New Proposed Wireless Facility US-AZ-5186 | SUP-008-24

Pinal County Planning and Zoning Hearing | October 3, 2024

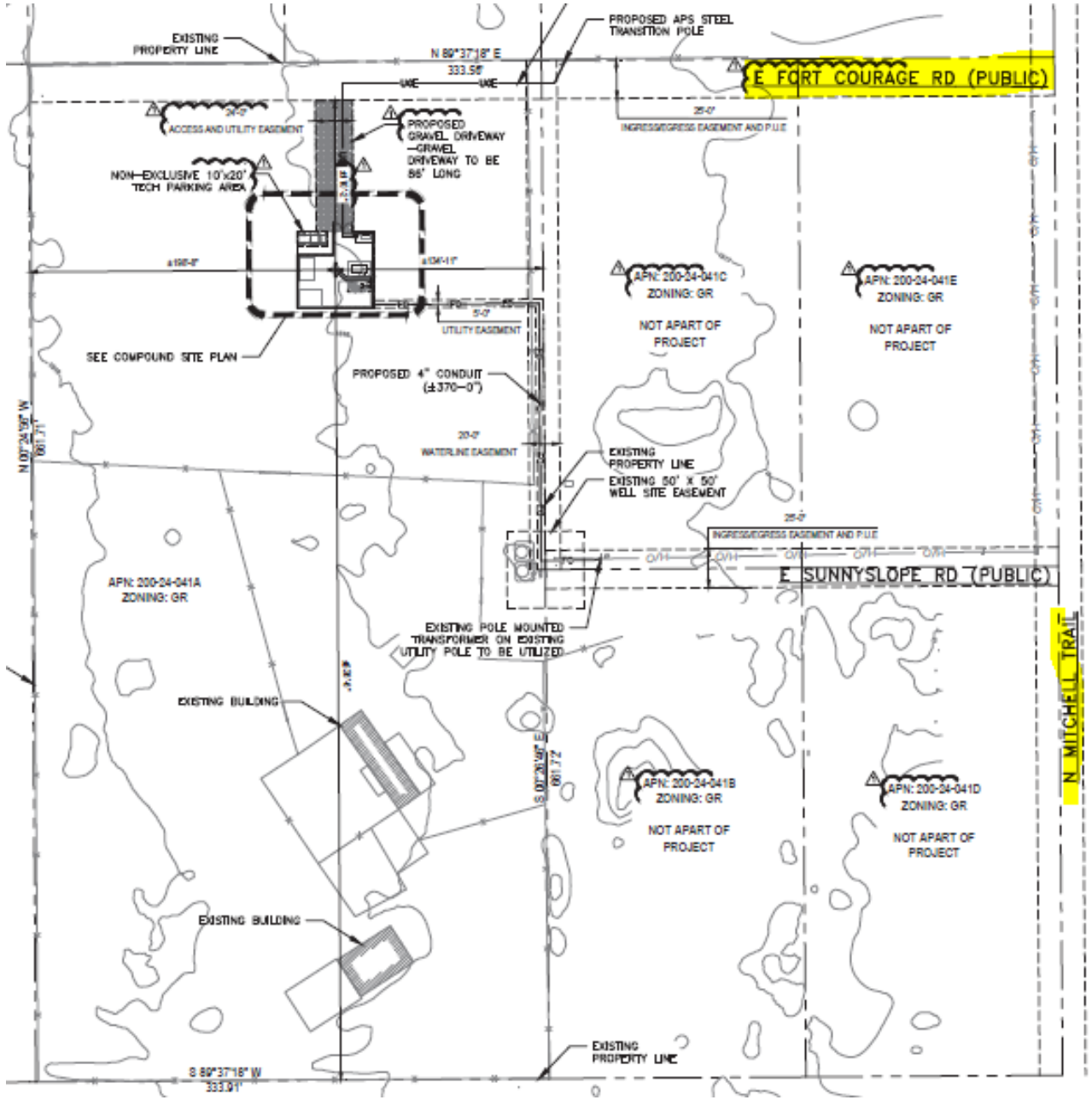
Assessors Parcel Number | 200-24-041A

Presentation Prepared by State 48 Development Consulting

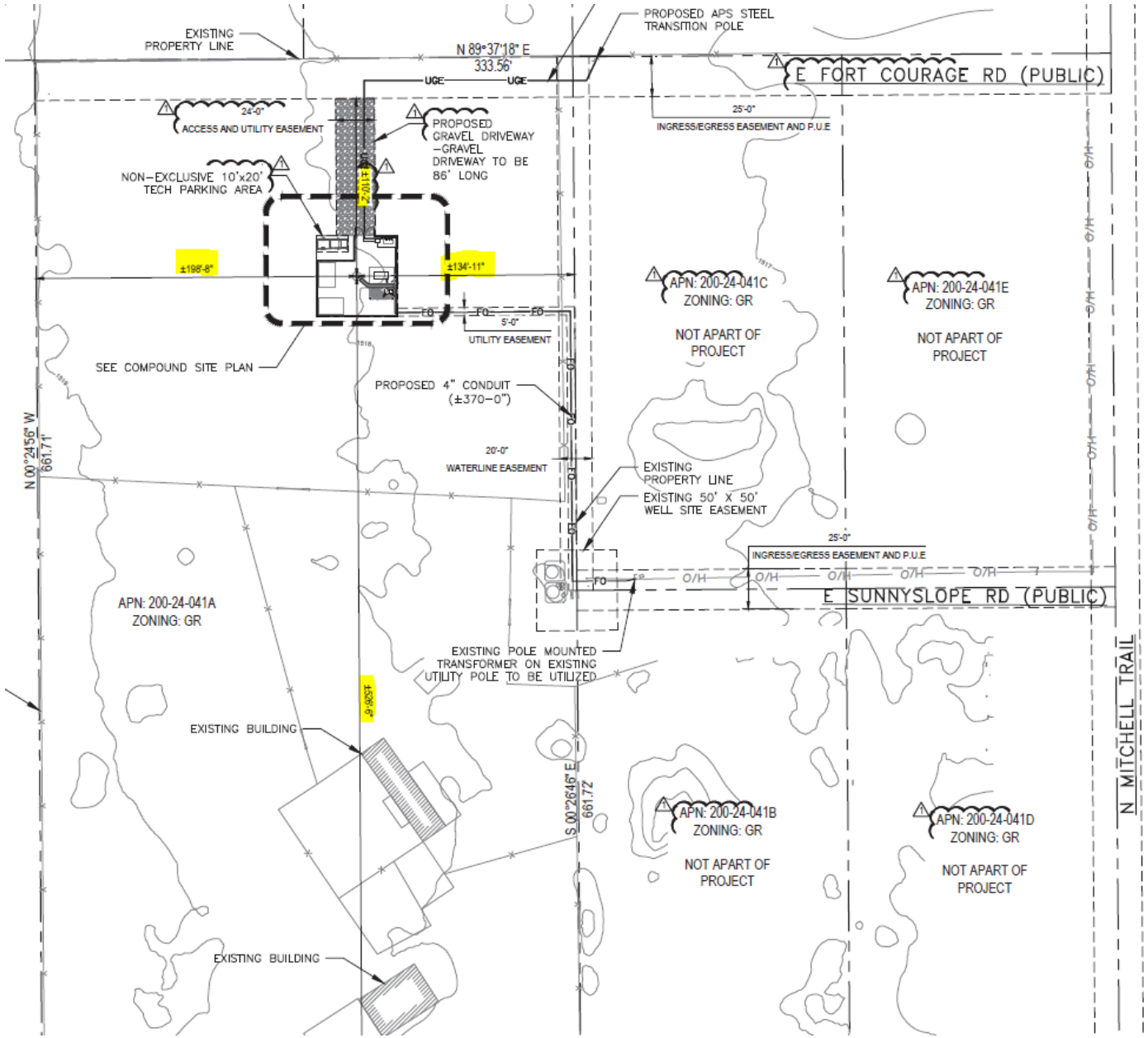
New Proposed Wireless Facility

- Located on Parcel 200-24-041A | General Rural (GR)
- Designed as a Monoelm
- Located within a 50’ x 35’ CMU Wall Compound (8’ in height)
- Overall height of 85’ Top of Steel, with a 4’ Lightning Rod
- Allows for co-location and may include multiple concealed antenna

Overall Site Plan



Overall Site Plan Continued



Setbacks:

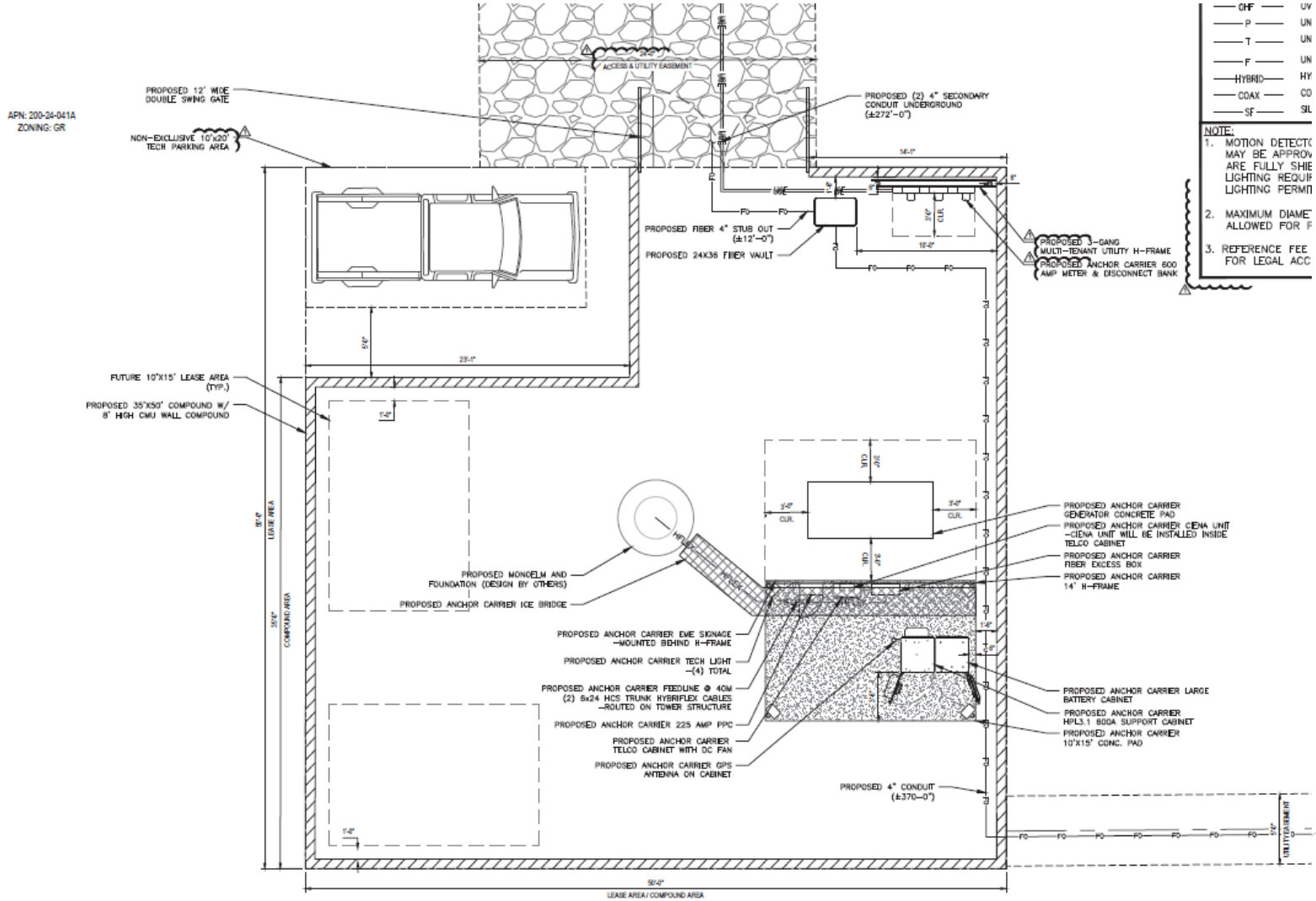
- North: 110'-2"
- South: 526’-3"
- West: 198'-8"
- East: 134'-11"

Enlarged Site Plan

10’x15’ Concrete Pad for associated ground equipment

4’x9’ Concrete Pad for Emergency Backup Generator

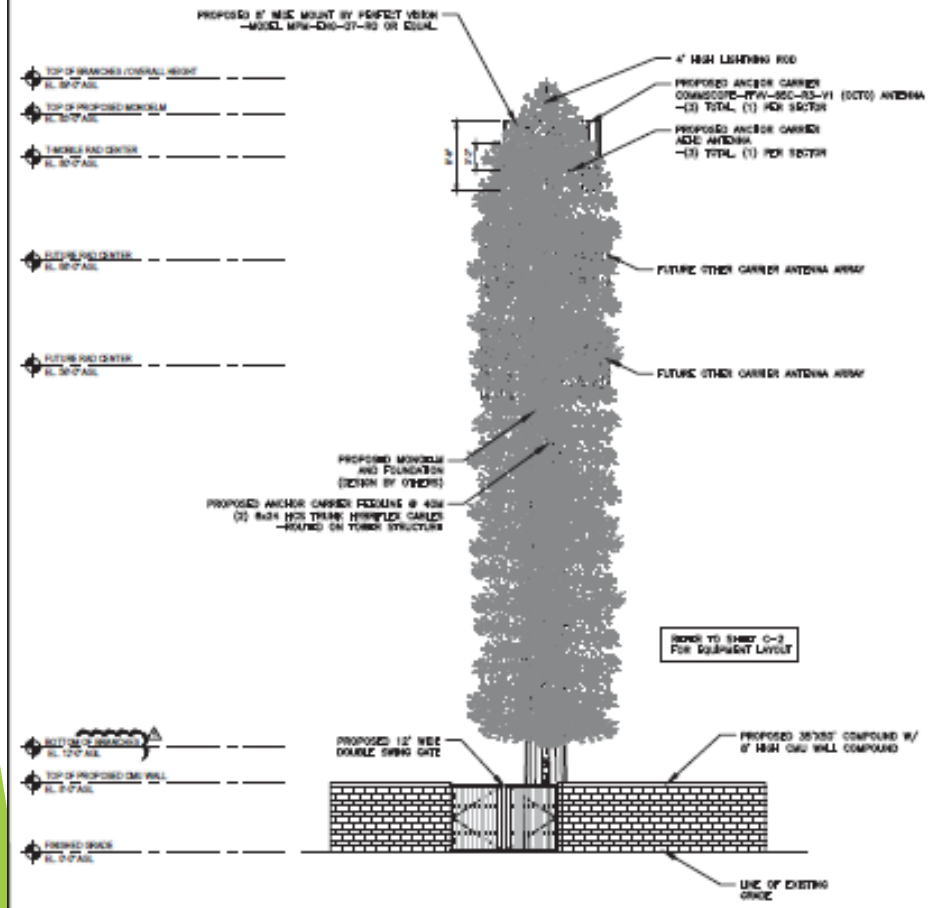
Emergency backup generator will cycle once per week, for a total of 15 minutes



Co-location and Stealth

- Pinal County's Code of Ordinances: CHAPTER 2.205. - WIRELESS COMMUNICATIONS FACILITIES, section 2.205.010.
  - To regulate the placement of wireless communications facilities; to establish zoning standards that will protect the integrity, character and identity of neighborhoods; to encourage co-location, stealth design and camouflaged facilities; to maximize the use of existing communication towers; and to minimize the adverse visual effects of towers through careful design, siting and screening.
- As such, Vertical Bridge has designed the proposed WCF as a Monoelm with an overall height of 89' to allow for additional wireless carriers to co-locate in the future, thereby reducing the need for future towers in the area
- This tower will be able to accommodate the initial Anchor tenant and two additional carriers at the RADs listed below:
  - Anchor Tenant: 80' RAD
  - Future Tenant: 68' RAD
  - Future Tenant: 56' RAD

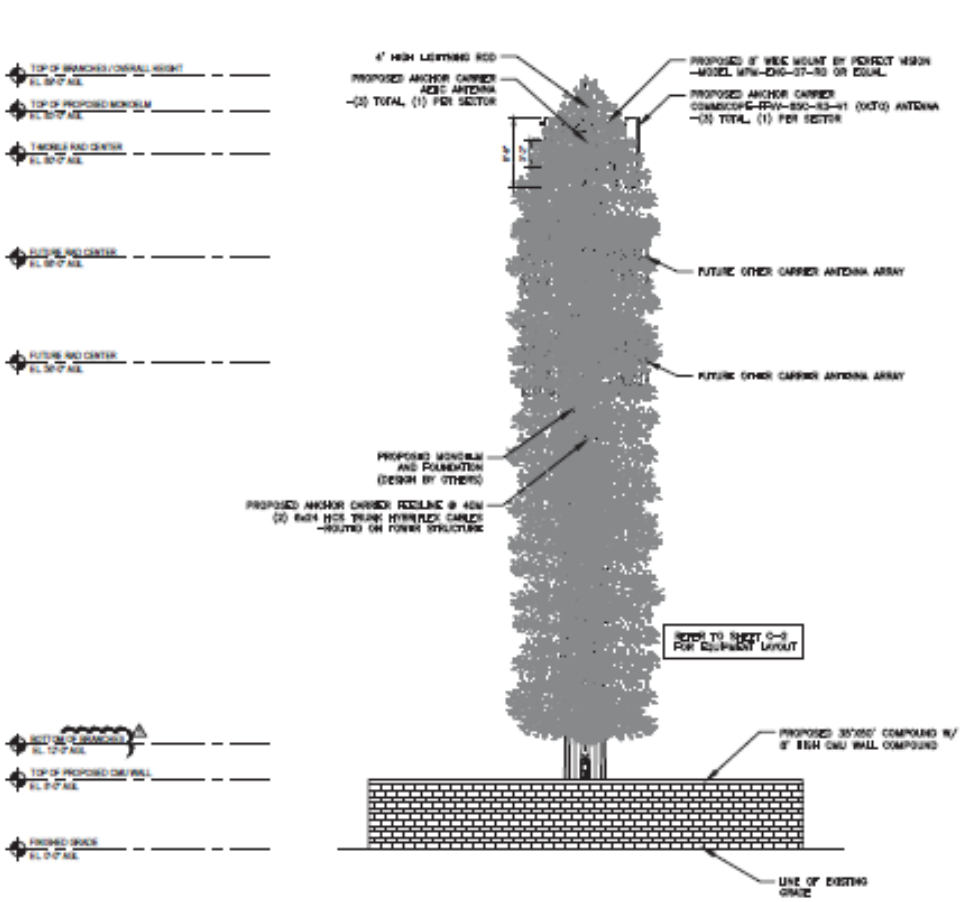
NOTE:
1. STARTING AT THE BASE, PROVIDE FULL BARK CLADDING ON TRUNK.
2. MAXIMUM DIAMETER OF 36" IS ALLOWED FOR POLE STRUCTURE



NORTH ELEVATION

0' 4' 0 8' 16'
1/8"=1'-0"

1

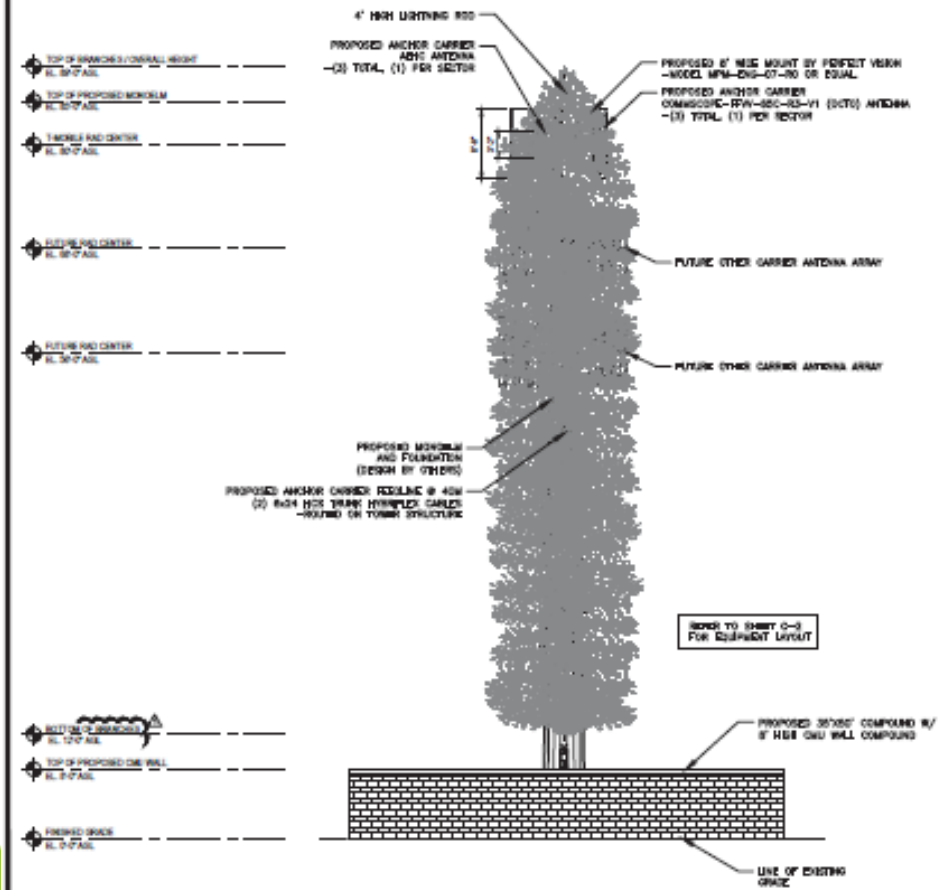


EAST ELEVATION

0' 4' 0 8' 16'
1/8"=1'-0"

2

NOTE:
1. STARTING AT THE BASE, PROVIDE FULL BARK CLADDING ON TRUNK.
2. MAXIMUM DIAMETER OF 36" IS ALLOWED FOR POLE STRUCTURE

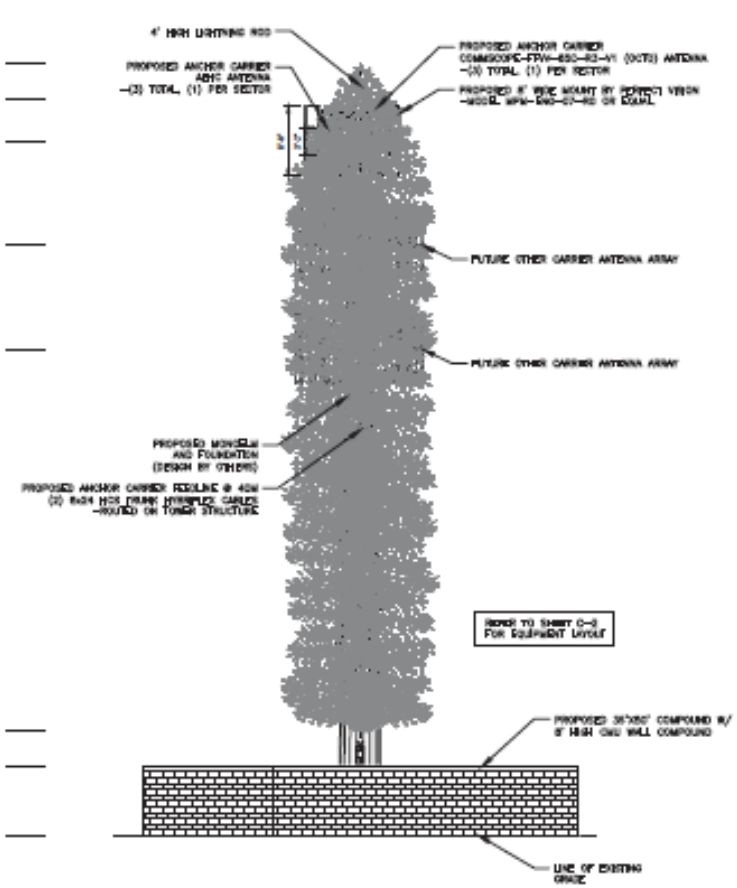


SOUTH ELEVATION

0' 4' 0 8' 16'
1/8"=1'-0"

1

NOTE:
1. STARTING AT THE BASE, PROVIDE FULL BARK CLADDING ON TRUNK.
2. MAXIMUM DIAMETER OF 36" IS ALLOWED FOR POLE STRUCTURE



WEST ELEVATION

0' 4' 0 8' 16'
1/8"=1'-0"

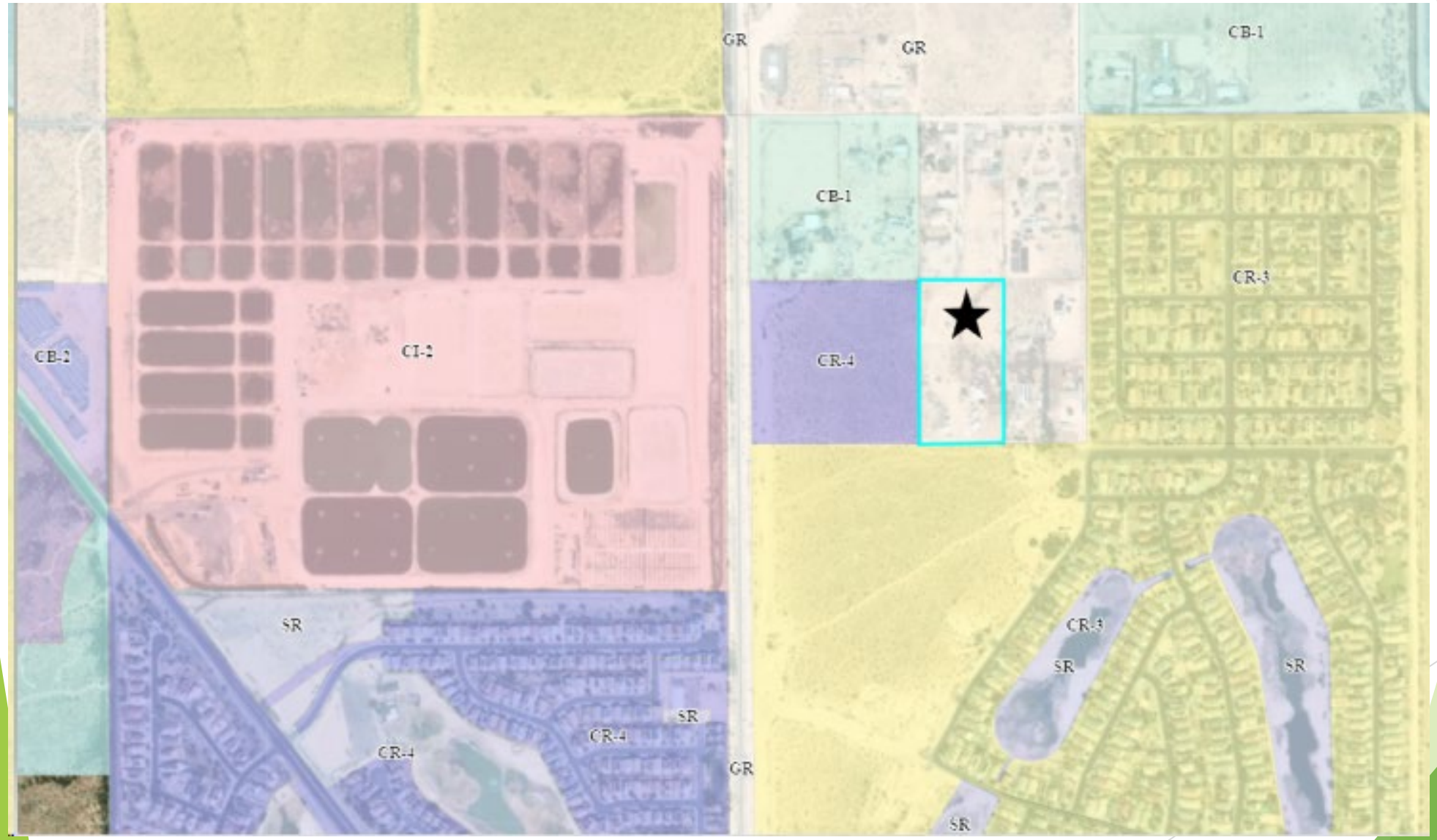
2

Mono-elm Photo Examples:





Zoning Map of proposed site:



Zoning:

- CI-2 (Industrial Zone)
- CR-4 (Multiple Residence Zone)
- SR (Suburban Ranch Zone)
- GR (General Rural Zone)
- CB-1 (Local Business Zone)
- CB-2 (General Business Zone)
- CR-3 (Single Residence Zone)

Aerial view of proposed site:



WIRELESS NETWORK CONSULTING



AZ-5186 / T-Mobile PH68005B

Coverage Cell Split

RF DESIGN ANALYSIS

2024

Coverage vs Capacity

- **Capacity is providing bandwidth or processing capacity to service the customers in the area.**
  - Areas where large numbers of users are in a specific geographic areas
  - Areas where users are demanding higher data rates for services
  - Areas with a large amount of indoor users
- **Coverage is Providing Service where service does not exist, calls drop, or "no service".**
  - Areas where sites are farther apart
  - Areas where terrain or buildings block signals
  - Areas where indoor service is low or nonexistent

Objective of new site

- **Coverage**
  - Provide coverage to homes and businesses surrounding proposed
  - Provide coverage along Hunt Highway and feeder roads in the area
- **Why is this site important?**
  - 96% of Americans own a Cellular Phone
  - 57% of American Homes rely exclusively on cellular phones
  - 84% or more of 9-1-1 emergency calls are made from wireless devices

Proposed Site

- 85’ Mono-elm Tower
  - With 4’ lightning rod
  - 6947 E Sunnyslope Road, Florence, AZ 85132
    - Latitude: 33.101758 N (NAD83)
    - Longitude: -111.496464 W (NAD83)
    - Ground Elevation: 1518.01' (NAVD88)
    - Anchor tenant is T-Mobile
  - Antenna Centerline at 80’ AGL

Why here?

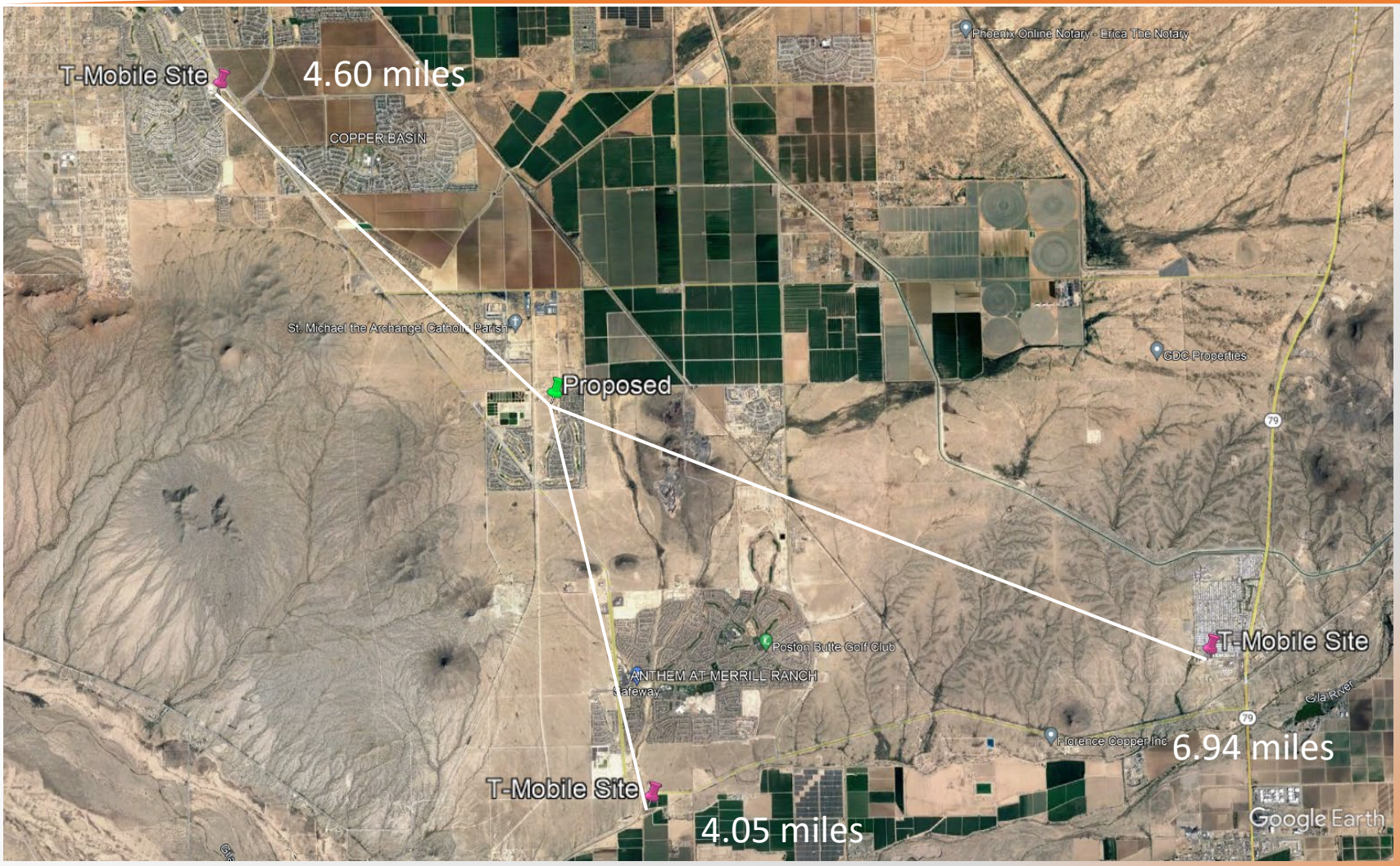
- Lack of coverage along Hunt Highway
- Lack of indoor services in the surrounding suburban/rural area
- Significant amount of increased network use in the suburban and rural areas of Arizona

Zoom – proposed site



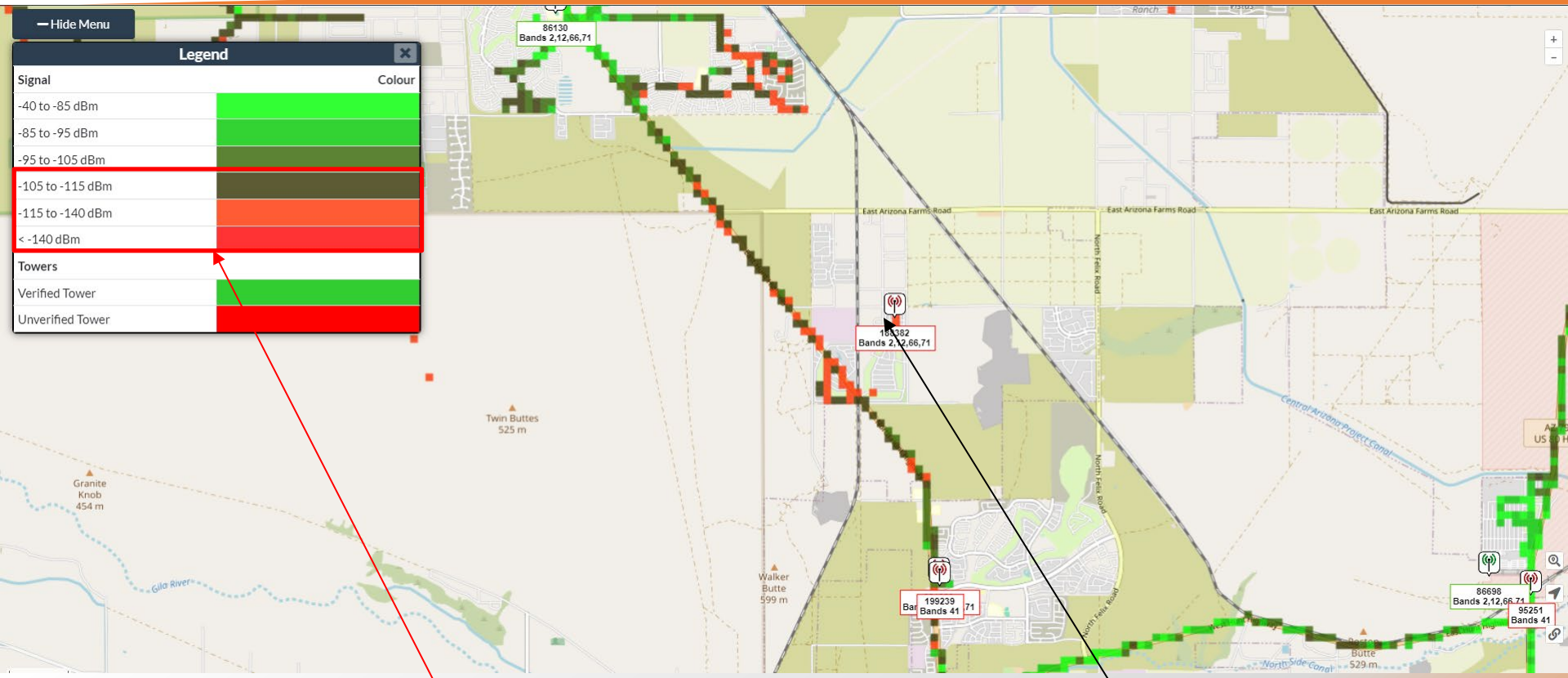
2024

T-Mobile Sites



2024

T-Mobile CellMapper

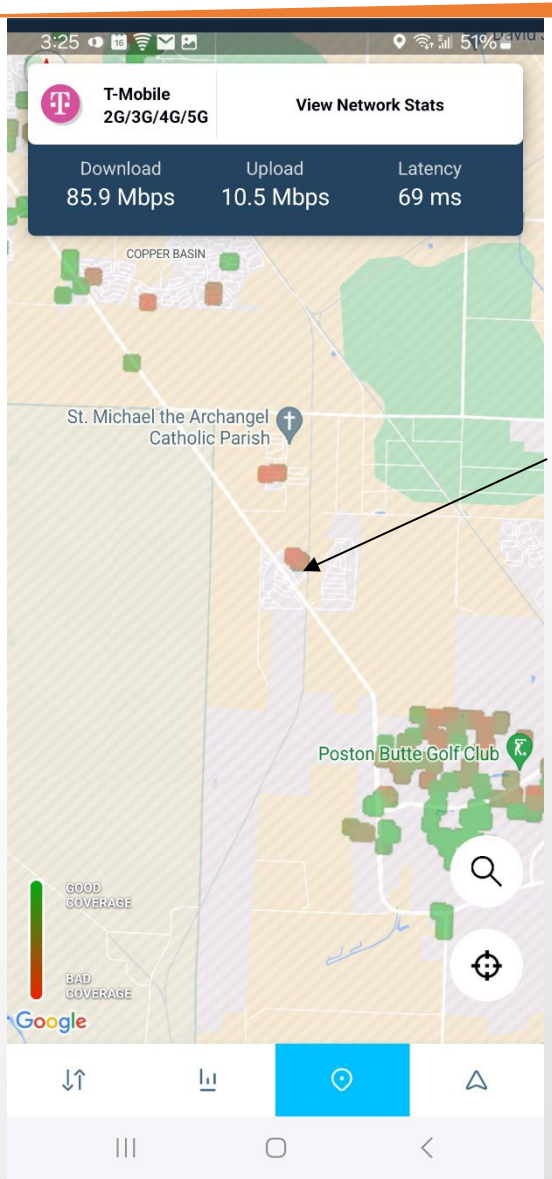


Poor Service Quality

Proposed Site

2024

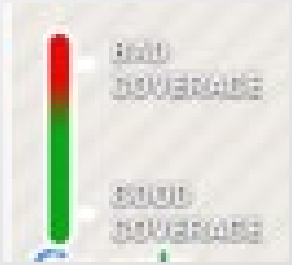
Open Signal
T-Mobile Quality Map



This map show mobiles reporting quality of their connections to the network. This is crowdsource data from T-Mobile users made available by the OpenSignal App: https://www.opensignal.com/apps#section-os-app

Green data points show good coverage and red data points show bad coverage and lack of data points show no coverage

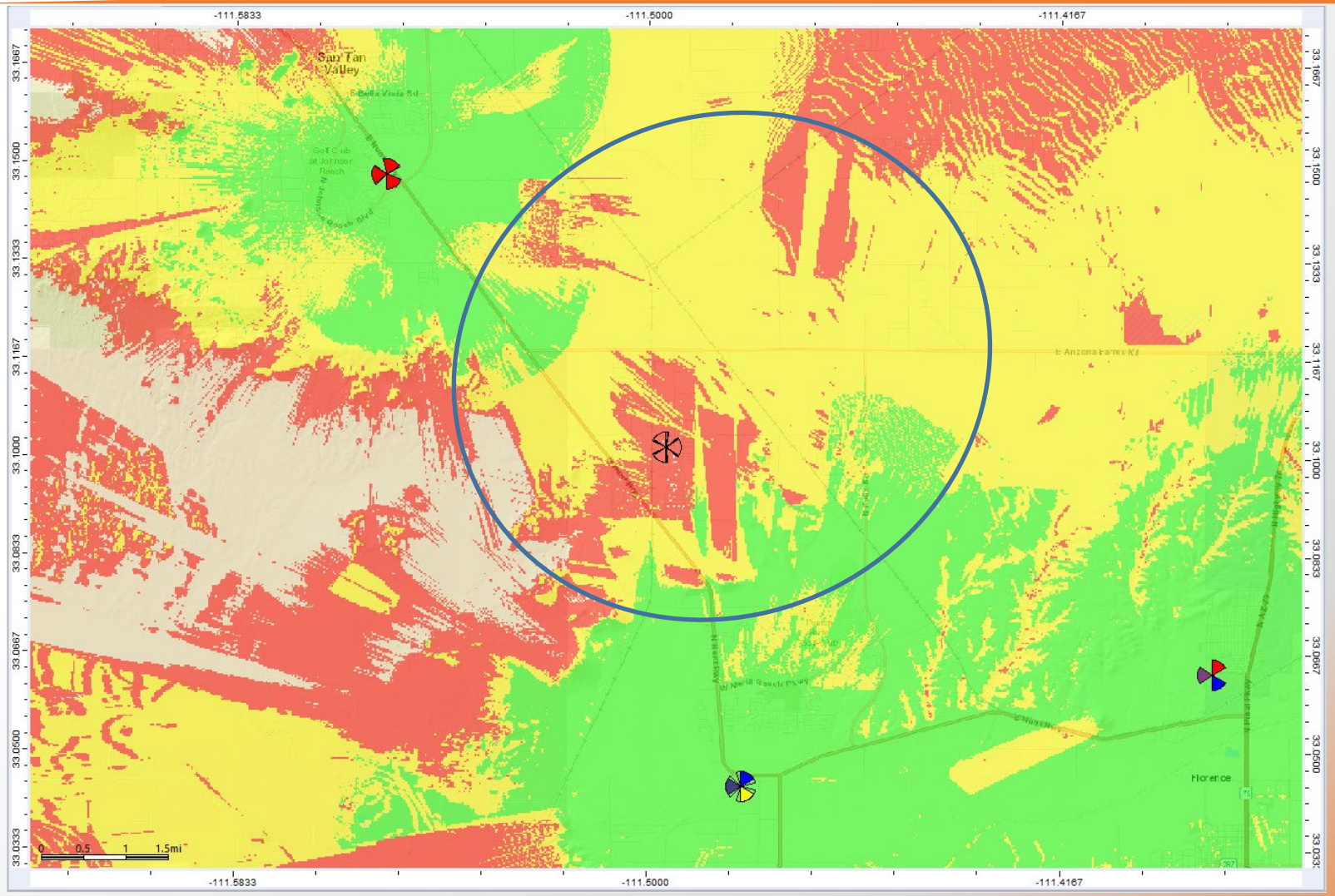
Notice the amount of bad coverage points for T-Mobile users in the area around the proposed



2024

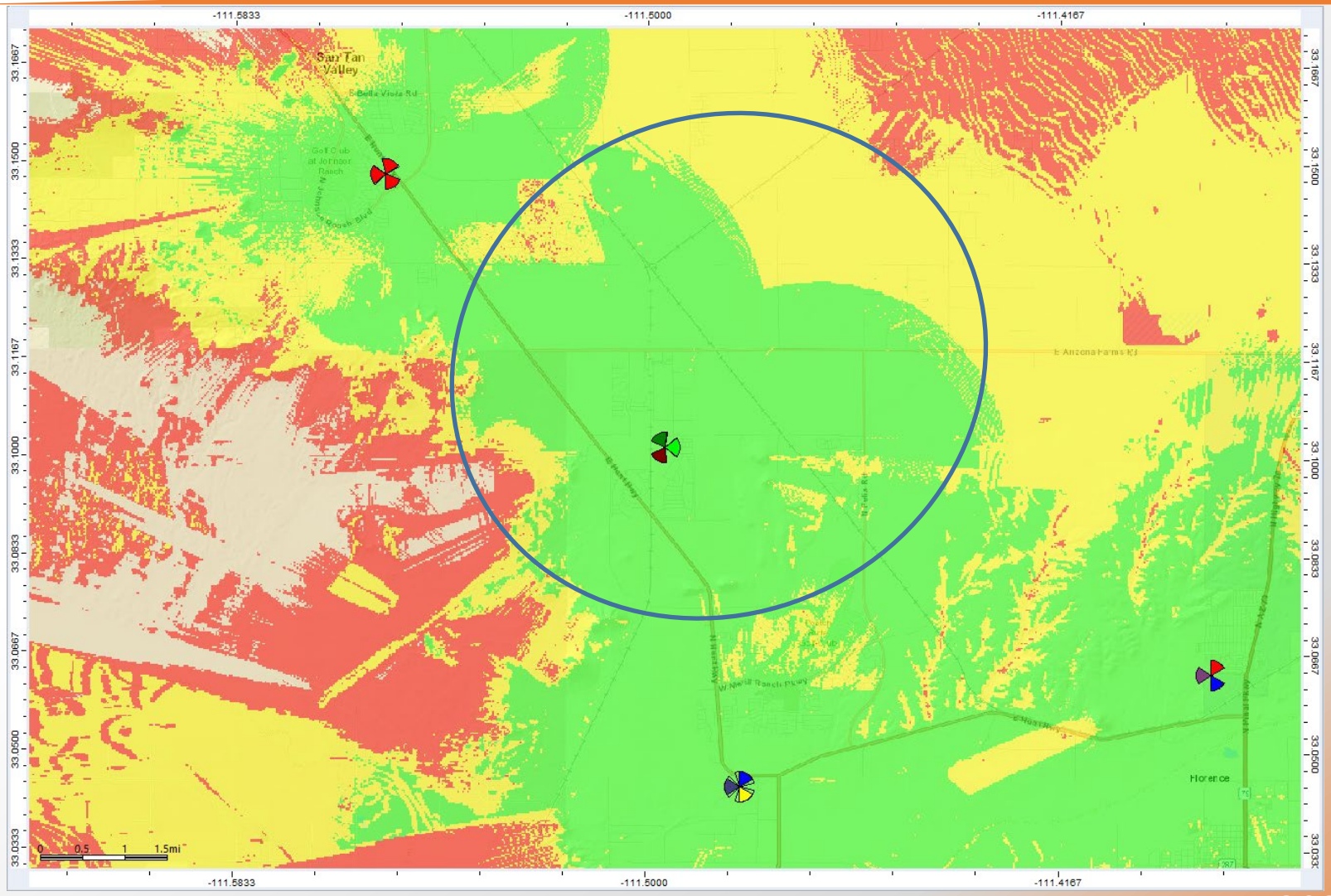
RSRP - Current Coverage low band

LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



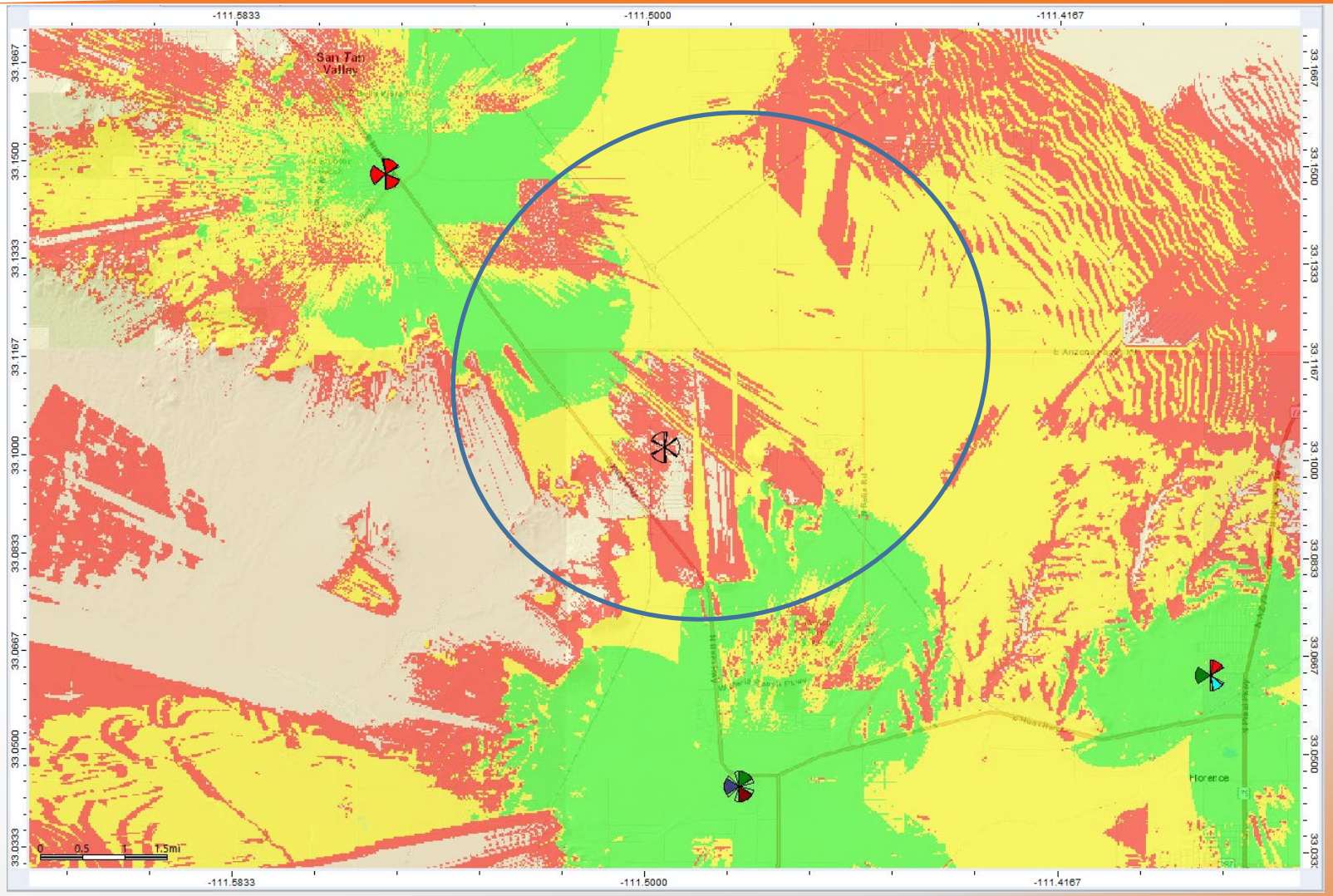
RSRP – Proposed Coverage low band

LEGEND	
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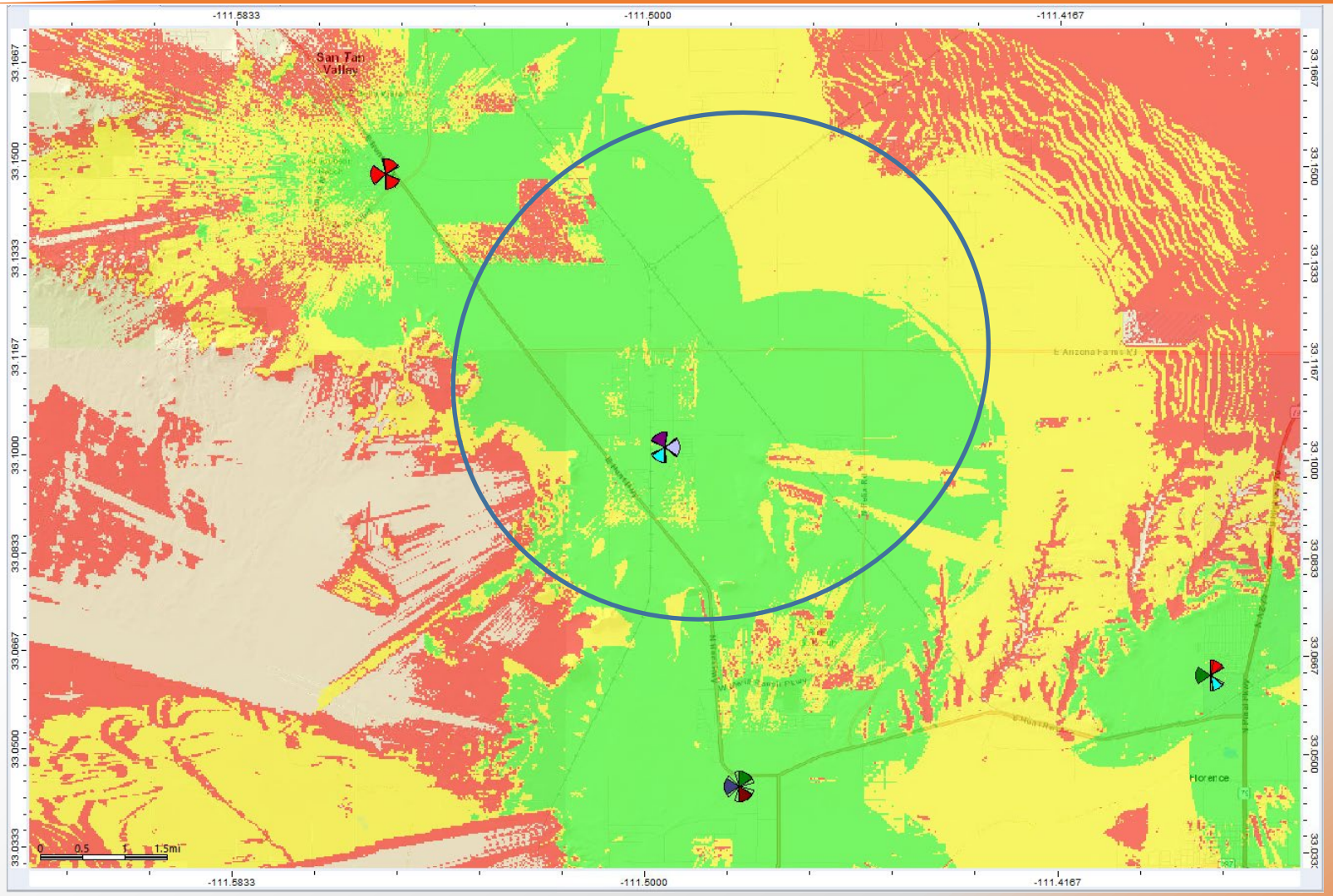
RSRP - Current Coverage mid band

LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



RSRP – Proposed Coverage mid band

LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



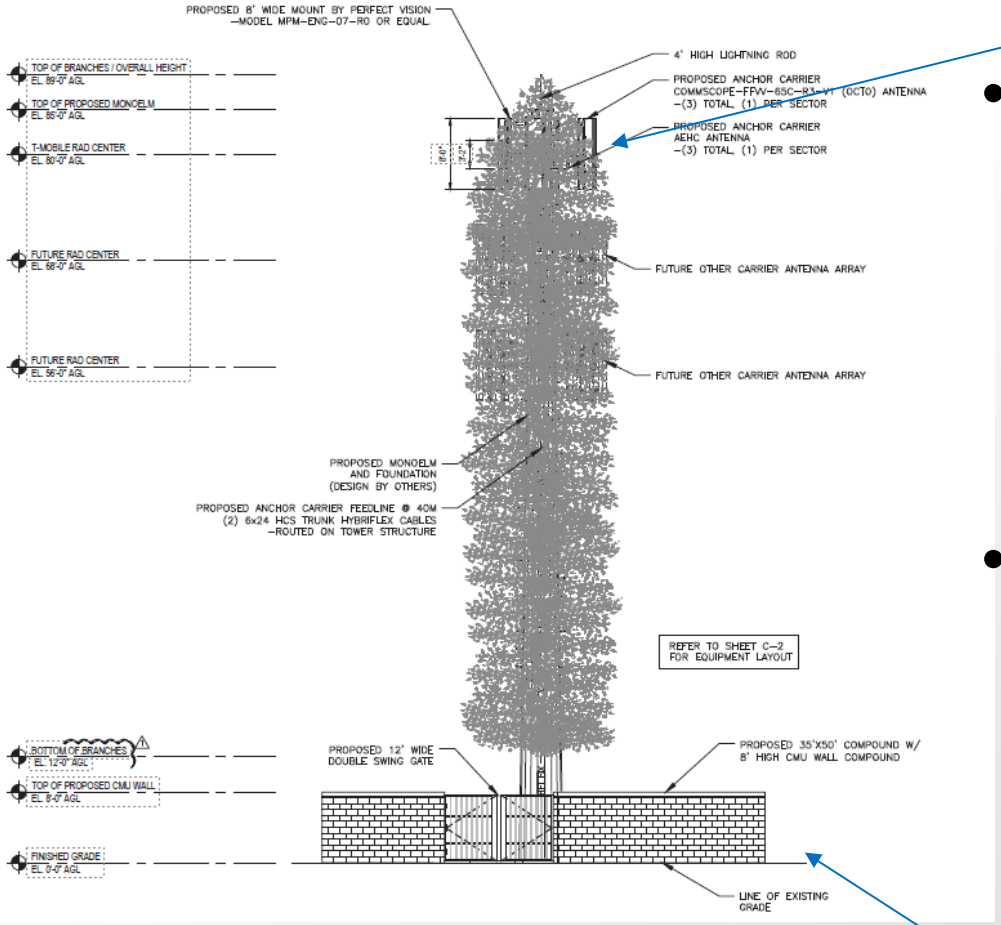
Ionizing vs Non-Ionizing

- There are two (2) types of Energy/Radio Waves
  - **Ionizing**
    - These are waves that can effect human DNA
    - Examples are:
      - Gamma rays
      - X-Rays
    - This is one of the reasons the nurse steps out of the room and you wear a lead overcoat when you get X-Rays at the dentist.
  - **Non- Ionizing**
    - These are waves do not effect human DNA
    - Examples are:
      - Car Radios
      - Television
      - Wi-Fi Access points and routers
      - Bluetooth headsets
      - Cellphones and Smartphones
      - Lightbulbs
      - Wireless Baby Monitors
      - TV remotes
  - Absorption of waves is proximity based, the closer you are to the antenna the more non-ionizing energy is absorbed. You will absorb 50% of the FCC's General Public limit with your smartphone next to your ear versus less than 10% of the FCC's General Public limit from the antennas when you are standing 20' away from the proposed tower.
  - The further you walk away from the tower it decreases even more.

General Public & Occupational limits

- The FCC isolated two (2) groups relative to access around wireless antennas
- The first group is called Occupational
  - This refers to areas where workers would be allowed (general public cannot access) but the workers would not have knowledge about antennas (An example would be an Air Conditioner Repair Technician). Barriers or signage may be needed to alert the worker when close to the antennas.
    - Examples are:
      - Rooftop access behind a locked door
      - Compound access behind a locked gate
  - The FCC determined the safe value and then lowered by a factor of 10 and that is the value the wireless carriers use in the studies
  - The exposure levels are averaged over 6 minutes
- The second group is called General Public
  - Uncontrolled access (General Public)
    - This group is for areas with general public access, the public would not have a knowledge of an antenna being close to them
    - Examples are:
      - Sidewalks
      - Parks
      - Public accessed buildings
  - The FCC determined the safe value and then lowered by a factor of 50 and that is the value the wireless carriers use in the studies
  - The exposure levels are averaged over 30 minutes
- Compare the value for a tower which is 10mW to the power of a smartphone which is 200mW of power.

Power Levels below a tower

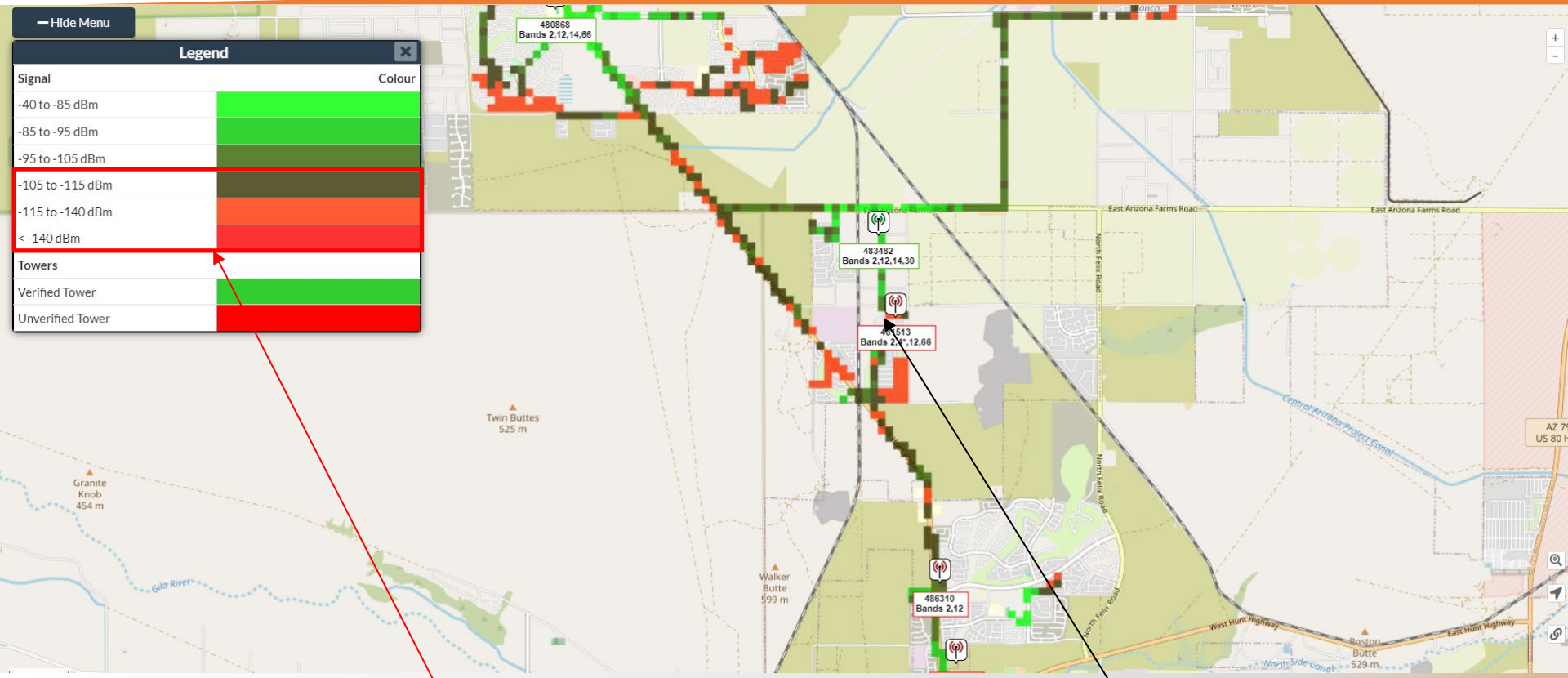


Main beam of the antenna

- Power levels on the ground around the tower are much less than what is at the antennas
- Power on the ground adjacent to the tower is 1/1000 of the power compared to what is at the antenna

1/1000 of the power on the ground around the site

AT&T CellMapper

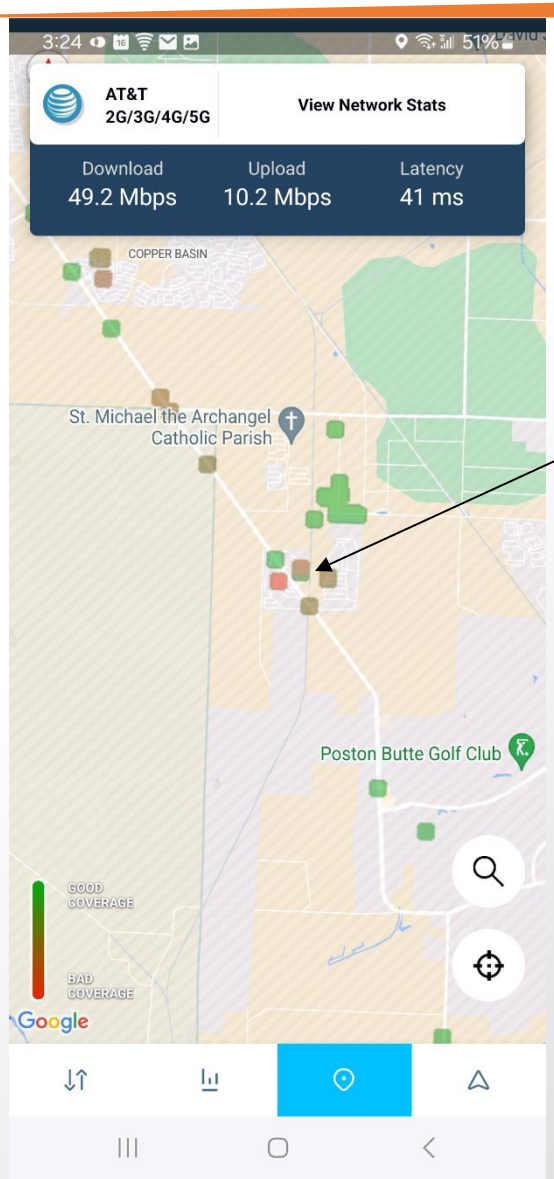


Poor Service Quality

Proposed Site

2024

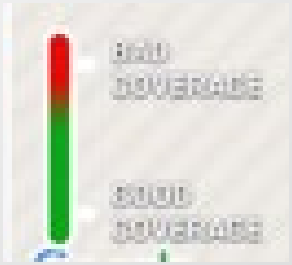
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AT&T Quality Map



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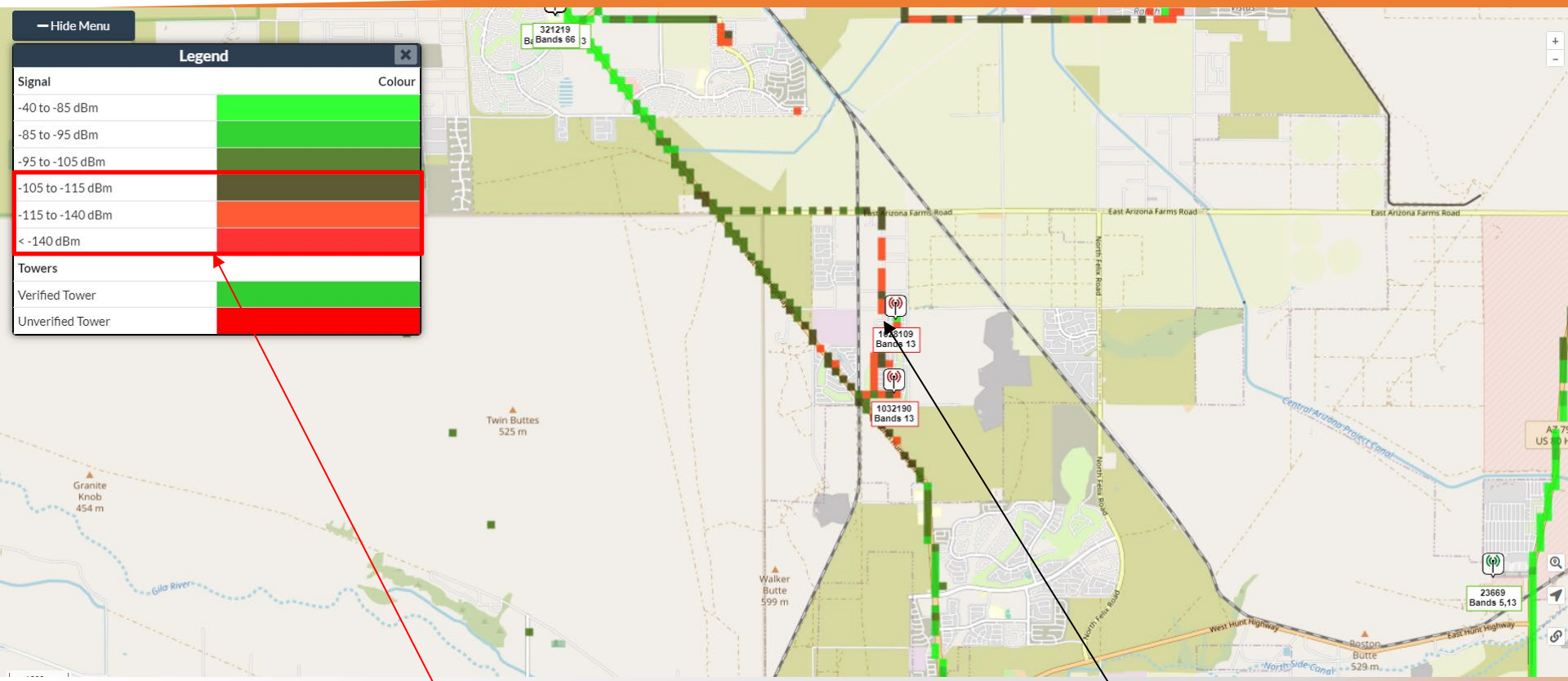
Green data points show good coverage and red data points show bad coverage and lack of data points show no coverage

Notice the amount of bad coverage points for AT&T users in the area around the proposed



2024

Verizon CellMapper

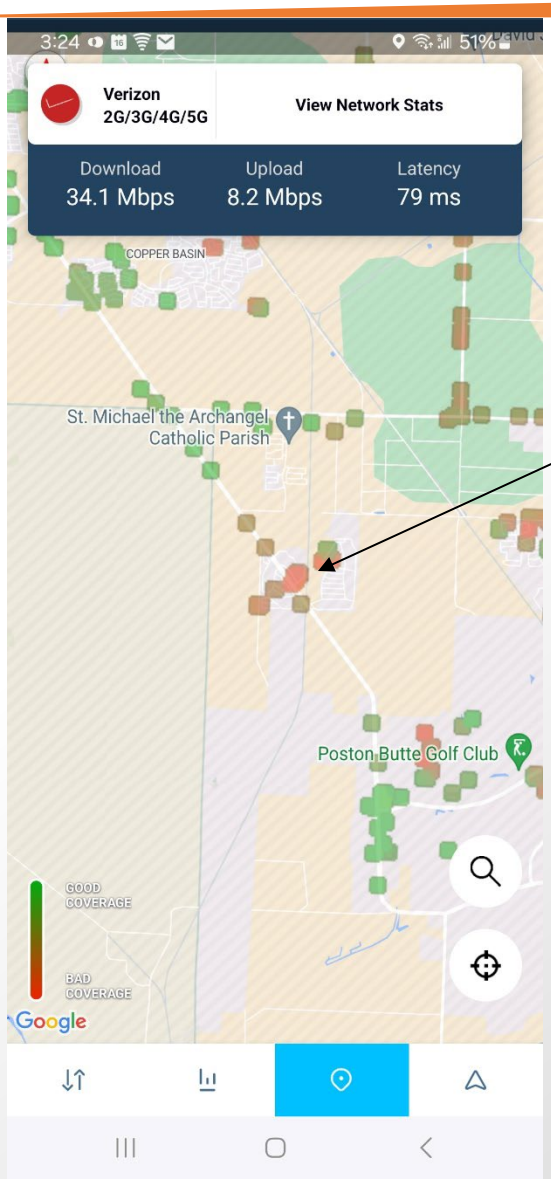


Poor Service Quality

Proposed Site

2024

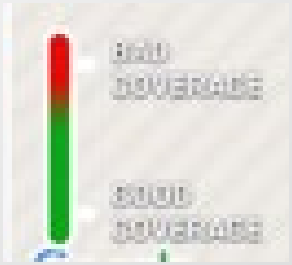
Open Signal
Verizon Quality Map



This map show mobiles reporting quality of their connections to the network. This is crowdsource data from Verizon users made available by the OpenSignal App: https://www.opensignal.com/apps#section-os-app

Green data points show good coverage and red data points show bad coverage and lack of data points show no coverage

Notice the amount of bad coverage points for Verizon users in the area around the proposed



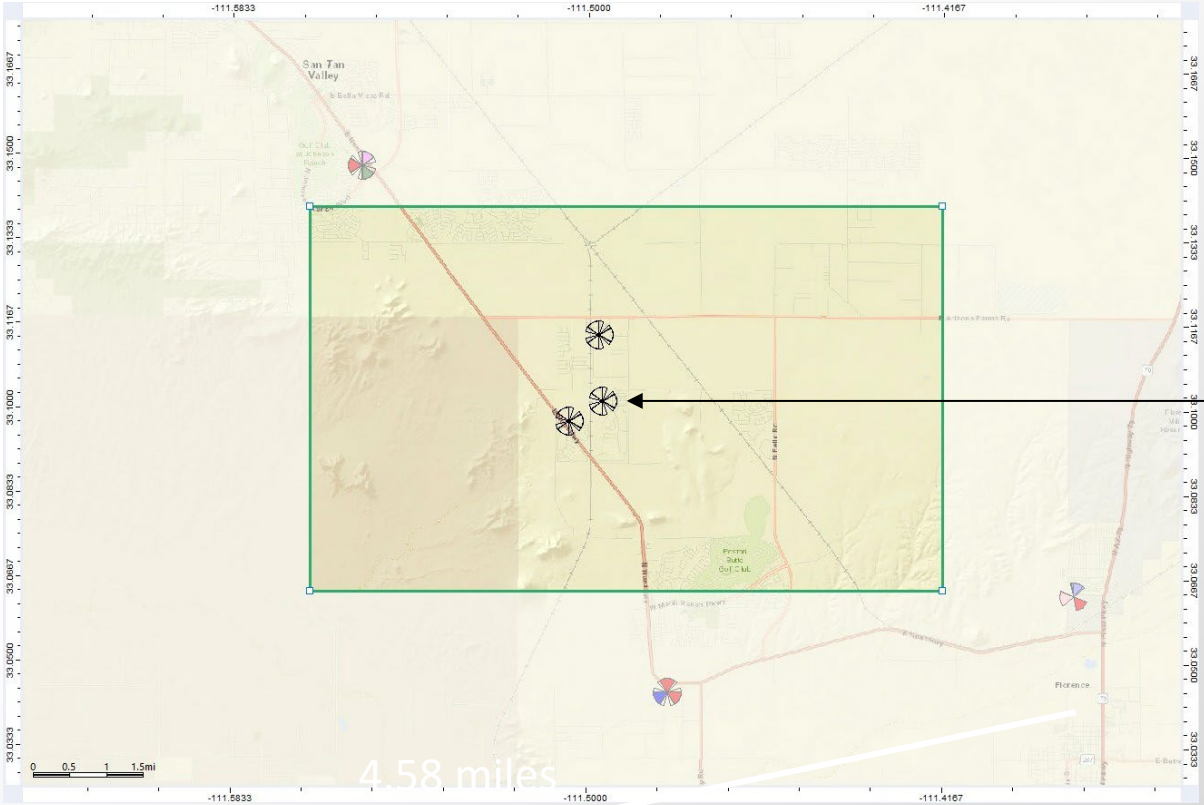
2024

ALTERNATIVE SITE ANALYSIS

Alternate Site Analysis

- Local Jurisdiction has requested a review of alternate site locations
- Existing Mono-palm towers within 1’ mile of proposed
- The sites modeled are as follows:
- Alt 1 - Approx 60’ AGL Mono-palm
  - 33.097682 Latitude
  - -111.504223 Longitude
- Alt 2 - Approx 60’ AGL Mono-palm
  - 33.114931 Latitude
  - -111.497319 Longitude
- The alternate site analysis will consider the available height on the towers

Focus Zone

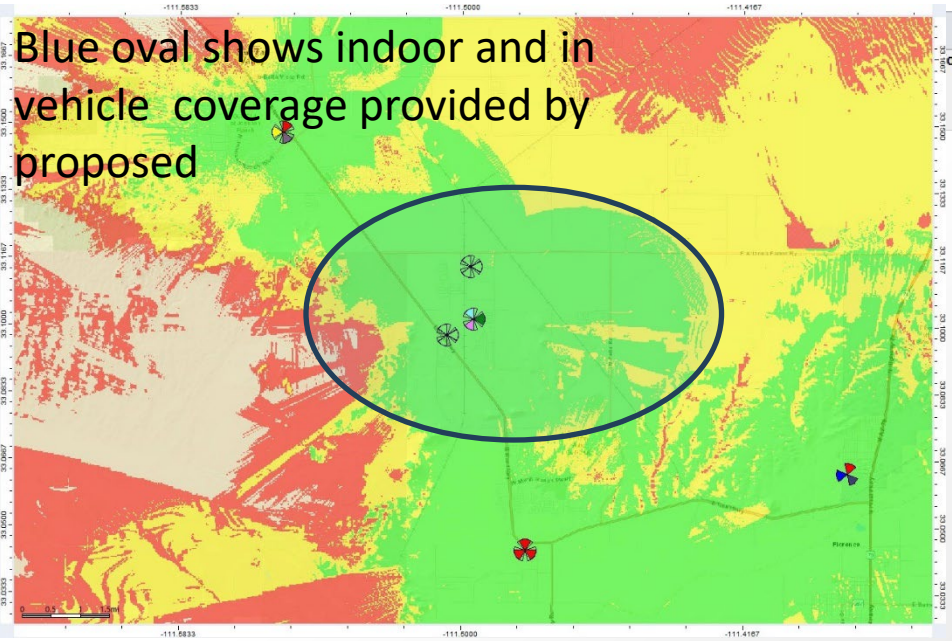


Proposed Site

Focus Zone (Inside Green Line) is set up to analyze difference in coverage between the proposed and alternate sites requested by jurisdiction

RSRP Coverage - Low Band Proposed vs Alternate 1

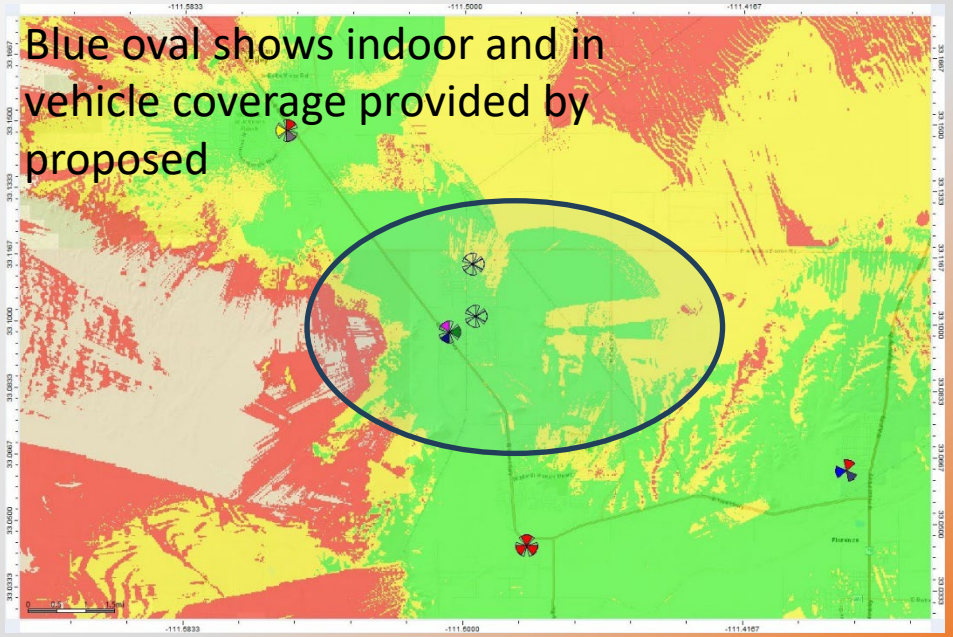
LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	110.656792	100	95
		RSRP Level (DL) (dBm) >=-85		54.266399	49	46.6
		RSRP Level (DL) (dBm) >=-95		97.888496	88.5	84.1
		RSRP Level (DL) (dBm) >=-106		110.656792	100	95

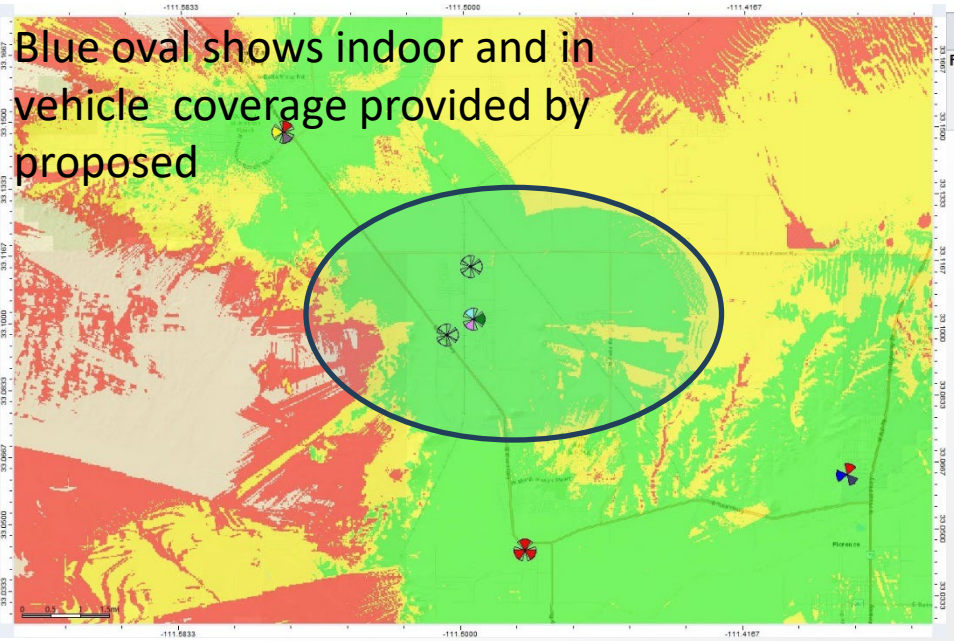
Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
ocus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	112.445999	100	96.6
		RSRP Level (DL) (dBm) >=-85		66.954597	59.5	57.5
		RSRP Level (DL) (dBm) >=-95		100.008896	88.9	85.9
		RSRP Level (DL) (dBm) >=-106		112.445999	100	96.6

Above and left picture shows Proposed data showing 66.95 square kilometers are covered with indoor service vs Alt 1 tower data showing 54.26 square kilometers covered with indoor service. Approximately a 19% reduction in coverage for the objective.



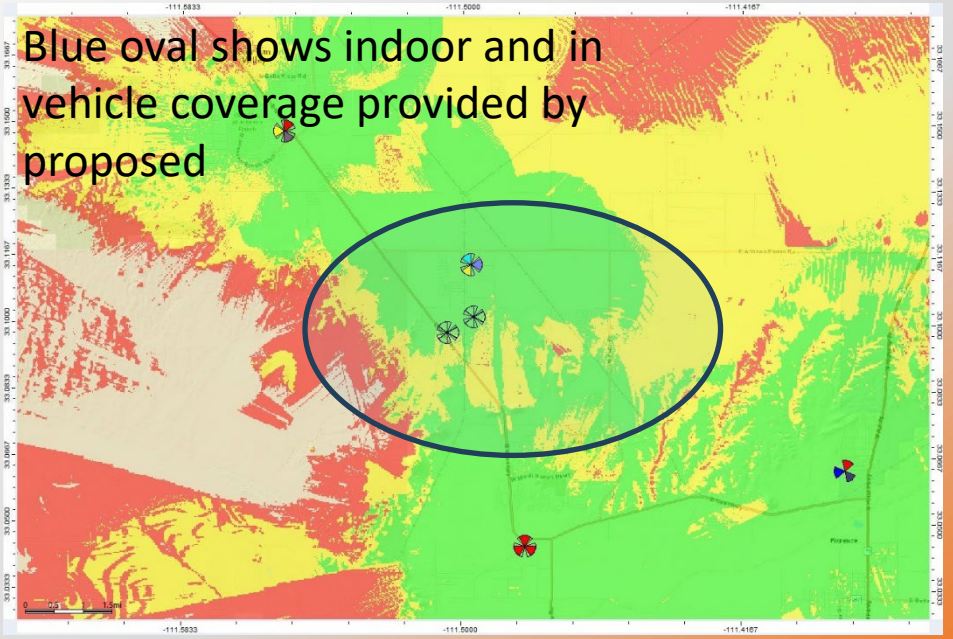
RSRP Coverage - Low Band Proposed vs Alternate 2

LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	112.445999	100	96.6
		RSRP Level (DL) (dBm) >=-85		66.954597	59.5	57.5
		RSRP Level (DL) (dBm) >=-95		100.008896	88.9	85.9
		RSRP Level (DL) (dBm) >=-106		112.445999	100	96.6

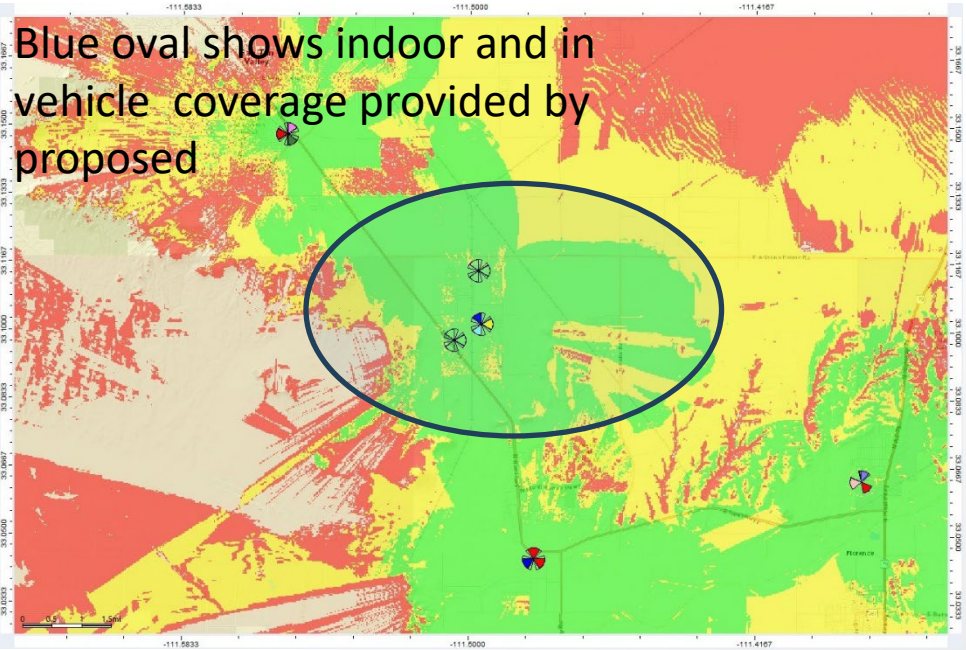
Above and left picture shows Proposed data showing 66.95 square kilometers are covered with indoor service vs Alt 2 tower data showing 55.53 square kilometers covered with indoor service. Approximately a 18% reduction in coverage for the objective.



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	108.215996	100	92.9
		RSRP Level (DL) (dBm) >=-85		55.5327	51.3	47.7
		RSRP Level (DL) (dBm) >=-95		95.911201	88.6	82.4
		RSRP Level (DL) (dBm) >=-106		108.215996	100	92.9

RSRP Coverage - Mid Band Proposed vs Alternate 1

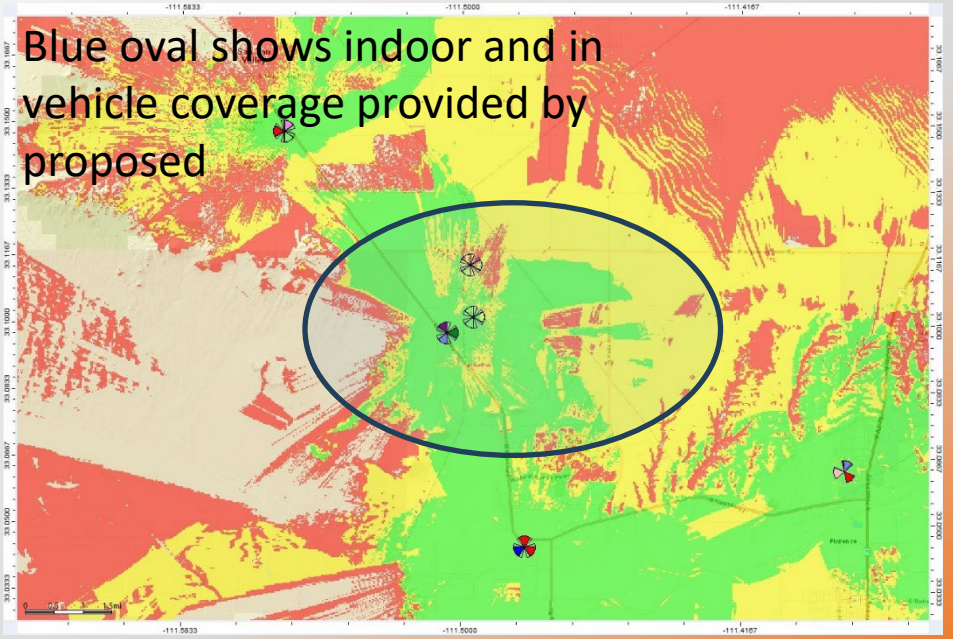
LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	99.781197	100	85.7
		RSRP Level (DL) (dBm) >=-85		32.011196	32.1	27.5
		RSRP Level (DL) (dBm) >=-95		78.448494	78.6	67.4
		RSRP Level (DL) (dBm) >=-106		99.781197	100	85.7

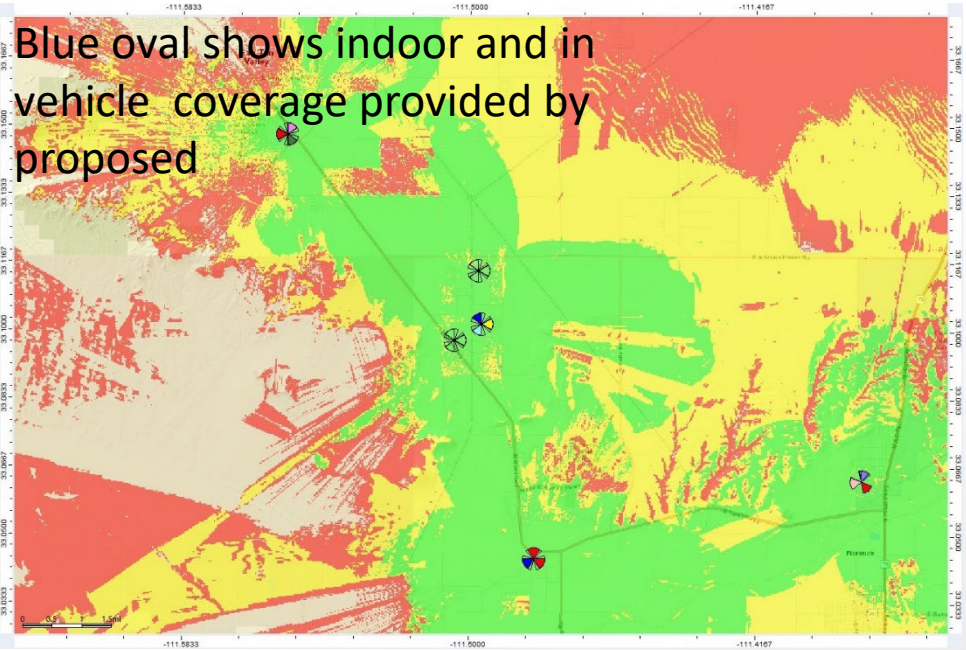
Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	105.067795	100	90.2
		RSRP Level (DL) (dBm) >=-85		51.872398	49.4	44.6
		RSRP Level (DL) (dBm) >=-95		91.897194	87.5	78.9
		RSRP Level (DL) (dBm) >=-106		105.067795	100	90.2

Above and left picture shows Proposed data showing 51.87 square kilometers are covered with indoor service vs T-Mobile tower data showing 32.01 square kilometers covered with indoor service. Approximately a 39% reduction in coverage for the objective.



RSRP Coverage - Mid Band Proposed vs Alternate 2

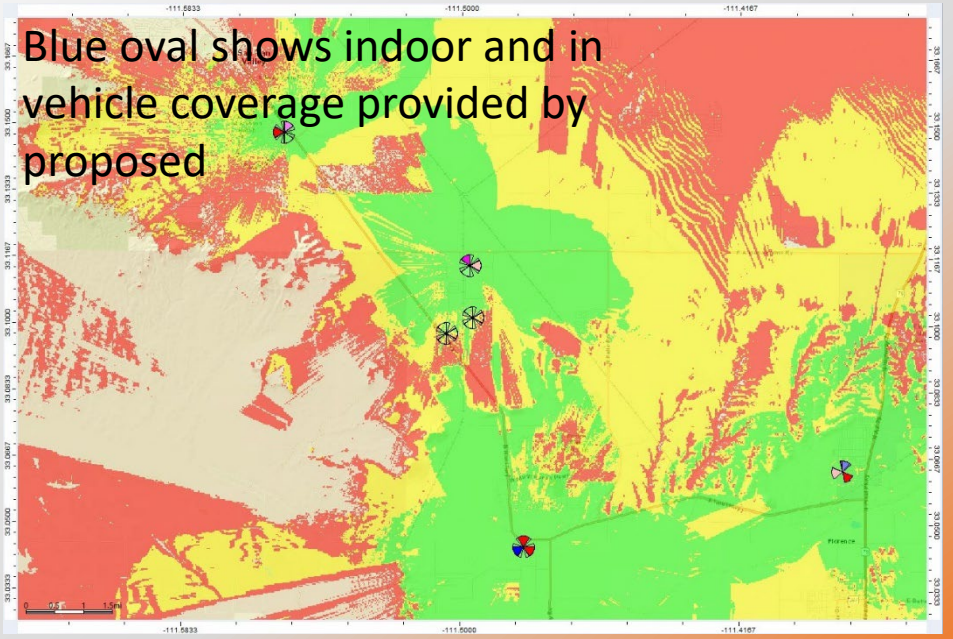
LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	98.838898	100	84.9
		RSRP Level (DL) (dBm) >=-85		30.833998	31.2	26.5
		RSRP Level (DL) (dBm) >=-95		75.211197	76.1	64.6
		RSRP Level (DL) (dBm) >=-106		98.838898	100	84.9

Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		116.427018	105.067795	100	90.2
		RSRP Level (DL) (dBm) >=-85		51.872398	49.4	44.6
		RSRP Level (DL) (dBm) >=-95		91.897194	87.5	78.9
		RSRP Level (DL) (dBm) >=-106		105.067795	100	90.2

Above and left picture shows Proposed data showing 51.87 square kilometers are covered with indoor service vs T-Mobile tower data showing 30.83 square kilometers covered with indoor service. Approximately a 41% reduction in coverage for the objective.



Analysis

- Reviewing the modeling the alternate sites do not provide the same level of service of the proposed
- Locating the antennas on lower heights on the alternate sites would provide less coverage than the proposed
- The alternate sites were analyzed against the primary objective

Recommendation

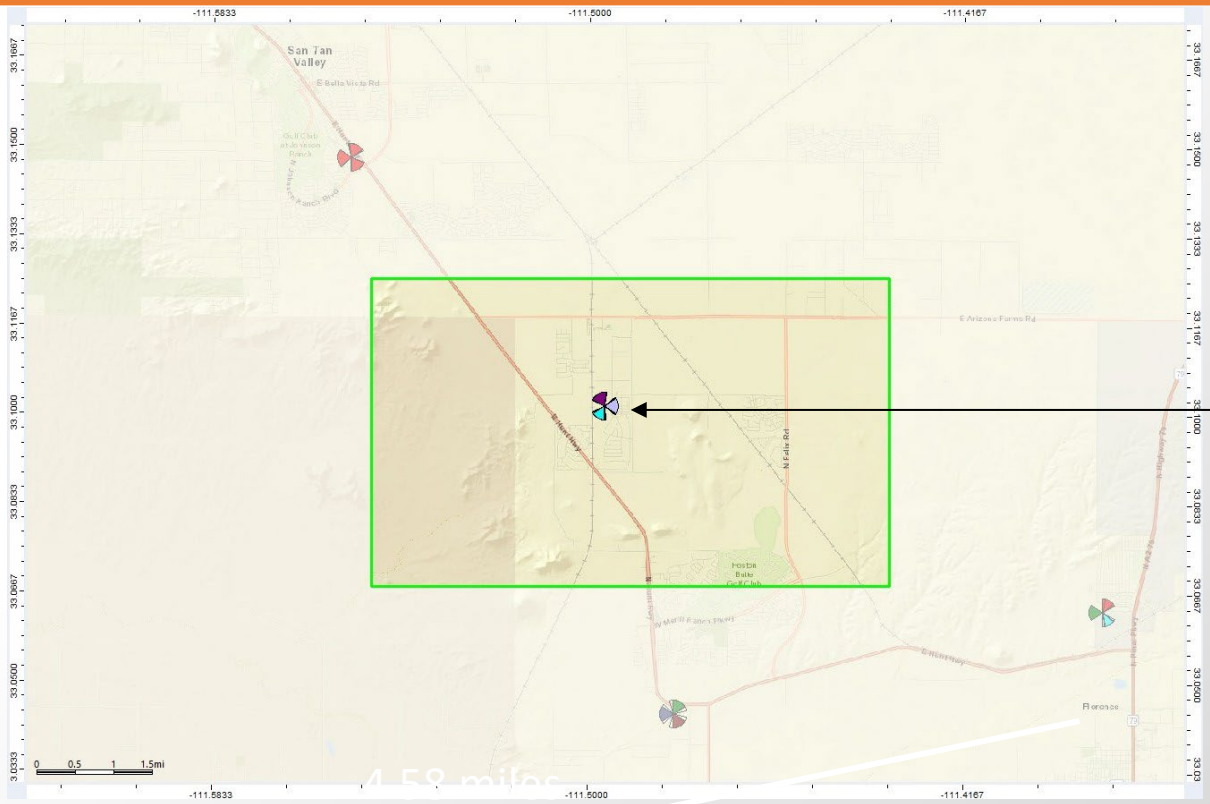
- Recommend approval of the proposed at the height requested for T-Mobile to provide high quality service to the area

ALTERNATIVE HEIGHT ANALYSIS

Alternate Height Analysis

- Local Jurisdiction has requested a review of alternate antenna heights
- Propagation was completed using mid band frequencies.
- The heights modeled are as follows:
- 110’ AGL Tower
  - Platform 1 – 100’, Platform 2 – 88’, Platform 3 – 76’
- 90’ AGL Tower
  - Platform 1 – 80’, Platform 2 – 68’, Platform 3 – 56’
- The alternate heights analysis will consider the lowest mounting height as well due to the tower being built for multiple operator colocations

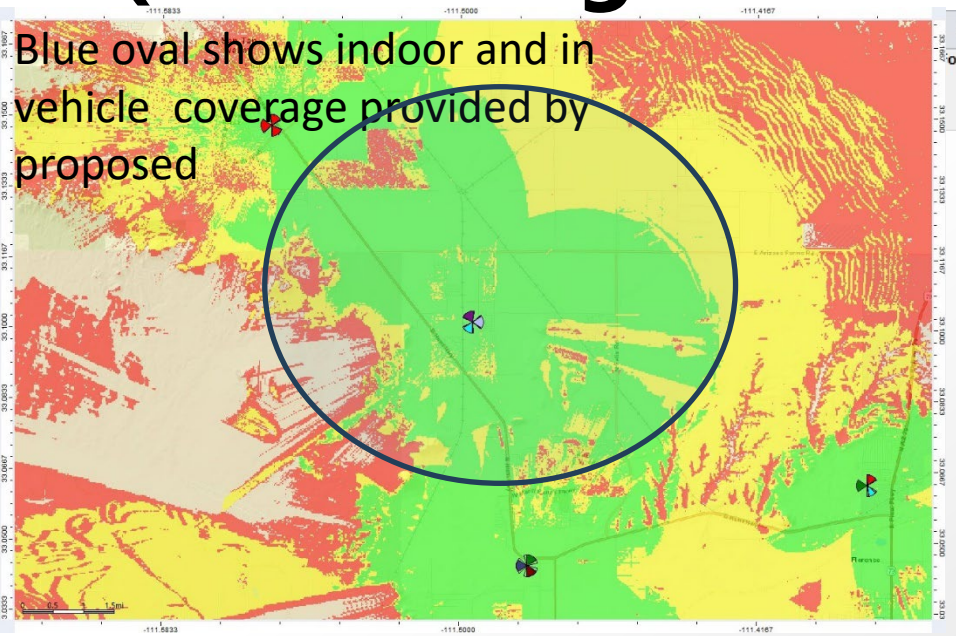
Focus Zone



Focus Zone (Inside Green Line) is set up to analyze difference in coverage between the proposed the lower heights requested by jurisdiction

RSRP Coverage Mid Band 100’ vs 80’ C/L (tower height 110’ vs 90’ AGL)

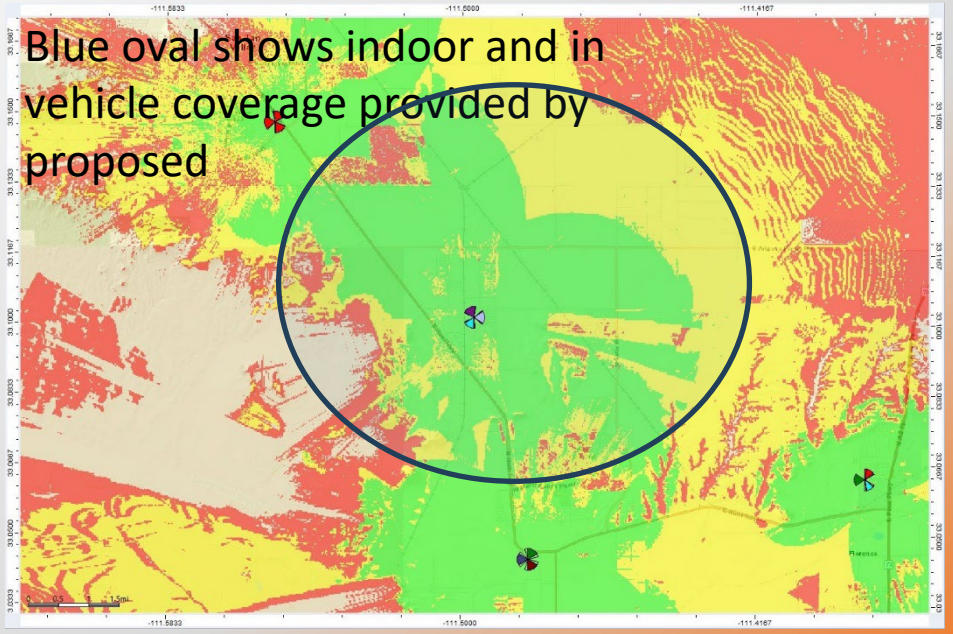
LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	62.211597	100	91.1
		RSRP Level (DL) (dBm) >=-85		41.485497	66.7	60.7
		RSRP Level (DL) (dBm) >=-95		56.0439	90.1	82
		RSRP Level (DL) (dBm) >=-106		62.211597	100	91.1

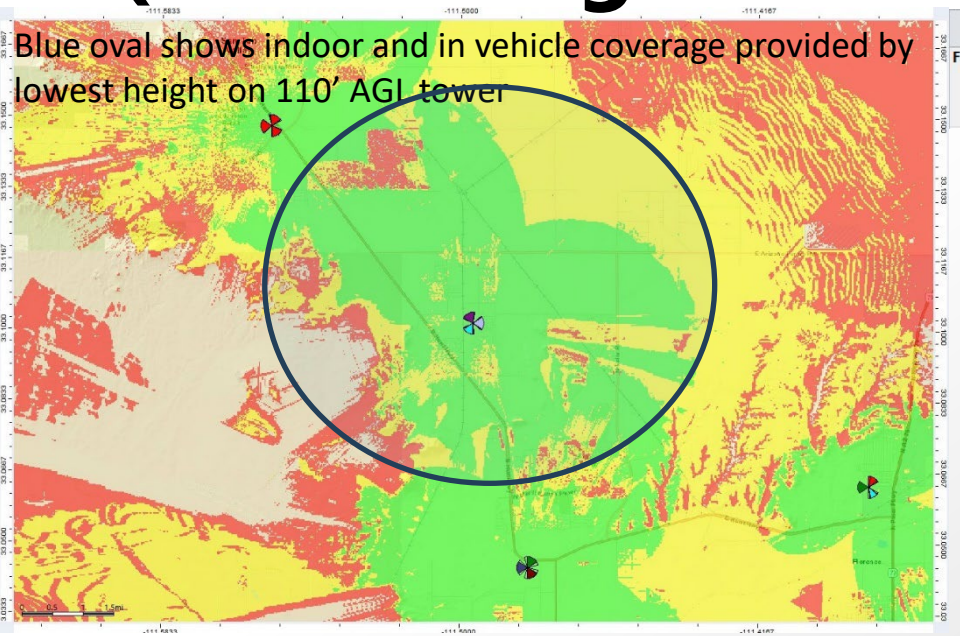
Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
ocus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	63.720898	100	93.3
		RSRP Level (DL) (dBm) >=-85		45.576897	71.5	66.7
		RSRP Level (DL) (dBm) >=-95		57.339897	90	83.9
		RSRP Level (DL) (dBm) >=-106		63.720898	100	93.3

Above and left picture shows Proposed data showing 45.57 square kilometers are covered with indoor service vs T-Mobile tower data showing 41.48 square kilometers covered with indoor service. Approximately a 9% reduction in coverage for the objective.



RSRP Coverage Mid Band 76’ vs 56’ C/L (tower height 110’ vs 90’ AGL)

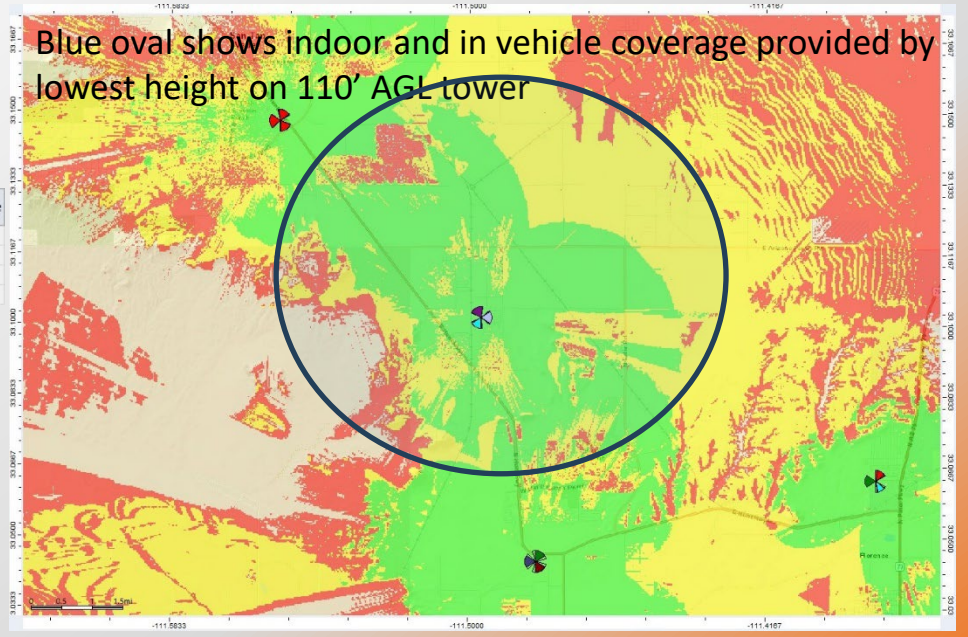
LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	60.276596	100	88.2
		RSRP Level (DL) (dBm) >=-85		34.2477	56.8	50.1
		RSRP Level (DL) (dBm) >=-95		54.491398	90.4	79.8
		RSRP Level (DL) (dBm) >=-106		60.276596	100	88.2

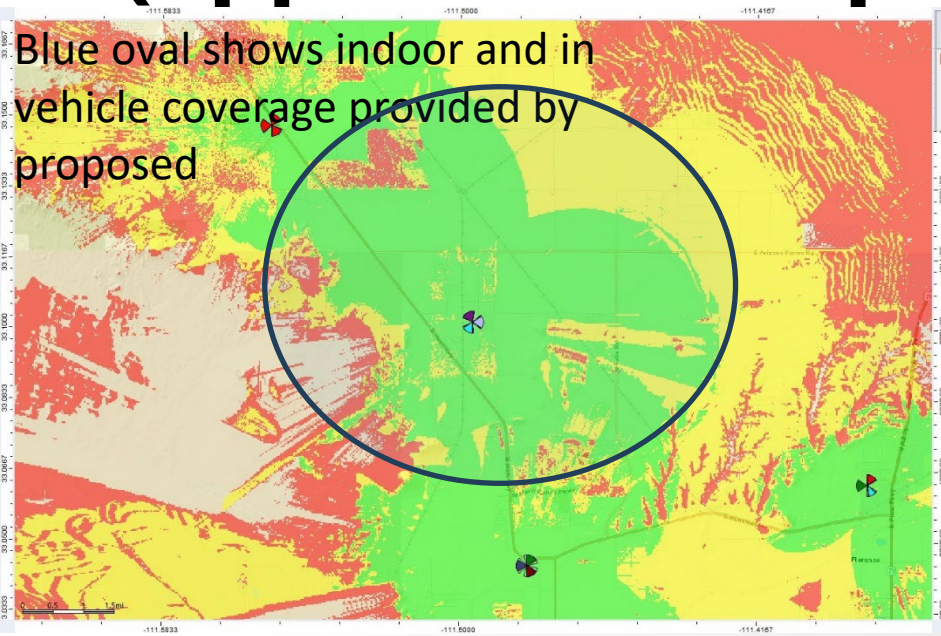
Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	61.909195	100	90.6
		RSRP Level (DL) (dBm) >=-85		40.554897	65.5	59.4
		RSRP Level (DL) (dBm) >=-95		55.761299	90.1	81.6
		RSRP Level (DL) (dBm) >=-106		61.909195	100	90.6

Above and left picture shows Proposed data showing 40.55 square kilometers are covered with indoor service vs T-Mobile tower data showing 34.24 square kilometers covered with indoor service. Approximately a 16% reduction in coverage for the objective.



RSRP Coverage Mid Band 100’ vs 76’ C/L (upper vs lower platform)

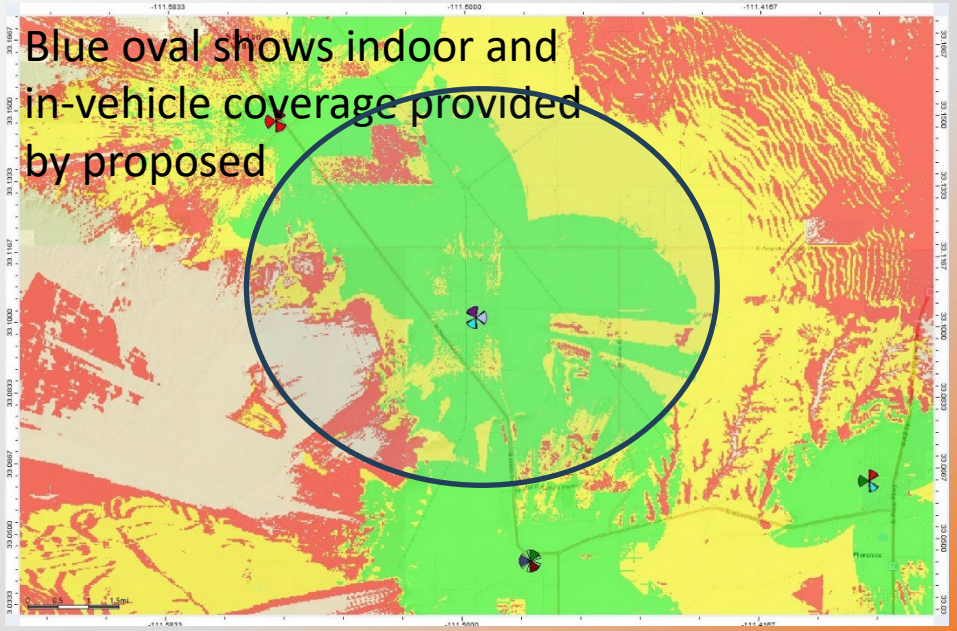
LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm



Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	63.720898	100	93.3
		RSRP Level (DL) (dBm) >=-85		45.576897	71.5	66.7
		RSRP Level (DL) (dBm) >=-95		57.339897	90	83.9
		RSRP Level (DL) (dBm) >=-106		63.720898	100	93.3

Above and left picture shows Proposed data showing 45.57 square kilometers are covered with indoor service vs T-Mobile tower data showing 40.55 square kilometers covered with indoor service. Approximately a 12% reduction in coverage for the objective.

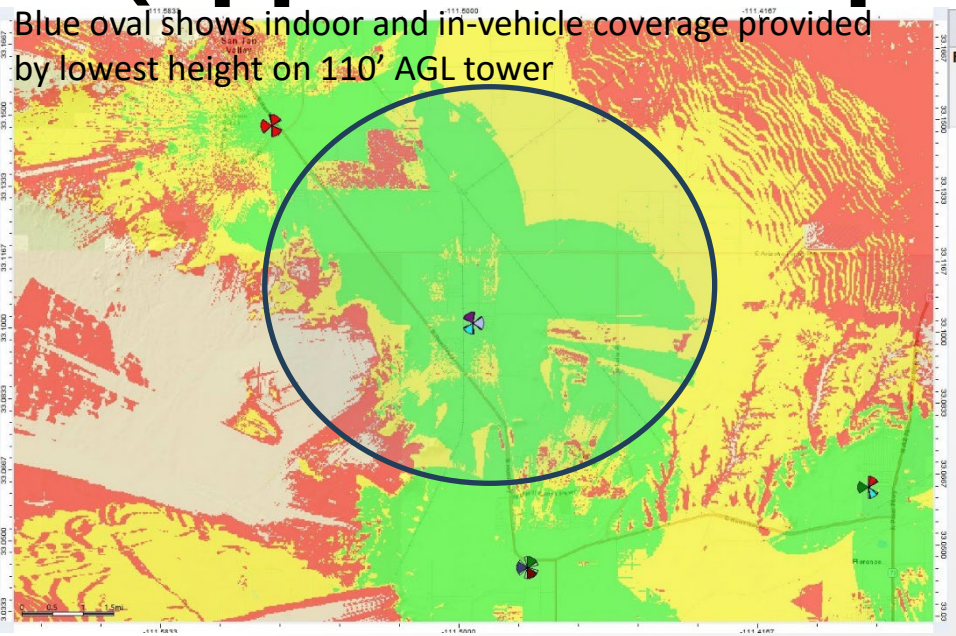
Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	61.909195	100	90.6
		RSRP Level (DL) (dBm) >=-85		40.554897	65.5	59.4
		RSRP Level (DL) (dBm) >=-95		55.761299	90.1	81.6
		RSRP Level (DL) (dBm) >=-106		61.909195	100	90.6



RSRP Coverage Mid Band 80’ vs 56’ C/L (upper vs lower platform)

LEGEND	
	Indoor >= -85 dbm
	In-Vehicle >= -95 dbm
	On-Street >= -106 dbm

Blue oval shows indoor and in-vehicle coverage provided by lowest height on 110’ AGL tower

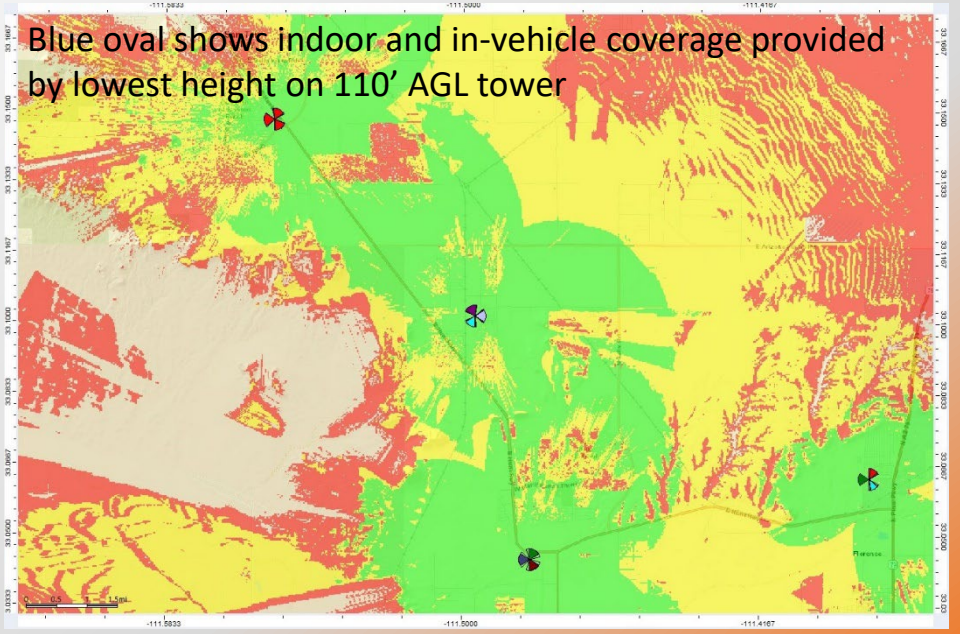


Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	60.276596	100	88.2
		RSRP Level (DL) (dBm) >=-85		34.2477	56.8	50.1
		RSRP Level (DL) (dBm) >=-95		54.491398	90.4	79.8
		RSRP Level (DL) (dBm) >=-106		60.276596	100	88.2

Zone	Prediction	Legend	Zone Surface (km²)	Surface (km²)	% of Covered Area	% Focus Zone
Focus Zone	LTE_NW-Mobility_RSRP-dBm (0)		68.321604	61.909195	100	90.6
		RSRP Level (DL) (dBm) >=-85		40.554897	65.5	59.4
		RSRP Level (DL) (dBm) >=-95		55.761299	90.1	81.6
		RSRP Level (DL) (dBm) >=-106		61.909195	100	90.6

Above and left picture shows Proposed data showing 40.55 square kilometers are covered with indoor service vs T-Mobile tower data showing 34.24 square kilometers covered with indoor service. Approximately a 16% reduction in coverage for the objective.

Blue oval shows indoor and in-vehicle coverage provided by lowest height on 110’ AGL tower



Analysis

- Reviewing the lowest platform modeling the shorter tower impacts the coverage negatively
- All (3) major carriers are lacking in quality service in the area
- Reducing the height of the tower causes a reduction in what the lower platform antennas provide
- The lower heights were analyzed against the primary objective

Recommendation

- Arbitrary height restrictions can cause decreases in coverage for tower sites
- This impacts the number of towers in an area and what they provide coverage to
- It increases the chances for more towers as the towers are not able to accommodate (3) carriers
- Recommend approval of the proposed at the height requested for T-Mobile to provide high quality service to the area