one foot in the air and two inches in body tissue and, therefore, RF radiation may only be concentrated to about an inch or two in size. Consequently, it is implausible that radio wave energy could concentrate on a small piece of tissue and affect individual cells (American Cancer Society, 2006). Along with the radio waves' energy characteristics, the towers' radiofrequency exposure levels are relatively low and intermittent, which may further reduce the residents' potential to develop health conditions from tower emissions.

Although cellular phone tower antennas may use higher power levels than other land-mobile antennas, these levels occur far below those utilized in radio and television broadcast stations (American Cancer Society, 2006). In addition, the FCC has established RF exposure guidelines that transmitting facilities must comply with. These regulations are designed to protect the public health within a wide safety margin and have been endorsed by agencies, such as the Environmental Protection Agency, and the Food and Drug Administration. The FCC has formed distinct maximum permissible exposure limits for the "general population/uncontrolled exposure" and the "occupational/ controlled exposure," which are identified in the tables below.

Table 1: Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

Table 2: Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	$(900/f^2)$*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

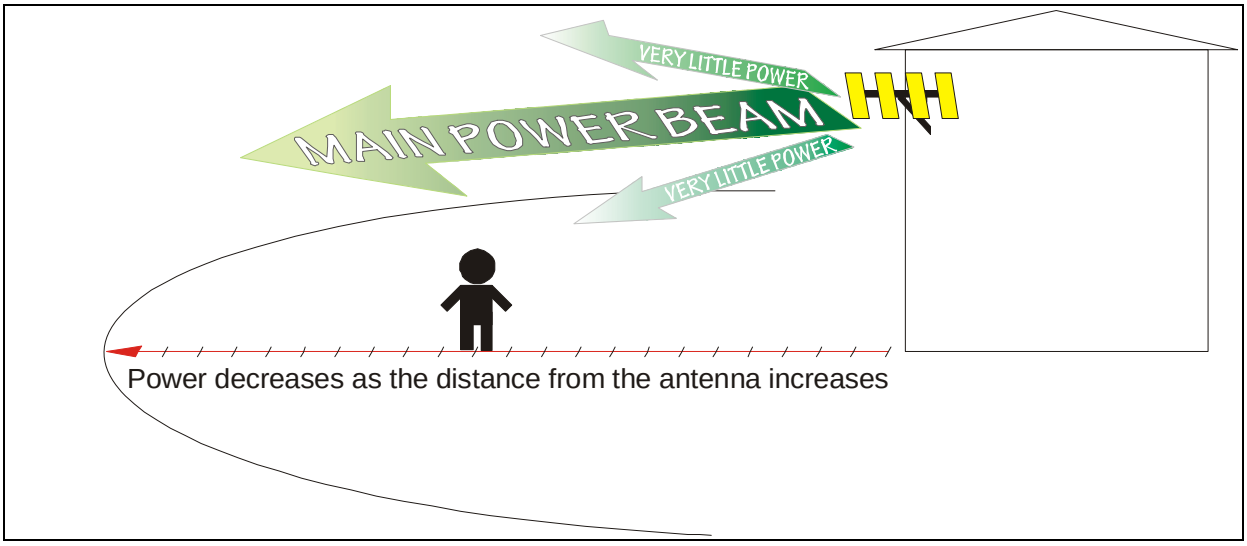
f = frequency in MHz *Plane-wave equivalent power density

(Source: Federal Communications Commission, 2007)

For the most part, general population/uncontrolled exposure limits apply to those within the general public who are exposed and are not involved in tower equipment installation or maintenance. On the other hand, occupational/controlled exposure limits usually pertain to those who are exposed on account of their employment as long as these individuals are fully aware of the potential exposure and may exercise control over this effect. Although these limits are averaged over specified time intervals of thirty and six minutes respectively, time averaging is often disregarded for the general public due to varying exposure conditions. Because of this, the FCC's calculations assume that any RF exposure to the general public is continuous. For each exposure category, the recommended limits occur well below levels that have been identified for potentially stimulating adverse health effects. Moreover, the towers' physical structures enable them to produce maximum exposures which significantly undershoot the FCC's regulations.

At a cell site, the base station signals are directed toward the horizon in a relatively narrow beam. Because of this, the majority of the power is projected parallel to the ground with some downward scatter, as depicted in **Figure 28**.

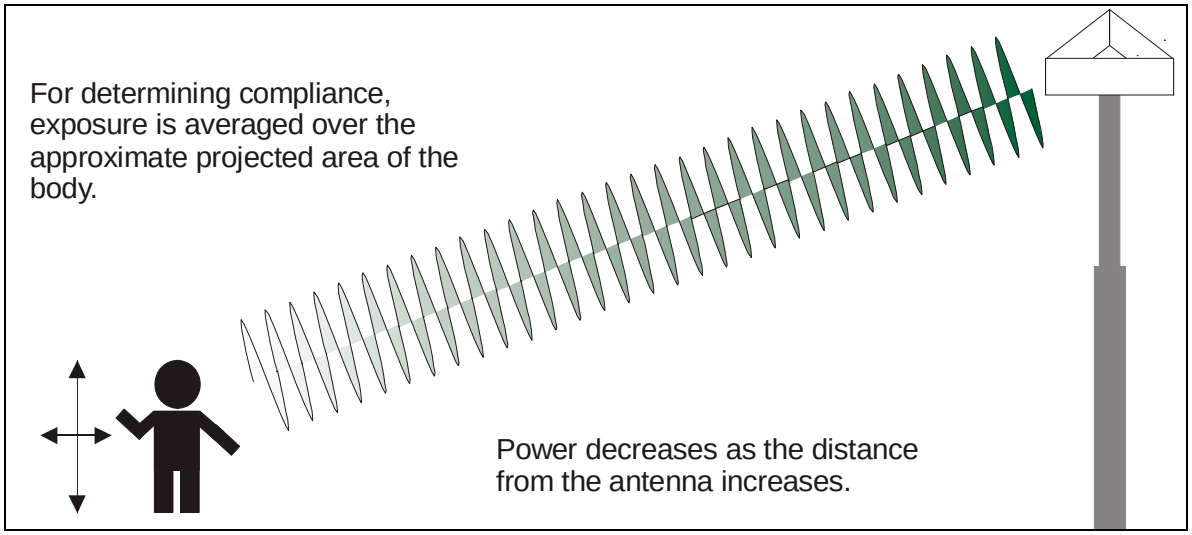
Figure 28: (Source: Federal Communications Commission, 2000)



The total amount of RF power that may be transmitted from the site corresponds to the number and power of authorized radio channels, or transmitters. Depending on the system, twenty-one channels per sector is generally the maximum number utilized. Therefore, a cell site with sector antennas may have each of the three antennas connected to as many as twenty-one transmitters for a total of sixty-three transmitters per site. When omni-directional antennas are employed, up to ninety-six transmitters could be implemented at the cell site, but this configuration is much less common (Federal Communications Commission, 2006). Even though a standard base station may contain as many as sixty-three transmitters, all transmitters are not expected to operate simultaneously. This may reduce overall exposure levels because the signals are transmitted intermittently, rather than constantly.

Additionally, as with all electromagnetic energy forms, cellular phone towers' power densities rapidly decrease as one travels away from the antenna. Because of this, **Figure 29** illustrates that normal ground-level exposures are significantly lower than the exposures experienced near the tower's main transmitted beam.

Figure 29: (Source: Federal Communications Commission, 2000)



In fact, the ground-level exposures are generally thousands of times lower than the FCC's adopted standards. For example, the FCC allows for base stations with an 869 MHz frequency to have a maximum permissible exposure of about 580 microwatts per square centimeter (µW/cm2), as averaged over a thirty-minute period, for the general public. However, this limit far exceeds the RF levels that are often found near cellular phone tower bases. Measurement data has consistently revealed that "worst-case" ground-level power densities near typical towers, which assume that all transmitters would be operating simultaneously and continuously at the maximum licensed power, are approximately 1 µW/cm2 or less (Federal Communications Commission, 2006). Therefore, an individual would essentially have to remain in the antenna's main transmitting beam (at the height of the antenna) from only a few feet away in order to be exposed to radiation levels near the FCC's limit. Evidently, it is implausible that a resident could experience RF levels from a cellular phone tower that greatly surpass these exposure guidelines. Occasionally, exposure levels may exceed 1 µW/cm2 when base stations are mounted on rooftops. This may be problematic if the rooftop is accessible to maintenance personnel, or

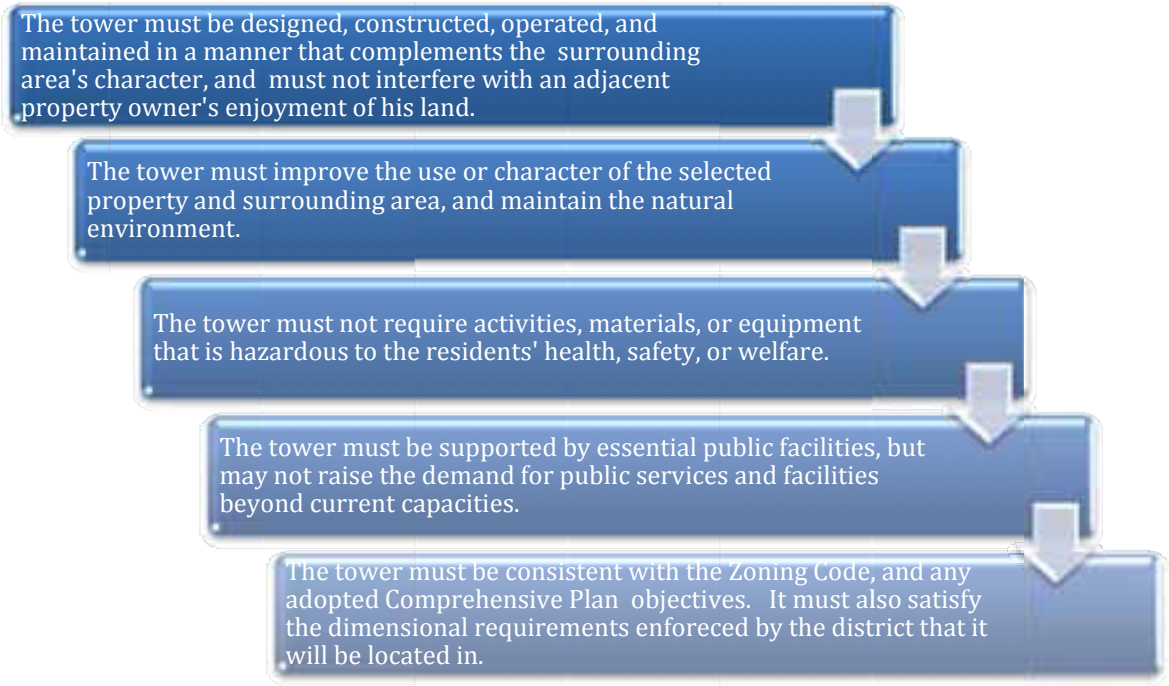
others. However, RF exposure levels that are undesirably high are likely to be encountered in close proximity to and directly in front of the antennas. Subsequently, access restrictions and appropriate safety standards may be placed in order to limit potential exposure (Federal Communications Commission, 2006).

Based upon present research, it appears unlikely that cellular phone towers' RF emissions may detrimentally impact the public health. According to the American Cancer Society, evidence in support of the towers producing cancer or other health problems has not been presented in published scientific reports. Nevertheless, cellular phones are still a relatively new technology, and the FCC has imposed standards to protect the public from any potential dangers. Consequently, these regulations should continue to be strictly adhered to for all future towers in Lansing. In addition to the radiofrequency emission regulations, the City and some federal agencies have established tower location standards that Lansing's tower projects must follow.

6. Rules and Regulations

6.1 City Zoning Regulations for Cellular Phone Towers

Due to the fact that Lansing's current Zoning Ordinance does not specifically identify cellular phone towers as an allowable use in any of the zoning districts, the service providers and residents are constantly at odds over proposed tower construction projects. For the most part, the City has approved towers for a given area as long as they satisfy all of the zoning district's criteria. Before construction may begin, all towers that are not located within the two industrial districts must receive a Special Land Use Permit (for a detailed explanation of this process, see **Appendix 1, page 62**). In order to receive the permit, an applicant must file a request with the City Clerk, who forwards it to the Planning Board. The Planning Board will then publish a notice in one of the general local newspapers that the request has been received and will also notify all property owners within 300 feet of the proposed site's boundary. A public hearing will occur at a minimum of fifteen days, but no more than thirty days, thereafter. During the hearing, the Board will consider the special land use request and recommend whether the Council should approve, approve with conditions, or deny the special land use. An overview of the evaluation criteria used to determine whether a tower is eligible to receive the permit follows (for a complete description of the criteria, see **Appendix 1, page 62**):



Soon after it receives the recommendation, the Council will hold a public hearing to evaluate the Board's decision. Upon approval, the Council is empowered to impose conditions that it deems necessary for maintaining the public services and facilities affected by the special land use (to view the conditions, see **Appendix 1, page 64**). These conditions are designed to preserve natural resources, and the community's health, safety, and social and economic welfare. The Council's regulations must also represent a valid exercise of police power, and comply with the Zoning Code and other city standards. For example, each district contains height restrictions that potential cellular phone tower projects must comply with. A list of various districts' height requirements are recorded within the table below.

Table 3: Source: (City of Lansing Zoning Ordinance, 2007)

Zoned District	Allowed Height (in feet)	
(a) A Residential District	35	Detached Structure – 15 feet
(b) A-1 Residential District	35	Detached Structure – 15 feet
(c) B Residential District	35	Detached Structure – 15 feet
(d) C Residential District	35	Detached Structure – 15 feet
(e) DM-1 Residential District	45	Detached Structure – 15 feet
(f) DM-2 Residential District	45	Detached Structure – 15 feet
(g) DM-3 Residential District	45	Detached Structure – 15 feet
(h) DM-4 Residential District	100	Detached Structure – 15 feet
(i) D-1 Professional Office District	45	
(j) D-2 Residential/Office District	------	Detached Structure – 15 feet
(k) E-1 Apartment Shop District	100	
(l) E-2 Local Shopping District	25	
(m) F Commercial District	40	
(n) F-1 Commercial District	45	
(o) G-1 Business District	No Height Limit	
(p) G-2 Wholesale District	40	
(q) H Light Industrial District	120	
(r) I Heavy Industrial District	120	
(s) J Parking District	45	

If any structure exceeds the allowable height regulation established for the district it is located in, then the project must receive a variance to authorize the increased height (for a detailed explanation of this process, see **Appendix 1, page 65**).

Additionally, the tower itself is subjected to a set of criteria before the City approves it (to view the full set of criteria, see **Appendix 1, page 66**). According to these guidelines, new cellular phone towers must be monopoles and should allow for antenna co-location. In particular, the co-location provision is essential because it may enable the City to satisfy a higher cellular phone service demand with fewer tower construction projects.

6.2 The Co-location Process

Figure 30: A Variety of Locks from Each Service Provider bar the Entrance to a Co-location Tower Compact Area in Lansing.

In Lansing, it is not uncommon to observe more than one service provider utilizing a single tower. The process in which multiple wireless providers share antenna space on a single tower is referred to as co-location. A photograph of one of Lansing's co-location monopole towers may be viewed in **Figure 31**.

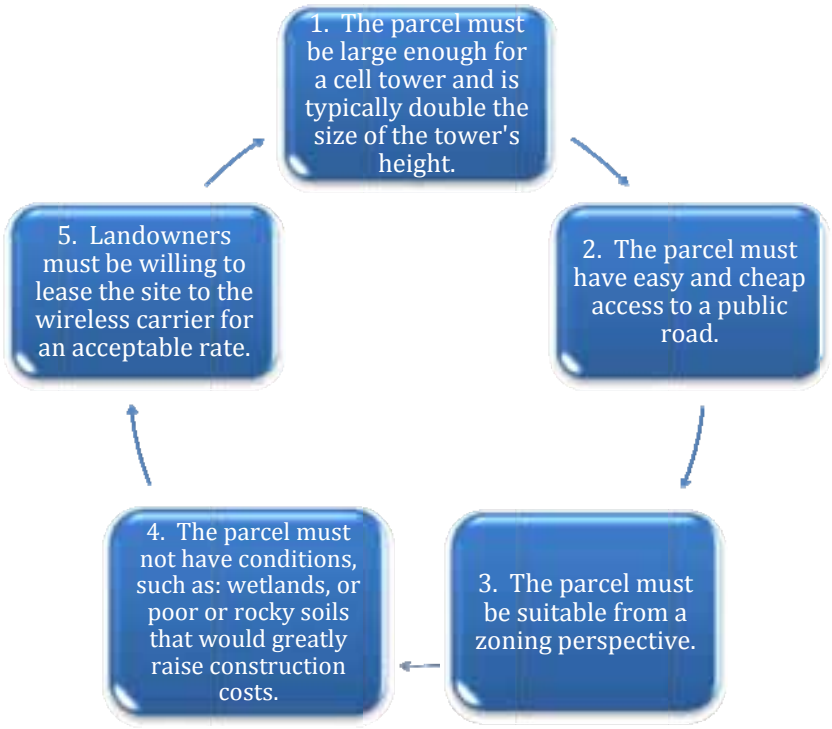
Figure 31: Co-location Antennas on a Monopole Tower located at 3128 South Martin Luther King Boulevard in Lansing, Michigan.

During this procedure, when a wireless carrier desires to extend its coverage into areas with insufficient service, it conveys the request to a tower construction company. The company will then research the possibility of co-location on an existing tower by identifying which carriers hold licenses in the area. Once a tower that will suit the wireless service provider's needs is found, the management company will place an antenna on the tower and lease the space to the carrier. This practice is beneficial because it allows the wireless companies to reduce costs. For example, co-location may allow carriers to cut deployment costs by fifty to seventy-five percent (Federal Communications Commission, 2006). Moreover, this method enables carriers to build

out faster and avoid lengthy negotiations with municipalities. Wireless carriers and management companies frequently struggle to pass through the approval process, which may require years to complete, when attempting to construct a new tower. However, in Lansing, co-location only requires a building permit, which may be obtained through an administrative process in approximately seven days. Therefore, co-location is a time and cost efficient process that should continue to be applied to future tower projects. Along with the local zoning and structural regulations, Lansing's prospective towers must also conform to the FCC's guidelines.

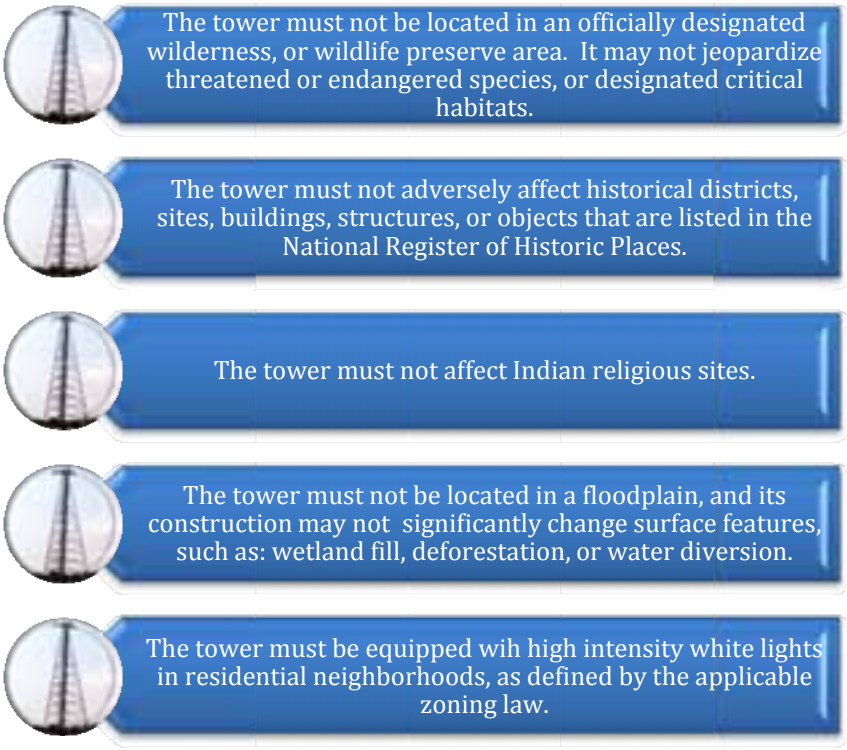
6.3 Federal Communications Commission Regulations

When wireless carriers conclude that a new cell tower or antenna site is required in a particular area, the Radio Frequency Engineering Department issues what is commonly known as a "search ring." The search ring is represented by a circle or other shape drawn on a map to indicate where the cellular phone tower could be located to satisfy the RF engineering guidelines. A search ring's size may vary based upon factors such as the location's topography, demographics, and whether it is urban, suburban or rural (Steel in the Air, Inc., 2004). Due to the fact that wireless carriers prefer to locate on pre-existing towers rather than constructing new ones, the Site Acquisition Agent will ensure that the search ring does not encompass any workable structures. If none of the structures offer a suitable height, the Agent will contact landowners whose parcels meet the following standards:



(Steel in the Air, Inc., 2004)

After an interested landowner is found, the tower management company will notify the FCC, which will also evaluate the location and present the potential bidder with an Environmental Agreement. This document checklist is used to determine whether the tower may detrimentally impact the surrounding land area. A summary of the criteria used are listed on the following page (for a detailed criteria list, see **Appendix 1, page 66**):



(Federal Communications Commission, 2006).

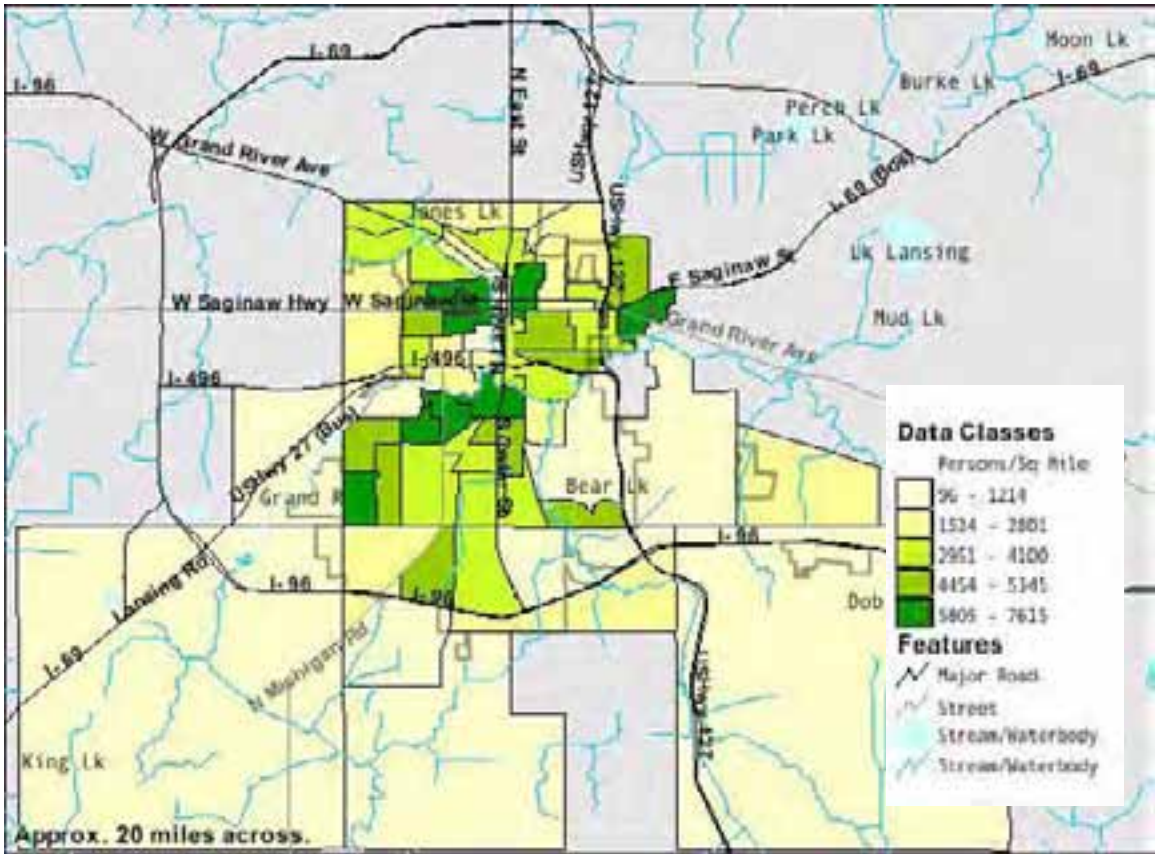
Once the checklist is completed and the potential tower location has been analyzed, the decision to accept the tower is based upon the effects associated with its construction. Many towers are immediately denied if they are planned around areas of high environmental interest, or pose a major threat to the surrounding land. Additionally, the FCC mandates that certain towers, generally those that stand taller than 200 feet or are located in close proximity to an airport, must be registered with them. The Commission's Antenna Structure Registration program insists that those structures which may pose a hazard to air navigation must be painted and lighted in order to make them conspicuous to aircrafts. Based upon Lansing's cellular phone tower coverage gaps and the regulations it must comply with, the City may benefit from incorporating certain strategies.

7. Recommendations

7.1 Achieving Lansing's Coverage Goals and Improving Services

Although the wireless carriers ultimately determine where new towers will be located, Lansing may be able to influence future tower placement by directing the structures to particular sites within the selected target areas. Since the number of towers that a city needs is primarily related to capacity, Lansing officials may refer to population density maps in order to predict where additional towers are likely to be placed. **Figure 32** highlights the City's densely populated areas, which may eventually require new towers to improve services.

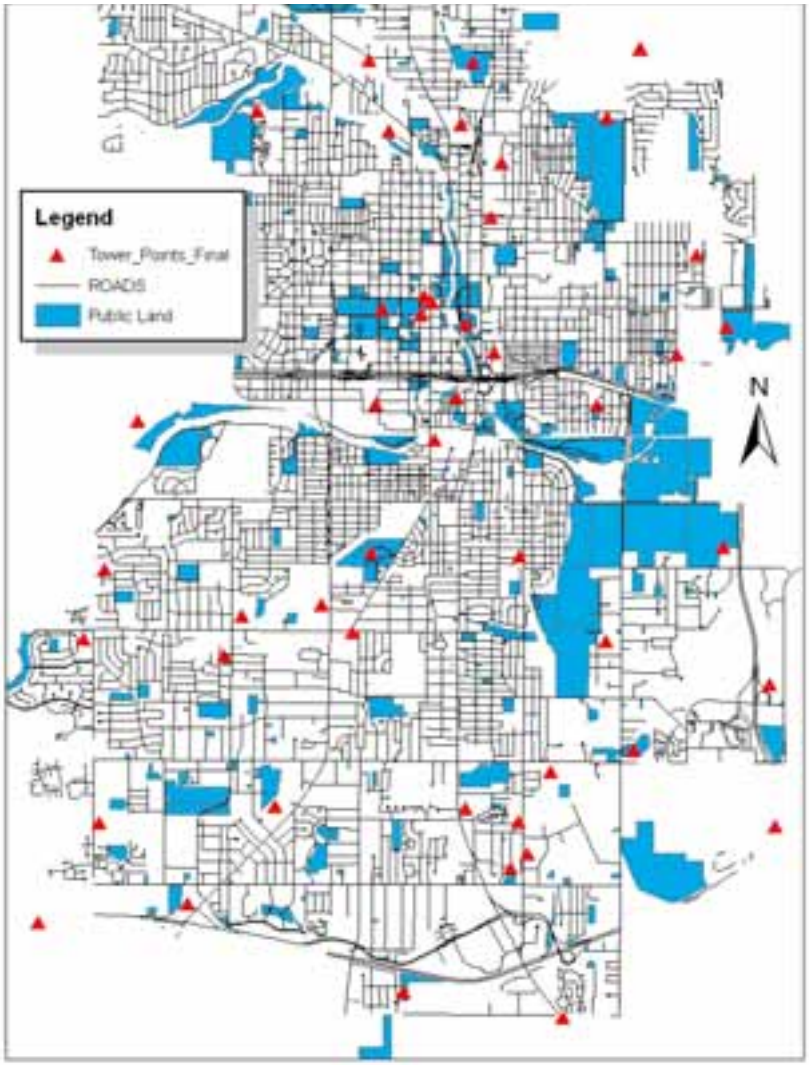
Figure 32: City of Lansing Population per Square Mile, 2000



(Source: US Census Bureau, 2006)

With this in mind, Lansing may select locations that would be ideal for enhancing wireless services while reducing coverage gaps (see **page 29**) and generating revenue for the City. For example, by placing new towers on available public land, which is displayed in the map below, Lansing may not only improve its cellular phone coverage, but also channel significant revenues back to the City.

Current Lansing Tower and Public Land Map



However, if wireless companies or providers experience too much difficulty when attempting to site a new tower on public land, they will likely seek private property to locate on. Consequently, Lansing could encourage tower companies to build on public land by offering a lease price that is competitive with the private sector market rate. By doing this, Lansing may accomplish its financial objectives and, at the same time, assume more control over tower placements. The City could further entice companies to site towers on public land through a Wireless Telecommunications Ordinance that outlines a more efficient tower siting process.

7.2 Proposed Model Wireless Telecommunications Ordinance

This Model Ordinance was developed based upon effective policies that have been enacted in several other communities, and Lansing's personal tower siting challenges and goals. It is a research-based guide that offers some time frames and numbers, appearing in red, which may need to be adjusted according to the Lansing officials' discretion. The Ordinance begins in the following page.

Proposed City of Lansing Model Wireless Telecommunications Ordinance

I. Purpose and Authority

This Wireless Telecommunications Ordinance is meant to serve as a guide for siting future telecommunication facilities, towers, and antennae in Lansing. While the Telecommunications Act of 1996 greatly restricts a community's ability to regulate these projects, it may exert reasonable authority over the towers' structural design as related to height, co-location, setbacks, and other visual characteristics. Consequently, the Ordinance offers uniform standards which aim to minimize safety and aesthetic concerns through appropriate siting, buffering, and design techniques. At the same time, this policy promotes an adequate and reliable telecommunications service provision for the general public. Through this Ordinance, Lansing may eliminate some of the tower placement controversy and ensure that future tower siting, construction, and modification is a smooth process that is consistent with federal and City regulations.

By adopting this Wireless Telecommunications Ordinance, the City intends to:

- Achieve full wireless communication coverage throughout the City of Lansing.
- Prioritize co-location on existing structures, such as monopoles, transmission towers, utility poles, or other feasible structures.
- Maintain public health, safety and welfare.
- Comply with state and federal laws that allow certain antennas to be exempt from local regulations.

II. Definitions

- *Accessory Equipment*: Any equipment that serves, or is being used in conjunction with a telecommunications facility or support structure.
- *Antenna*: A device used to transmit and receive electromagnetic waves.
- *Co-Location*: The use of one telecommunications tower/site by multiple providers.
- *Federal Aviation Administration (FAA):* Is responsible for the advancement, safety and regulation of civil aviation (FAA.gov).
- *Federal Communications Commission (FCC)*: Is an independent United States government agency directly responsible to Congress that is charged with regulating interstate and international communications by radio, television, wire, satellite and cable (FCC.gov).
- *FCC Telecommunications Act of 1996*: A major overhaul of telecommunications law with the goal of allowing anyone to enter a communications business and allowing these businesses to compete in any market against any others.
- *Guyed Tower*: A telecommunications tower that has a straight, single poled design supported by cables that anchor the structure to the ground.
- *Lattice (Self-supporting) Tower*: A telecommunications tower made of metal braces which form three sides with a triangular base.
- *Monopole Tower*: A telecommunications tower consisting of a single pole that is attached to a grounded foundation
- *Radiofrequency (RF) Emissions*: Electromagnetic waves released from telecommunication towers.

- *Stealth Tower*: Uniquely designed antennas that are effectively camouflaged or concealed from plain sight.
- *Telecommunications Tower*: Structure built more than twenty feet in height to support telecommunication antennas.
- *Telecommunications Base Facility*: A structure located at the base of telecommunication towers to house the equipment necessary for receiving and transmitting signals from wireless communication devices.

III. Approval Process

- Administrative Review and Approval
  - Telecommunications facilities placed upon an existing support structure in any zoning district are authorized.
  - New support structures lower than **60 feet** are permitted in any zoning district.
  - New support structures as tall as **199 feet** are allowed in any industrial zoning district.
  - Monopoles or replacement poles are approved in utility easements or any right-of-way in any zoning district.
  - Stealth towers are endorsed in any zoning district.
- Special Use Permit
  - By obtaining a special use permit through the Zoning Board of Appeals, any district is available to new support structures or telecommunications facilities.

IV. Design Standards

- Monopoles
  - Monopole towers and base structures must allow for at least 3 providers.
  - The towers' compound areas must be large enough to accommodate at least three telecommunications providers' accessory equipment.
  - The towers shall be designed with an unobtrusive silver or grey finish.
- Lattice Towers
  - Lattice towers and base structures should accommodate at least four providers.
  - The towers' compound areas must be large enough to accommodate at least four telecommunications providers' accessory equipment.
  - The Towers shall be designed with an unobtrusive silver or grey finish.
- Stealth Towers
  - Antennas must be enclosed, camouflaged, obscured or otherwise not readily visible to a casual observer.
  - The stealth designs may include, but are not limited to, flagpoles, clock towers, streetlights, or faux pine trees.
  - The towers should accommodate co-location if the Zoning Board deems it economically and technically feasible, or aesthetically appropriate.

V. Setbacks

- Residential Zoning District
  - The towers must be setback from residential dwellings at a distance **equal to** the tower's height.

- The towers' accessory equipment shall be setback from all property lines based upon the minimum setback requirements established for the zoning district.

VI. Height

- Non-Residential Zoning District
  - When sited in a non-residential zoning district, the support structures' heights may not exceed **199 feet** from its base to the highest point.
- Residential Zoning District
  - When sited in a residential zoning district, support structures' heights shall not exceed **150 feet** from its base to the highest point.

VII. Visual Impact Requirements

- Towers and support structures should only have lighting and marking if these features are mandated by the FCC and FAA.
- Signs posted near the towers and support structures must only include ownership and contact information, FCC registration numbers, and any other government required telecommunications information. Commercial signage is strictly prohibited.
- Landscaping should be provided in an appropriate quantity to obscure the accessory equipment from view. It must also be conducive to the type of zoning district in which the tower is located, and be maintained by the facility owner.
- Supporting structures shall only be used to house tower equipment and any other supplies necessary for supporting the base facility's operation.

- The accessory equipment facility's appearance must be consistent with the zoning district in which the tower is located.

VIII. Other Provisions

- Safety
  - Prior to regular facility operation, all facility owners and operators must submit a certificate of compliance with all current FCC radiofrequency emission regulations.
  - All facility operators and owners must sign an agreement that requires their facilities to adapt to any new and applicable federal, state, or local laws related to RF emissions within **120 days** of the effective regulations date.
  - Base facilities shall be surrounded and secured by a fence that is considered to be appropriate, and has been approved by the Zoning Board.
- Abandonment and Removal
  - The Zoning Board may declare an existing tower structure that is not in use during a **120 day** period to be abandoned. Any abandoned structures are required to be removed within **90 days** of abandonment pronouncement.

IX. Waiver of Requirements

Proposed facilities that are unable to comply with the above requirements may be eligible for a waiver and special use permit upon the Zoning Board's review.

(Primary Sources: PCIA, 2006, East Lansing, 2007, Scenic America, 2003, City of Davis, 2004).

Through this Wireless Telecommunications Ordinance, Lansing may exert a greater influence over the tower siting process and alleviate some of the residents' aesthetic and health concerns. Additionally, the City may pursue other strategies which could also curtail some of the tower placement disputes.

7.3 Other Recommended Actions

1. Lansing should consider initiating dialogue with the School District to determine if they would be willing to place cellular phone towers on their property.

The towers would generate a tremendous revenue opportunity of thousands of dollars per month for the City's ailing schools. It has been ten years since this approach has been seriously considered and the leadership, technology, knowledge, and economic state have considerably changed during that time. The City should approach School District leaders with more recent tower safety studies as well as revenue potential. This could allow the Lansing School District to expand its resources and, consequently, offer a higher quality educational experience for students.

2. Neighborhoods should be encouraged to create and approve a potential cellular tower site plan.

This plan could specify minimum aesthetic standards that would best suit the community's needs and desires in the event that a tower will be located on nearby public land. Pre-approval may help alleviate confusion and tension among residents when a provider seeks to bring service into an area. In particular, the benefits of multiple, unobtrusive (stealth) poles rather than fewer,

large traditional poles, should be considered for controversial projects. Communities should keep in mind; however, that refusing a tower's placement is not a valid option. The federal government generally prevails in legal cases, and if a provider wishes to locate in a given area, he will most likely earn that right.

3. Lansing should also provide accessible information about cellular phone tower sites on the City website.

By doing this, residents will be able to answer basic questions regarding aesthetic and health concerns and may learn about the towers' value-added services, such as wireless 911 capabilities. They could also have an opportunity to comment on their cellular service experiences within the City.

8. Conclusion

By considering these recommendations, Lansing may adopt a more proactive role in the tower siting process while protecting the public interest and neighborhood character. The Comprehensive Telecommunications Plan will enable Lansing to transition into the 21st Century with an efficient implementation of wireless communication facilities. The Plan will guide the City in establishing a connected infrastructure that may attract talented workers and knowledge-based industries. This will provide the connected, high-tech quality of life that today's cities demand.

9. Appendix 1

9.1 Special Land Use Permit Process

(a) An application for a special land use permit may be made by an applicant on forms provided by the Planning Division. The application shall be filed with the City Clerk and shall be accompanied by the fees established by Council and the documents required by Section 1242.05.

(b) The City Clerk shall refer the application described in subsection (a) hereof to the Planning Board for consideration and recommendation to Council.

(c) The Board, upon receipt of an application from the City Clerk, shall publish one notice in a newspaper of general circulation in the City that a request for a special land use approval has been received. The Board shall also send a notice by first class mail to all persons to whom real property is assessed, according to the records maintained in the office of the City Assessor, within 300 feet of the boundary of the lot. If the name of the occupant is not known, the term "occupant" may be used in making notification.

(d) The notice described in subsection (c) hereof shall be given not less than ten days and not more than 15 days before the public hearing described in subsection (f) hereof.

(e) The notice shall:

(1) Describe the nature of the special land use request;

(2) Indicate the lot which is the subject of the special land use request;

(3) State when and where the special land use request will be considered;

(4) Indicate when and where written comments concerning the request will be received; and

(5) Indicate that a public hearing will be held by the Board on the special land use request and give the date, time and location of the public hearing described in subsection

(f) The Board shall hold a public hearing for the purpose of considering the special land use request and recommend to Council whether it should approve, approve with conditions, or deny the special land use. In making its recommendation, the Board shall consider each of the following standards:

(1) If the special land use is designed, constructed, operated and maintained in a manner harmonious with the character of adjacent property and the surrounding area;

(2) If the special land use changes the essential character of the surrounding area;

(3) If the special land use interferes with the general enjoyment of adjacent property;

(4) If the special land use represents an improvement to the use or character of property under consideration and the surrounding area in general and also is in keeping with the natural environment of the lot;

(5) If the special land use is not hazardous to adjacent property, or does not involve uses, activities, materials, or equipment which are detrimental to the health, safety, or welfare of persons or property through the excessive production of traffic, noise, smoke, odor, fumes, or glare;

(6) If the special land use is adequately served by essential public facilities and services, or it is demonstrated that the person responsible for the proposed special land use is able to continually provide adequately for the services and facilities deemed essential to the special land use under consideration;

(7) If the special land use does not place demands on public services and facilities in excess of current capacity;

(8) If the special land use is consistent with the intent and purpose of this Zoning Code and the objectives of any currently adopted Comprehensive Plan; and

(9) If the special land use meets the dimensional requirements of the district in which the property is located.

(g) The Board shall state to Council, in writing, its recommendations as to each special land use request and the reasons for its recommendation.

(h) Council, upon receiving the recommendation from the Board, shall hold a public hearing for the purpose of a de novo review of the recommendation of the Board and deciding whether to concur in such recommendation.

(i) A notice that a request for special land use approval has been received by Council and that a public hearing will be held shall be published in a newspaper of general circulation in the City. Notice shall also be sent by first class mail to those persons described in subsection (c) hereof.

(j) The notice described in subsection (i) hereof shall meet all of the requirements described in subsections (d) and (e) hereof.

(k) Council may deny, approve or approve with conditions a request for special land use approval, based upon the standards described in subsection (f) hereof. If conditions are

imposed, they shall meet the requirements of Section 1282.03. The decision of Council shall be reduced to writing. The writing shall state Council's decision and shall specify the basis for the decision and conditions imposed upon the special land use, if any.
(Ord. No. 735, 11-24-86)

1282.03. Conditions of approval

(a) Council may impose conditions described in subsection (c) hereof upon its approval of a special land use. The conditions, if any, shall be recorded in the written decision described in Section 1282.02(k).

(b) The conditions described in subsection (c) hereof shall remain unchanged, except upon the mutual consent of the applicant and Council. If a change of conditions is agreed upon, Council shall maintain a record of such change.

(c) Council may impose on its approval of a special land use any conditions which, in the opinion of Council, ensures that public services and facilities affected by the proposed special land use or activity will:

(1) Be capable of accommodating increased service and facility loads caused by the special land use;

(2) Protect the natural environment and conserve natural resources and energy;

(3) Ensure compatibility with adjacent uses of land; and

(4) Promote the use of land in a socially and economically desirable manner.

(d) Any condition imposed under this section shall:

(1) Be designed to protect natural resources and the health, safety, and welfare, as well as the social and economic well being, of those who will use the special land use and the community as a whole;

(2) Be related to the valid exercise of police power and purposes which are affected by the special land use;

(3) Be necessary to meet the intent and purpose of this Zoning Code;

(4) Be related to the standards established in Section 1282.02(f); and

(5) Be necessary to ensure compliance with such standards.
(Ord. No. 636, 3-7-83)

9.2 Procedures for Issuing a Variance

Procedures

1. Obtain an application form in the Planning Office of the Department of Planning and Neighborhood Development, 316 N. Capitol Ave., Suite D-1, Lansing, MI 48933. Assistance is available when filling out the form. **A site plan drawn to scale is required.**

2. Completed applications are filed in the Planning Office.

3. The Planning Office staff prepares a letter or postcard that is mailed to surrounding owners and occupants within 300 feet of the subject property notifying them of the place, date, and time of the scheduled public hearing, as well as a description of what the applicant proposes. This letter is sent 10-15 days in advance of the public hearing.

4. Each appeal is then discussed at a staff meeting where an opinion is formulated based on the criteria and standards outlined in the Code, and the reasonableness of the proposed change.

5. The Planning Office staff prepares a report upon information gathered regarding the subject property and the surrounding area including times such as site size, existing land use, zoning, and development. This preliminary report is sent to the Board members approximately one week prior to the public hearing.

6. At the public hearing, staff will make a short presentation of the request and the staff's report. The petitioner, or a representative, will be called to speak, then other persons whether in favor of or opposed to the proposal.

7. At the close of public hearing on each case, the BZA discusses the merits of that appeal.

   Following their discussion, a decision is made. The BZA may act to approve, approve with conditions, modify, or deny an appeal. If additional information is needed, the Board may act to table the appeal.

8. Once a decision has been made, a letter will be sent by the Secretary of the Board informing the applicant of the decision.

Decisions

Decisions of the Board of Zoning appeals are final. However, Board of Zoning Appeals decisions may be appealed to Circuit Court.

9.3 City Tower Approval Criteria

1. The tower shall be “monopole” type.

2. The proposed monopole tower shall provide for co-location of antennas.

3. The tower shall not interfere with telemetry communications of local hospitals and emergency services.

4. Landscaping should be added around the base of the tower to buffer the view of the base from surrounding properties.

5. The tower should be appropriately accessible and fenced for security.

6. The tower and any mechanical equipment shed be consolidated and placed in locations as far away from surrounding residential units so as to minimize the visual impact.

9.4 FCC Environmental Agreement Checklist

1) Will tower be located in an officially designated wilderness area?

2) Will tower be located in an officially designated wildlife preserve?

3) Will tower affect listed threatened or endangered species or designated critical habitats; or is likely to jeopardize the continued existence of any proposed endangered or threatened species or likely to result in the destruction or adverse modification of proposed critical habitats?

4) Tower may not affect districts, sites, buildings, structures or objects significant in American history, architecture, archeology, engineering or culture that are listed, or are eligible for listing, in the National Register of Historic Places.

5) Tower may not affect Indian religious sites.

6) Will tower be located in a floodplain?

7) Will construction involve significant change in surface features (*e.g.* wetland fill, deforestation or water diversion)?

8) Tower will be equipped with high intensity white lights which are to be located in residential neighborhoods, as defined by the applicable zoning law.

10. Appendix 2

10.1 Scope of Services

URBAN AND REGIONAL PLANNING
MICHIGAN STATE UNIVERSITY
Practicum Group – Spring 2008
Telecommunication Towers

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SCOPE OF SERVICES

Goals
Objectives
Methodology
Timeline
Expectations

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SCOPE OF SERVICES

Telecommunication towers, particularly cell phone towers, are both a NIMBY for adjacent neighborhoods and a potential revenue generator for the City and Lansing School District. The City's initial approach was to license the placement of cell towers on City or LSD property, and derive the revenues accruing therefrom. This arrangement backfired as the demand for cellular phone service increased, and LSD's support for cell towers eroded. With the passage of time, private developers began cashing in on the demand for new towers, resulting in sometimes contentious land use proposals.

This project is to create a Comprehensive Telecommunications Plan for the City of Lansing that presents the data and history, analyses these issues, suggests alternatives, and provides a basis for policy decisions relative to this issue.

The scope of services will describe the process by which the Practicum group at Michigan State University will attempt to provide alternative solutions for cellular phone tower placements and issues in the City of Lansing and School District area.

Goals

The goal is to address the issue of cellular phone towers being a NIMBY for adjacent neighborhoods, while wireless communication is an increasingly in demand service with skyrocketing profits for private carriers, and revenues brought into the City and Lansing School District.

The FCC has established regulations for towers, and the regulations in the local level seek alternate solutions, recommendations, and possible amendments to current methods of placement and regulation in Lansing and the School District.

Some goals of the MSU practicum group are:

- To provide a Comprehensive Telecommunications Tower Plan for the City of Lansing
- Zoning variance for cell towers
- Provide alternate solutions
- Full coverage for Lansing
- Full wireless service
- Protection of neighborhood character
- Minimize externalities of tower placement
- Propose new methods of tower placement
- Identify best locations for towers

Objectives

The City of Lansing and the School District provide public and private properties for Cell Towers, and the practicum group will address issues of NIMBY, aesthetics, zoning regulations, FCC regulations, and possible coverage expansion.

- Set regulations on cell towers
- FCC regulations
- All towers to be licensed and registered
- Zoning to regulate number and location of towers
- Public relations interface with local community groups
- Provide accurate site mapping
- Maintain aesthetics of towers (attractive nuisance)
- Address safety issues
- Provide coverage data
- Coverage necessary (demand), missing locations
- Increase public knowledge about towers
- Locate present and ongoing cell tower locations
- Location and relation to other towers: TV, Radio, CATV, etc.
- Propose alternatives and recommendations

Methodology

To achieve goals and objectives members will utilize resources from City of Lansing, Lansing School District, and Michigan State University.

Current zoning regulations will need modification, thus regulations and issues of other cities and neighboring areas will be referred to.

Other methods include:

- Involve public participation
- Involve stakeholders: City Council, Administration, Telecommunications Industry, plus the Lansing School District
- Interview Lansing School District staff (admin) on cell towers' locations, revenue thereof, and issues on the topic
- LSD Properties: gain, objections, opportunities, and their stand
- Revenues anticipated for the city
- Map of current locations
- Original tower scheme
- FCC regulations
- Zoning Regulations
- Historical data (case studies for Lansing and neighboring areas)

Timeline

Jan 14	Begin Socioeconomic profile Research and gather data on Cell Towers: o Locations o Safety o Technology o Planning issues o Zoning / Regulations o Wireless Carriers
Jan 18	Meet with department's staff by the end of the week (by Friday the 18th)
Jan 25	Maps and on-site photography by the end of the week (by Friday the 25th) o Coverage maps o Cell Tower Photography
Feb 1	Speak with zoning and siting professionals by the end of the week (by Friday the 1st)
Feb 18	Present First Draft Reports (Feb 18th & 20th) Consolidate/ analyze gathered information Complete client review drafts
March 17	Client Review Drafts Due Complete Final Drafts
April 7	Final Drafts Due Presentation Rehearsal
April 9	Presentation Rehearsal
April 21	Final Client Presentations

Expectations

Policy decisions relative to cellular phone towers should be able to refer to the project and research from the Practicum Group.

Results will be utilized to propose and recommend alternatives and/or set regulations for placement and expansion of towers. Residents' questions regarding technology, safety, and coverage of towers shall be addressed.

Other expectations of project:

- Deliver results to city of Lansing
- Make available research and facts to residents
- Utilize and rely on sources
    - City of Lansing
    - Lansing School District
    - Michigan State University
    - FCC
    - Wireless Communication Corporations (Carriers)

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