# Small Cell Presentation - Morristown

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# Agenda

1. Introduction – Kevin Jones
2. Facility Design – Colleen Connolly, PE
3. Safety & Compliance – Andrew Petersohn

# Why Are We Here

## Why are we expanding the wireless network?

### More people than ever before rely on wireless connections to manage their lives and businesses.

Verizon is expanding its wireless network to meet the growing demands of today and tomorrow.

But it takes time.

**39GB**
**of data per month**
Mobile data traffic per smartphone will rise from 7 GB per month in 2018 to 39 GB per month in 2024.[1]

**57%**
**are now wireless**
Around 57 percent of American households are now wireless only for voice service.[2]

**31**
**billion devices**
It is projected that there will be 31 billion connected devices by 2023.[3]

## What it takes to keep families and businesses connected.

### How does wireless service work?

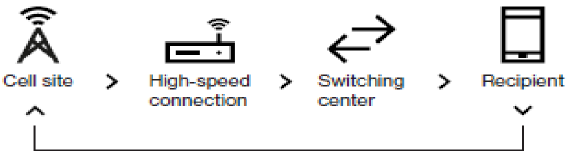
Radio frequencies can carry signals from radios and televisions, to baby monitors, garage door openers,home Wi-Fi service, and cordless phones.

Cell service uses these radio frequencies to wirelesslyconnect a mobile device with the nearest antenna. That antenna may be hidden in a church steeple, sitting on a rooftop, attached to a building façade or mounted on a freestanding tower structure. All are known generically as cell sites.

From the cell site, the call or data session then travels through a high-speed connection to a network switching center where it is then directed to the recipient.

This all happens in fractions of a second.

**The many types of wireless technologies include cellular and fixed wireless, or Wi-Fi.**




1. Ericsson Mobility Report, June 2019
2. CDC's 2016 Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, July-December
3. CTIA Infographics, January 2020

# Why Are We Here

## Finding the right location.

**To meet customer needs and expectations, wireless providers need the ability to expand and enhance their networks where users live, work, travel and play.**

Verizon gathers information from many sources including customer feedback, results of our own exhaustive network testing, and data from third parties.

When an area for improvement is identified, utilizing our existing network is always our first effort. If that is not possible, we then look at adding a new site.

**Steps to finding a new site**

Our engineers analyze the areas that need improvement to figure out the ideal location based on customer needs, terrain and modeling results.

Using existing structures is considered first.

Network teams perform exhaustive searches in the area needing improvement to find a location that will meet our technical needs. We also look at interest from property owners.

We pick a location that has the highest likelihood of meeting technical needs and works for the community.

**Guidelines for new sites**

We comply fully with all requirements for community notification and review, zoning and permitting.

Potential antenna locations must meet all local, state and federal regulations.

Verizon holds Federal Communications Commission (FCC) licenses for the frequencies utilized and we strictly follow their regulations.

## Wireless facilities and property values.

**Cell service in and around the home has emerged as a critical factor in home-buying decisions.**

National studies demonstrate that most home buyers value good cell service over many other factors including the proximity of schools when purchasing a home.

**75%**

More than 75% of prospective home buyers said a good cellular connection was important to them.[1]

**83%**

The same study showed that 83% of Millennials (those born between 1982 and 2004) said cell service was the most important fact in purchasing a home.

**90%**

90% of U.S. households use wireless service. Citizens need access to 911 and reverse 911 and wireless may be their only connection.[2]

1. RootMetrics/Money, The Surprising Thing Home Buyers Care About More than Schools, June 2, 2015
2. CTIA, June 2015

# Why Are We Here

## Different locations require different solutions.

**Verizon uses a balanced approach to engineering the best possible network given the local community's needs.**

Traditional, or macro cell sites, are most often the best choice for meeting coverage and capacity needs. Macro sites are traditional cell sites or towers that provide coverage to a broad area, up to several miles.

Small cells are just like the name implies – short range cell sites used to complement macro cell towers in a smaller geographic area ranging from a few hundred feet to upwards of 1,000 feet. These lower power antennas enhance capacity in high traffic areas, dense urban areas, suburban neighborhoods, and more. Small cells use small radios and a single antenna placed on existing structures including utility poles and street lights.

Distributed Antenna Systems (DAS) are a group of antennas in outdoor or indoor locations that connect to a base station. DAS systems are typically used in large venues including stadiums and shopping centers.

## Staying ahead of demand.

**A wireless network is like a highway system...**

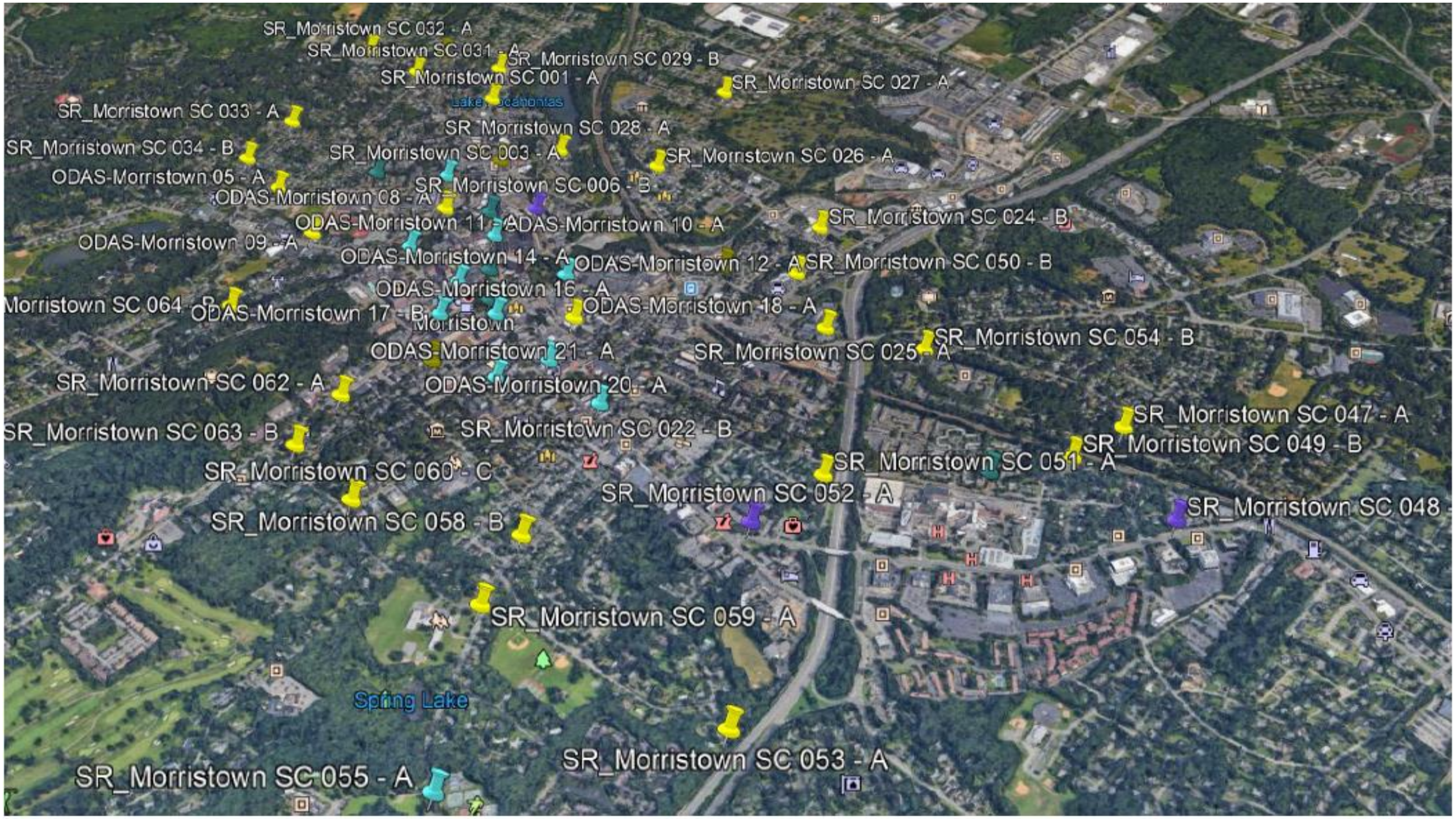
More wireless traffic needs more wireless facilities just like more vehicle traffic needs more lanes.

- Many wireless users share each cell site and congestion may result when too many try to use it at the same time.
- Wireless coverage may already exist in an area, but with data usage growth increasing exponentially each year, more capacity is needed.
- To meet capacity demands, we need to add more wireless antennas closer to users and closer to other cell sites to provide the reliable service customers have come to expect from Verizon.

In the US, mobile data traffic was 1.3 Exabytes per month in 2016, the equivalent of 334 million DVDs each month or 3,687 million text messages each second.*

*Cisco VNI Mobile Forecast Highlights, 2016-2021, February 2017

# Proposed Locations – All Nodes (50)




| Map Structure Symbol | Proposed Structure Type | Proposed Number of Small Cell Nodes |
|---|---|---|
| | Utility Poles | 31 |
| | Public Lighting Structures | 16 |
| | Stealth Poles | 3 |
| | Total Number Proposed Small Cell Nodes | 50 |

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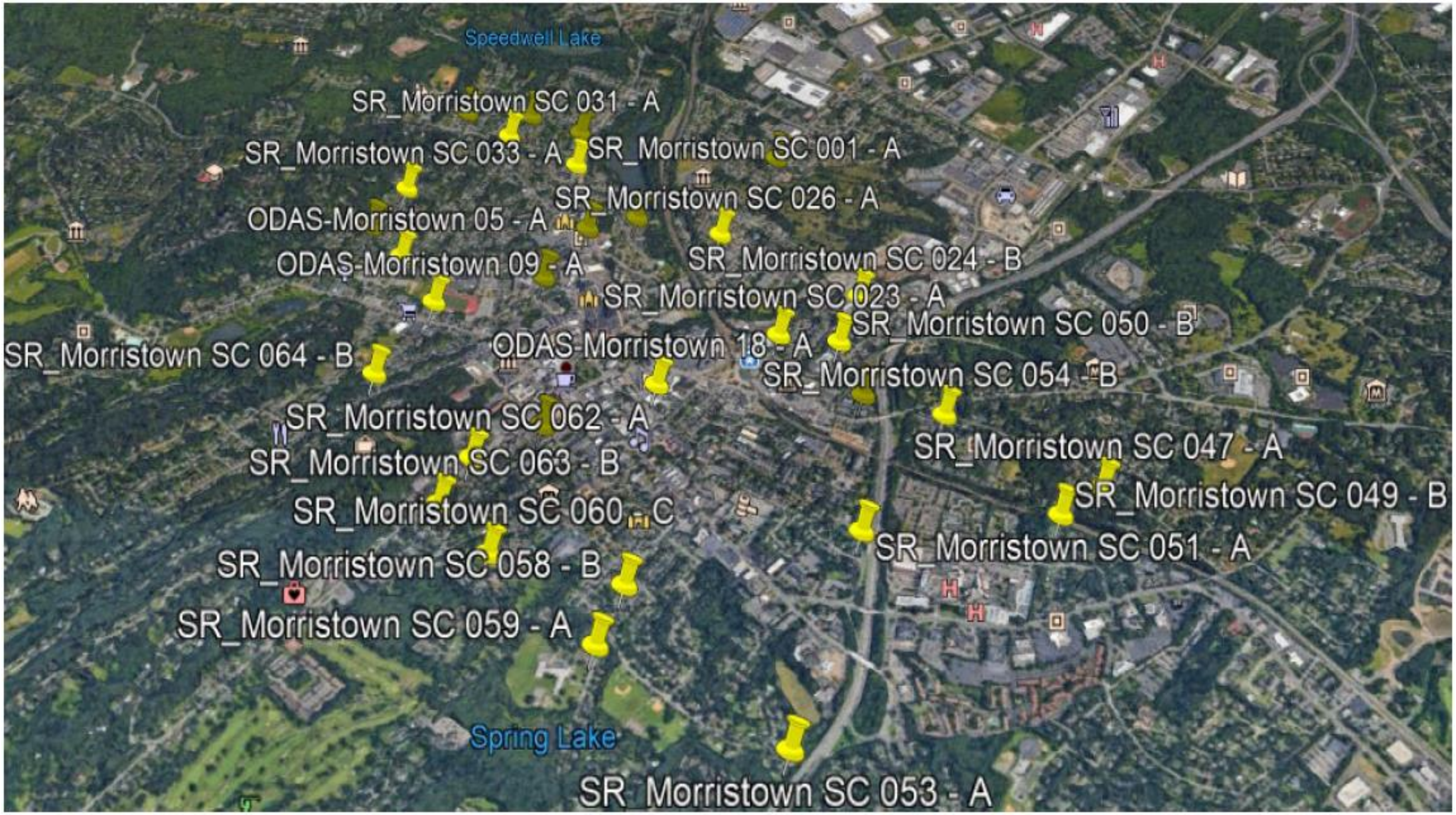
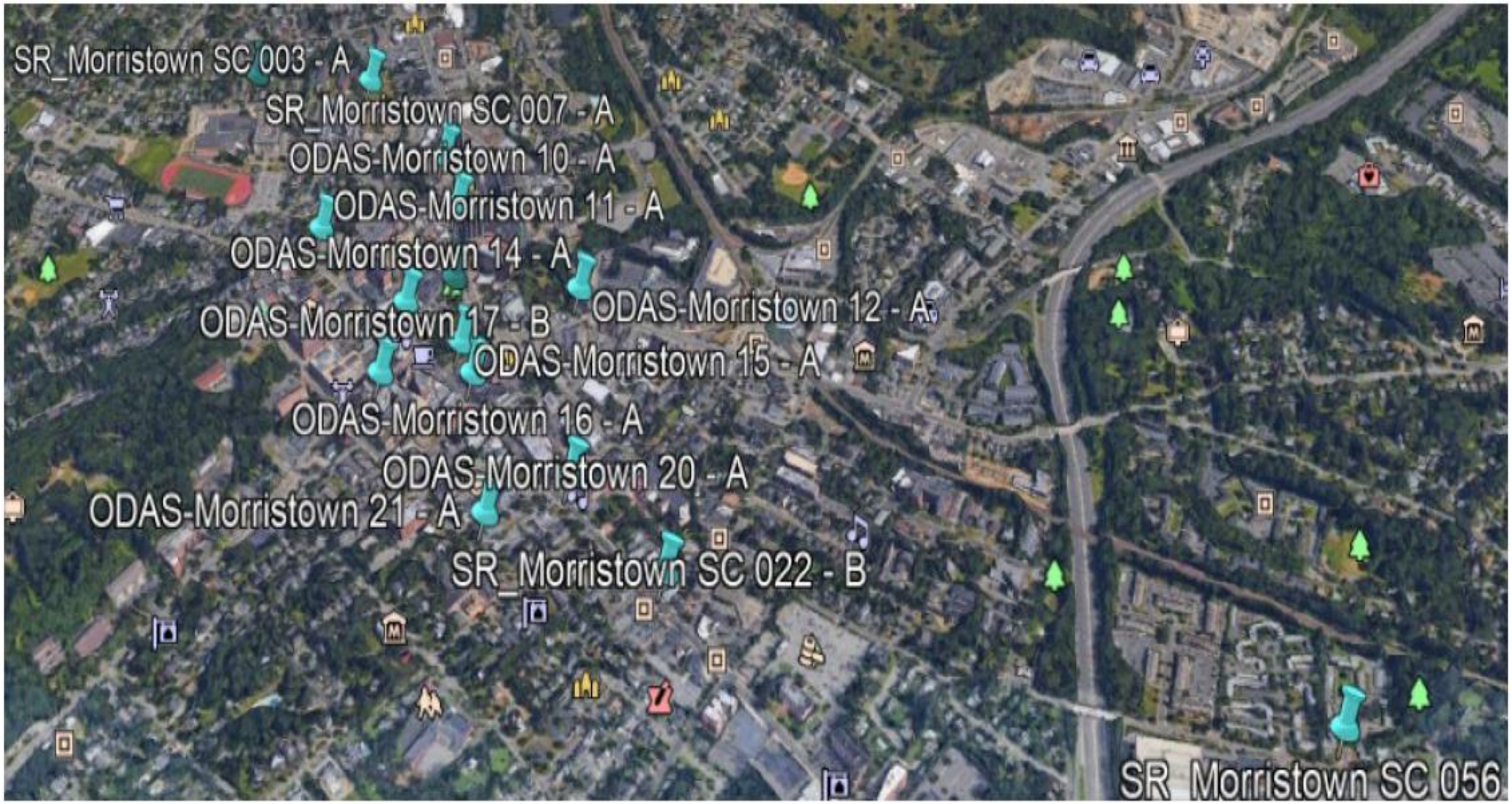
# Proposed Locations – Utility Poles (31)



# Proposed Locations – Public Lighting Structures (16)

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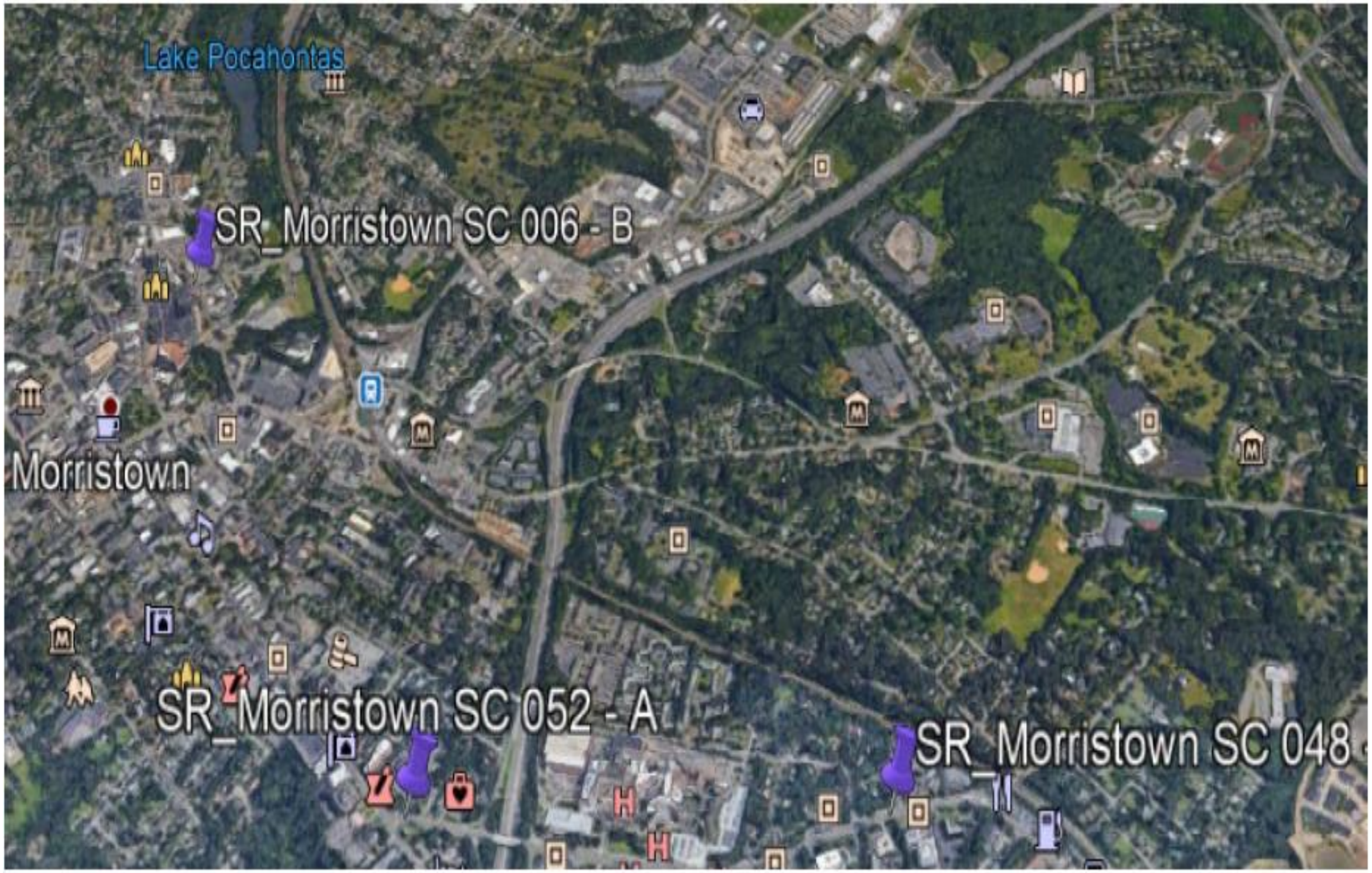
# Proposed Locations – Stealth Poles (3)



# Node Locations – List View (Utility Poles)

| Site Name | Street Address | City | Block/Lot | Structure Configuration | Latitude | Longitude | ROW Owner |
|---|---|---|---|---|---|---|---|
| ODAS-MORRISTOWN 05 | 25 Mills St. | Morristown | 7901 / 1.01 | Utility Pole | 40.801298 | -74.489637 | Morristown |
| ODAS-MORRISTOWN 08 | 31 Prospect Street | Morristown | 5801 / 10 | Utility Pole | 40.800279 | -74.483306 | Morristown |
| ODAS-MORRISTOWN 09 | 104 Washington St. | Morristown | 7802 / 1 | Utility Pole | 40.799253 | -74.487767 | Morris County |
| ODAS-MORRISTOWN 18 | 38 Dumont Place | Morristown | 4801 / 23 | Utility Pole | 40.795797 | -74.478006 | Morristown |
| ODAS-MORRISTOWN 19 | 28 Dehart Street | Morristown | 6104 / 1 | Utility Pole | 40.794114 | -74.482323 | Morristown |
| SR_Morristown SC 001 | 186 Speedwell Ave | Morristown | 5102 / 1 | Utility Pole | 40.805548 | -74.482693 | State |
| SR_Morristown SC 002 | 145 Speedwell Ave - Flagler Ave side of Parcel | Morristown | 5001 / 11 | Utility Pole | 40.802503 | -74.481753 | Morristown |
| SR_Morristown SC 023 | 1 Lackawanna Pl - Lafayette Ave side of building | Morristown | 3602 / 11 | Utility Pole | 40.797819 | -74.473172 | Morris County |
| SR_Morristown SC 024 | 81 Abbett Ave | Morristown | 1901 / 9 | Utility Pole | 40.799606 | -74.469868 | Morristown |
| SR_Morristown SC 025 | 196 Morris St | Morristown | 1802 / 1 | Utility Pole | 40.79545 | -74.469653 | Morris County |
| SR_Morristown SC 026 | 12 Martin Luther King Ave | Morristown | 2302 / 7 | Utility Pole | 40.802345 | -74.475945 | Morristown |
| SR_Morristown SC 027 | 81 Martin Luther King Ave | Morristown | 501 / 13 | Utility Pole | 40.805881 | -74.473677 | Morristown |
| SR_Morristown SC 028 | 33 Clyde Potts Dr | Morristown | 3401 / 1 | Utility Pole | 40.80321 | -74.479684 | Morristown |
| SR_Morristown SC 029 | 212 Speedwell Ave - Cutler St side of parcel | Morristown | 5103 / 26 | Utility Pole | 40.807182 | -74.482748 | Morristown |
| SR_Morristown SC 030 | 145 Mills St | Morristown | 3202 / 14 | Utility Pole | 40.808078 | -74.485172 | Morristown |
| SR_Morristown SC 031 | 124 Mills St | Morristown | 5301 / 5 | Utility Pole | 40.807012 | -74.485999 | Morristown |
| SR_Morristown SC 032 | 100 Sussex Ave | Morristown | 5401 / 9 | Utility Pole | 40.808142 | -74.488129 | Morris County |
| SR_Morristown SC 033 | 14 Milton Pl - Intersection of Kenmuir Ave and Milton Pl | Morristown | 5502 / 1 | Utility Pole | 40.80436 | -74.490082 | Morristown |
| SR_Morristown SC 034 | 119 Early St | Morristown | 8001 / 17 | Utility Pole | 40.802661 | -74.491235 | Morristown |
| SR_Morristown SC 047 | 28 Valley View Dr | Morristown | 1202 / 4 | Utility Pole | 40.791725 | -74.460452 | Morristown |

# Node Locations – List View (Utility Poles Cont.)

| Site Name | Street Address | City | Block/Lot | Structure Configuration | Latitude | Longitude | ROW Owner |
|---|---|---|---|---|---|---|---|
| SR_Morristown SC 049 | 13 Shady Lane | Morristown | 4002 / 9 | Utility Pole | 40.790828 | -74.462133 | Morristown |
| SR_Morristown SC 050 | 38 Ridgedale Ave | Morristown | 1901 / 12 | Utility Pole | 40.797564 | -74.47066 | Morristown |
| SR_Morristown SC 051 | 33 Revere Rd - Green Hill Rd side of parcel | Morristown | 4302 / 7 | Utility Pole | 40.790295 | -74.469679 | Morristown |
| SR_Morristown SC 053 | 38 Paula Court | Morristown | 7002 / 1 | Utility Pole | 40.783445 | -74.472071 | Morristown |
| SR_Morristown SC 054 | NE side of intersection of W Valley View Dr and Hopewell Pl | Morristown | 3803 / 1 | Utility Pole | 40.794596 | -74.46642 | Morristown |
| SR_Morristown SC 058 | 59 James St | Morristown | 7202 / 13 | Utility Pole | 40.788503 | -74.478393 | Morris County |
| SR_Morristown SC 059 | 105 James St | Morristown | 8901 / 1 | Utility Pole | 40.7865929 | -74.47920035 | Morris County |
| SR_Morristown SC 060 | 35 Ogden Pl | Morristown | 8701 / 6 | Utility Pole | 40.789508 | -74.483585 | Morristown |
| SR_Morristown SC 062 | 26 Mt Kemble Ave - Colles Ave side of parcel | Morristown | 7502 / 19 | Utility Pole | 40.792925 | -74.484901 | Morristown |
| SR_Morristown SC 063 | 49 Wetmore Ave - On Doughty St side of parcel | Morristown | 7502 / 12 | Utility Pole | 40.791286 | -74.485828 | Morristown |
| SR_Morristown SC 064 | 71 Western Ave | Morristown | 8401 / 25 | Utility Pole | 40.796039 | -74.489435 | Morristown |

# Node Locations – List View (Lighting Structures)

| Site Name | Street Address | City | Block/Lot | Structure Configuration | Structure Sub-Type | Latitude | Longitude | ROW Owner |
|---|---|---|---|---|---|---|---|---|
| ODAS-MORRISTOWN 04 | 61 Early Street | Morristown | 5702 /39 | Public Lighting Structure | New Cobra Street Light | 40.801908 | -74.486203 | Morristown |
| ODAS-MORRISTOWN 10 | 30 Speedwell Ave. | Morristown | 5901 / 1 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.799008 | -74.481281 | State |
| ODAS-MORRISTOWN 11 | 57-61 Washington St. | Morristown | 5802 / 2 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.798498 | -74.484115 | Morris County |
| ODAS-MORRISTOWN 12 | 28 Morris St | Morristown | 4901/11 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.79744 | -74.478547 | Morris County |
| ODAS-MORRISTOWN 14 | 1 Washington street | Morristown | 5905 / 5 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.79708 | -74.482122 | Morris County |
| ODAS-MORRISTOWN 15 | 2 South Street-South Park Place | Morristown | 5905 / 7 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.796364 | -74.4809 | State |
| ODAS-MORRISTOWN 16 | 13 South Street | Morristown | 6004 / 7 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.795786 | -74.480596 | State |
| ODAS-MORRISTOWN 17 | 40 Market St | Morristown | 6004 / 16 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.79581111 | -74.482459 | State |
| ODAS-MORRISTOWN 20 | 83 South St | Morristown | 6102/4 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.794075 | -74.478529 | State |
| ODAS-MORRISTOWN 21 | 52 Maple Ave | Morristown | 6102 / 9 | Public Lighting Structure | Replace Existing Cobra Street Light | 40.79346111 | -74.48012222 | Morristown |
| SR_Morristown SC 003 | 21 Early St | Morristown | 5702 / 28 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.801776 | -74.483585 | Morristown |
| SR_Morristown SC 007 | 62 Speedwell Ave | Morristown | 5801 / 26 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.800057 | -74.481685 | State |
| SR_Morristown SC 013 | 15 North Park Pl | Morristown | 5902 / 1 | Public Lighting Structure | Replace Existing Cobra Street Light | 40.797565 | -74.481168 | State |
| SR_Morristown SC 022 | 151 South St | Morristown | 6204 / 18 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.792536 | -74.476693 | State |
| SR_Morristown SC 055 | 14 Lynn Ct - Windmill Dr side of parcel | Morristown | 9201 / 10.01 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.782566 | -74.473976 | Private |
| SR_Morristown SC 056 | 27 Windmill Drive | Morristown | 9201 / 14.01 | Public Lighting Structure | Replace Existing Decorative Street Light | 40.781287 | -74.474991 | Private |

# Node Locations – List View (Stealth Poles)

| Site Name | Street Address | City | Block/Lot | Structure Configuration | Structure Sub-Type | Latitude | Longitude | ROW Owner |
|---|---|---|---|---|---|---|---|---|
| SR_Morristown SC 006 | 106-50 Spring St - North of Martin Luther King Ave | Morristown | 4901 / 1 | Stealth Pole | New | 40.800416 | -74.480111 | Morristown |
| SR_Morristown SC 048 | 151 Madison Ave | Morristown | 1402 / 4 | Stealth Pole | New | 40.788812 | -74.459408 | State |
| SR_Morristown SC 052 | 233 South St | Morristown | 6301 / 8 | Stealth Pole | New | 40.788632 | -74.472102 | Morris County |

# Node Design Specifics

**Site Selection and Design Options**

- **Photo Simulation Shown for Each Site Type**
- **Designed to Match Streetscape as Much as Possible**
- **Limited Height to (below 50' allowable per FCC)**
- **Equipment Concealed within Pole to Achieve Aesthetic Balance Where Applicable**

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# Design Detail – Utility Poles (New)

# Design Detail – Utility Poles (Replacement)

# Design Detail – Public Lighting Cobrahead Replacement Attachment Design

# Design Detail – Public Lighting Cobrahead Concealment Design

# Design Detail – Stealth Pole Attachment Design

# Design Detail – Stealth Pole Concealment Design


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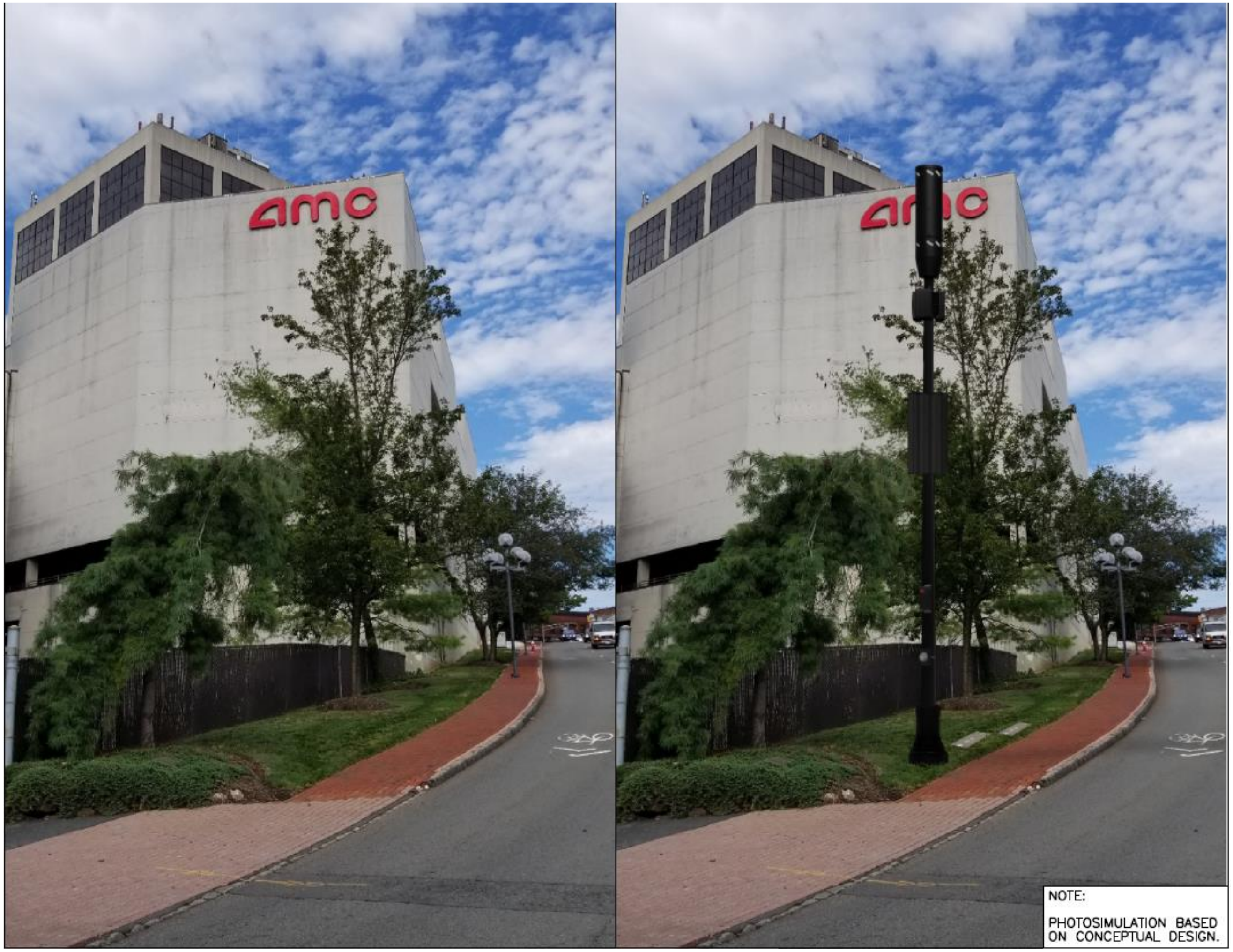
# Design Detail – Stealth Pole Attachment Design



# Design Detail – Stealth Pole Concealment Design

# Design Detail – Stealth Pole Concealment Design (South Street)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# Design Detail – Co-Location Pole

# Facts About RF Energy

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## RF 101

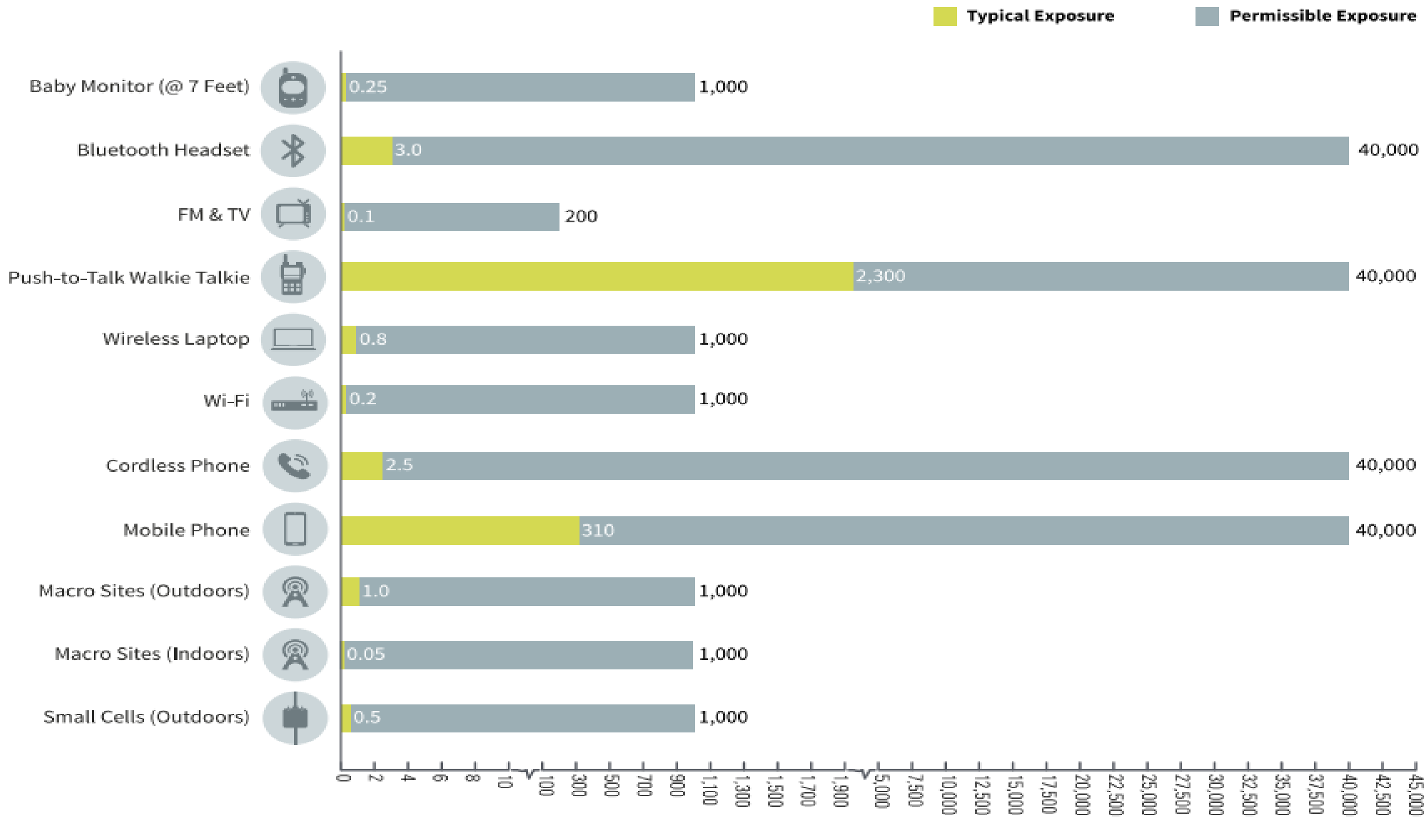
Radiofrequency (RF) energy is used to transmit information without wires. It has been safely used for over 100 years. Today, RF is used for life's daily connections – from radios and televisions to smart watches/fitness trackers and wireless headphones, Bluetooth and WiFi routers , and even baby monitors.

RF energy is also used for the wireless technology that provides connectivity for your mobile devices.

# Site Safety

## Common Radiofrequency Exposures (μW/cm²)

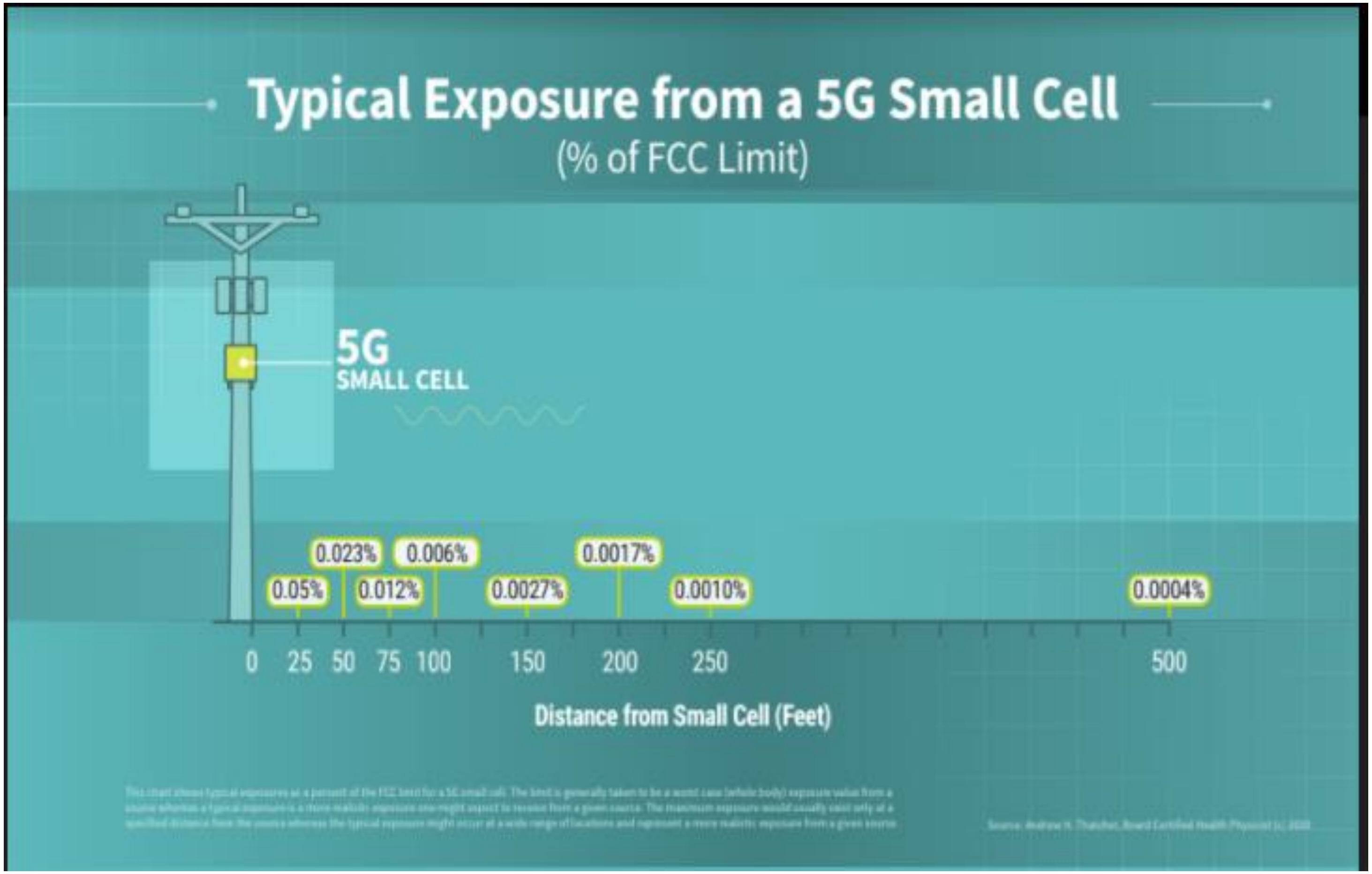
(μW/cm²) = microwatts per centimeter squared




A maximum exposure is generally taken to be a worst case (whole body) exposure value from a source whereas a typical exposure is a more realistic exposure one might expect to receive from a given source. The maximum exposure would usually exist only at a specified distance from the source whereas the typical exposure might occur at a wide range of locations and represent a more realistic exposure from a given source.

Source: Andrew H. Thatcher, Board Certified Health Physicist (c) 2020

# Site Safety


Typical Exposure from a 5G Small Cell
(% of FCC Limit)
5G
SMALL CELL
0.023%
0.006%
0.0017%
0.05%
0.012%
0.0027%
0.0010%
0.0004%
0 25 50 75 100 150 200 250 500
Distance from Small Cell (Feet)

# Site Safety

## Separating the myths from the facts

**MYTH**: 5G is new and has not been researched.

**FACT**: Scientists in the U.S. and around the world have conducted research on RF energy for decades. In December 2019[2], in a unanimous and bipartisan decision, the FCC affirmed that the same RF safety standards that apply to earlier wireless technologies (e.g., 3G and 4G) apply to 5G. The FCC took action after a lengthy proceeding, in consultation with multiple federal agencies and close examination of the RF research. In 2020, the U.S. Food and Drug Administration (FDA) released a report reviewing studies on RF health and safety from the last ten years, and found that "there are no quantifiable adverse health effects in humans caused by exposures at or under the current cell phone exposure limits."[3] The research continues to this day, and agencies continue to monitor it.

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**MYTH**: 5G use of millimeter wave spectrum is harmful.

**FACT**: RF energy exists all around us, and has many helpful uses. For example, baby monitors use RF energy to convey information and light bulbs use it to provide light. 5G technology uses RF energy to enable very fast wireless internet access service. And 5G technology that uses millimeter wave spectrum is subject to the same FCC safety standards that apply to all frequencies of spectrum used for wireless communications. So, 5G networks using millimeter wave spectrum are not only helpful, but also must meet FCC safety standards.

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**MYTH**: Wireless carriers clustering in an area will cause cumulative RF energy to exceed FCC limits.

**FACT**: The cumulative RF energy generated by the aggregate antennas must fall within FCC limits.

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# Site Safety

**MYTH**: 5G networks put our children at risk.

**FACT**: No matter which generation of technology we use, all Verizon networks and equipment must comply with federal government safety standards. Those standards have wide safety margins and are designed to protect everyone, including children .

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**MYTH**: 5G will harm the environment and wildlife, disrupting migratory patterns and killing off birds.

**FACT**: Reports suggesting harmful effects of RF to non-humans, including birds, honey bees, and other insects have been largely discredited. Audobon magazine[4] published a piece observing that there is no evidence that 5G radio waves kill or otherwise harm birds. The American Bee Journal[65] also published a piece addressing why there is "no good reason to expect [5G] to harm honeybees."

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**BOTTOM LINE: Telecommunications networks and equipment that comply with FCC standards are safe for communities and consumers.**

## Additional Resources

**FCC:** RF Safety FAQ
https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety

**FDA:** Radio Frequency Radiation and Cell Phones
https://www.fda.gov/radiation-emitting-products/cell-phones/radio-frequency-radiation-and-cell-phones

**CTIA:** Wireless Health Facts
https://www.wirelesshealthfacts.com/faq/


**Sources**

1 Adapted from https://www.fda.gov/radiation-emitting-products/cell-phones/radio-frequency-radiation-and-cell-phones
2 https://www.fcc.gov/document/fcc-maintains-current-rf-exposure-safety-standards
3 https://www.fda.gov/media/135043/download
4 https://www.audubon.org/news/no-5g-radio-waves-do-not-kill-birds
5 https://americanbeejournal.com/why-we-shouldnt-fear-5g/

# Site Safety

**Are small cells safe?**

**The Federal Communications Commission, in consultation with multiple federal agencies, sets federal government safety standards regarding small cells. Those standards have wide safety margins and are designed to protect everyone, including children, and were established after close examination of research that scientists in the US and around the world conducted for decades. The research continues to this day, and agencies continue to monitor it.**

**Scientists have studied potential health effects of RF emissions from cell phones for decades. Based on all the research, federal agencies have concluded that equipment that complies with the safety standards poses no known health risks. And advisers to the World Health Organization have specifically concluded that the same goes for 5G equipment. In fact, the RF safety standards adopted by the United States Federal Communications Commission (FCC) are even more conservative than the levels adopted by some international standards bodies.**

**FCC: The FCC provides information about the safety of RF emissions from cellular base stations on its website at: http://www.fcc.gov/oet/rfsafety/rf-faqs.html.**

**FDA: The Food and Drug Administration's Cell phone website.**

**EPA: The Environmental Protection Agency's overview of cell phone safety: Cell phone safety.**

# Next Step

- Amendment – Language approved by town attorney.  Needs council approval
- Ordinance – Newly proposed by Committee. Needs legal approval and council action.

# Thank you.