



# Cell Phone Towers

## Finding the Best Place For a New Cell Tower in Marblehead

by Daniel Hudson

# Types of Cell Towers

- The first tower is used to transmit data to other towers and to provide people with cellular service for up to 10 square miles.
- The second picture is a small cell tower built into a steeple these transmit over a small area. Most cell towers are like the one pictured. There are three similar ones in Marblehead.



# Outline

- Introduction
- Objectives
- Methodology
- Data Sources
- Results



# Introduction

- Cell phone reception in Marblehead is severely lacking everywhere but the center of the town.
- I plan on finding a suitable location for a new cellular tower.
- The new tower must be in an area with little reception, lots of people, and on a high elevation.

My objective is to find a suitable location for a new cell phone tower in Marblehead.

The new cell location has to give the most people reception that did not have adequate reception in the past

The location for the new cell tower has to be on the highest elevation possible so the signal can reach as far as the tower allows.

The new tower can't be too close to any existing tower because it would be unnecessary.

# Methodology

I will map out existing tower sites and give them each a buffer of  $\frac{1}{2}$  a mile.

Using Digital Terrain Models I found 14 locations with relatively high elevations where there are no cell towers currently.

A layer file was created featuring the 14 possible locations with a  $\frac{1}{2}$  mile buffer around each.

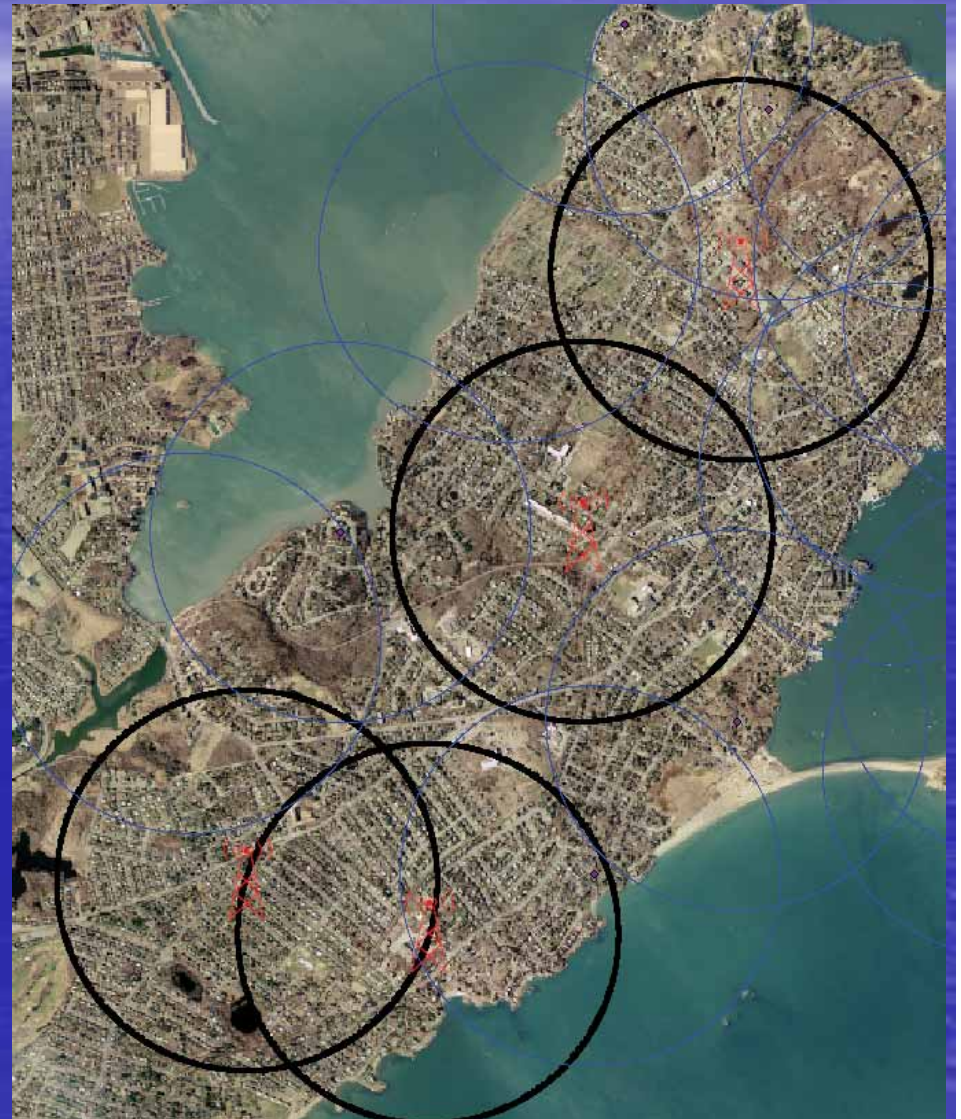
Population Data was clipped so that the map only shows population data for the 14 possible cell locations.

A new cell tower location was found that would give the most people coverage that didn't have it before.



## Existing Cell Towers with ½ Mile Buffers and Potential Sites with ½ Mile Buffer

- Existing towers are in red with black buffers.
- Potential tower sites are in the center of the blue buffer circles.





# Population Density

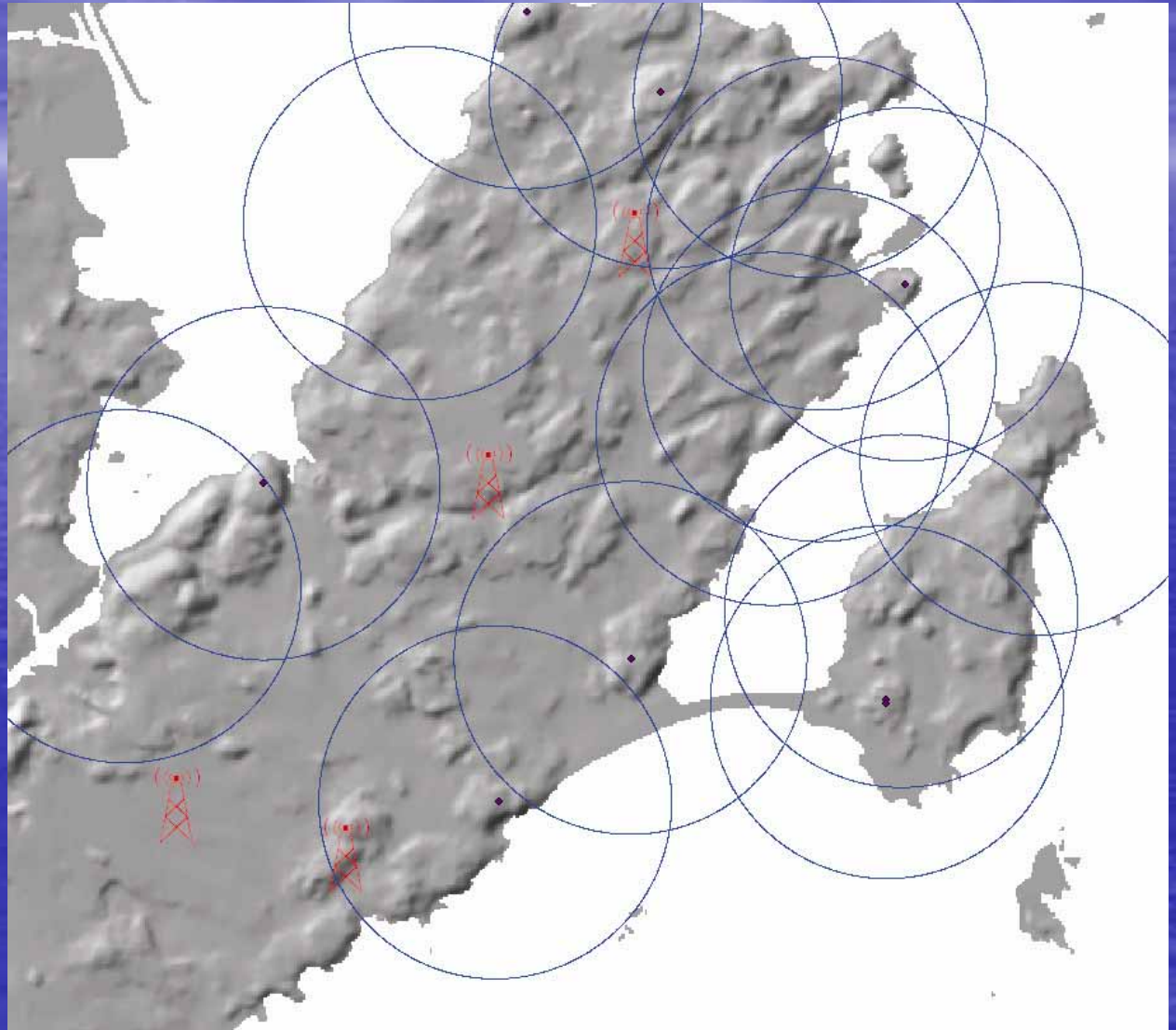
- Each dot is equal to 100 people in that particular census block





# Elevation

- The purple dots represents possible tower sites
- Possible Tower sites were placed on areas with slightly higher than average elevations for Marblehead.



# Data Sources

- Locations of existing cell towers need to be mapped out, cell tower location was found by getting publicly available building permits at the Marblehead Planning Board.
- Population data was acquired through Mass GIS in the form of “blocks” from the 2000 census.
- Satellite images were used to make the project look good. (Mass GIS)
- Town boundary files were used as a template to clip the remaining files. (Mass GIS)
- A Digital Terrain Model was used to find the highest elevations. (Mass GIS)



# Results

- The best site I found
- The second best site



# The Best Site I Found

- The site will give the most people coverage possible. Approximately 2,600 people that didn't have coverage before would get coverage.
- Its elevation is slightly higher than surrounding areas.
- However the area does not have high traffic so primary only residents will benefit.
- The Circle in light blue shows the area that the new tower would cover, each dot equals 100 people.





# Second Best Site

- The second best site I found is on Marblehead Neck where there are currently no cellular towers and very limited reception.
- The site will only give reception too about 400 people or most of the population of the neck.
- Many people drive around the neck that would need reception, there are a couple yacht clubs and some scenic sites that attract a lot of people.
- The best location for the site is near the edge of a bird sanctuary so it would be hard to get permission to build a tower.
- The site will offer cell coverage to most of Marblehead harbor as well as the neck.



# Sources

- <http://www.mass.gov/mgis/>
- <http://www.census.gov/>
- <http://www.cellreception.com/index.html>
- <http://electronics.howstuffworks.com/cell-phone2.htm>
- <http://www.mobiledia.com/guides/page1.html>
- <http://www.tennessean.com/growth/archives/05/03/69088010.shtml>  
!
- And Rebecca Curran the town planner for Marblehead