TOWN OF DAVIE , FLORIDA

TELECOMMUNICATIONS MASTER PLAN

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Draft Telecommunications Master Plan

- Tutorial on wireless telecommunications
- Tutorial on network design and radio frequency engineering
- Inventory of existing base stations and public land
- Wireless telecommunications deployment analysis

June 18, 2003

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PREFACE

PURPOSE OF THIS PLAN

Over recent years, the Town of Davie has experienced wireless telecommunication infrastructure growth. In accordance with Federal Communications Commission (FCC) guidelines, the Town of Davie (Town) hired CityScape Consultants, Inc. (CityScape) to analyze current demand for wireless communications services in the Town.

The purpose and intent of the Master Plan (Plan) parallels the goals and objectives of other long-range plans for roadway improvements and the extension of water and sewer lines. The Plan combines the land-use planning strategies used in public policy with the industry-accepted radio frequency engineering standards to create an illustrative planning tool that complements the Town's Development Ordinance. This is accomplished first through the identification of existing tower locations and signal coverage conditions; then by comparing this information to public policy; followed by a series of evaluations founded on land use principles and engineering practices. The plan offers strategies to reduce tower infrastructure by improving efforts to "merge" wireless deployments from various service providers, thereby minimizing tower proliferation by increasing shared sites.

The Master Plan includes the following:

- An inventory of existing antenna-supporting structures and buildings, upon which wireless antennas are currently mounted,
- Analysis of expected wireless facility growth for the next ten years,
- Engineering analysis of potential coverage based on Town-regulated height restrictions and other locations and design criteria,
- Recommendations for managing the development of wireless structures for the next 10 years.

CityScape, in combination with Davie's public policy and with the cooperation of the Town of Davie's management and staff, has prepared this document as an up to-date representation of present and future wireless telecommunications for the Town of Davie. The Plan is based on current engineering practices, on-site research and analysis of the wireless deployment history in the Town of Davie.

CITYSCAPE CONSULTANTS, INC.

CityScape Consultants, Inc., is a land-use planning, radio frequency engineering and consulting firm in Coral Springs, Florida. CityScape specializes in developing land use strategies to control the proliferation of wireless infrastructure, while maintaining compliance with the Federal Telecommunications Act of 1996.

The town has provided CityScape with existing public policy concerning the placement of tower locations within the jurisdiction of the town, and the locations of existing towers and publicly-owned properties available for future towers. The Town of Davie inventoried the exishting tower sites and CityScape visited, reviewed and catalogued the public sites to create the inventory which is the basis of the Plan design.

Chapter 1 The Telecommunications Industry

Introduction

Telecommunications is the transmission, emission or reception of radio signals, digital images, sound bytes or other information via wires, cables and space, through radio frequencies, satellites, microwaves, or other electromagnetic systems. Telecommunications includes the transmission of voice, video, data, and broadband using wireless or satellite technologies.

One-way communication for radio and television uses a combination of antennas and receivers to transmit signals from the station to an antenna or group of antennas located on a broadcast tower, which then transmits to the receiving devices found in a radio or television.

Two-way communications through traditional land line telephone service utilizes an extensive network of land lines to transmit a phone call between two people. Fiber optic cable delivers high speed internet connection, cable television reception and an alternative to traditional land line telephones. It uses an extensive network of copper wire lines which are found in above and below ground locations.

Wireless telephony, also known as wireless communications, includes mobile phones, pagers, and two-way enhanced radio systems and relies on the combination of land lines, fiber and an extensive network of elevated antennas, typically found on communication towers, to transmit voice and data information. This technology is known as the first and second generation (1G and 2G) of wireless deployment.

Third, fourth and fifth generations (3G, 4G and 5G) of wireless communications will include the ability to provide instant access to e-mail, the internet, radio, videos, mobile commerce, and Global Positioning Satellite (GPS), in one hand-held, palm pilot type wireless telephone unit. Successful use of this technology will require the deployment of a significant amount of infrastructure, i.e., elevated antennas on above ground structures such as towers, water tanks, roof-tops, signage and light poles.

The evolution of telecommunications dates back to the beginning of time and continues to change at a very fast pace. Figure 1 identifies some of the most significant telecommunication benchmarks over the past 160 years.

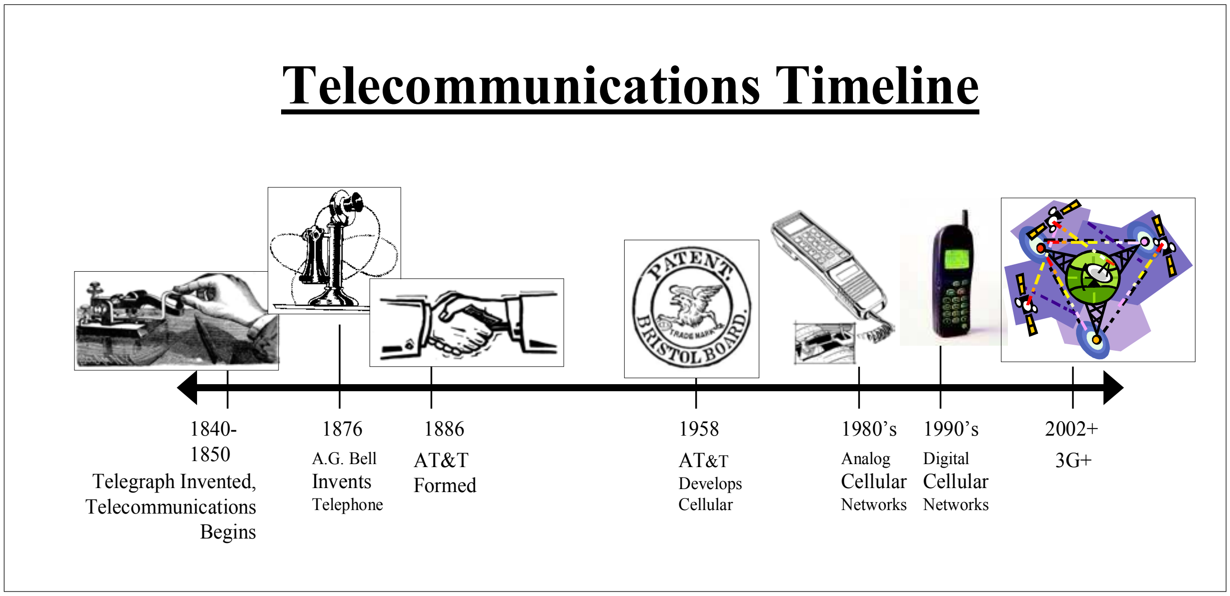


Figure 1 Telecommunication Timeline

Wired telephone networks

When the traditional wired, land line telephone networks were introduced in the United States, the first systems were built in largely populated cities where the financial return on the infrastructure investment could be quickly maximized. Telephone lines were installed along side electrical power lines to maximize efficiency. As the technology improved the service was expanded from coast to coast.

Figure 2 on the page 9 illustrates the wired, land line network system.

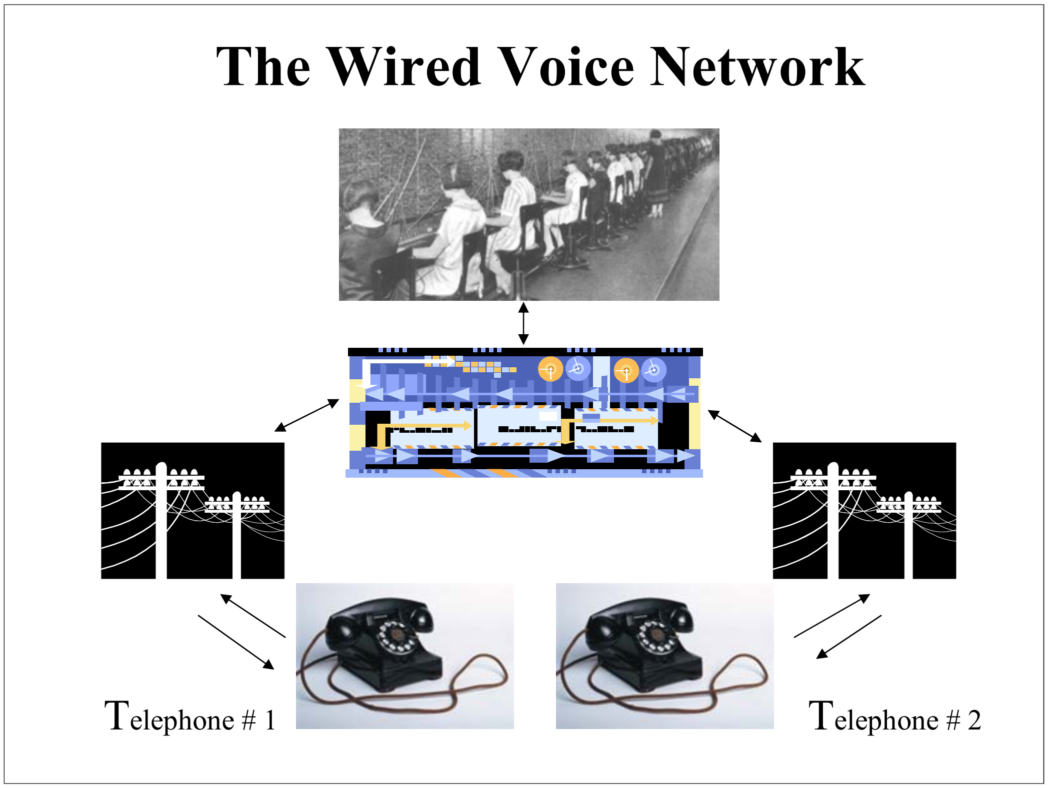


Figure 2 Wired Voice Network System

Wireless telephone networks

Wireless telephone networks operate utilizing wireless frequencies similar to radio and television stations. To design the wireless networks, Radio Frequency (RF) engineers overlay hexagonal cells or circles on a map creating a grid system. These hexagons or circles represent an area equal to the proposed base station coverage area. The center of the hexagon pinpoints the theoretical "perfect location" for a base station. These grid systems are maintained by each different wireless provider's engineering department, resulting in up to nine different grid systems in each community.

During the 1980's, the first generation of 800 MHz band cellular system was launched nationwide. Similar to the deployment strategy for the land lines, the 800 MHz system was first constructed in largely populated areas. Some networks in rural areas are still underdeveloped. Originally, the 800 MHz band only supported an analog radio signal. Customers using a cell phone knew when they traveled outside of the service area because a static sound on the phone similar to the sound of a weak AM or FM radio station was heard through the handset. Recent technological advancements now allow 800 MHz systems to also support digital customers which has improved the audio quality of service.

The 1990's marked the deployment of the 1900 MHz band Personal Communication Systems (PCS). This second generation of wireless technology primarily supports a digital signal, which audibly can be clearer than the analog signal. The technology of 2G includes a static free signal, paging device, and the ability to send text messaging through the handset. Deployment of 2G also targeted largely populated areas and to date much of rural America has limited or no PCS coverage.

In addition to 800 MHz cellular services and 1900 MHz PCS services, there are additional wireless providers utilizing services in the 800 MHz and 900 MHz frequency range. This service is called Enhanced Specialized Mobile Radio or ESMR. The largest ESMR band provider is Nextel Communications. System deployment for all three of these "telephone" operations (800, 900 and 1900 MHz) are specifically addressed, along with some other services, in the Telecommunications Act of 1996.

Both the 800, 900 and 1900 MHz bands utilize a system of elevated antennas attached to a base station and the traditional land lines to send and receive the voice and data signals between customers. Wireless systems must have a continuous trail of antennas to successfully send and receive the signals without interruptions, interference, or dropped calls. The antennas must be elevated to a height where a reasonably clear line of site is attained to avoid interference from obstruction from vegetation and buildings. The elevated base stations of choice have been telecommunication towers; but rooftops, water tanks and tall signage are also utilized as mounting platforms for wireless infrastructure. Rooftops are especially effective in downtown areas where buildings cause interference issues and ground space for new towers is usually unavailable. Figure 3 illustrates the wireless telephone network.

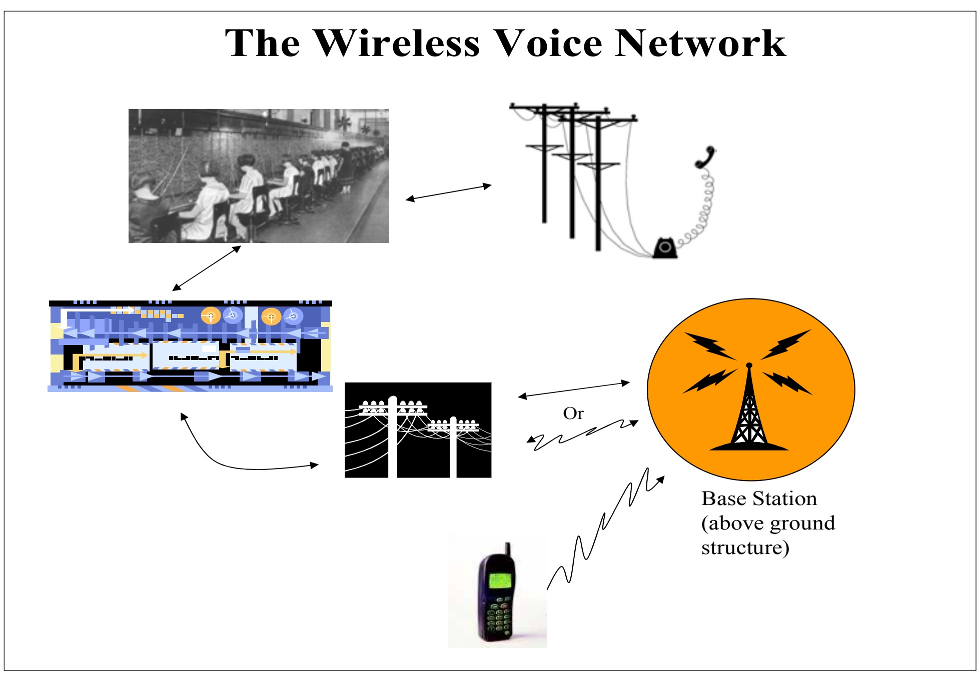


Figure 3 Wireless Voice Network

Wireless providers

In 1983, the Federal Communications Commission (FCC) granted licenses (not sold) to two competing wireless providers to provide cellular coverage nationwide. The early stages primarily were served by the local telephone companies, and on a national level by companies like Cellular One. There were many initial problems and growth was slow. Most wireless providers preferred tall towers in the range of 300 to 500 feet to service large areas. There was also a preference for analog services to reach farther, without much concern for static. Due to the difficulty of constructing new facilities the expansion was costly and challenging.

In 1995 and 1996, the FCC auctioned six additional licenses to competing wireless providers for purposes of building a nationwide digital wireless communication system. This auction raised over 23 billion dollars for the US Treasury which effectively eliminated the Federal deficit.

Wireless coverage

Wireless system providers attain service coverage via antennas located on elevated base stations. The height and location of the towers is critical to meeting the objectives of RF engineering. The systems need continuous coverage with minimal overlap to provide the "hole-free" service that the public desires.

In wireless system evolution, a wireless provider initially built fewer base stations with relatively tall antenna-supporting structures to maximize the network footprint. These initial 1G 800 and 900 MHz systems sought to broadcast coverage to large geographic areas with minimal infrastructure. Typically, these tall towers were spaced 4-8 miles apart.

By nature, the 1900 MHz frequency is higher than the 800 MHz band and cannot transmit an equal signal as great of a distance. For the same coverage, these base stations must be closer together; generally 2-4 miles apart. The mounting height of the antenna for 2G was not as critical as 1G and these towers were shorter.

Figures 4 and 5 on page 12 illustrate the ideal wireless network grid. In figure 4, the yellow and blue hexagons represent 800 MHz and 1900 MHz coverage, respectively. As previously described, the yellow hexagons cover a larger geographic area because the 800 MHz frequency can broadcast the cellular signal a greater distance. The blue hexagons are closer together because the 1900 MHz frequency transmits a shorter range. Figure 5 illustrates the applied grid design to providing network coverage parallel to an Interstate. The red triangles represent the base station and the circles represent the estimated wireless coverage to be operated from the base stations.

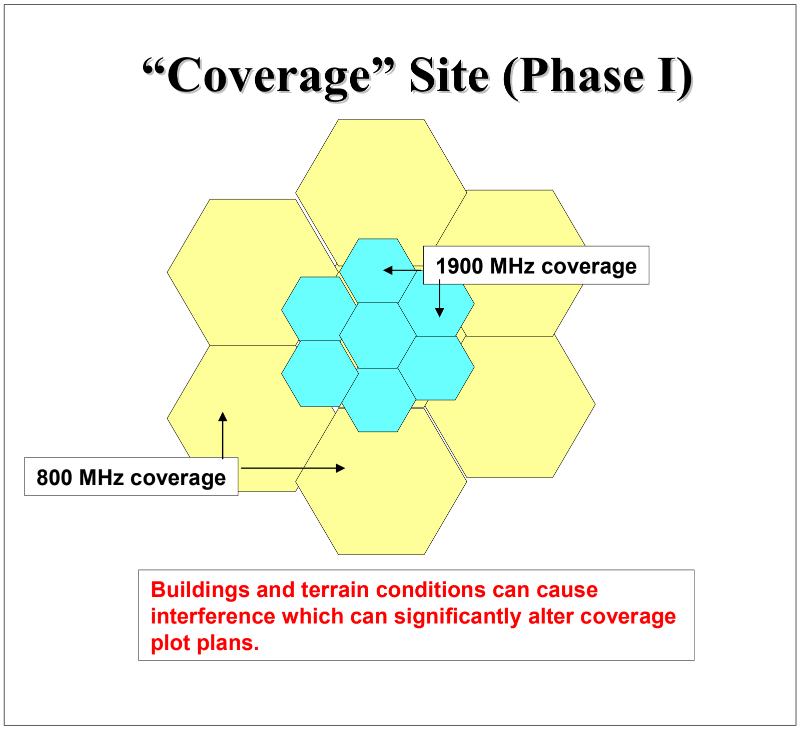


Figure 4 Coverage Grid

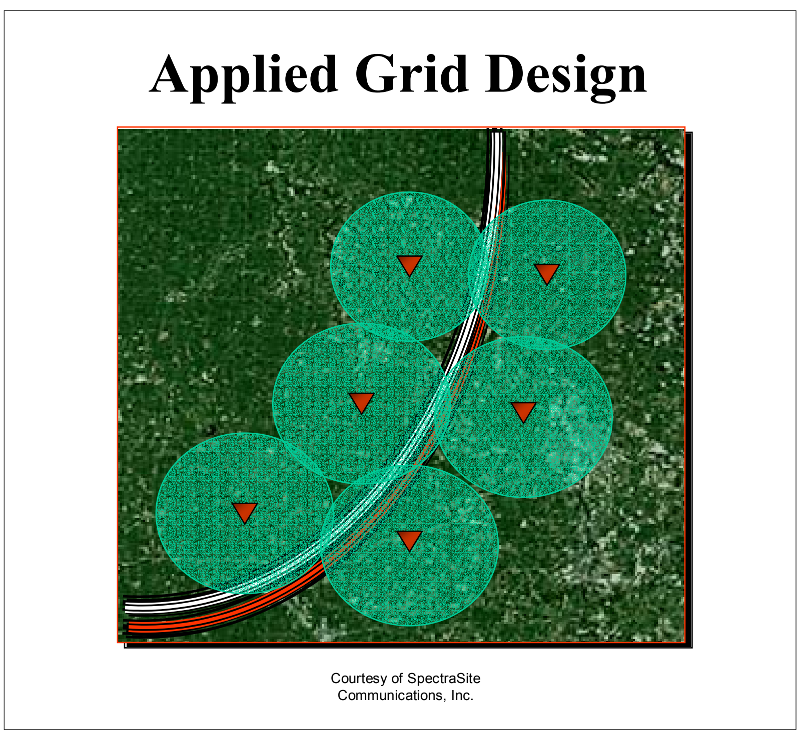


Figure 5 Applied Grid Design

Network capacity

The number of base station sites in a grid network not only determines the limits of geographic coverage, but the number of subscribers (customers) the system can support at any given time. Each base station can process an average of 1,000 subscribers per minute (different providers prefer different numbers, the 1,000 is an average). This process is referred to as network capacity. As population and wireless customers increase, excessive demand is put on the existing system's network capacity. When the network capacity reaches its limit, a customer will frequently hear a rapid busy signal, get a message indicating that all of the circuits are busy, or will be asked to leave a message without hearing the phone ring on the receiving end of the call.

As the wireless network reaches design network capacity, the coverage area shrinks, further complicating coverage objectives. Network capacity can be increased several ways. One, the service provider can add more antennas to an existing base station; two, the service provider can readjust the antennas to better serve the needed area; and three, the provider can add additional base stations with additional infrastructure.

A “capacity” base station has provisions for additional calling resources which enhances the network’s ability to serve more wireless phone customers within a specific geographic area as its primary objective. An assumption behind the capacity base station concept is that an area already has plenty of radio signal from existing coverage base stations, and the signals are clear. But there are too many calls being sent through the existing base stations resulting in capacity blockages at the base stations, leading to “no service” indications for subscribers when they press the “call send” button.

Figures 6 and 7 on page 13 illustrate the complications and resolutions of network capacity issues.

In figure 6, the 1G networks covered specific areas. As more customers purchased wireless communication services, the coverage areas shrunk, creating gaps in the original coverage area.

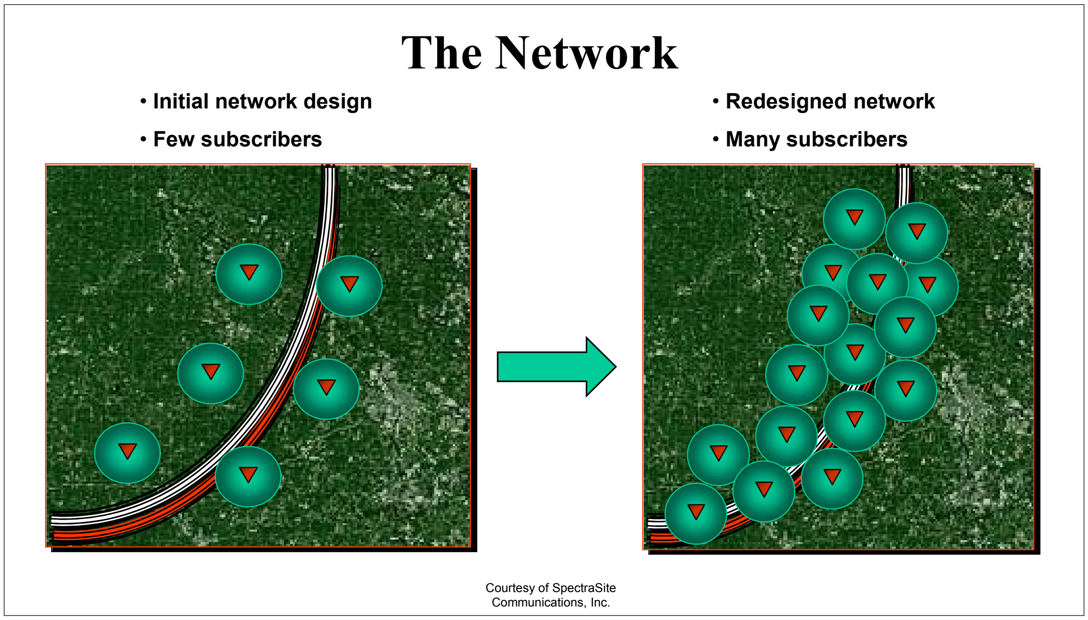


Figure 6 Network Capacity

Figure 7 demonstrates the combination of options available for solving coverage gaps as networks reach maximum capacity.

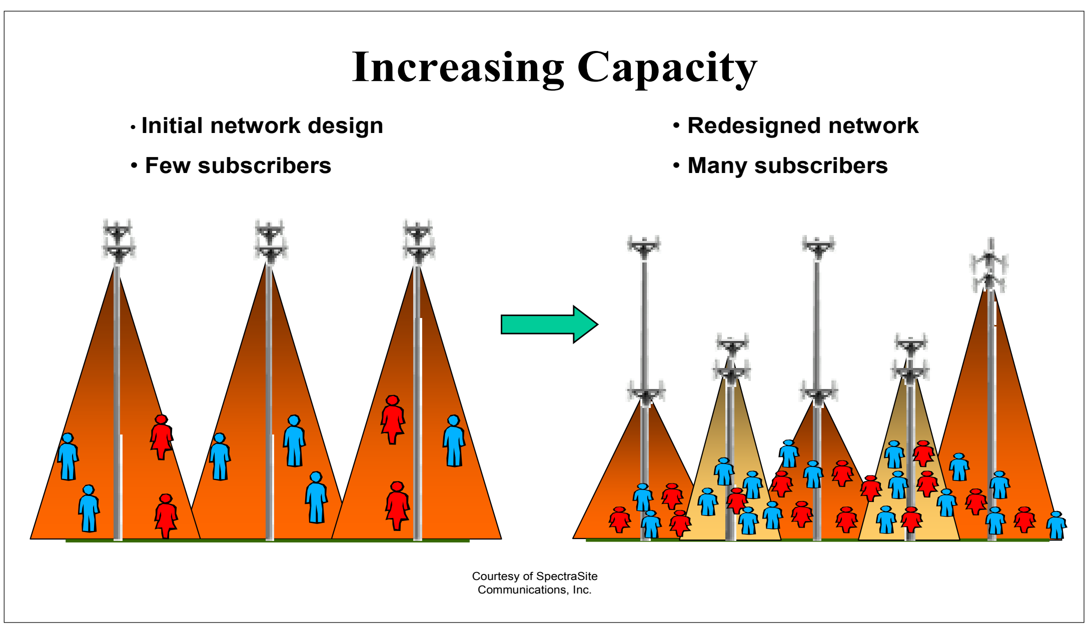


Figure 7 Increases Network Capacity

Wireless infrastructure

Wireless base stations are facilities for mounting antenna arrays for meeting wireless telecommunication network deployment plans. A variety of structures can be used as base stations, such as towers, buildings, water tanks, existing 911 tower facilities, tall signage and light poles; provided that, 1) the structure is physically capable of supporting the antenna and the coaxial cables; and, 2) there is sufficient ground space to accommodate the accessory equipment cabinets used in running the network. Base stations can also be camouflaged in some circumstances to visually blend-in with the surrounding area.

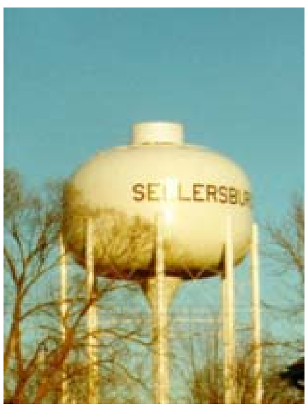
Figure 8 on page 16 shows examples of some typical base stations. The monopole is a free-standing pole similar to an oversized utility pole. The lattice tower is also a free-standing, tripod shaped tower, with crisscrossing brackets. The guyed tower is not a free-standing tower and relies on the attached cables and anchors to support the facility. The flagpole is a camouflaged tower. The antennas are flush-mounted onto a monopole and a fiberglass cylinder is fitted over the antenna concealing them from view. The bell tower is a camouflaged lattice tower. The antennas are hidden above the bells and behind the artwork at the top of the structure.

Antenna Mounting Facilities

Monopole Tower

Lattice Tower

Guy Tower



Water Tank Mount

Rooftop Mount

Tall Signage Mount (inside)

Camouflaged Tower

Camouflaged Tower

Camouflaged Tower

Figure 8 Examples of Base Stations

Wireless infrastructure and local zoning

The location of the antenna is critical to attaining an optimally functioning network. With the deployment of 1G, there were only two competing wireless cellular providers. But with the deployment of 2G the wireless market place became furiously competitive. “Speed to market” and “location, location, location” became the slogans for the competing 1G and 2G providers. The initial strategy was for each provider to have their own base station. The concept of sharing base stations was not part of the strategy as each provider sought to have the fastest deployment, so as to develop the largest customer base, resulting in a quick return on their cost of deployment. This resulted in an extraneous amount of new tower construction without the benefit of local land use management.

Coincidently, as local governments began to adopt development standards for the wireless communications industry, the industry strategy changed again. The cost associated with each provider developing an autonomous inventory of base stations put a financial strain on their ability to deploy their networks. As a result, most of the wireless providers divested their internal real estate departments and tower inventories. This change gave birth to a new industry, vertical real-estate; and it includes a consortium of tower builders, tower owners and site acquisition and site management firms.

No longer was a tower being built for an individual wireless service provider, but for a multitude of potential new tenants who would share the facility without the individual cost of building, owning and maintaining the facility. Sharing antenna space on the tower between wireless providers is called colocation.

This industry change should have benefited local governments who adopted new tower ordinances requiring colocation as a way to reduce the number of new towers. But, it did not, because the vertical real estate business model for new towers was founded on tall tower structures intended to support as many wireless providers as possible. As a result, local landscapes became dotted with all types of towers and communities began to adopt regulations to prohibit or have the effect of prohibiting wireless communication towers within their jurisdictional boundaries.

Wireless deployment came to a halt in many geographical areas as all involved in wireless deployment became equally frustrated with the situation. Second generation wireless providers had paid a large sum of money for the rights to provide wireless services, the license agreements between the wireless providers and the FCC mandated the networks be deployed within a specific time period and local government agencies were prohibiting the deployments through new zoning standards.

This perplexing situation prompted the adoption of Section 704 of the Federal Telecommunication Act of 1996.

Federal Telecommunications Act of 1996

Section 704 of the Federal Telecommunications Act of 1996 gives local governments zoning authority over the deployment of wireless telecommunication facilities subject to several specific guidelines.

First, land use development standards may not unreasonably discriminate among the wireless providers, and may not prohibit or have the effect of prohibiting the deployment of wireless infrastructure. For example, some communities adopted development standards restricting the distance between towers to 3 miles. In some geographic locations with sparse populations this may have been adequate for the 1G deployment. But the laws of physics make it impossible for 2G wireless deployments to meet this spacing requirement. Without realizing it, some communities inadvertently prohibited the deployment of 2G.

Second, local governments must act on applications for new wireless infrastructure within a "reasonable" amount of time. If a community adopts a moratorium on new wireless deployment, it must be for a limited amount of time, and the community must demonstrate a "good-faith" effort to resolve outstanding issues during the moratorium time period.

Third, incentives may be adopted to promote the location of telecommunications facilities in certain designated areas; and the Act encourages the use of third party professional review of site applications.

Fourth, the Act provides Federal standards for RF emissions that must be met by the wireless provider, local government cannot deny an application for a new wireless facility or the expansion of an existing facility on the grounds that radio frequency emissions are harmful to the environment or to human health.

Fact sheets authored by the Federal Communications Commission summarizing Section 704 are provided as Appendix A.

Exposure to radio frequency emissions

The Federal Communication Commission has rules for human exposure to electromagnetic radiation. Electromagnetic radiation should not be confused with ionizing radiation.

Ionizing radiation is radiation that has sufficient energy to remove electrons from atoms. This type of radiation can be found from many sources, including health care facilities, research institutions, nuclear reactors and their support facilities, nuclear weapon production facilities, and other various manufacturing settings, just to name a few. Some high-voltage beam-control devices, such as high-power transmitter tubes can emit ionizing radiation, but this is usually contained within the transmitter tube itself. Overexposure to ionizing radiation can have serious effects, including cancers, birth deformities and mental illness.

Electromagnetic radiation is non-ionizing radiation, which ranges from extremely low frequency (ELF) radiation to ultraviolet light. Some typical sources of non-ionizing radiation include lasers, radio antennae, microwave ovens, and video display terminals (VDT). However, any electrical appliance or electrical wiring itself emits ELF radiation. Cellular and PCS installations must confirm compliance with published standards on radio frequency exposure levels.

Radio frequency radiation attenuates very rapidly with distance from a wireless services antenna, and most wireless sites, not accompanying broadcast facilities, will easily comply.

The RF exposure rules adopted by the FCC are based on the potential for RF to heat human tissue. Basically, the level at which human tissue heating occurs has been studied, and rules are set such that humans are not to be exposed to anywhere near the level that can cause measurable heating.

There have been extensive long-term studies and at best they are inconclusive as to any harmful effects. Debate continues on whether or not there might be biological effects associated with "non-thermal" causes, such as magnetic fields.

Base stations

For the cellular and PCS bands, human exposure limitations are given in terms of "power density," with the units mW/cm^2. The power density associated with a cellular or PCS installation may be easily calculated or measured with instruments.

"Time averaging" is used along with the level measured. This means that the level must not exceed the standard value over any period. For instance, if the standard calls for a limitation of 1.0 mW/cm^2 averaged over 30 minutes, the standard permits a level of 2.0 mW/cm^2 for up to 15 minutes as long as this is followed by a 15-minute period of no exposure.

In general, the FCC's "general population/uncontrolled" exposure limitation must be used in the service, unless it can be clearly demonstrated that unsuspecting persons can be radiated at standard levels from a site.

In many cases, no field evaluation is required, since the site is "categorically excluded," based on the presumption that in its radio service there is no possibility of an excessive RF level if the provider certifies such compliance. For example, facilities on towers with the antennas higher than 10 meters and a power less than 2000 Watts require no further consideration.

In general, single provider installations on towers will be categorically excluded. Multiple provider colocations and very high power sites will require further consideration.

In consideration of how conservative the evaluation method is, an engineer may wish to make actual power density measurements. In almost all cases, those measurements have been far below the calculated values.

If the site truly doesn't comply, some alternatives include:

- Limit the site access such that only authorized personnel can reach the vicinity of the antennas. The applicable standard then becomes the "occupational/controlled" one,
- Raise the height of the antennas,
- Reduce the power,
- Re-position antennas such that people cannot get close to them.

In multi-transmitter facilities, it is necessary to evaluate each contributor individually. Its "percent of standard" figure is computed (or measured), and added together to sum all percentage figures to determine the total site exposure.

Phones

In July 2001, the FDA issued a Consumer Update on Wireless Phones, which stated that "the available scientific evidence does not show that any health problems are associated with using wireless phones," while noting that, "there is no proof, however, that wireless phones are absolutely safe."

The FCC issued a Consumer Information Bureau Publication in July 2001, which stated that "there is no scientific evidence to date that proves that wireless phone usage can lead to cancer or other adverse health effects, like headaches, dizziness, elevated blood pressure, or memory loss."

Before a wireless phone model is available for sale to the public, it must be tested by the manufacturer and certified to the FCC that it does not exceed limits established by the FCC.

One of these limits is expressed as Specific Absorption Rate (SAR). SAR is a measure of the rate of absorption of RF energy in the body. Since 1996, the FCC has required the SAR of handheld wireless phones not exceed 1.6 watts per kilogram, averaged over one gram of tissue.

Steps one can take to minimize RF exposure from cell phones:

- Reduce your talk time.
- Place more distance between your body and the source of the RF.
- And in a vehicle, use a phone with an antenna on the outside of the vehicle.

The FDA stated "[t]he scientific evidence does not show a danger to users of wireless phones, including children and teenagers." People who wish to reduce their RF exposure may choose to restrict their wireless phone use.

Emerging Technologies

In the United States, the wireless industry has been significantly affected by a decline in the technology markets and consequently is not deploying the infrastructure at the fast rate in which is has in the past. Deployments have not stopped, but significantly slowed down.

However, on a worldwide market viewpoint, the next several phases of wireless are inevitable. In Japan and Europe, 3G is already being deployed and utilized by the citizens in those countries. According to the wireless telephone manufacture Nokia; the Nokia 3G network solution was available for operators in 2001 and 2002. The first locations to have 3G services were Japan in 2001 and Europe in 2002. (www.nokia.com web page)

At the onset of this millennium economist and telecommunication forecasters debated the actuality of third, fourth and fifth generations of wireless actually coming to fruition in the United States. Skepticism that customers would have little demand for the emerging wireless services appeared in articles and newsrooms, while others recognized the infrastructure in the United States was significantly behind schedule as compared to the European and Asian deployments. It was predicted that consumers would demand the 3G products once theoretical plans were instituted through technological advancements.

3G deployments have progressed slower when compared to the 1G and 2G deployments, but systems are being tested, designed, built and instituted.

For example Lucent Technologies announced the following on February 20, 2002:

> "…According to Lucent, its secure IP VPN mobility solution will help operators of 3G UMTS networks enter the emerging market for secure communications between enterprise data networks and end-users such as traveling employees or remote workers. The company said the secure IP VPN connections will enable mobile subscribers to use a service provider's wireless network as an extension of their corporate local area network (LAN) or intranet, allowing them to work from any location as if they were in the office... The end-user was authenticated and assigned an IP address, and then was able -- once the connection was established -- to successfully send and receive email, including messages with large attachments, in a fully encrypted mode, thus allowing even sensitive data to be accessed." (Intranet Journal, 02/20/02, "Lucent Demos 3G Mobile Service Connection to Corporate Intranet")

More recently, on December 23, 2002, Sprint announced they are the first U.S. wireless provider to introduce the next generation of services nationwide knows as PCS VisionSM. The 3G upgrades to infrastructure were done primarily through software improvements at the existing Sprint base stations. The wireless phone capable of accessing these services is the SPH-i330 manufactured by Samsung.

Figure 9 illustrates the Nokia 7250 handset and the SPH-i330 handset and the new services available by Sprint.

(www.nokia.com)

- The Nokia 7250 phone has an innovative keypad layout and a versatile scroll key that makes it easy to navigate the high-resolution color display.
- Take pictures with the built-in camera and then share them with your friends or family using multimedia messaging technology.
- Eight color schemes let you personalize some of the display elements like header lines or the battery and signal strength indicators.
- Extremely appealing audio features include a selection of pre-loaded ringing tones, a built-in stereo FM radio, and the possibility to receive new polyphonic sounds through MMS, WAP, or Nokia PC Suite.
- The Nokia 7250 tri-band phone operates in three networks - EGSM 900 and GSM 1800/1900 - providing coverage on five continents.
- The Nokia 7250 phone is one of the first to have a Pop-Port™ interface connector. It supports advanced functionalities, such as digital enhancement identification, stereo audio, and fast data connectivity.

(www.samsung.com)

- An updated version of Samsung Electronics Co. Ltd.'s Palm OS-based cellular telephone has debuted in the U.S. market.
- Has a large 256 color LCD (liquid crystal display) with 160 by 240 pixel resolution. South Korea's Samsung has built 16M bytes of memory into the handset, which is double that of its predecessor.
- The phone's radio is a dual-band, tri-mode model offering compatibility with CDMA (Code Division Multiple Access) at both 800MHz and 1,900MHz and the analog AMPS network.
- The handset is available first in the U.S. though Sprint PCS Group and is compatible with the carrier's CDMA2000 1x data service, which offers packet-based data transmission at speeds of up to 144k bps (bits per second).
- Expected to be available through Sprint.

  (ITworld.com, 12/26/02, "Samsung's i330 Palm OS cell phone debuts"
  Martyn Williams, IDG News Service, Tokyo Bureau)

Figure 9 3G Wireless Phones and Related Services

Future wireless generations

While atlas the United States is starting to experience the first deployments of 3G, other parts of the world are being introduced to 4G. Proving to early skeptics that while the deployment of wireless services in the United States have slowed down, the 3G services will continue to evolve and be sold here and abroad. The article below explains the type of wireless services now being promoted in Asia, which will eventually be promoted in the United States.

> "At the recent Telecom Asia exhibition in Hong Kong, Samsung showed for the first time its M400 handset. Based on Pocket PC 2002 Phone Edition, the device runs on CDMA 2000 1x EvDO (Evolution Data Only) networks, which are in commercial service in South Korea and offer data transmission at speeds of up to 2.4M bps. Features of the phone, which is based on an Intel Corp. XScale processor running at 400MHz, include a display capable of showing 65,000 colors, voice recognition and a text-to-speech engine, a TV tuner and GPS (Global Positioning System). Samsung also has a handset based on Microsoft's Windows Powered Smartphone platform under development. That operating system is targeted at handsets that are more like traditional cell phones and offers a limited number of PDA-like functions." (ITworld.com 12/26/02, "Samsung's i330 Palm OS cell phone debuts" Martyn Williams, IDG News Service, Tokyo Bureau)

Satellite Technologies

Satellite growth has surpassed the highest expectations of only a few years ago. The reason is simple…cost. Previously, relaying information, data, and other related materials were cumbersome and required many relay stations located in very specific locations and relatively close together. Initially satellite use was expensive because to the rarity and limited amount of available "air time" needed. With the deployment of more and more satellite services, and advancing technologies allowing more usage of the same amount of bandwidth, satellite "air time" has become more affordable. Competition always leads to lower cost, and that is what has occurred. In addition satellite services are in the early stages of designing a more localized aspect. As this occurs there will be even more growth more rapidly.

Recently Licensee's of satellite telephone services petitioned the Federal Communications Commission to allow additional deployment of land based supplemental transmission relay stations for the ability to compete more aggressively with existing Cellular and PCS services. The FCC is looking favorably upon this request, even though the existing land based services are strongly objecting for various reasons. If this is allowed there will be more demands placed on Governmental agencies as another service begins to construct a land-based infrastructure.

Preparations for 3G infrastructure

The FCC recently announced it would permit the phasing out of analog compatibility requirements for cellular phones over a five-year period. The Commission's action still allows providers the option to continue analog services as needed to meet customer needs. According to the Cellular Telecommunications & Internet Association (CTIA) about 85% of all wireless subscribers are already using digital technology, and wireless users generally replace their phones every eighteen months. Thus, the five-year phase out period is more than ample time to migrate the remaining analog users to digital, which also has the added benefit of increasing cell site capacity.

The CTIA also recently announced wireless carriers are now participating in a program that allows a customer of Carrier A to communicate through text messaging with a customer of Carrier B. One of its many benefits is as an electronic alternative to a postage stamp; you can send text messages from anywhere and they can be delivered anywhere at anytime.

Text messaging has been proven to very successful in other countries; in Australia, a recent Coca-Cola promotion resulted in over 7 million text messages over a span of thirteen weeks. In Europe, one company quit issuing paychecks to its employees; instead it now sends them a text message confirming that the funds have been deposited.

The statistics are impressive. In 2001 there were 1 billion messages sent a day globally. Every digital phone that is sold today in the United States has messaging capability; in Europe last year, 15% of the carriers' revenue came from text messaging.

The growth of text messaging in the United States will undoubtedly lead to a greater demand for wireless facilities because the additional spectrum use by text messages will create a system capacity demand for providers. Third, four and fifth generations of wireless deployment will bring the next phases of wireless technology and place great demands on network capacity. With voice, text and data all competing for spectrum space, providers will need to maximize their spectrum allocations by creating more compact base station facilities at closer intervals.

Chapter 2 Demographics

The Town

The Town of Davie is located in the central portion of Broward County. Interstate 595 is the northern boundary, Interstate 75 is the western boundary and Highways 818/Griffin Road and 441/SR7 are respectively the general southern and eastern boundaries.

Broward County occupies approximately 1,205 square miles, of which the Town of Davie's jurisdictional boundaries occupy 34.23 square miles. Approximately .74 square miles is water and 33.43 square miles is land.

The 2000 Census by the U.S. Census Bureau identified the 1990 population for the Town of Davie as 47,217 and in 2000, it increased to 75,720; a sixty percent gain over ten years. This is significantly higher than the State's population average gain of 23.5 percent over the same period. In 2000 the housing unit count was 31,284, (including occupied housing units and vacant housing units for seasonal, recreational, or occasional use) indicating a housing population of 914 people per square mile.

The 2001 population estimate for Broward County was 1,668,560, an increase of 2.8 percent over a one-year period; and 75,994 for the Town of Davie, a 1.7 percent increase during the same time period.

The Town's population is younger than Broward County's and Florida's as a whole. Persons 65 years and older account for 9.4 percent of the population in 2000, compared to 16.1 percent from the county and 17.6 percent statewide. The median age for the Town of Davie is 35.5.

The Wireless Industry

Prior to the granting of the cellular licenses in 1980 for the first phase of deployment, the United States was divided into 734 regions described as Cellular Market Areas (CMA). The spectrum auction conducted by the Federal Government for the 1900 MHz bands for 2G (PCS), further divided the United States into 493 geographic areas call Basic Trading Areas (BTA). The Town of Davie is located in the Miami-Ft. Lauderdale-Hollywood CMA 012 and the Miami-Ft. Lauderdale BTA 293.

A partial list of holders of FCC licenses for CMA 012 and BTA 293 are as follows: Sprint PCS, AT&T Wireless, Verizon Wireless, Metro PCS, Voicestream (also known as T-Mobile), AT&T and Florida Cellular Services.

These are names of the license holders. However, they may do business under different trade names.

The wireless "explosion" of the 1990s has slowed considerably. However, demand for new facilities will continue as populations increase and technology evolves and maximizes the capacity of the existing networks.

The industry is expected to mature in several important ways, each having an effect on local governments such as the Town of Davie. First, wireless providers will offer more service options to increase the number of airtime "minutes" that subscribers buy. Second, 3G, 4G and 5G enhanced phone services will require more network capacity. The resulting effect requires more base stations as network capacities exhaust and relief is required. Consequently, the Town can expect to see applications for more towers continuing throughout the decade.

Consolidation in the wireless industry can also be expected. Current FCC guidelines limit the amount of wireless "spectrum", or frequency space, which any one wireless provider may own in a market. This "spectrum cap" will likely be lifted in 2003. One theory is that through the spectrum cap removal , the public may see fewer wireless telephone providers, despite unchanged demand.

Wireless demographic analysis

Considering a current market "penetration rate" of about 39 percent, 25,000 to 30,000 users of personal wireless phones can be expected in the Town, not counting "roaming" transients. There are approximately 25 wireless facilities hosting 39 antenna sites in Davie, which averages to 757 subscribers per base station.

Using the Town of Davie's population projections in Table 1.5 of the Comprehensive Plan, the 2010 population is expected to reach approximately 90, 387, an increase of approximately 14,667. Considering this population estimation and the current wireless market penetration rate of 39 percent, such growth will result in an additional 5,720 wireless subscribers. Thus, with present growth models and the current wireless market penetration rate, the Town can expect a total of about 35,250 wireless subscribers by 2010 for wireless telephone services alone.

Please be aware this addresses only the projected growth of wireless type telephone subscriptions and only considers 2003 trends.

It is most likely that "wired" telephone services will further decrease, creating an exponential growth rate for new wireless type telephones, creating even more demand than envisioned in this report. In the near future, governments will need to allow additional services for ancillary wireless services as future generations of services are deployed. This includes everything from electronic vending to wireless internet services, and 800 MHz, 1900 MHz, to future 2.4 GHz, and 5.4 GHz frequencies.

Based simply on subscriber increases, the total number of wireless sites will grow from 39 presently to about 47 or more antenna sites in the very near future. As technology advances and service areas are clearly defined as capacity concerns the actual number of antenna sites could grow at a substantially higher rate. In addition, the public will demand more wireless service to access the internet. This alone will have a dramatic effect on the need for more antenna locations.

Increased usage of wireless devices (phones, instant messaging, pagers) should be expected. This continual increase in used minutes will overwhelm existing sites. A 25 percent growth in the amount of usage minutes per subscriber is reasonable to expect. If that translates directly into new base station sites, the future total may be expected to approach 51, an increase of about 12 additional antenna sites, for all providers of all services in the next decade.

At some point in the future, when our local and national economy improves and economic improvements offer the wireless industry the opportunity to expand their wireless telephone networks, the Town of Davie will eventually need approximately 140 total antenna sites to allow for complete and uninterrupted service by all known wireless service providers over the next ten years.

The Town has adopted an Interim Zoning Ordinance limiting the heights of towers to 120 feet. Assuming each 120 foot tower can accommodate four antenna arrays, the Town can expect to add an additional ten new towers.

It may also be expected that broadcasters, data transfers, satellite telephones, public safety communications, and other services will require tower space.

Chapter 3 Wireless Technical Issues

Search area radii within coverage areas

The search area is ideally specified in a document given to site search consultants in pursuit of a lease for property on which to place their facilities, whether a new tower, a rooftop or some other existing structure that could accommodate wireless antennas. From an engineering perspective, any location within the proposed search area is considered to be acceptable for the provider.

Maximum coverage radii for typical in-vehicle coverage is calculated for various tower heights, and is de-rated by 20% to account for a reasonable handoff zone. That figure is then divided by four to obtain a search area radius for each tower height. Cellular search areas are usually circles of approximately one-quarter the radius of the proposed cell. In practice it is fairly simple to determine whether the search area radius is reasonable. The distance from the closest existing site is determined, halved, and a handoff "overlap" of about 20 percent is added. One fourth of this distance is the search area radius.

Search areas for both 800 MHz and 1900 MHz are computed in the tables below. The "Okumura-Hata" propagation path loss formula is used for 850 MHz, and the similar "COST-231" formula in the 1900 MHz case.

<u>**Okumura-Hata Formula for Cellular Deployment**</u>

Antenna Height	**50′**	**80′**	**100′**	**110′**	**120′**
Frequency (MHz)	850	850	850	850	850
Radius, mi	2.53	3.20	3.60	3.79	3.97
Allow for handoff	2.03	2.56	2.88	3.03	3.18
Search area, miles	0.51	0.64	0.72	0.76	0.79

<u>**COST-231 For PCS Deployment**</u>

Antenna Height	**50′**	**80′**	**100′**	**110′**	**120′**
Freq (MHz)	1900	1900	1900	1900	1900
Radius, mi	1.33	1.64	1.82	1.91	1.99
Allow for handoff	1.07	1.31	1.46	1.53	1.60
Search area, miles	0.27	0.33	0.36	0.38	0.40

For instance, if a 1900 MHz wireless provider applies for a new antenna support structure and supporting data show that coverage expected is one mile, the maximum height necessary would be approximately 50 feet, according to the (COST-231) formula table. Figure 10 illustrates this graphically. The hexagonal search areas radius is one-quarter of the radius of the cell's coverage less a 20% hand-off overlap.

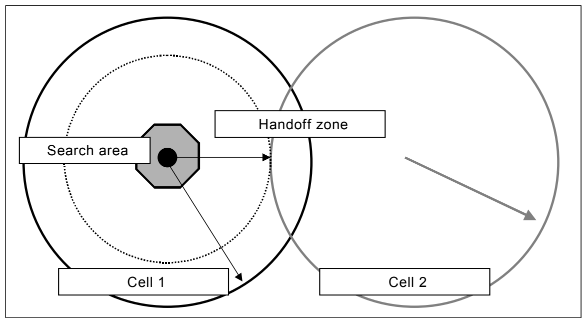


Figure 10 Search Area Determination

Height Considerations

Taller structures may offer more opportunity for colocation, which could potentially decrease the number of additional towers and antennas required in an area. The extent to which height may increase colocation opportunities must be verified by an RF engineering review on a case-by-case basis, given that the build-out plans for some dense areas may require very low antenna location heights. Antennas located at a higher level on a facility may be more attractive in some rural areas, but in many cases, the wireless providers seek to limit the height in more populace areas.

The height varies with each wireless provider, each location and each build-out plan. Thus, wireless providers will vie for differing heights on a single tower, reducing the potential for harmful interference.

Emerging technologies

Wireless providers are presently deploying new equipment to support data services over the wireless interface. One of the first of these deployments has been a Global System for Mobile Communications (GSM) overlay on top of existing facilities, in recognition of GSM's data-handling capability.

In most cases, a GSM overlay is accomplished by placing a new BTS (base transceiver station) cabinet into an existing shelter or near the tower base. In many cases, new antennas are required, which is of interest to the Town because they take up space just as a "new" wireless provider.

Particular operating bands also affect the Town's interests. In certain cases, like AT&T's case, the GSM overlay is on 1900 MHz, where signals only cover about half the distance of the existing system, implying more wireless facility locations will be required to meet coverage and network capacity objectives.

Chapter 4 Procedures Used to Create Plan

Plan design process

This Master Plan evaluates the Town of Davie for future wireless facility growth. This is accomplished by:

- Researching the *inventory* of existing antenna-supporting structures and buildings and evaluating designated public lands as potential sites for wireless facilities,
- Designing an *engineered search radii* template and applying it over the jurisdictional boundary of the Town to evaluate existing build-out conditions,
- Providing an *engineering analysis* of existing coverage based on the inventory and regulatory height restrictions within the Town.

The inventory

The Town conducted a tower inventory based on the needs of Cityscape to identify the locations of existing wireless telecommunication providers operating within Davie Town limits, along with potential existing sites and telecommunications facilities currently existing in the Town, and existing structures that could be utilized at a future date for support structures for the wireless antennas. This inventory was conducted by actual size visits. The Town suggested existing facilities located around the perimeter of the Town limits should be included in the inventory, since these affect the wireless coverage to the Town. CityScape agreed to include these sites since they do impact the design in the town and will dictate the needs of further locations.

CityScape conducted an inventory of public land sites such as designated fire stations, parks and other public property for potential future wireless communication facilities.

Engineering search area radii

The foundation for CityScape's engineering analysis is based on legally defensible wireless deployment guidelines that are consistent with accepted engineering practices, existing and estimated future population density, and the use of the 800 MHz and 1900 MHz band systems.

Generally accepted 800 MHz engineering principles establish a reasonable "search area" for a wireless base station as a circle with a radius about one-quarter that of the proposed cell, centered on the ideal location for the cell according to the wireless provider's deployment plan. Davie's land use regulations generally restricts tower heights to 120′, however CityScape has designed the engineering of this Mater Plan based on the assumed availability for wireless platforms at the 100′ elevation. This results in a "handoff" zone with a reasonable search area radius of approximately 2.88 miles.

Future subscriber growth and an increase in subscriber minutes will require antenna sites to be closer together and lower in elevation. Based on this, CityScape estimates that a half-mile "search area grid" will serve the Town of Davie over the next ten-year period.

Engineering analysis

The Master Plan is designed to provide a template to guide the Town of Davie toward a fair and equitable development of needed wireless services. The particular organizations requiring such development will change from time to time and, in addition, the frequency bands available for allocation will grow. For now the Town of Davie has three blocks of service to be considered. Those are service providers in the two blocks of Cellular services allocated in the 800 MHz bank; four blocks of Personal Communications Services (PCS) allocated in the 1900 MHz band; and an existing Enhanced Specialized Mobile Radio (ESMR) provider also in the 800 MHz band. These are the current services requiring uninterrupted continuous, hand-off service within the town. In the near future, there is a likelihood that additional services in the 2400 MHz and 5400 MHz bands will follow similar requirements.

Creation of a Master Telecommunication Plan starts with the cataloging of existing telecommunication facilities. This includes everything from towers to rooftops, light stanchions to billboards, and anything that presently is used as a wireless antenna support structure. Once CityScape reviews the infrastructure in place and the capability of further utilization for addition carriers or services is derived, the engineering group works in conjunction with the legal team to construct legally defensible wireless development guidelines and public policy based on the demographics of Davie. The eastern portion of the Town of Davie is densely populated and, based on both coverage needs and capacity overload engineering, this area will eventually require new antenna-support structures to meet network demand.

Cityscape has developed a series of maps, based on population density and frequency spectrum allocations. These maps illustrate initial Cellular and PCS coverage without the variable of population density, wireless service coverage and traffic patterns, caller hand offs, and search area grids over the Town.

Initial coverage maps (figures 11 and 12) illustrate wireless telecommunication signal coverage in a perfect radio frequency environment, one without population, terrain, or traffic concerns. These variables effectiveness of the wireless signal between the antenna and a wireless telecommunication handset.

A single telecommunications site can only handle a finite number of calls simultaneously, so as population increases, coverage from a base station site decreases. Too many subscribers at a single base station results in dropped wireless telephone calls and redial tones. CityScape includes the effects population can have upon the signal's coverage on figure 13.

Wireless subscriber "hand off" areas are shown in figures 15-17, indicating the distance from a site a subscriber can travel before being transferred to a neighboring site. The goal is to hand off the subscriber to a stronger signal before his present signal fades to the point of being unacceptable.

Search area grid maps are provided as a tool to be used to locate facilities appropriate for antenna placement. For example, to locate a two-mile radius cell, reasonable in PCS frequencies, a half-mile search area circle represents an area of "local satisfaction" for the wireless provider, and any spot within this circle would be a good spot for the location of the transmission equipment. One half mile is reasonable ONLY for a two-mile limited range cell. For a cell of greater radius, the search area is greater, thus more opportunities that an existing structure may serve as a candidate for collocation.

After this aspect of the project is completed, engineering can analyze the existing deployment patterns in the Town and predict future needs for base stations. Engineering will sometimes shift the cells to best suit existing operations with obstruction concerns and known future expectations, then project enhanced future services and anticipated consumer demands. CityScape then recommends how to best reuse existing sites while, whenever possible, directing any new facilities toward Town-owned property.

Sometimes the engineering analysis and recommendations have implications on existing public policy. For example, when the engineering was completed for another community in Florida, it was obvious some geographic areas could not be serviced by the wireless providers because the community prohibited any wireless infrastructure on public properties and limited the height of the new towers to a maximum of 150 feet. This community owns multiple, large tracts of land, classified as conservation areas. The laws of physics do not allow radio signals from a 150′ antenna platform to transmit from one side of this particular conservation area to the other without uninterrupted coverage. This combination of approved public policy inadvertently created a barrier to entry by the wireless providers. This is in conflict of the Federal Telecommunications Act of 1996 (Appendix A).

As a solution, the community decided to allow wireless facilities on the public land provided the facilities are camouflaged and approved through the public hearing process.

Chapter 5 Master Plan Engineering Analysis

Basic coverage predictions

The Town of Davie has adopted a Zoning Ordinance that limits the overall height of new towers to 120′ in designated Commercial, Office and Business zoning districts; and in Business Park and Industrial districts subject to approval of a Special Permit, and in all Recreational Community Facilities and Utilities Districts. Based on these standards the engineering analysis and maps are predicated on the following assumptions:

- Existing tower structures already have facilities at this maximum height and therefore new facility attachments on existing structures are presumed to be at a lower height, to wit, 100′,
- Other existing structures, other than towers, in excess of 120′ are presumed to already have wireless services at the 120′ and above level,
- New facilities proposed for public and private lands are presumed to have a launch tenant at the 120′ maximum height, as well as immediate interest at the 100′ level and possibly even the 80′ level.

For these reasons, the wireless deployment engineering analysis and accompanying maps depict a build out at the median height of 100′ which best illustrates the level of coverage achieved from existing and future wireless infrastructure.

According to the Okumura-Hata propagation path loss formula coverage tables in Chapter 3, a reasonable coverage area for a 100′ cellular site is 3.6 miles. The engineering exercise in Figure 11 shows approximately 7 hexagons within which the Town of Davie's jurisdictional boundaries are located. These hexagons represent a theoretical build out of 100′ towers at equal dispersion for one cellular provider, assuming no suitable existing structures have been constructed and excluding population variables. The circles shown within the hexagons represent the limits of the search area for locating the tower. Although three cells cover the vast majority of the Town of Davie for one provider, this does not include the concept of capacity. Population of specific geographical areas and the total number of minutes used by the wireless subscribers within that designated area can have significant affects on the circumference of the coverage area.

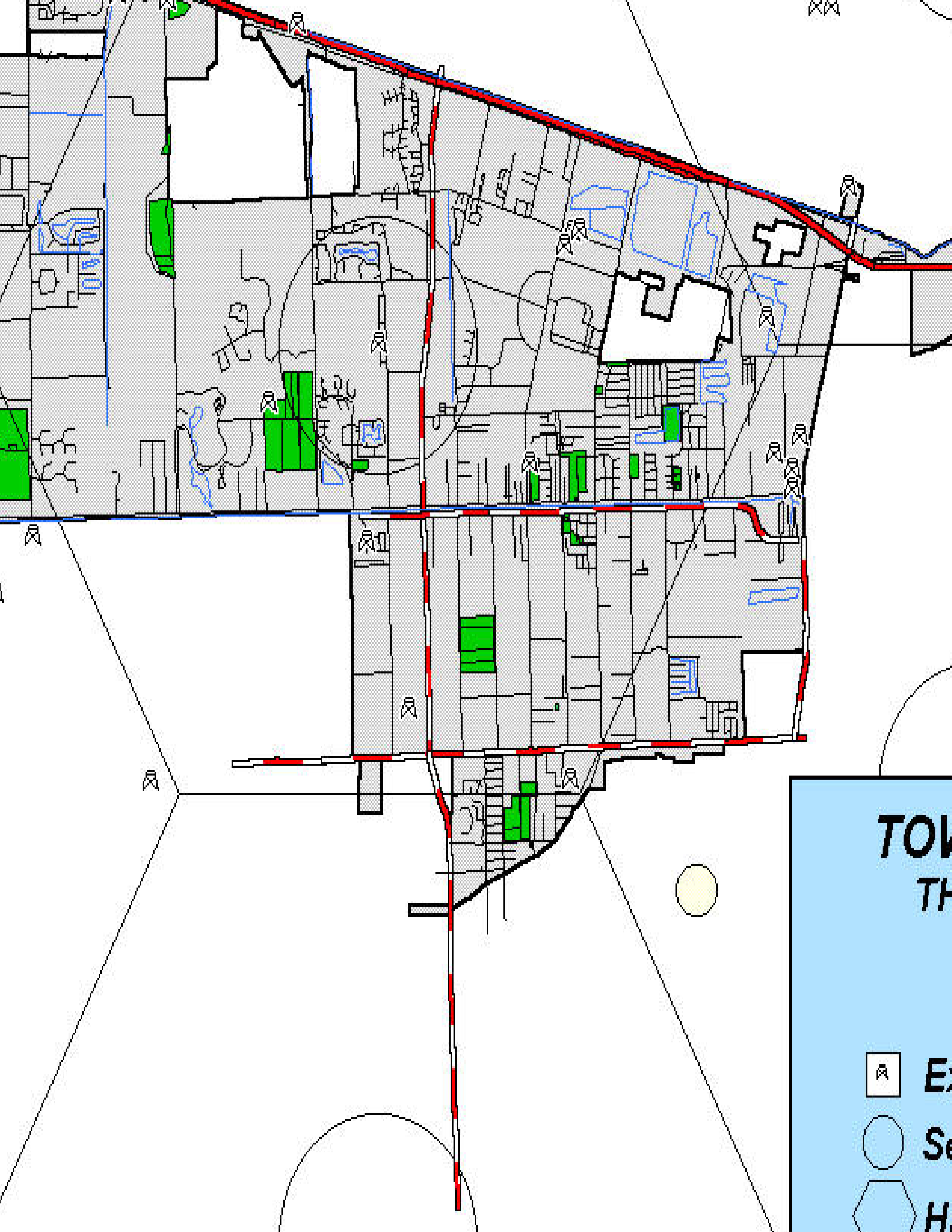
Referring to the "COST-231" formula coverage tables in Chapter 3 a reasonable coverage area for a 100′ PCS site is 1.82 miles. Figure 12 shows approximately 14 hexagons within which the Town of Davie's jurisdictional boundaries are located. These hexagons represents a theoretical build out of 100′ towers at equal dispersion for one cellular provider assuming, no suitable existing structures have been constructed and excluding population variables. This engineering exercise for Figure 11 depicts 9 cells covering the large majority of the Town of Davie, which means theoretically 9 base stations, spaced equally throughout the Town, could provide adequate PCS coverage. The circles shown within the hexagons also represent the limits of the search area for the tower within each individual hexagon.

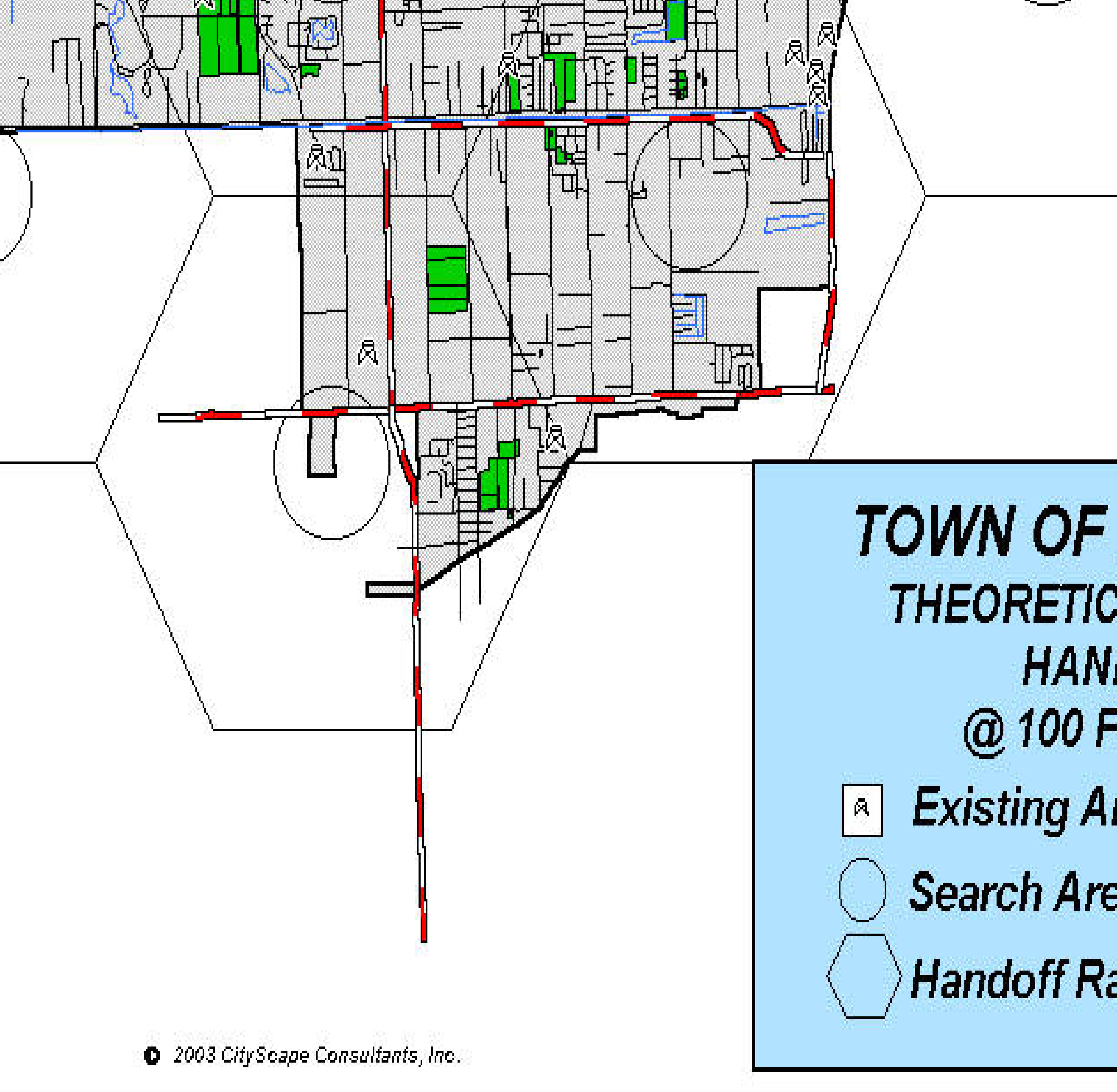
Coverage predictions based on ten-year demographic trends

As previously stated, Figures 11 and 12 provide a view of the number of towers necessary to provide basic cellular and PCS coverage without considerations of the demographic profiles for the Town of Davie. Specifically, figures 11 and 12 do not address capacity issues related to network overloads caused by population increases and increases in consumer demand for more minutes of service. Based on the Town of Davie Comprehensive Plan, the Town could have a possible population of 90,387 by year 2010. Presently the majority of the Town's population is located around and east of University Drive. Assuming the population of this area continues to grow at the recent rates of the past decade, in 2010, two-thirds of the Town would reside in the eastern portion of the Town. The Town is about 34 square miles, which equates to approximately 60,258 people in 16 square miles. Based on today's penetration rate, 39 percent of the community would have cell phones; meaning 23,500 subscribers in 16 square miles, or approximately 1,468 subscribers per square mile. A base station can accommodate approximately 1000 subscribers per site, requiring much smaller hexagons, approximately two per square mile.

The western portion of the Town is low density, rural agriculture. It is not likely this area will transition to higher density residential by year 2010. Assuming one-third of the projected 2010 population lives in the western portion of the Town, then approximately 30,129 people would live in this area. The hexagons are twice as big, seeing as one third of the population is half of two-thirds, therefore half as many sites.

Figure 13 demonstrates the impact of population density on a wireless service network. The number of sites necessary for the less populated western portion of the Town would be about 12 and the number of sites necessary for the more populated eastern portion of the Town would be about 24. These hexagons do not include tower height variables, only population density.

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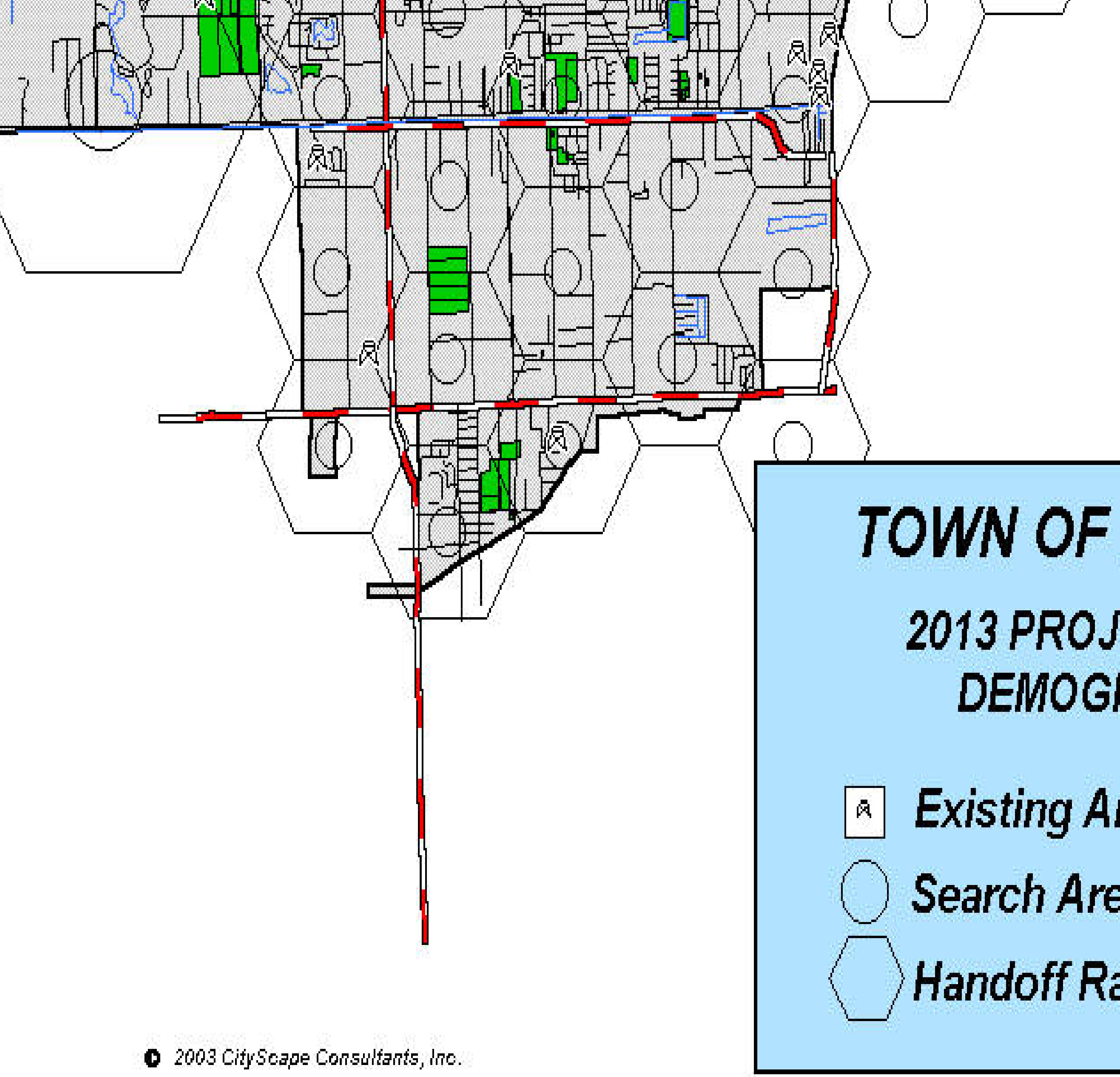

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Existing tower locations

The existing antenna locations within and surrounding the Town of Davie are identified in Figure 14 as shown in the Inventory Catalogue in Chapter 8. Mapping the existing antenna sites creates the base map and starting point from which observations and analysis are derived concerning current wireless deployment trends and projected future deployments for the Town.

For example, most of the deployment to date: 28 of the 32 existing antenna structures in and surrounding the Town of Davie are concentrated along the Interstates and major thoroughfares. Interstate 595 has six base stations; Interstate 75 has eight base stations, two of which are at the interchange with Griffin Road. Six additional base stations are within the vicinity of Flamingo Road; one along Nob Hill Road; two adjacent to University Drive; three along US Highway 441 and two parallel to Griffin Road. Three of the remaining towers are in a cluster at the intersection of College Avenue and SW 29th Street and the remaining tower is located around SW 92nd Avenue.

This deployment pattern illustrates the industry's present desire to provide coverage to the mobile customer by providing initial wireless service to the roadway networks with the highest traffic counts. It also reflects the standards of the zoning regulations at the time of deployment that permitted wireless providers in certain zoning districts with limited heights, and that did not strictly require colocation between service providers; which is why in several locations multiple towers are clustered together.

For example, on Figure 14, towers numbered 44, 54 and 55 at the intersection of College Avenue and SW 29th Street the tower heights are 120′, 100′ and 200′ respectively. Ideally, one 200′ tower in this location could accommodate the antenna attachments on the other two towers, thereby reducing the number of towers in this vicinity.

A second tower cluster is located on Highway 441/SR7. Tower number 39 is 120′ and towers 49, 58 and 59 are each 100′, and three of the four towers have only one antenna array. While this tower grouping will provide for substantial future wireless growth is this geographic area as forecasted in the 2013 demographic growth projections; having four significantly underutilized towers in this vicinity presently is excessive.

In the future these two scenarios will not be repeated within the Town of Davie because the standards adopted in the Zoning Ordinance do not permit this pattern of deployment. Prior to a new tower being approved for construction the applicant will have to substantially demonstrate the need for the new facility and provide an affidavit that all possibilities of colocation on existing elevated structures have been analyzed and proven not feasible.

Wireless coverage hand-off

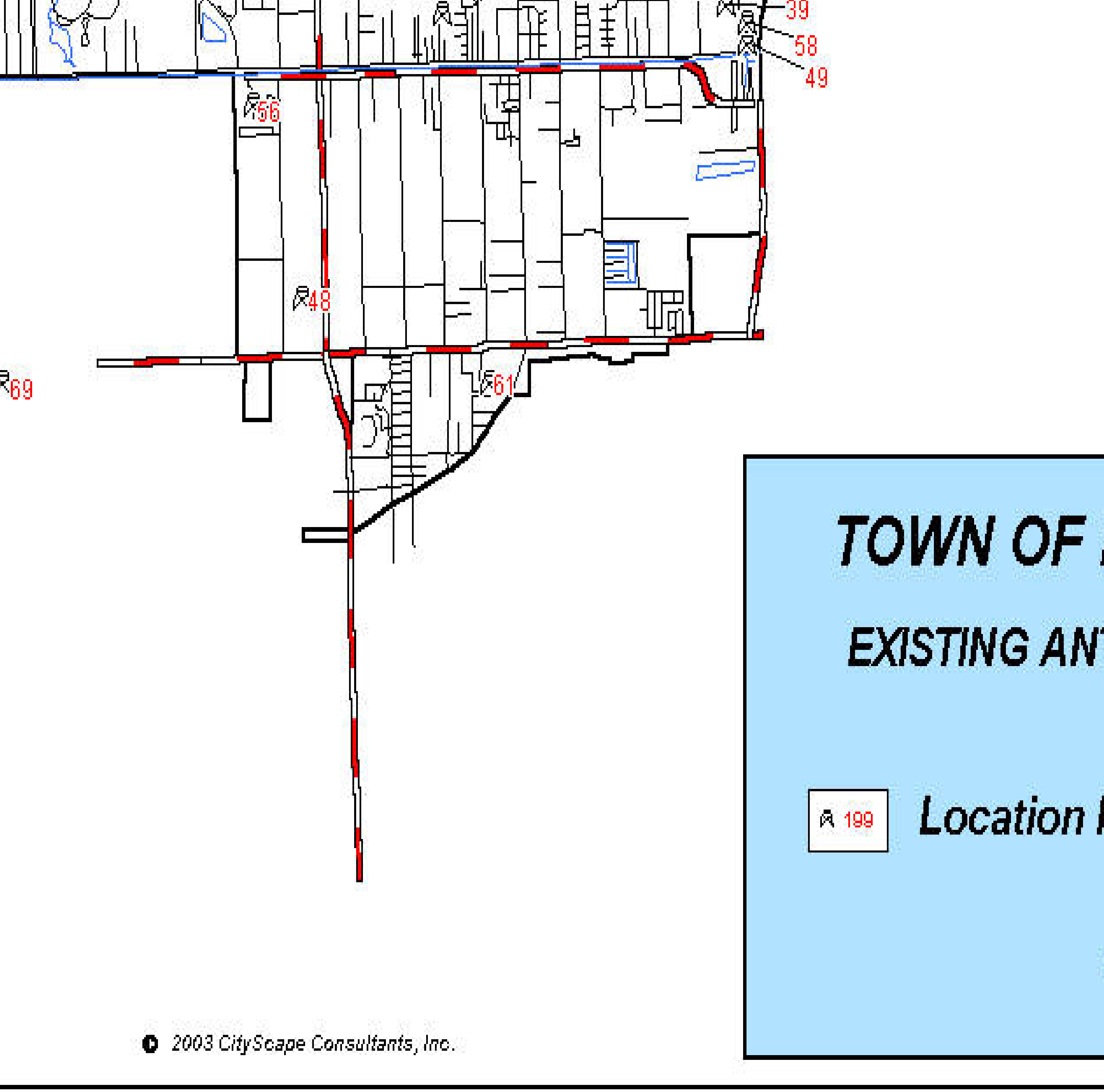
Wireless telecommunication networks are comprised of antenna arrays attached to elevated base stations that transmit and receive radio signals to allow wireless telephone handset to operate correctly. The radio frequency of the wireless network system, height of the antenna and the location of the infrastructure are all important components to a complete network plan. One set of elevated antenna arrays do not provide service to a geographic area independently of other nearby elevated antennas, rather, each set of antenna arrays work together to provide complete wireless coverage. Complete coverage is only attained when the radio signal from one antenna array successfully relays or "hands-off" the radio signal to another antenna array without causing an interruption in service. Successful network hand-off is only possible when the geographic coverage areas from individual antenna arrays overlap and when the new base station has available capacity. Geographic areas with good site hand-off and available capacity will also have good wireless coverage and generally uninterrupted services.

CityScape has reviewed the hand-off radius from existing tower locations in the Town of Davie for 800 MHz and 1900 MHz deployments assuming space availabilities at the 100′ level on existing elevated base stations. The radiuses reflect the actual in use service areas at the assumed 100′ height. In reality the radiuses may be larger or smaller due to the actual antenna height location and variables of different technologies and topographies.

Figure 15 illustrates the hand off radius applicable to 800 MHz between eight of the 34 existing towers demonstrating that initial cellular coverage without considerations of population concentrations is good. CityScape is not illustrating the hand off radius from each tower so as to reduce clutter on the map, but theoretically, applying the same 800 MHz hand off radius to each tower would illustrate a total cellular coverage to the Town.

The hand off radius for 1900 MHz is reduced because of the difference in PCS operating frequencies and technologies as compared to the 800 MHz. Figure 16 illustrates the hand off radius applicable to 1900 MHz from all existing towers and tower clusters within and adjacent to the Town of Davie, demonstrating that initial PCS coverage is incomplete. Initial coverage in the rural and less populated western portions of the Town has limited PCS coverage. It is likely that some PCS coverage exists in the areas not included within the hand off radius, although it may be weak and inconsistently available for service.

The Town has indicated an interest in utilizing public lands for future wireless telecommunications infrastructure. Figure 17 illustrates how utilizing public land sites numbered 4, 8, 14 and 6 for the construction of new 120′ towers, assuming the underlying property is zoned to allow such a facility, could benefit the initial hand off radius coverage in the western portion of the community. However, as population increases in this geographic area, the network capacity will become overloaded, requiring additional sites spaced closer together.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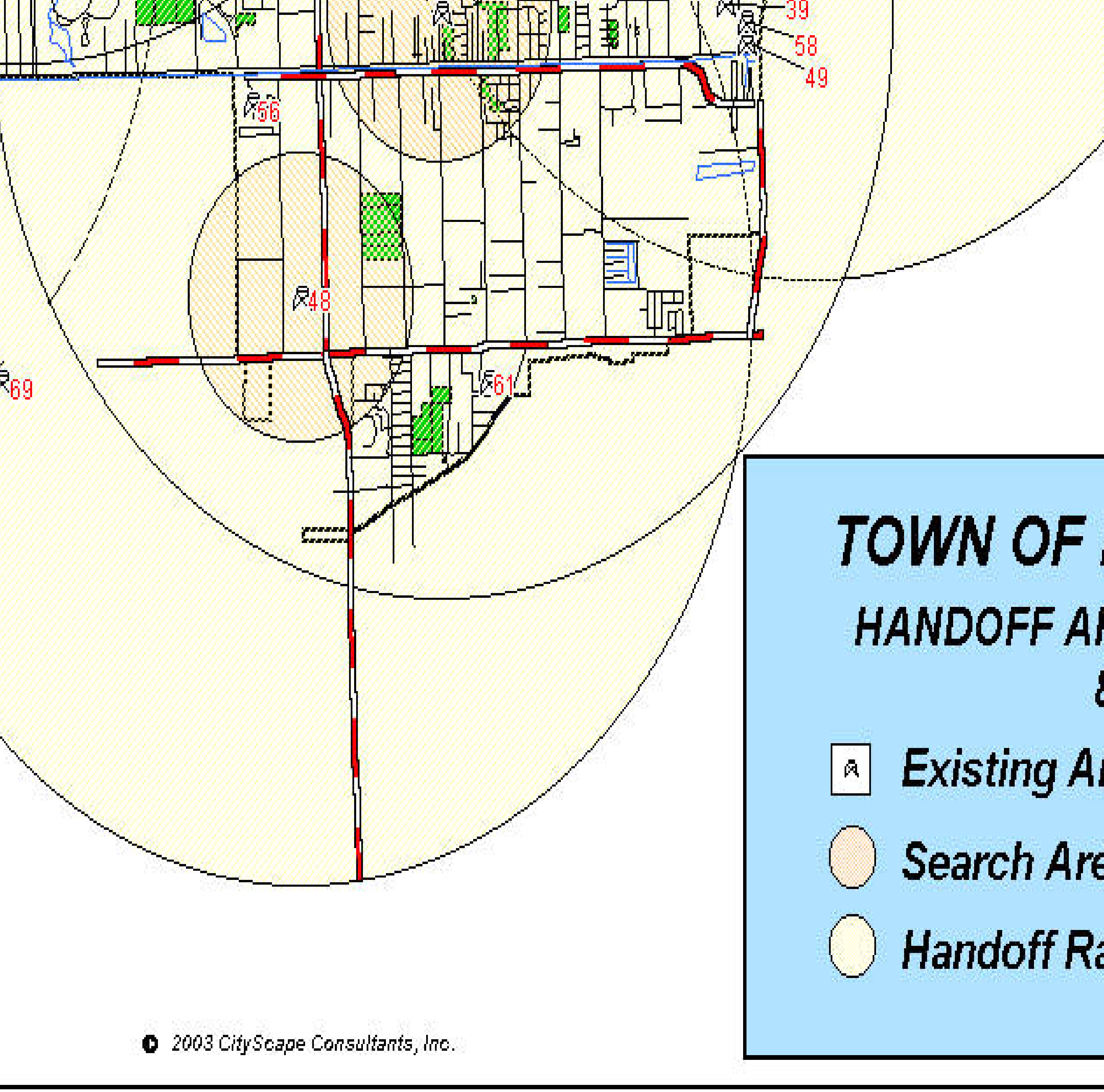

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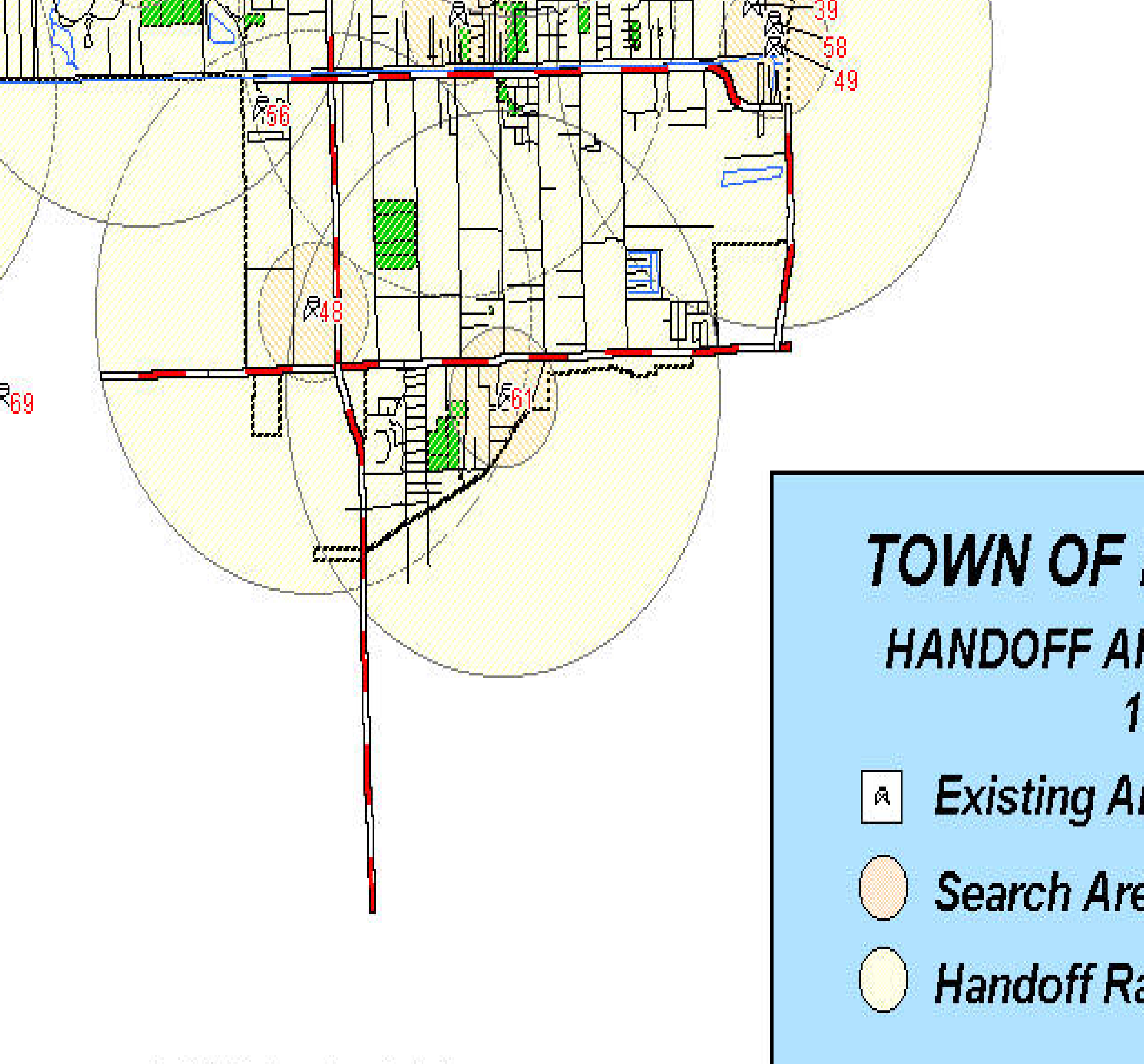
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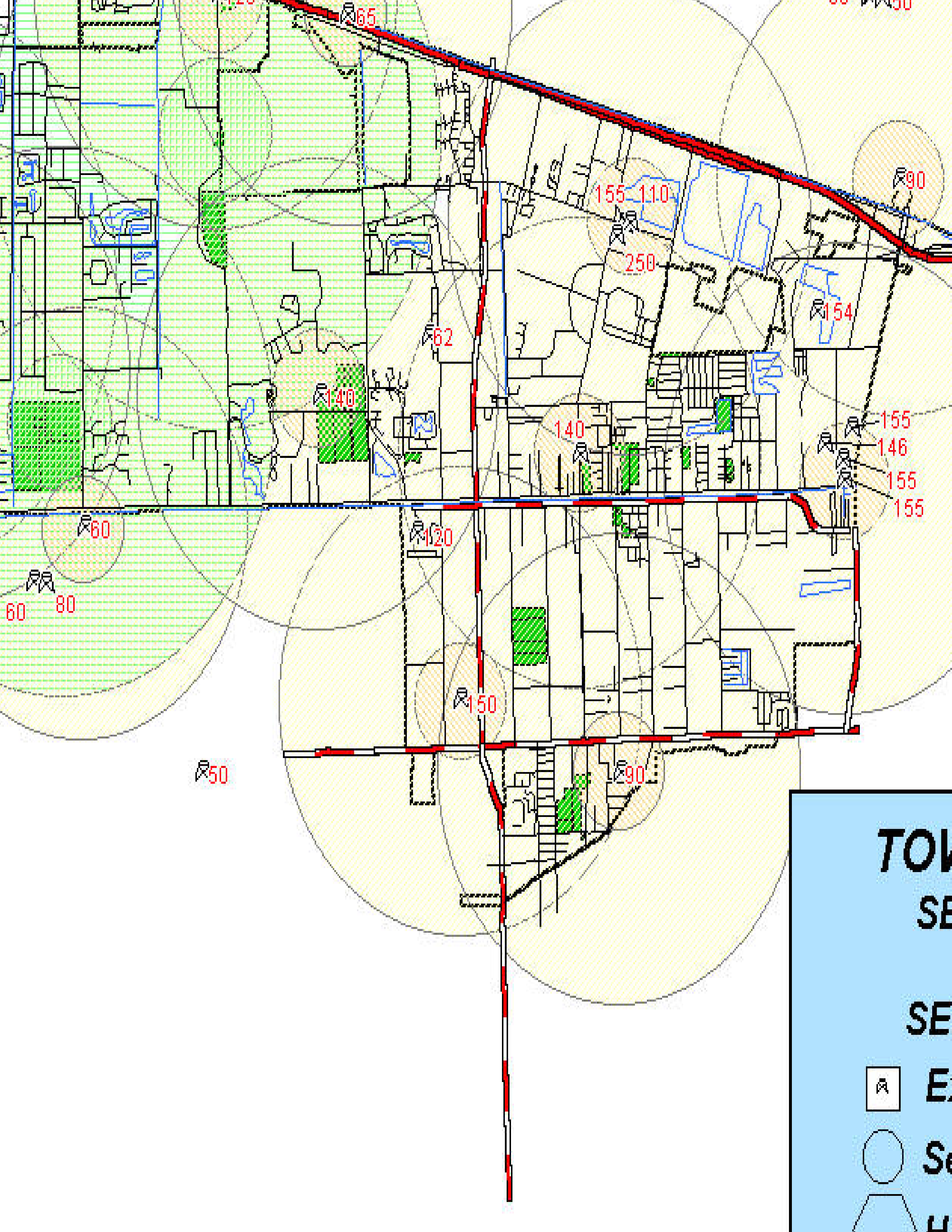

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Search area radii

The maps thus far have illustrated coverage and hand off radii from specific antenna locations from within the center of the coverage and hand off areas. This area within the coverage and hand off radius is called a search area. The search area radius is much smaller than the coverage and hand off areas and defines the limits in which an antenna must be located to meet coverage objectives and network efficiencies. For 800 MHz frequencies and an assumed tower height of 100′ the search area is a radius of .72 miles. For 1900 MHz frequencies and an assumed tower height of 100′ the search area radius is .36 miles. The elevated tower, water tank, rooftop, sign or similar type structure serving as the platform for the antenna attachment must be within this designated area.

Figure 18 shows the Town of Davie overlaid with .72-mile search areas representing the locations in which a 100′ tower would be needed to provide 800 MHz coverage throughout the Town. The design requires 54 search area grids to cover the jurisdictional boundaries of the Town.

Figure 19 shows the Town of Davie overlaid by .36-mile search areas representing locations in which a 100′ towers would have to be built for 1900 MHz coverage throughout the Town. The design requires 161 search area grids to cover the jurisdictional boundaries of the Town.

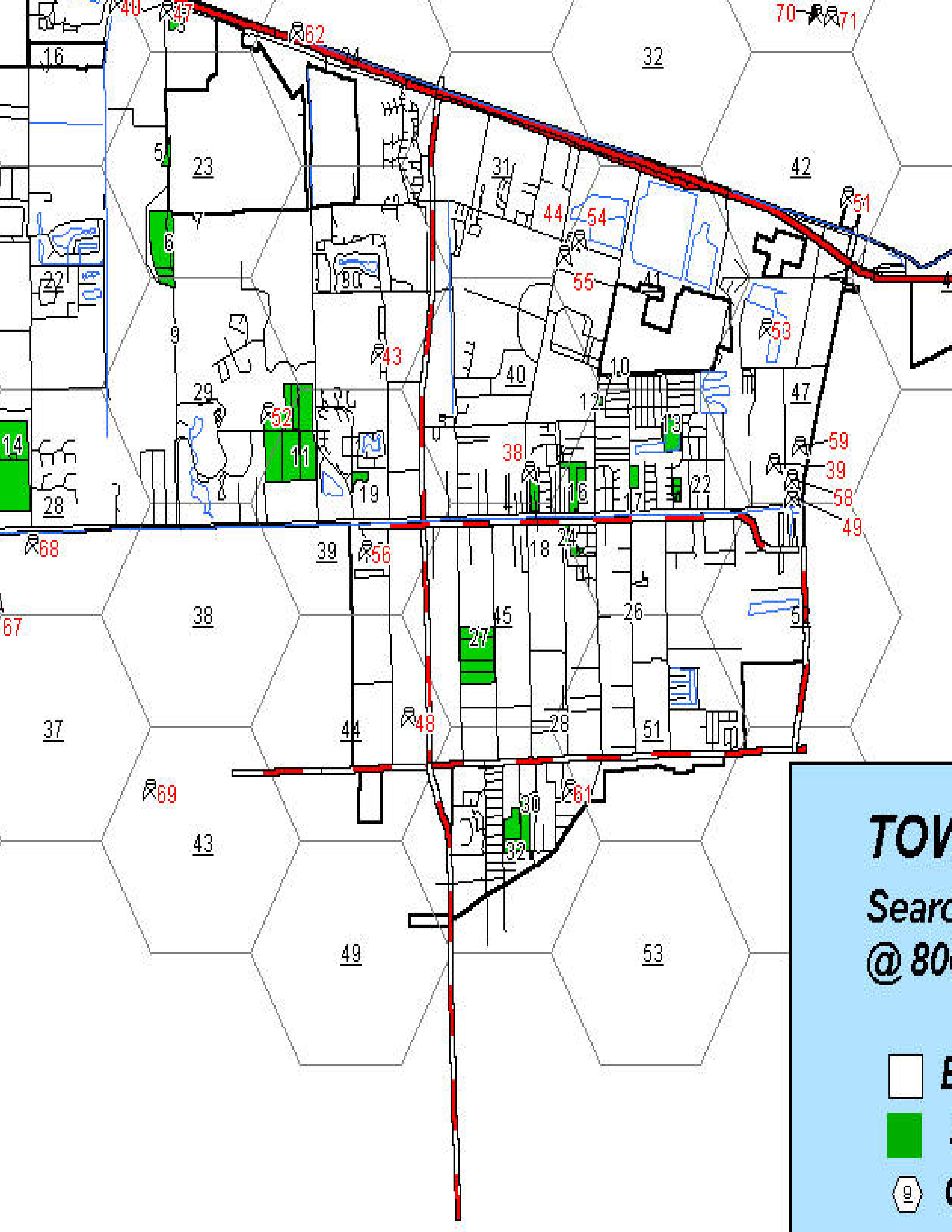
As populations increase, technologies advance to 3G, 4G , 5G and beyond, and new wireless service providers enter the market area, some of these search areas may need more than one base station or may subdivide to meet consumer demands for additional network capacity.

Town property

In areas where new sites may be required, due to anticipated future coverage and capacity objectives, as many of those sites as possible should be located on city property. The Town of Davie provided CityScape with information on Town-owned areas where tower development might be permitted. Those locations are shown in Figure 19 and included in the Inventory Catalogue in Chapter 7. Locating new wireless facilities on publicly-owned property has several advantages, including improvement in “stealthing” standards and generating revenue for the Town.

Leasing Town-owned lands assures the Town of Davie of preferable stealthing materials and technologies presently available to the industry. As Town sites are developed, the infrastructure installed becomes the precedent of how future sites should be developed on private land. For example, many “tree towers” and “flag pole” towers are available to the industry. But so are other creative ideas for stealthing towers; some are more aesthetically pleasing and more practical than others. As the Town of Davie utilizes these products, these applications become the standard for future tower sites on both public and private land. For example, on park properties many communities utilize light poles for towers, but towers utilized as decorative signage are also effective. As public land sites are considered for development, the Town of Davie can specify which stealthing product should be used based on the underlying land use of the given property.

Leasing public lands for purposes of new wireless infrastructure can create new sources of revenue. As new sites are developed on public land, the Town collects lease revenue from that tower owner, wireless service providers, and tenants.



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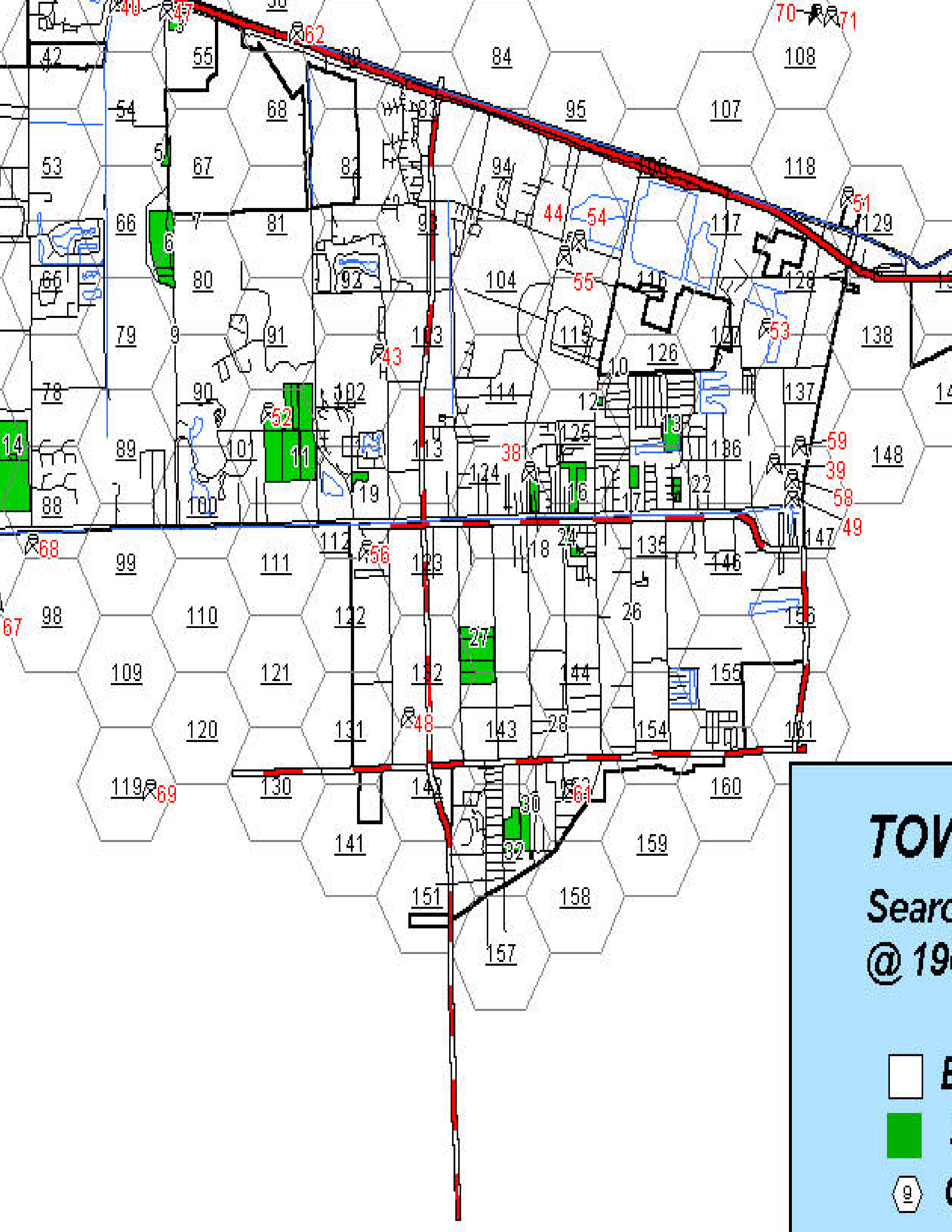

Chapter 6 Land Use Analysis

Public policy

The Town of Davie has adopted an Ordinance to address land use development standards applicable to the installation, construction or modification of wireless telecommunication infrastructure. The Ordinance establishes a hierarchy of preferable locations for new wireless antenna structures which requires the use of collocation on existing support structures before requesting a replacement tower or a new antenna support structure altogether. Once existing towers fill with antenna arrays, new towers necessary for capacity and emerging technology should be located on public land thereby establishing a precedent for concealment techniques and products as well as revenue to the Town. The Ordinance hierarchy is below:

A. Stealth Attached Wireless Communications Facility
   1. On Town-Owned site.
   2. On Non-Town Owned site.

B. Colocation on Existing Antenna Supporting Structure.
   1. On Town-Owned site.
   2. On Non-Town Owned site.

C. Stealth Wireless Communications Facility.
   1. On Town-Owned site.
   2. On Non-Town Owned site.

D. Attached Wireless Communications Facility
   1. On Town-Owned site.
   2. On Non-Town Owned site.

E. Replacement of Existing Antenna Support Structure.
   1. On Town-Owned site.
   2. On Non-Town Owned site.

F. New Antenna Support Structure.
   1. On Town-Owned site.
   2. On Non-Town Owned site.

The order of ranking, from highest to lowest, shall be A1, A2, B1, B2, C1, C2, D1, D2, E1, E2, F1 and F2.

Where a lower ranked alternative is proposed, the applicant must file an affidavit demonstrating that despite diligent efforts to adhere to the established hierarchy within the Geographic Search Area, as determined by a qualified radio frequency engineer, higher ranked options are not feasible. Cost of various options is not a reason to deviate from the established hierarchy.

Except as provided in subsection (B) below, no wireless communications facility shall be allowed in a particular zoning district except in accordance with the table:

Zoning District	Stealth Facility	Colocation	Stealth Attached Facility	Attached Facility	Replacement of Existing Antenna Structure	New Facility
RR	N	N	N	N	SP	N
AG	N	N	N	N	SP	N
S	SP	SP	N*	N*	SP	N
A-1	N	N	N	N	SP	N
R-1	N	N	N	N	SP	N
R-2-5	SP	SP	N*	N*	SP	N
RM-8-16	SP	SP	N*	N*	SP	N
MH-1-10	SP	SP	N*	N*	SP	N
SC & B1	P	P	P	P	SP	SP
WT	SP	SP	SP	SP	N	N
B2	P	P	P	P	SP	SP
UC & B-3	P	P	P	P	SP	SP
O	P	P	P	P	SP	SP
FB	P	P	P	P	SP	SP
CC	P	P	P	P	SP	SP
C1	P	P	P	P	SP	SP
RO	SP	SP	SP	SP	N	N
BP	P	P	P	P	P	SP
M-1	P	P	P	P	P	SP
M-2	P	P	P	P	P	SP
M-3	P	P	P	P	P	SP
RS	P	P	P	P	P	P
CR	P	P	P	P	P	P
NCF	P	P	P	P	P	P
CF	P	P	P	P	P	P
PCF	P	P	P	P	P	P
U	P	P	P	P	P	P

P – Permitted. SP- Special Permit N- Not Permitted

* A facility in this zoning district which is otherwise prohibited shall be eligible for a Special Permit if attached to a building for which the principal use is non-residential and there is no residential use on the same lot.

The intent of the Ordinance is to maximize the use of all existing above ground alternatives for antenna attachments so as to limit the number of new towers built within the Town, without compromising wireless services to the community.

Section 12-509 of the Ordinance addresses development standards for new and existing antenna supporting structures, replacement of an existing support structure, and colocation and attachments of antenna array onto existing elevated structures. These development standards address safety, aesthetic, and compatibility concerns of the community.

In general, towers have an increased setback than that of the underlying zoning district. The height of any antenna-supporting structure, antenna and/or antenna array is limited to 120 feet. Non-stealth tower types are limited to galvanized gray finished monopoles. Monopoles and stealth applications are to be designed to meet wind speeds per design requirements of ASCE 7-96 and accommodate multiple wireless service tenants. Lighting is limited to the standards required by the FAA and limited signage is allowed similar to that of a nameplate sign.

The Ordinance in its entirety is available from the Town.

Chapter 7 How to Use This Plan

The Master Plan is a planning tool designed to complement public policy. By using these documents together, Town representatives can respond to inquiries from the industry and community more quickly and accurately. The inventory and maps identifying the location of existing tower infrastructure aid in directing the industry to utilize existing facilities. These materials also serve as a cross-reference for verifying information on new equipment permit applications for new wireless infrastructure and will save time when prospective wireless providers require a site evaluation.

Each proposed wireless antenna location can be "pre-evaluated" to determine the location alternatives available.

An example of how the process could flow includes the following steps:

1) A phone call, office visit or application package is received by the town and compared to the established hierarchy, zoning district table and the Master Plan.

2) The proposed facility location is found on figure 19 and compared to alternative options of colocations or any Town-owned property that could be developable.

3) If materials are submitted they are evaluated against Article XII, Section 21-504, "Wireless Communications Facilities", to determine compliance with the development standards for the type of construction requested.

4) The proposed facility search area is compared to the Okumura-Hata or COST 231 formula for height and placement.

5) Location and design criteria are applied to achieve the least obtrusive facility possible, given the engineering needs of the applicant.

6) The Application and Review fee is paid.

7) Staff determines the completeness of the request.

Application evaluation

As a first step in the determination process, the applicant's package should state the zoning classification of the area in question, as well as the precise location. It should be possible to determine the hexagonal search area grid in which the proposed construction is located by looking at figure 19.

The applicant's package should address all of the Development Standards in section 12-509 of the Ordinance and contain, at a minimum, the following, in order to allow staff to determine if a reasonable search area exists:

- A graphical representation, and an accompanying statement, of the coverage area planned for the cell to be served by the new antenna supporting structure. This must be in the form of a propagation plot,
- A graphical representation, and an accompanying statement, of the search area used to locate the prospective antenna supporting structure parcel. This can be in any of the forms listed above,
- A graphical representation of the surrounding "handoff" sites near the proposed location, and
- The applicant must also adequately demonstrate that compliance with all locational and design criteria has been achieved.

Height evaluation

These tables (also shown in Chapter 3) show calculated tower heights for various coverage distances. These numbers are based on suburban land use conditions, and a BTS gain of 135dB. The Okumura-Hata or COST-231 formulas are applied as appropriate for 800 MHz (cellular and ESMR band) wireless providers:

<u>Okumura-Hata Formula for Cellular</u>:

Antenna Height, (ft)	**50′**	**80′**	**100′**	**110′**	**120′**
Radius, miles	2.53	3.20	3.60	3.88	3.97
Allow for handoff	2.03	2.56	2.88	3.10	3.18
Search area, miles	0.51	0.64	0.72	0.78	0.79

<u>COST-231 Formula for PCS</u>:

Antenna Height, (ft)	**50′**	**80′**	**100′**	**110′**	**120′**
Radius, miles	1.33	1.64	1.82	1.91	1.99
Allow for handoff	1.07	1.31	1.46	1.53	1.60
Search area, miles	0.27	0.33	0.36	0.38	0.40

Note that this objective evaluation methodology is not absolute. For instance, vegetation and "clutter" (buildings) may render the "cook-book" analysis inappropriate for a certain situation. However, Town staff should be able to evaluate some simple situations completely, and at the least, gather much required information, prior to calling in expert help.

The burden of proof for the required height is placed on the applicant. The required height must be based on clearly demonstrated coverage needs, as evidenced by propagation plots that show the coverage of the new site "before" and "after" deployment. In no case will a higher tower proposed simply for the speculative purpose of future colocations be automatically approved.

Search area evaluation

In order to determine the feasibility of potential alternatives, staff must first assess the "reasonableness" of the search cell proposed by the applicant as follows:

- To determine if the radius of the proposed cell's coverage is reasonable, it is necessary to compare any coverage deficiency currently existing with the coverage that will exist following deployment. The new cell's footprint should fit like a jigsaw puzzle piece within the coverage hole the wireless provider hopes to fix,

- To determine if the search area radius is reasonable, the proposed cell's coverage radius is reduced by approximately 20%, and the result is divided by four to obtain a reasonable radius. If the radius is grossly over- or under- one quarter of the handoff coverage radius, the wireless provider should be asked for an explanation,

- To determine if the search area radius is fairly located, a comparison with the existing and surrounding sites is made. In general, the new site should be roughly equidistant from those surrounding sites. If the search area greatly favors the direction of one or another existing cell, the applicant should be asked for a clarification.

Note that some cells are "capacity cells," designed to relieve a congested BTS. Those cells may indeed favor a particular cell geographically. However, unless the applicant designates a proposed cell as such, staff should consider any site within the proposed search area as adequate.

In order to determine the availability of these alternatives, and having assessed the reasonableness of the proposed search area, the following procedures should be used to respond to requests for new collocation or towers.

First, look at Figure 19 and identify the grid search area in which the proposed site is located. Second, based on the identified search area, reference the Inventory Catalogue in Chapter 8 to determine whether an existing structure or publicly owned property exists within the applicants search area which may reasonably accommodate the proposed facility. If such a facility does exist – a tower, or sign for example – the applicant should be asked to demonstrate why colocation on the existing facility is not possible. The applicant should be asked to provide additional data and engineering information if the potential for one of these alternative mounts is disputed. If an existing facility is not located in the search area grid, then the inventory should be reviewed to determine if a publicly owned site is within the applicants search area. If Town-owned property is available the applicant should be asked to consider that land as a possible candidate for a new stealth tower.

Staff decision

Given that the wireless provider's application is complete and complies with the steps listed above, staff should be able to make a decision on the appropriateness of the application. Colocations, rooftops, and surface-mounts should be straightforward. Applications clearly showing the need for a new tower, however, may require analysis and interpretation of data outside of the staff's experience level.

Stealth facilities

In the case of "stealth" communications facilities, expert review may be required to evaluate installation effectiveness. A "stealth" facility can be expensive and less flexible for a wireless provider. It requires special engineering beyond the usual catalog choices for towers. Any questions about stealth installations should be referred to a third party consultant for review and assistance.

Chapter 8 Inventory Catalogue

Purpose of the inventory

In order to determine suitability of existing wireless communications facilities in the Town for future collocation or combining, with the intention of limiting additional antenna-supporting structure construction to the extent possible, CityScape created this catalogue of sites.

The Town has designated certain additional public properties that may be suitable for the development of wireless telecommunications facilities. Examples of such sites are certain schools, parks, fire stations and other public land and facilities. However, one certain park, identified as Site Number 8, Oakhill Equestrian Park, in Grid Number 50, is identified on the Land Use Plan as Recreation Open Space. Locating a facility of any type on this property will require approval by the Broward County Planning Council or a map amendment. This site and all other properties are included in the inventory catalogue.

Procedure

The Town of Davie provided the site list of existing antenna locations, public land and public building locations. The Town assessed the existing antenna sites and CityScape assessed the public land sites. Additional information on existing antenna sites adjacent to the Town was received from adjacent communities and assessed by the Town.

Contents

Inventory catalogue. Pictures of existing structures, parks and selected fire stations (as designated by the Town), and other selected properties are included in the inventory catalogue. These sites correspond to maps included in this document. Public land sites are outlined in green, and existing structures and buildings are outlined in black.

Structural evaluation. Based on a visual inspection of antennas already on existing antenna supporting structures, CityScape has made a judgment as to whether the support structure is likely able to physically accommodate more antennas. The number of estimated colocations is referenced as future capacity and is included in the inventory. This was based on visual observations only. In this consideration, "more antennas" means another wireless antenna platform consisting of several antennas and requiring several "runs" of heavy coaxial cable. Prior to mounting new antennas, the structure must be examined and analyzed by a structural engineer for its ability to support the proposed addition. For land sites, the number reflects the number of tenants that could be located on a new facility.

Site photographs. Photographs of most sites are included in this inventory. The identification number in the inventory corresponds to the site's identification on the site maps.

Site map. Figure 19 indicates the location of existing structures, selected fire stations, other selected Town buildings and property. Note that due to the scale of the map, some site locations are approximate.

Location tabulations

The search area grids for 1900 MHz at assumed 100′ platform locations are identified in figure 19. Each search area grid has been numbered for purposes of identifying options for new antenna locations. These search areas provide a guide to identify any possible property within the Town that could serve the needs of the wireless provider. Should a wireless provider requests any type of facility location, the location will be contained within one of the projected search areas, and that area will have already been analyzed as to the most suitable alternative for that wireless provider's facility, based upon all Town zoning regulations and Ordinances.

Based on its analysis, Cityscape has overlaid and identified 161 search area grids (hexagons), within the Town of Davie. Forty-four grids contain either an existing support structures or public property. Twenty-six of the 44 grids contain an existing antenna support structure, 33 of the 44 grids contain public property potentially available for new antenna support structures, and 117 grids contain no existing antenna support structures or publicly-owned lands. Multiple grids have a combination of public properties, towers or a combination of each as possible locations for new antenna sites.

The following tabulation specifies whether an existing base station or publicly-owned property is available in that grid to be developed as a wireless communications facility site.

Updates

Inventory updates should be addressed to CityScape Consultants, at 954-757-8668.

Site roster

Grid	Towers	Rooftops Sites	Schools	Fire Stations	Parks	Town Land	Town Buildings
4	■						
5	■■						
6	■						
12					■		
14					■		■
15	■■						
17	■						
43	■■						
46	■						
50					■		
55				■			
56	■						
59	■						
63	■					■	
66						■	
67					■	■	
71						■	
77					■		
85	■■				■		■
86				■		■	
87	■■						
88	■						
101	■				■		
102		■					
105	■■■						

Site roster

Grid	Towers	Rooftops Sites	Schools	Fire Stations	Parks	Town Land	Town Buildings
108	■■						
112	■				■		
119	■						
124	■			■		■	
125							■
126						■■	
127	■						
129	■						
132	■						
133					■		
134			■		■		
135					■	■	■
136							■
137	■■						
144						■	
145						■	
147	■■						
152					■	■	■
153	■						

SITE LOCATION
Grid 4, Site Number 73
Sunrise, FL
Lat:80.20.07 Lon:26.07.51

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 200 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 5, Site Number 65
Sunrise, FL
Lat:80.21.40 Lon:26.06.10

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height:
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 5, Site Number 72
Weston, FL
Lat:80.21.47 Lon:26.06.10

TOWER INFORMATION
FAA Registration: #
Tower Type: Mounted
Tower Height: 80 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 6, Site Number 64
Sunrise, FL
Lat:80.21.32 Lon:26.06.10

TOWER INFORMATION
FAA Registration: #
Tower Type: Mounted
Tower Height: 80 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 12, Site Number 4
Baseball Field
Lat:26.06.14 Lon:80.20.36

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 14, Site Number 1
Orange Park Playground
Lat:26.06.37 Lon:80.19.41

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 14, Site Number 2
Orange Park Facility House
Lat:26.06.32 Lon:80.19.35

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 15, Site Number 41
Davie, FL
Lat:26.07.00 Lon:80.19.34

TOWER INFORMATION
FAA Registration: #
Tower Type: Billboard
Tower Height: 80 ft.
Future Capacity: 0
Zoning:
Collocation process:

SITE LOCATION
Grid 15, Site Number 63
Plantation, FL
Lat:80.19.04 Lon:26.07.00

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 100 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 17, Site Number 42
Davie, FL
Lat:26.04.58 Lon:80.21.37

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 43, Site Number 40
Davie, FL
Lat:26.06.19 Lon:80.17.16

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 120 ft.
Future Capacity: 0
Zoning:
Collocation process:

SITE LOCATION
Grid 43, Site Number 47
Davie, FL
Lat:26.06.22 Lon:80.16.54

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 46, Site Number 60
Davie, FL
Lat:26.03.56 Lon:80.21.34

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 50, Site Number 8
Oakhill Equestrian Park
Lat:26.04.58 Lon:80.19.12

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 8
Zoning: Recreational & Open Space
Collocation process:

SITE LOCATION
Grid 55, Site Number 3
Police/Fire Complex
Lat:26.06.19 Lon:80.16.50

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 56, Site Number 62
Sunrise, FL
Lat:80.16.00 Lon:26.06.15

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 150 ft.
Future Capacity: 2
Zoning:
Collocation process:

SITE LOCATION
Grid 59, Site Number 50
Davie, FL
Lat:26.03.39 Lon:80.20.54

TOWER INFORMATION
FAA Registration: #
Tower Type: Stealth Pole
Tower Height: 80 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 60, Site Number 57
Davie, FL
Lat:26.03.56 Lon:80.20.18

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 150 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 63, Site Number 15
Flamingo Gardens
Lat:26.04.22 Lon:80.18.33

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 8
Zoning:
Collocation process:

SITE LOCATION
Grid 63, Site Number 37
Davie, FL
Lat:26.04.32 Lon:80.18.47

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 100 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 66, Site Number 6
Raw Land
Lat:26.05.16 Lon:80.16.54

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 8
Zoning:
Collocation process:

SITE LOCATION
Grid 67, Site Number 5
Playground
Lat:26.05.41 Lon:80.16.54

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 67, Site Number 7
Raw Land
Lat:26.05.28 Lon:80.16.43

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 71, Site Number 31
Utility/Raw Land
Lat:26.02.26 Lon:80.21.31

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 77, Site Number 14
Robbins Park
Lat:26.04.17 Lon:80.18.00

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 85, Site Number 33
Baseball Complex
Lat:26.02.15 Lon:80.12.21

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 85, Site Number 36
City of Sunrise Utilities
Lat:26.02.07 Lon:80.21.18

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 85, Site Number 45
Davie, Fl
Lat:26.02.12 Lon:80.21.13

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 85, Site Number 46
Davie, FL
Lat:26.02.08 Lon:80.21.13

TOWER INFORMATION
FAA Registration: #
Tower Type: Mounted
Tower Height: 100 ft.
Future Capacity: 2
Zoning:
Collocation process:

SITE LOCATION
Grid 86, Site Number 29
Ivanhoe Fire Station
Lat:26.02.36 Lon:80.20.46

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 86, Site Number 35
Utility/Raw Land
Lat:26.02.08 Lon:80.20.47

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 87, Site Number 66
Cooper City, FL
Lat:80.18.11 Lon:26.03.31

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 87, Site Number 67
Cooper City, FL
Lat:80.18.06 Lon:26.03.31

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 120 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 88, Site Number 68
Cooper City, FL
Lat:80.17.50 Lon:26.03.47

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 120 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 101, Site Number 11
Bamford Sports Complex
Lat:26.04.20 Lon:80.15.56

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 8
Zoning:
Collocation process:

SITE LOCATION
Grid 101, Site Number 52
Davie, FL
Lat:26.04.26 Lon:80.16.12

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 102, Site Number 43
Davie, FL
Lat:26.04.41 Lon:80.15.25

TOWER INFORMATION
FAA Registration: #
Tower Type: Mounted
Tower Height: 100 ft.
Future Capacity:
Zoning:
Collocation process:

SITE LOCATION
Grid 105, Site Number 44
Davie, FL
Lat:26.05.17 Lon:80.14.06

TOWER INFORMATION
FAA Registration: #
Tower Type: 120 ft.
Tower Height: Lattice
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 105, Site Number 54
Davie, FL
Lat:26.05.16 Lon:80.14.02

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 100 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 105, Site Number 55
Davie, FL
Lat:26.05.10 Lon:80.14.07

TOWER INFORMATION
FAA Registration: #
Tower Type: Guyed
Tower Height: 200 ft.
Future Capacity: 2
Zoning:
Collocation process:

SITE LOCATION
Grid 108, Site Number 70
Plantation, FL
Lat:80.12.22 Lon:26.06.20

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 100 ft.
Future Capacity: 2
Zoning:
Collocation process:

SITE LOCATION
Grid 108, Site Number 71
Plantation, FL
Lat:80.12.16 Lon:26.06.20

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 60 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 112, Site Number 19
Reflections Park
Lat:26.04.06 Lon:80.15.32

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 112, Site Number 56
Davie, FL
Lat:26.03.46 Lon:80.15.31

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 119, Site Number 69
Cooper City, FL
Lat:80.17.01 Lon:26.02.36

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 2
Zoning:
Collocation process:

SITE LOCATION
Grid 124, Site Number 18
Fire Station/Utility Complex
Lat:26.04.03 Lon:80.14.21

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 124, Site Number 38
Davie, FL
Lat:26.04.08 Lon:80.14.23

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 125, Site Number 12
Water Tank
Lat:26.04.29 Lon:80.13.54

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 125, Site Number 16
Bergeron Rodeo Facility
Lat:26.04.04 Lon:80.14.05

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 126, Site Number 10
Utility Station
Lat:26.04.36 Lon:80.13.46

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 126, Site Number 13
Lake
Lat:26.04.20 Lon:80.13.24

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 127, Site Number 53
Davie, FL
Lat:26.04.50 Lon:80.12.44

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 100 ft.
Future Capacity: 1
Zoning:
Collocation process:

SITE LOCATION
Grid 129, Site Number 51
Davie, FL
Lat:26.05.28 Lon:80.12.09

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 80 ft.
Future Capacity: 2
Zoning:
Collocation process:

SITE LOCATION
Grid 132, Site Number 48
Davie, FL
Lat:26.02.57 Lon:80.15.13

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 100 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 133, Site Number 27
Wolf Lake Park
Lat:26.03.22 Lon:80.14.45

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 134, Site Number 24
Davie School
Lat:26.03.51 Lon:80.14.08

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 134, Site Number 25
Park/Playground
Lat:26.03.46 Lon:80.14.05

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 135, Site Number 17
Future Parking Lot
Lat:26.04.07 Lon:80.13.40

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 135, Site Number 20
Baseball Field
Lat:26.04.06 Lon:80.31.22

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 8
Zoning:
Collocation process:

SITE LOCATION
Grid 135, Site Number 23
Police Recreation Complex
Lat:26.04.01 Lon:80.13.20

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 136, Site Number 21
Vacant Neighborhood Lot
Lat:26.04.05 Lon:80.13.16

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 136, Site Number 22
Community Center
Lat:26.04.05 Lon:80.13.13

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 137, Site Number 59
Davie, FL
Lat:26.04.16 Lon:80.12.29

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 100 ft.
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 144, Site Number 28
Raw Land
Lat:26.02.57 Lon:80.14.12

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height:n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 145, Site Number 26
Lift Station
Lat:26.03.29 Lon:80.13.41

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 2
Zoning:
Collocation process:

SITE LOCATION
Grid 147, Site Number 39
Davie, FL
Lat:26.04.16 Lon:80.12.29

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 120 ft.
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 137, Site Number 49
Davie, FL
Lat:26.04.01 Lon:80.12.33

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 100 ft.
Future Capacity: 0
Zoning:
Collocation process:

SITE LOCATION
Grid 147, Site Number 58
Davie, FL
Lat:26.04.06 Lon:80.12.33

TOWER INFORMATION
FAA Registration: #
Tower Type: Monopole
Tower Height: 100 ft.
Future Capacity: 3
Zoning:
Collocation process:

SITE LOCATION
Grid 152, Site Number 30
Water Treatment Facility
Lat:26.02.34 Lon:80.14.23

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 152, Site Number 32
Driftwood Park
Lat:26.02.26 Lon:80.21.31

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 4
Zoning:
Collocation process:

SITE LOCATION
Grid 152, Site Number 34
Raw Land
Lat:26.02.18 Lon:80.14.23

TOWER INFORMATION
FAA Registration: n/a
Tower Type: n/a
Tower Height: n/a
Future Capacity: 6
Zoning:
Collocation process:

SITE LOCATION
Grid 153, Site Number 61
Davie, FL
Lat:26.02.37 Lon:80.14.06

TOWER INFORMATION
FAA Registration: #
Tower Type: Lattice
Tower Height: 150 ft.
Future Capacity: 1
Zoning:
Collocation process:

Chapter 9 Summary

CityScape has concluded the engineering analysis of the impact that wireless deployment has had to date on the Town of Davie, the potential for an increase in wireless technologies in the future, and the affects that demographic changes could have on wireless networks. As a result of this work, CityScape recommends the following planning practices :

1. All applications and requests for new antenna facilities should be compared t the search area grids to determine possible locations within the Town with the least impact on the community.

2. Where towers exist, and there is adequate capacity, proposed new wireless facilities should be located on that tower, if possible. If it is necessary to increase the existing tower capacity through re-build or replacement, then that is a preferable option to construction of an additional facility. Especially in geographic regions where multiple towers are presently clustered together.

3. Where Town-owned property exists in or near a search area, that property should be evaluated by preferences in the Ordinance to find the least intrusive option for the placement of a new facility.

4. Where no existing tower, tall structure, or publicly owned property exists, specifically in the western portion of the Town, the underlying zoning of the that area should be studied to determine if new towers can be constructed in that region of the Town.