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BROADBAND WITHOUT BOUNDARIES

# Our Speakers

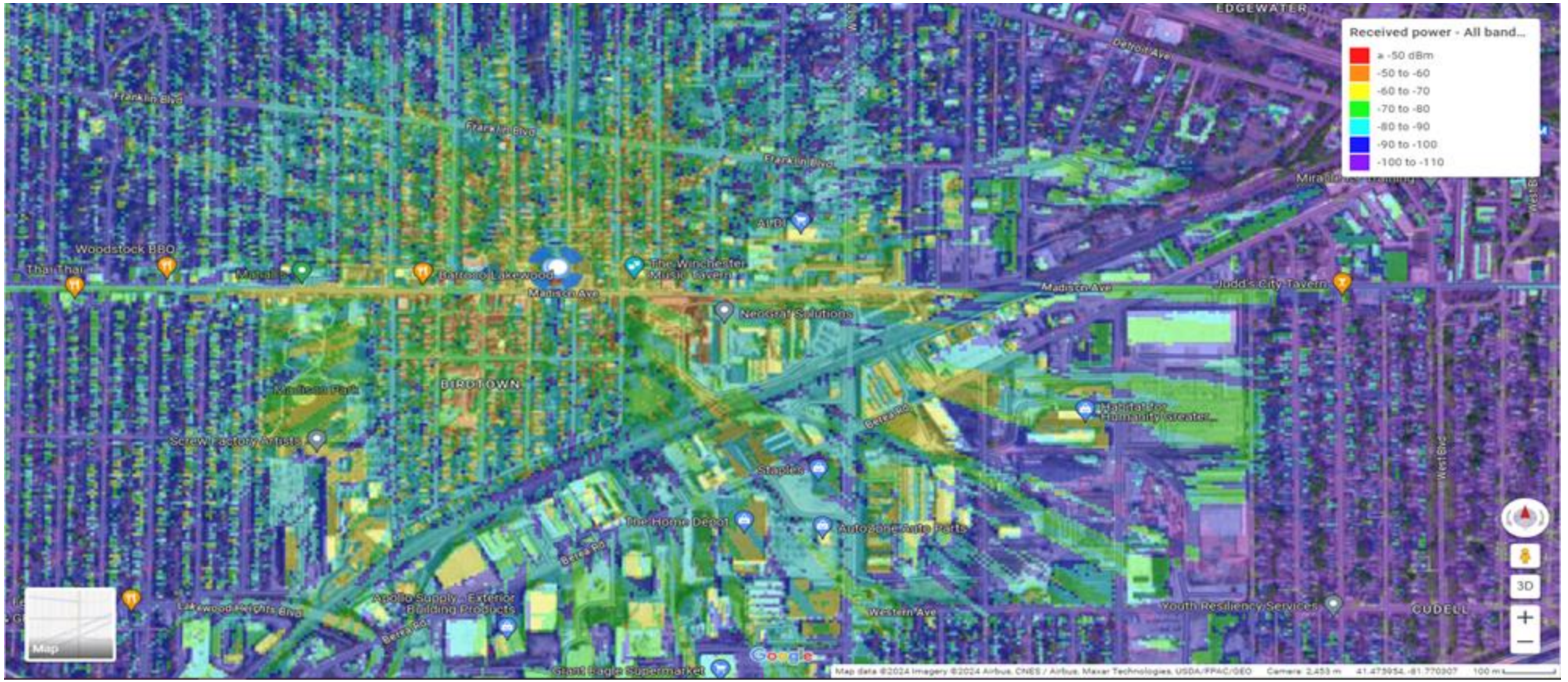
- Ryan Hudson – PCs For People
- Alan Agraz Huitrón – NetPoint
- Jeff Little – Above Wireless

# Best practices for radio installation

- Site visits requirements
  - Check the condition of the roof.
  - What other carriers are on the roof and what are some potential issues with interference
  - Where the closest breaker box is and check to see if there are any open circuits in the panel
  - Check your pathway from ground floor to the roof. Are there any open chases from first floor to the roof?
  - Check the location to confirm placement for the antennas. What is best use for the install? Non penetrating roof mounts or wall standoffs?
  - What is the path of least resistance from the rooftop to maximum household coverage? LOS is crucial!
  - What is the potential to expand off the rooftop to another site via wireless point to point radios

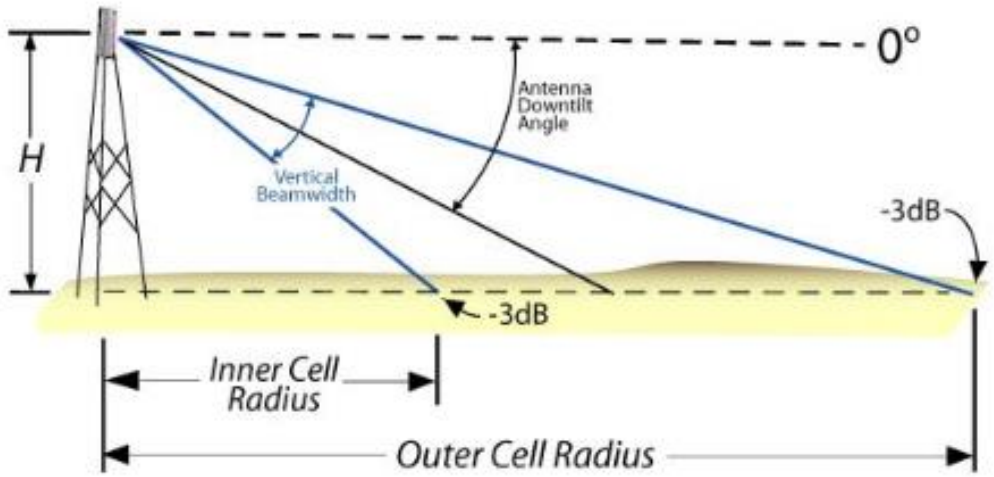
# Site planning

- After a site visit is made and a plan is in mind, create a statement of work
  - Make heat maps with proposed locations of radios and antennas



# Site planning

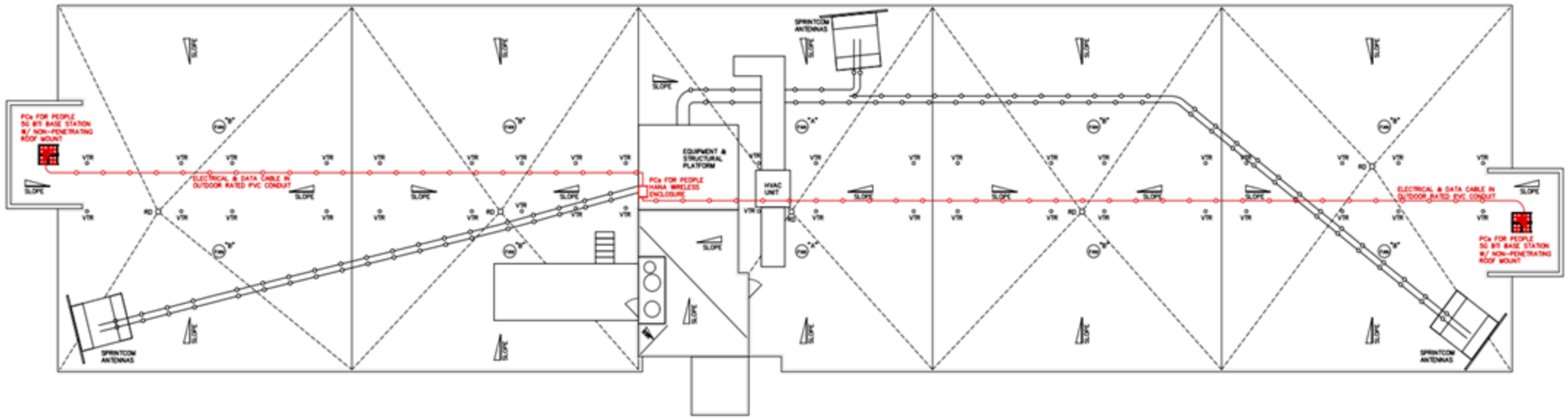
- Use downtilt calculators but take in account for the terrain (uphill / downhill)




$$\text{Inner Radius Distance} = \frac{H/\text{Tan}\left(A + \frac{BW}{2}\right)}{5280} \qquad \text{Outer Radius Distance} = \frac{H/\text{Tan}\left(A - \frac{BW}{2}\right)}{5280}$$

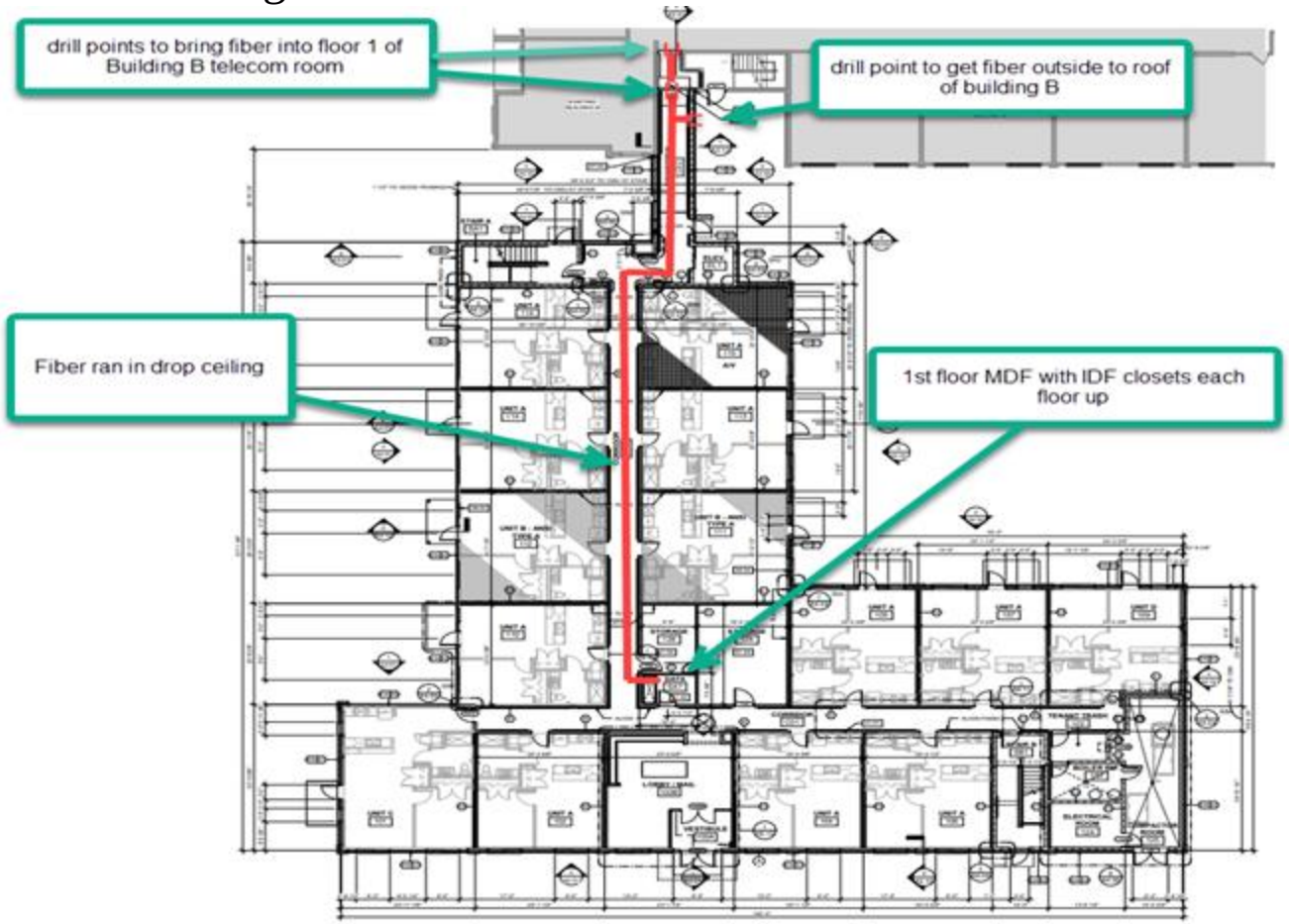
# Site planning

- Non penetrating roof mounts or wall mount standoffs? Will structural engineers need to see blueprints or make a site visit as well?
- What materials will need to be used to make the vision a reality? Create SOW's and don't be afraid to call vendors and colleges for assistance!



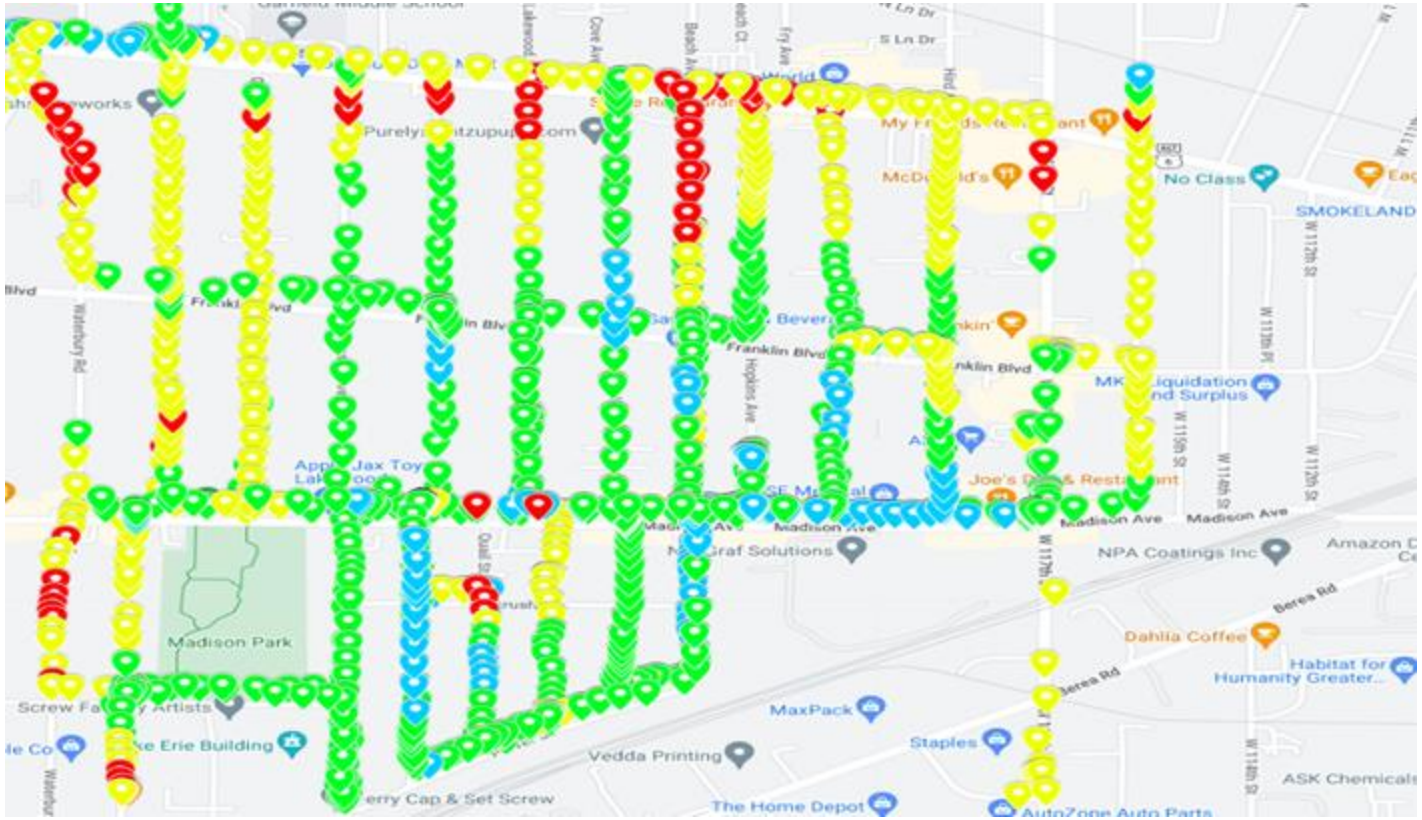
# Site planning

- Create a plan of action how to get fiber from the 1st floor to the roof.



# Testing

- Once the radios and antennas are installed and the network is connected, it's time to test!
  - Monitor local noise floor and interference. Change channels or bandwidth if interference is persistent
  - Adjust antenna tilt if needed



# GPS importance and TDD Configuration

- Time Division Duplex: The time cycle is divided into a number of transmission periods followed by reception periods all within the given frequency band
- If a cell site is out of sync–or radios are not synchronized–in a TDD channel, transmissions will drift outside the guard period and will cause intercell interference at nearby cell sites
- with OTA timing and synchronization, if technicians have cell-site GPS coordinates they can test multiple cell sites quickly without having to travel to each individual site under test. This speeds up the verification process and helps determine if all sites in a desired area are correctly synchronized.

# Alan Agraz Huitrón - NetPoint

# Practical recommendations

1. **Identify the Customer Type:**

Analyze the type of customers you have. How many customers are there, and what types of customers are we dealing with?

2. **Calculate Availability to Minimize Loss:**

Assess the required TX Power for each link to ensure it does not generate interference with other links, reducing potential signal loss.

3. **Consider the Loss Factor via Bandwidth Control:**

Optimize throughput by managing the channel bandwidth used, taking into account potential loss factors.

4. **GPS Synchronization for Energy Efficiency:**

Synchronize with GPS to optimize energy distribution between primary antennas and reduce interference.

5. **Ensure Easy Access for Quick Maintenance:**

Plan site access in a way that allows for rapid maintenance, minimizing downtime.

6. **Antenna Recommendation for 5 GHz Links:**

For 5 GHz links, we recommend using an antenna with a beamwidth of 2° to 3° for distances of 5 to 7 miles from the main access point (AP).

7. **Avoiding Interference for Subscribers Over 7 Miles:**

When subscribers are located more than 7 miles away, the most effective method to avoid interference is to install a Point-to-Point (PTP) link that does not interfere with the energy output of the primary AP.

8. **Frequency Inventory Recommendations:**

Maintain a frequency inventory that includes the following details: TX Power, Frequency, Distance, Beamwidth, and the best signal level (RSSI).

9. **Monitor and Upgrade Every 15 Days:**

Implement a monitoring system that you can update every 15 days to evaluate airtime availability. This ensures proper network planning, avoiding congestion due to the number of subscribers.

10. **Identify Users Out of Coverage:**

Determine how many users are out of coverage by validating signal levels, distance, and TX Power to decide if additional coverage is needed.

11. **AP Power Reduction for Distant Subscribers:**

Keep in mind that if a subscriber is far from the AP, the AP will reduce the TX Power for nearby subscribers in an attempt to deliver better performance to a smaller group of distant users. This approach, however, can negatively impact the performance of the entire network.

**Important Reminder:**

“If you reduce the power too much for nearby subscribers, you’ll damage your radio, leading to poor ROI (return on investment), and you risk losing customers.”

# THANK YOU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