

# Cell Towers, Community Perspectives, and Hedonic Price Modeling: Utility, Limitations, and Localism

Thesis Defense

by

**Jonathan Louis Kramer**

August 30, 2016

(Slides Updated September 3, 2016)

Northeastern University

College of Professional Studies

Doctor of Law and Policy Program

## Committee

Alan Clayton-Matthews, Ph.D

Neenah Estrella-Luna, Ph.D

Edward Kammerer, Ph.D

DLP Cohort VIII

# ERRATA

After presentation of the defense slides, some errors and inconsistencies were reported to the author. Those errors are listed below and corrected in this updated version, prepared on September 3, 2016.

Page 7: Deleted second reference to asbestos

Page 17: Corrected to read, "Calabasas, California"

Pages 17 – 27: Made consistent the capitalization of "Online" on each title line

Page 21: "One two" corrected to "Only two"

Page 30: Corrected capitalization of "Wireless" in the third bullet

*The author thanks Michael J. Friedman for his report.*

*for* **Sharon, Shoshanna, Aleah, and Rose**

# Background prompting this research:

- First cell phone call: April 3, 1973 (**a wireless poke in the eye**)
- Number of cell sites (1985): 900 *Expensive Business tool*
- Number of cell sites (2015): 307,000+ *Ubiquitous must have tool*
- Number of cell sites (5G+): **3,000,000+** *Densification*
- More U.S. cell phones/devices than U.S. citizens (2015): **378M** v. **320M**
- Number of U.S. homes **without** landlines (2015): ~50% and rising
- Resident concerns: perceived cell site impacts on **home values** and concerns regarding **health**

# Research Questions:

## **RQ 1: Hedonic price modeling in Calabasas and the courts**

- Is hedonic price modeling is a reliable tool to assess the disamenity value of a cell site on nearby homes prices in Calabasas, California?
- Are hedonic price models used by the courts to help resolve litigation following cell site permits denials by local governments? If so, how?

## **RQ 2: How do Calabasas Residents feel about cell sites and perceive health issues:**

- Should cell sites be permitted in residential areas of Calabasas? If so, what designs are supported by Calabasas residents?
- How do Calabasas residents feel about the issue of health safety connected with cell sites?
- What are the trusted sources for cell site placement and related health information?

# Research Design:

Mixed methods: Descriptive, historical

## **Literature review:**

- Foundation of hedonic price modeling
- All prior hedonic price modeling studies found in the literature involving cell sites
- Prior HPM involving high voltage overhead transmission lines
- Critiques of HPM by appraisers

## **Court case reviews:**

- All reported and unreported federal and state cases decided after the Telecom Act of 1996 mentioning cell sites and property value

## **Data collection:**

- Online opinion survey of Calabasas, California
- In-depth interviews of Calabasas residents

# What is Hedonic Price Modeling?

A method of comparing seemingly dissimilar things

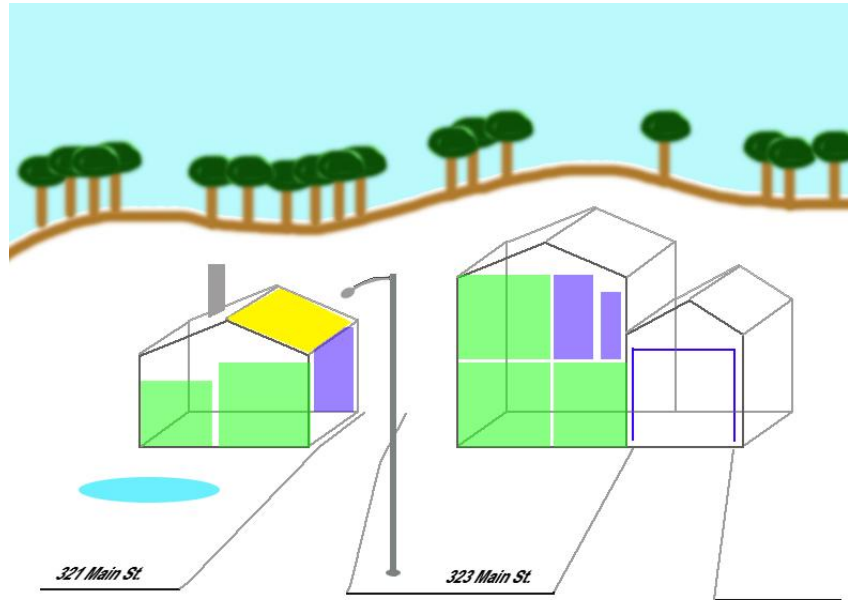
- Disassembling a something into its characteristic parts to allow for impact testing of changes to an internal or external characteristic
  - Change a color on the label background of a can of soup
  - Change the average number of noodles in the can of soup
  - Determine value impacts on homes (takes thousands)
  - Assessing the impact of strip clubs on neighborhoods
  - Assessing the impact to value on homes by adding a nearby cell site

# Hedonic Price Modeling: 321 & 323 Main St

## 321 Main St.

Single Story  
Built 1980  
1600 sq ft  
1 bedroom 200 sq ft  
1 bedroom 150 sq ft  
1 full bathroom  
Chimney  
Solar panel  
Water feature  
¼ acre lot  
Driveway parking  
Original kitchen  
Street light  
Solar panels  
Driveway only parking  
Cell site ¼ mile away

**=calculated value**



## 323 Main St.

Two Story  
Built 1960  
Contains asbestos  
2800 sq ft  
2 bedrooms 200 sq ft  
1 bedroom 175 sq ft  
1 full bathroom  
1 half bathroom  
½ acre lot  
Attached garage  
Driveway parking  
Upgraded kitchen  
Street light  
Garage, driveway parking  
Cell site ¼ mile away

**=calculated value**

← compared to →



# Hedonic Price Modeling:

Prior research regarding cell sites – 2005 and beyond

- Use of hedonic price modeling to assess the impact of cell sites on residential properties
  - New Zealand: Home prices in Auckland & Christchurch
  - U.S.: Home prices in Florida and Kansas
  - Europe: Apartment rents in Zürich, Switzerland & Hamburg, Germany

# Hedonic Price Modeling:

External disamenity characteristics of cell sites in HPM

- Cell sites are external disamenity characteristics that are reflected in the selection and values of dummy variables used in the model, including *but not limited to*:
  - Distance from home to cell site (feet)
  - Height of cell site above ground level (feet)
  - Type of cell site design (plain, camouflaged)
  - Age of cell site installation (years)
  - Big worry for HPM researchers: ***Omitted variables***

# Hedonic Price Modeling:

Some limitations of the prior research

- No consideration of elevation changes between homes and cell sites
  - Elevation changes may provide natural camouflage of a cell some to some homes
- Prior research focuses on the nearest cell site to a home
  - Problematic where multiple cell sites are closely grouped
  - Densification may place multiple cell sites very close to homes

Source: JLK





Source: JLK









Source: JLK



# The Courts and Property Value Concerns:

## Law and Policy Considerations

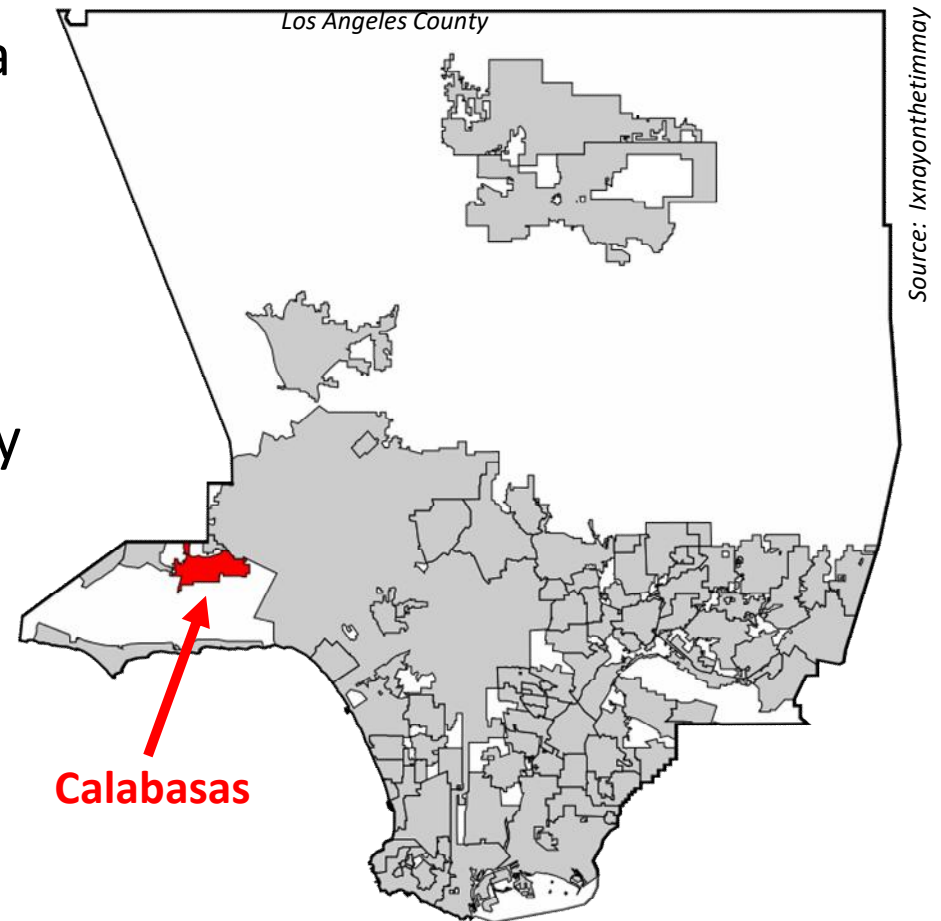
- Federal: Denials require substantial evidence (lots of lay testimony may be okay expert testimony better)
- Denials not allowed if based health *where* the cell site complies with FCC's rules
- Only 4 court cases reference HPM (substantial evidence only; no cases decided on HPM)
- Looming issue: Network densification for 5G ... upwards of 10X new cell sites (speed and capacity: not signal coverage)
- HPM decreasing utility as a tool with significant cell sites increases; harder to isolate specific impacts



# Calabasas: Online Survey and Resident Interviews

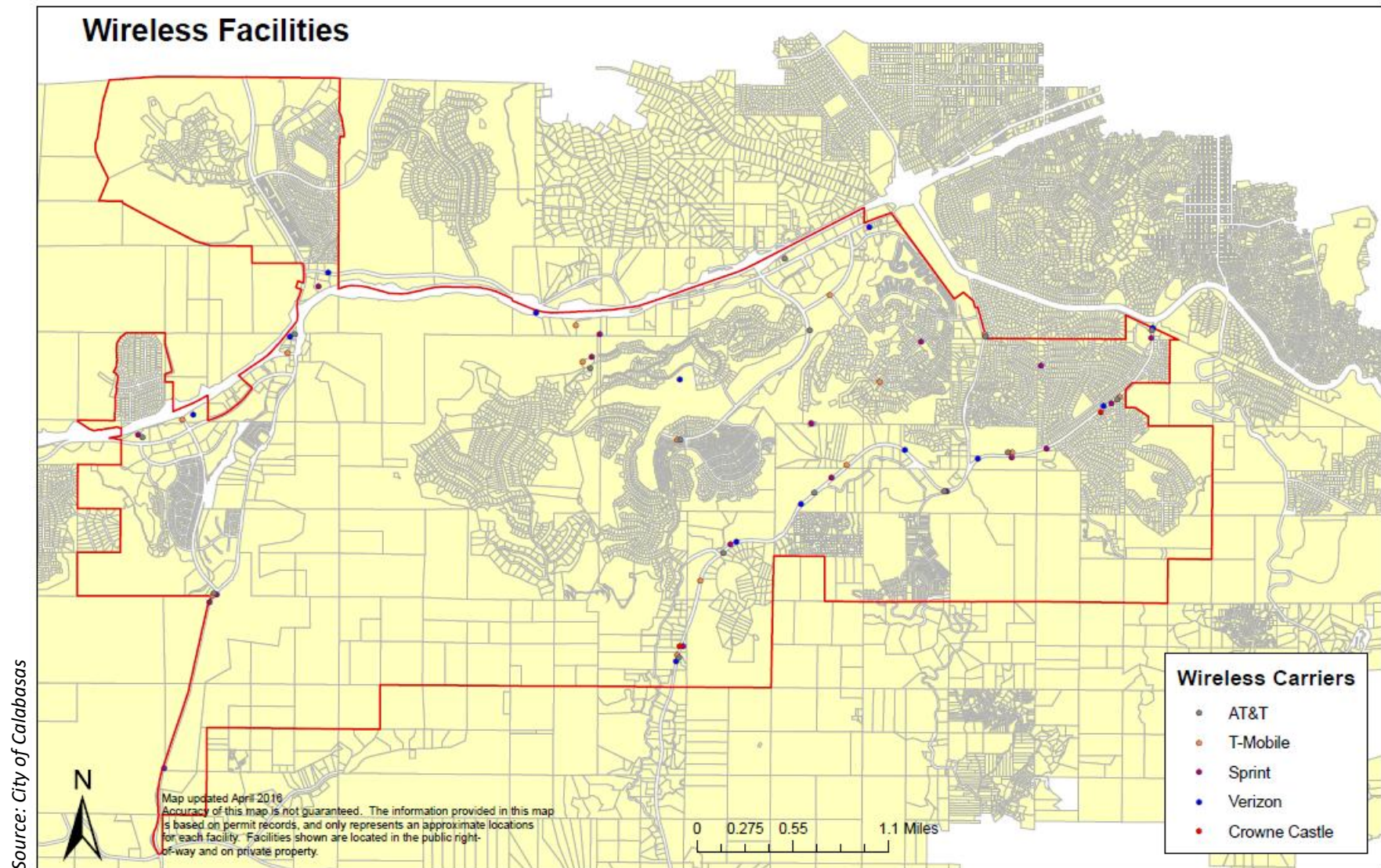
All politics is local - so are issues associated with cell sites

- Fast Facts: Calabasas, California
- Location: Western L.A. County
- Incorporated: 1991
- Size: 13.3 square miles
- People: 24,153, generally highly educated and wealthy
- Single Family Homes: 6,088
- Cell sites: ~~60~~ ~~62~~ 61?



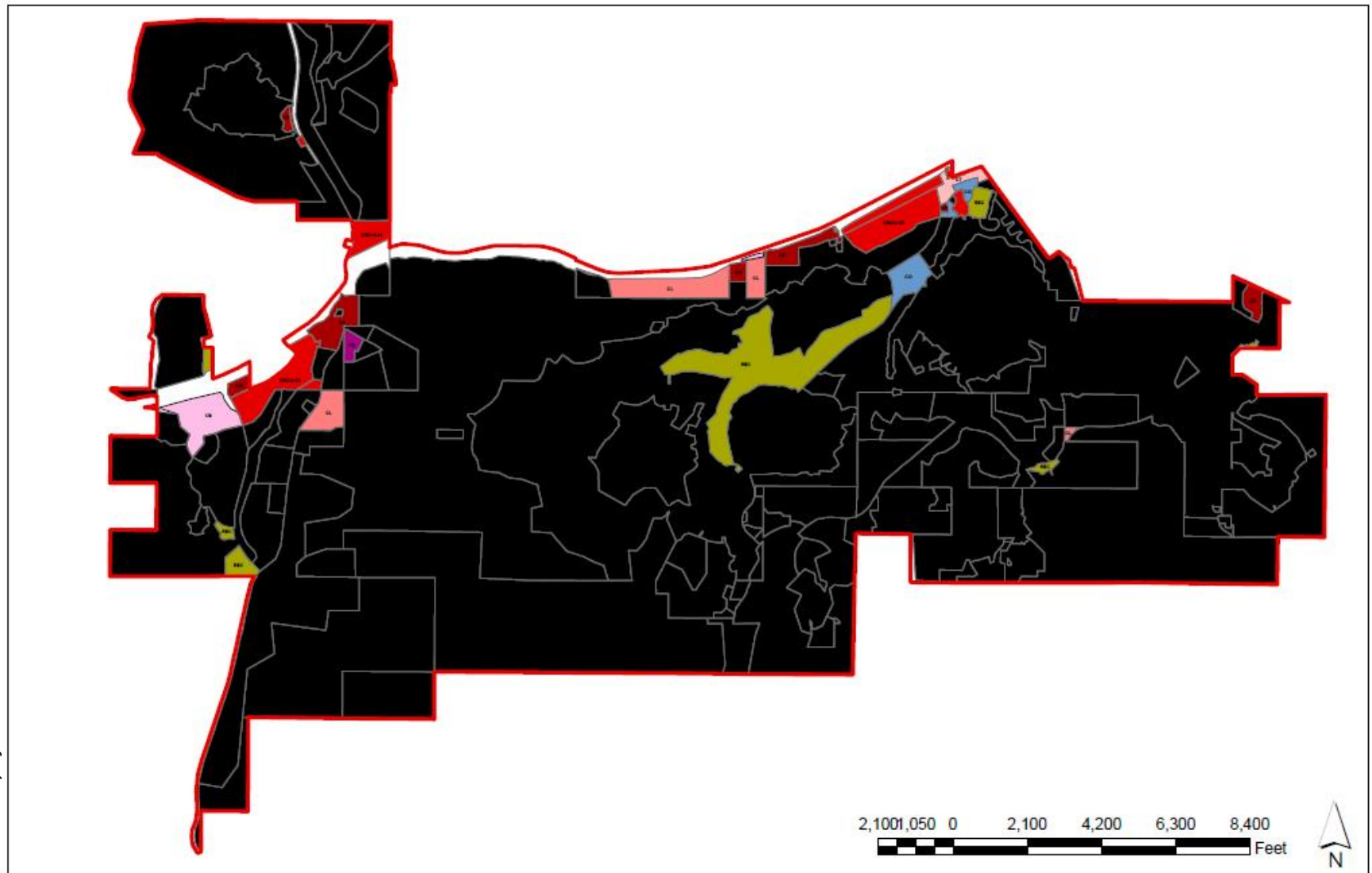
# Calabasas: Online Survey and Resident Interviews

Existing cell sites (April 2016)



# Calabasas: Online Survey and Resident Interviews

## Restrictive Wireless Telecommunications Facilities Ordinance (2012)



# Calabasas: Online Survey and Resident Interviews

All politics is local - so are issues associated with cell sites

Online respondents: 160 in Calabasas (220 total)

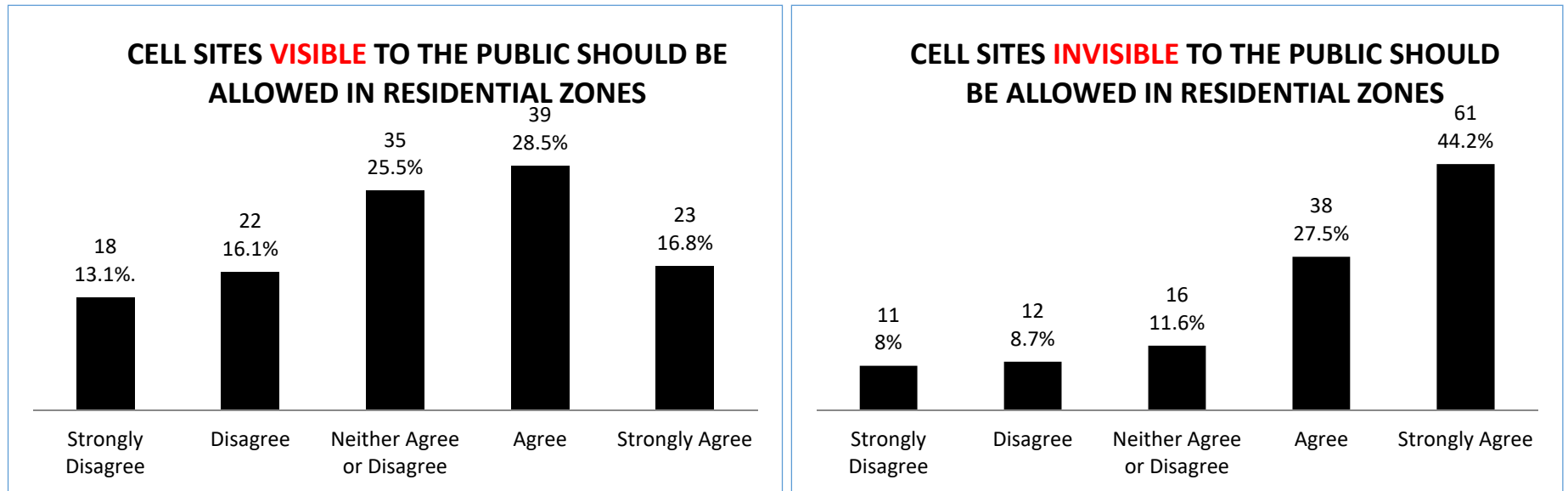
- Solicited by online ads targeted to Zip 91302
- Extensive survey: 49 Qs/23 pages – conditional branching

Resident interview: 6

- Solicited by U.S. mail (14 sent, 1 accepted) and online ads  
Facebook and Google ads targeted to Zip 91302
- Interviews: 1-2 hours (2 face-to-face; 4 by telephone)

# Calabasas: Online Survey and Resident Interviews

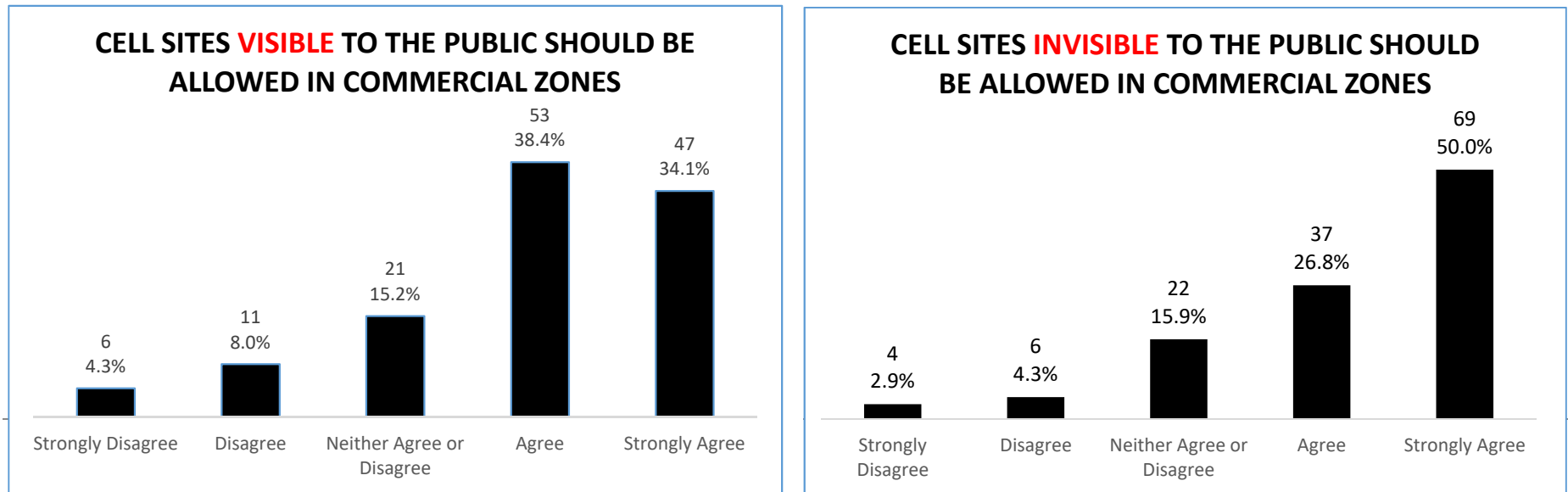
All politics is local - so are issues associated with cell sites



Interviewees: Only two could identify the location of the cell site nearest to their home; they were unaware of cell sites installed on street lights

# Calabasas: Online Survey and Resident Interviews

All politics is local - so are issues associated with cell sites

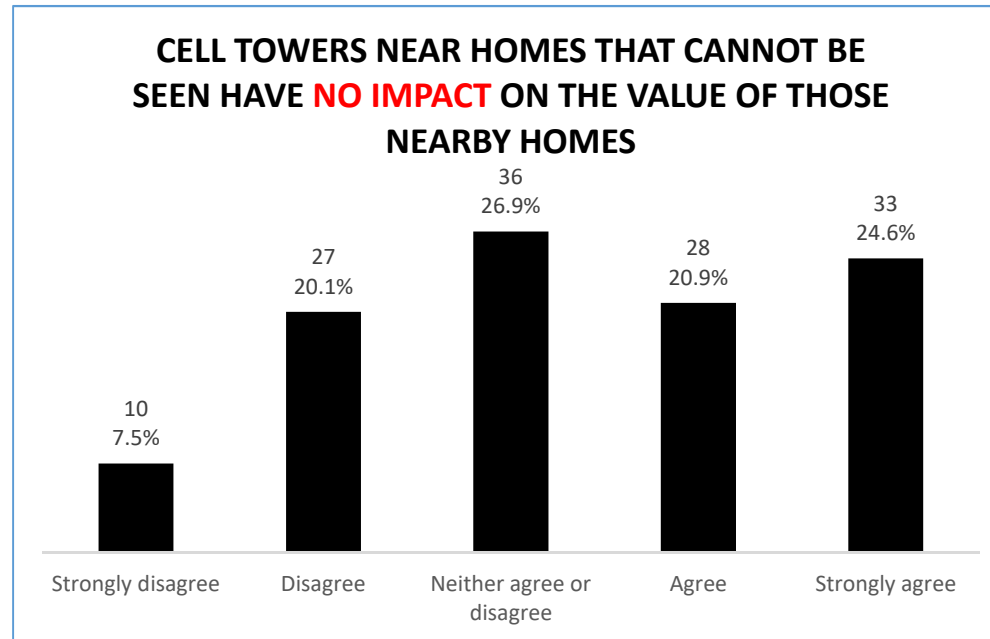


Interviewees: Did not want to look at unattractive site designs in commercial areas



# Calabasas: Online Survey and Resident Interviews

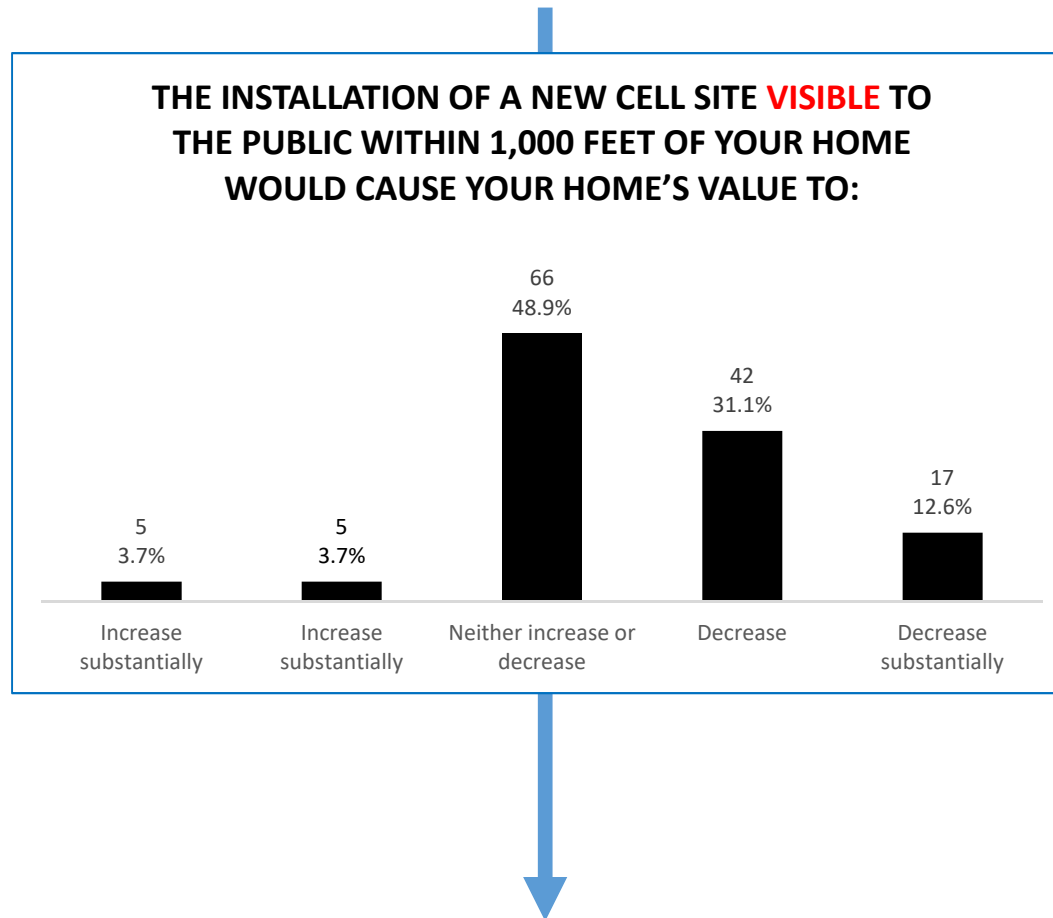
All politics is local - so are issues associated with cell sites



Interviewees: It would be inconvenient to live in a home without wireless access; would not buy a home in an area without wireless coverage; one purchased a booster allow for in-home coverage

# Calabasas: Online Survey and Resident Interviews

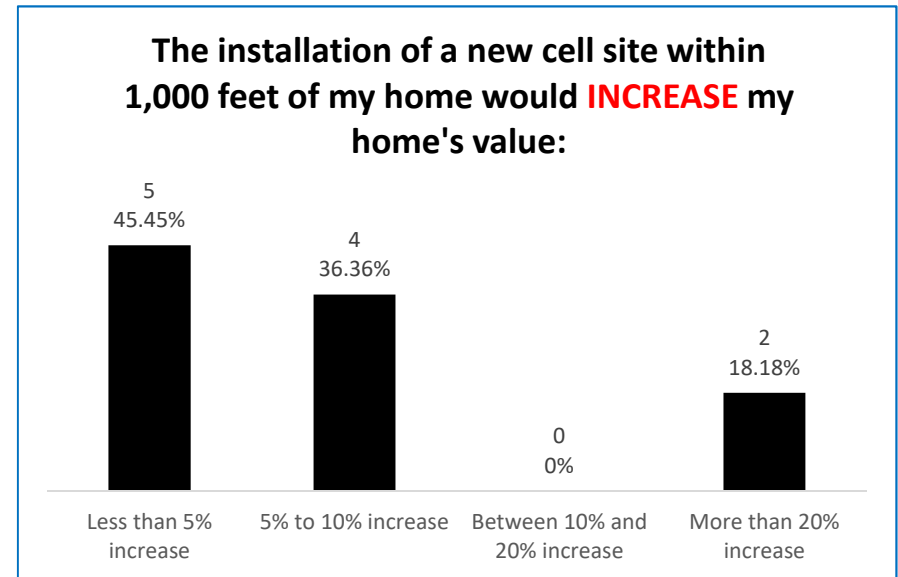
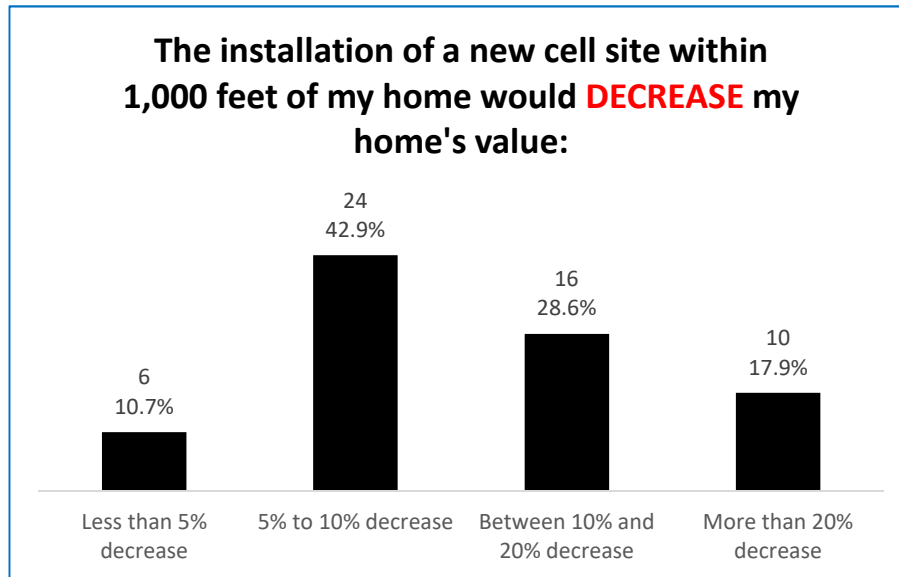
All politics is local - so are issues associated with cell sites





# Calabasas: Online Survey and Resident Interviews

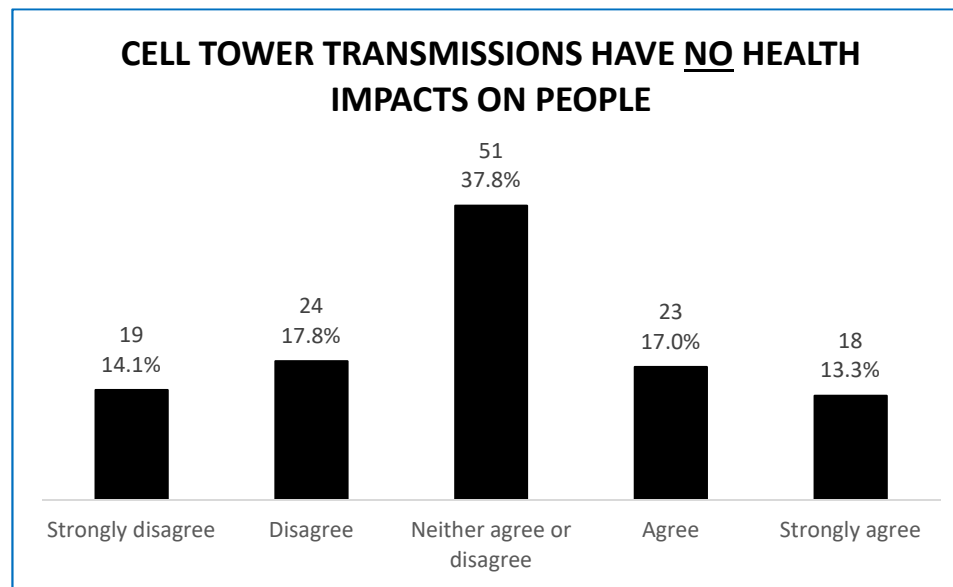
All politics is local - so are issues associated with cell sites



Note: Nearly 6x the number of survey takers expressing opinions regarding the percentage of property value change forecast a decrease

# Calabasas: Online Survey and Resident Interviews

All politics is local - so are issues associated with cell sites



Interviewees: The interviewees were split on whether the FCC's national standards for radio frequency safety standards were adequate, but they want more information to Help them make up their own minds.

# Calabasas: Online Survey and Resident Interviews

All politics is local - so are issues associated with cell sites

## Trusted Sources of Information related to cell sites

- Majority of the survey respondents rely on the Internet for cell site and health info
- Survey respondents are unsure whether to trust the cell site information they receive from the local government
- A clear majority of survey respondents distrust cell site information received from the cell phone company

Interviewees: They generally rely what they read on the Internet, but want to review multiple views to help them make up their own minds. They reflected the uncertainty about the information received from their local government; they distrusted information provided by the cell phone company.

# Localism:

All politics is local - so is a community's perception of itself

- Community identity

- Hedonic price modeling: large samples/large areas/  
spanning time

- Localism challenge to HPM

- Sales confirmation reports (and non-Sales conformation reports) as alternative tools to identify local issues and responses

# Surrogate Harm Theory:

The beginnings of a theory to describe an alternative reason for property value concerns

- **Background:** Generalized public concerns expressed at planning and zoning hearings that cell site radio frequency (“RF”) transmissions cause harm to humans coupled with property value concerns
- **Conflict:** Congress bars governments from denying cell sites permits *if* the RF transmissions meet FCC’s standards (47 U.S.C. § 332(c)(7)(B)(iv)), but...

No similar federal limitation for denying a cell site permit over concerns of property devaluation *if* substantial evidence in the administrative record.

- **Surrogate harm:** Residents limit their testimony at cell site permit public hearings to fears of property devaluation as a surrogate for federally-barred concerns regarding health issues associated with cell sites

# Local Governments:

## Law and Policy Considerations

### **Local Government Law and Policy Considerations**

- Conduct community surveys to learn broadest range of views
- Conduct sales confirmation studies to assess newcomer perspectives
- More residents cutting the cord (wireless is now the dominant provider)
- More cell sites closer to home (thoughtful camouflage versus excluding cell sites)
- Revisions to wireless ordinances to expedite permitting processes for preferred sites and preferred designs

# Recommendation for future research:

Future research starts with the conclusion of this research

- Future HPM researchers may wish to:
  - evaluate elevation differences in addition to flat-earth distance to the cell site
  - carefully evaluate local camouflage features
  - designed with assistance from wireless network engineers
  - employ more nuanced dummy variables attempting to account for multiple nearby cell sites of various designs

# Recommendation for future research:

Future research starts with the conclusion of this research

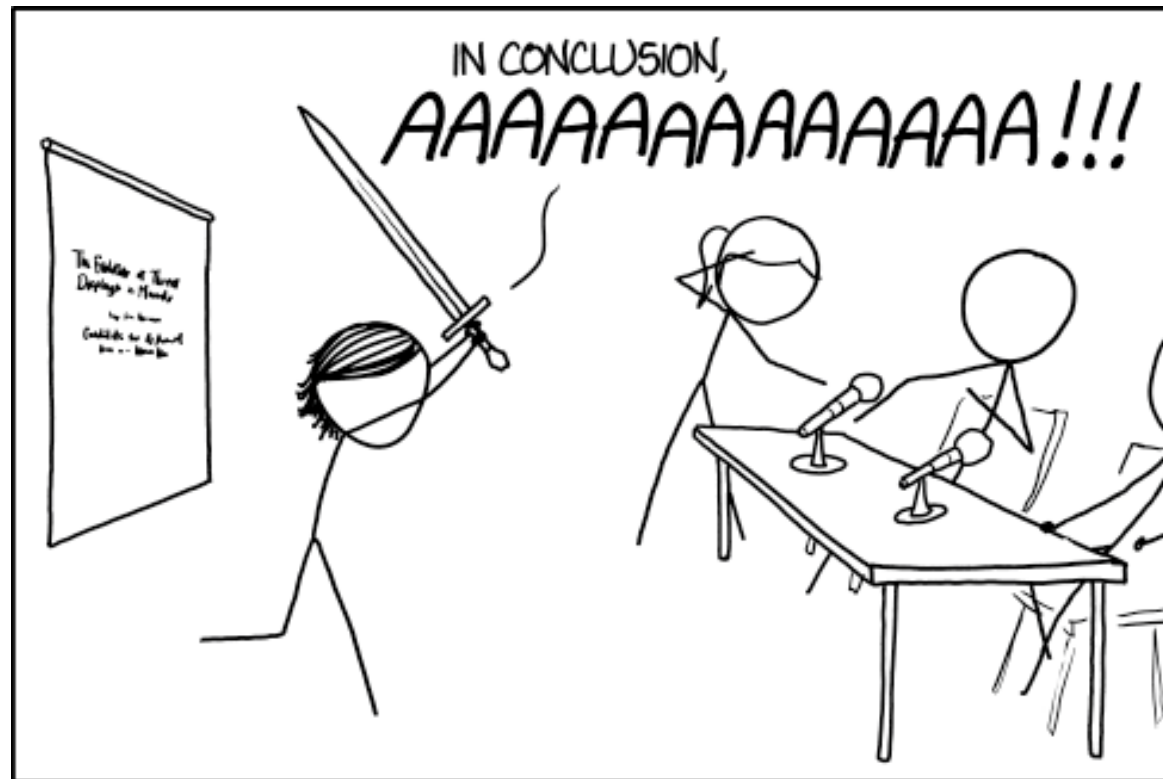
Future social science researchers may wish to:

- conduct local/regional sales confirmation report studies; non-sales report studies
- develop additional public educational means and tools regarding cell site matters
- recommend more streamlined government approval processes for cell sites that are effectively camouflaged
- explore theories that may explain public reluctance to cell sites during public hearings (surrogate harm theory)
- work with wireless network engineers



# Cell Towers, Community Perspectives, and Hedonic Price Modeling: Utility, Limitations, and Localism

## Questions



THE BEST THESIS DEFENSE IS A GOOD THESIS OFFENSE.