

MOD Data Tech Inc

RF Macro Site Analysis

For the Town of Jamestown, Rhode Island

Marlon DePaz
6-13-2019

Summary

The Town of Jamestown Rhode Island has requested an RF analysis of two possible tower locations that would be suitable for co-location by the major Cellular Carriers.

MOD Data Tech Inc has conducted a study utilizing Cellular Carrier grade prediction software which uses Elevation/Terrain and Clutter/Foliage data to provide approximate coverage predictions. Existing Cellular Macro Site locations were found in the field by measuring signal levels per Provider. Exact heights, antenna types, antenna azimuths (direction) and down-tilt (electrical or mechanical), power levels and frequency are not possible to have unless the carrier provides this information. Instead engineering experience and general knowledge of this information was used as well as visual estimations and measured signal levels. The predictions are to be used as an approximation of coverage that will be provided per specific locations. This methodology is similar to that used by tower companies that build tenant towers.

MOD Data Tech Inc took into consideration all four current major carriers including Verizon, AT&T, T-Mobile and Sprint. These carriers currently utilize high and low frequencies ranging from 600MHz to 2600MHz. The low frequencies have a bigger coverage footprint than the higher which generally ranges between 7db to 10dB difference in power. We used the 700MHz frequency as a benchmark since most carriers have this frequency. We also used LTE since it is the main technology used today for 4G and 5G. The predictions show the Reference Signal Received Power (RSRP) since it is what is used by the carrier to show the base Reference signal. The modeling considered the existing outdoor distributed antenna system (DAS), shown as the 10 brown dots in the predictions. Currently AT&T and Verizon are on the DAS. The model also includes the existing water tank macro sites that includes Sprint, AT&T, Verizon and T-Mobile.

Results

The Cedar Lane location, with an approximate ground elevation of 100ft, was analyzed at multiple heights, with 150ft tower height being the upper limit of the modeling. It provides more solid coverage along route 138, which is elevated, however the coverage overlaps the outdoor DAS that covers a similar area. The Cedar Lane tower would likely extend coverage to the north to West Reach Drive which is approximately 1.5 miles from the tower and from route 138.

North Main, with an approximate ground elevation of 80ft was analyzed at multiple heights, with 150ft pole height being the upper limit of the modeling. Because the site is further north, the North Main location does not overlap as much with the DAS but still provides additional coverage to route 138. The coverage would likely extend north approximately 1.7 miles north to Summit Ave and 2.3 miles to Summit Ave from route 138.

Both proposed locations experience degradation on the north-west side of the Island due to terrain and neither cover the entirety of the north but they would vastly improve the current coverage as shown in the propagation models. The results show that both locations would provide enhanced RF coverage to the area, but North Main St would provide more improved coverage especially to the north of the Island. In order to extend coverage to northernmost areas another site would be needed. A tower height of 150ft would be recommended to maximize coverage and allow 4 Carriers to utilize the tower. In general, the carrier's antennas will be spaced 10ft below each other. Note that coverage areas will generally decrease as the antenna height decreases. Coverage patterns for the lowest carrier will be smaller than the coverage maps indicate in this report.

Prediction Plots

Signal Levels

The Carriers generally use three thresholds of power: In-Building (level for signal to make it indoors), In-Vehicle (level for signal to make in vehicles) and Outdoor (signal to be able to make a reliable call outside but becomes less reliable in-vehicle and indoors). LTE technology has minimum requirements which the carrier uses to make their own requirements of minimal coverage. All carriers have slightly different numbers but are all close to each other. We used In-Building: -90dBm, In-Vehicle: -100dBm, Outdoor: -110dBm. These levels are sufficient for the carrier to determine site viability but will perform their own analysis to make sure as well as with their own detailed data.

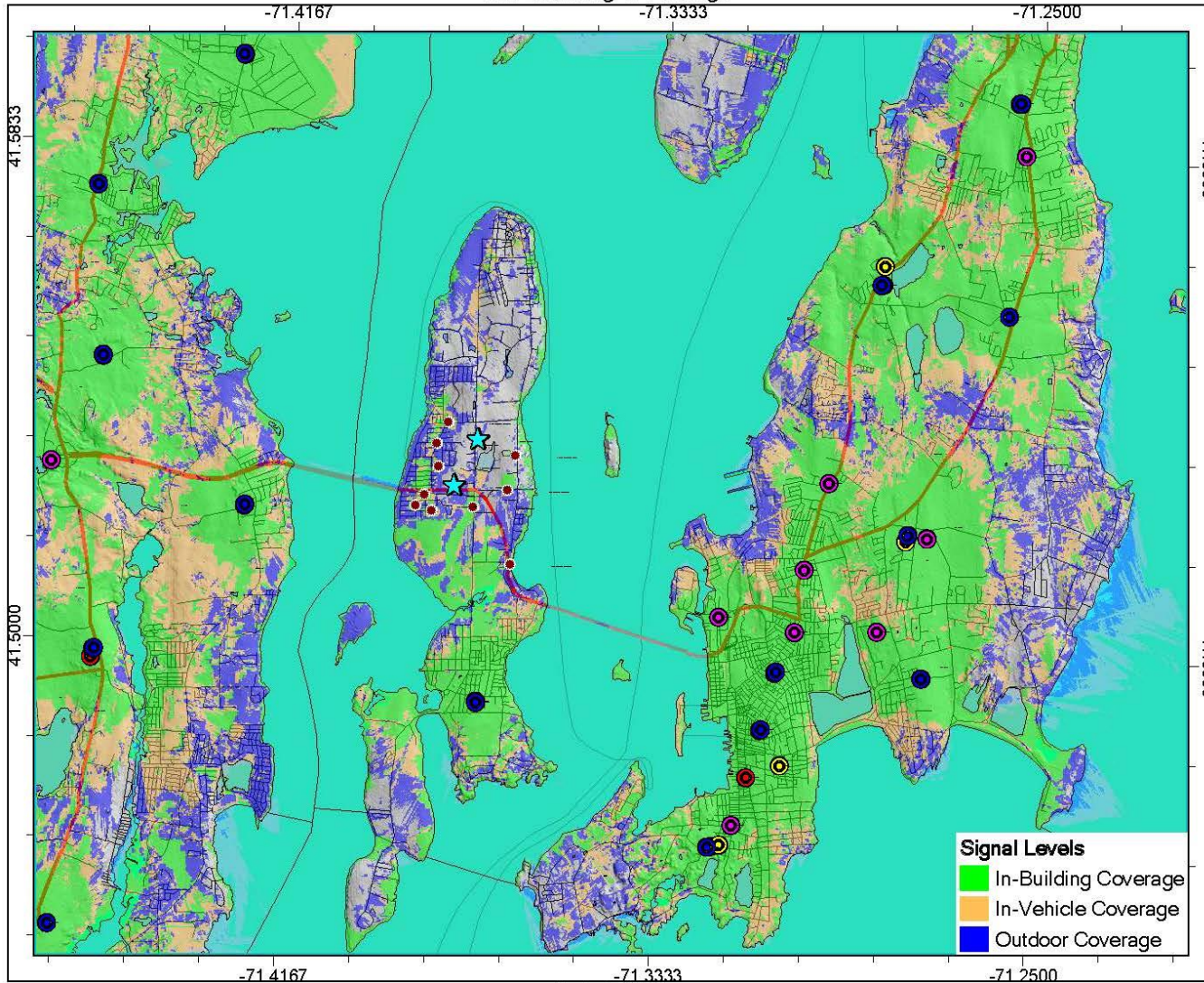
The plots show a red dot near the bottom which depicts the towers that are located near the water tanks in the southern Jamestown area. The brown dots are the outdoor DAS locations which are on top of utility poles. The Blue Stars are the Jamestown locations both are on the maps for reference.

The plots were done for best case scenario, which is the low band, 700MHz LTE, and showing all macro sites from all carriers being activated. This shows that even if a user had a phone that utilized all carriers, there would still be a gap in coverage in the north part of Jamestown Island.

There are 5 types of plots below for each proposed tower locations:

- **Coverage from the proposed location at various heights: 150ft, 125ft, 100ft, 80ft**
These were placed in separate plots so that you can flip back and forth between pages to see change in coverage footprint
- **Coverage at 150ft with Water Tank Tower on**
This shows the overlap in coverage which is necessary for the cellular user to handover between each macro site.
- **Coverage at 150ft with Water Tank Tower and outdoor DAS on**
This shows the amount of coverage coming from the outdoor DAS. There is some discrepancy since the software does not account for the raised highway.
- **Coverage at 150ft with Water Tank Tower and outdoor DAS and existing coverage from surrounding macro sites outside of Jamestown**
This shows all coverage including the existing and the proposed for each individual tower.
- **Existing coverage of all sites and oDAS in the area.**
This shows the current coverage signals and shows the need for additional coverage.

All Existing Coverage



Frequency: 700 MHz LTE

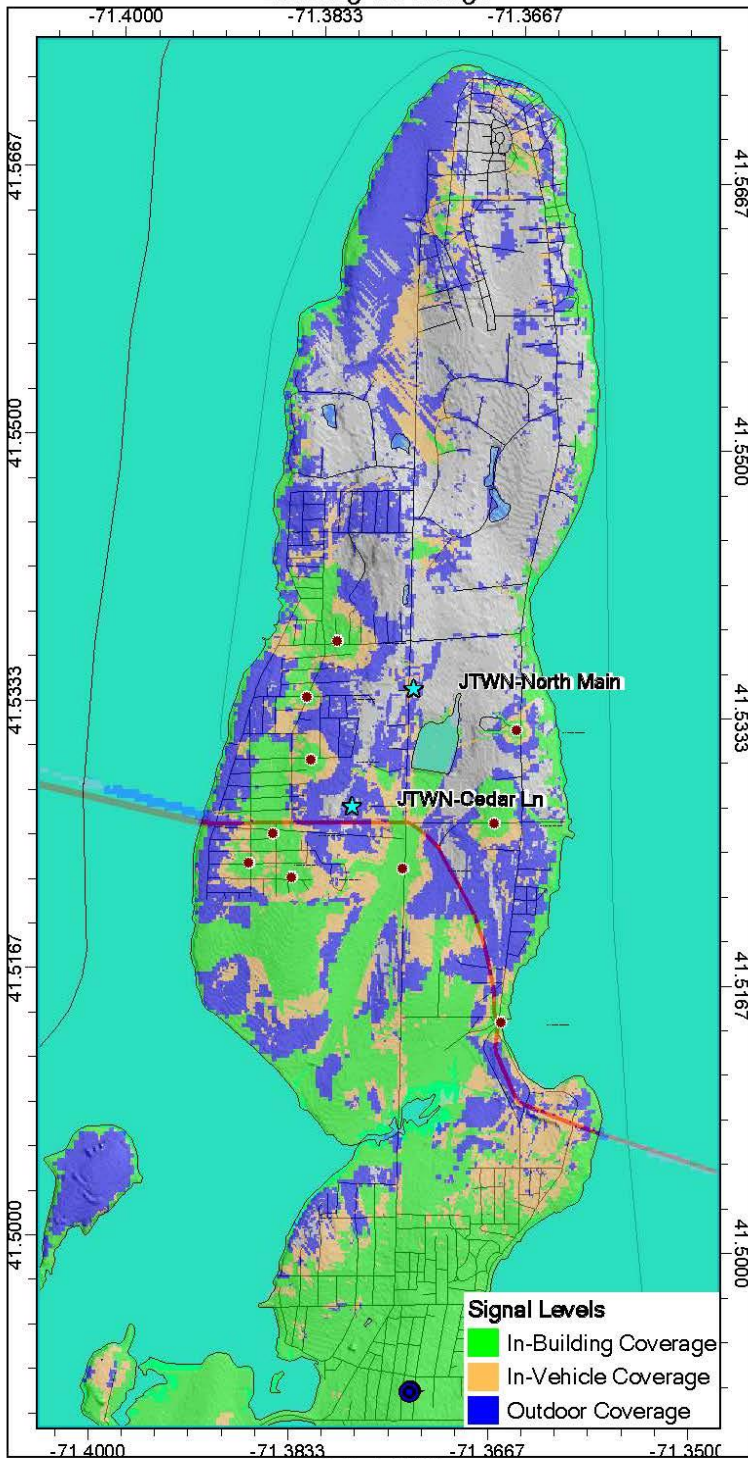
- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

Scale: 1:96,986
0 1 2 3mi

Existing Coverage



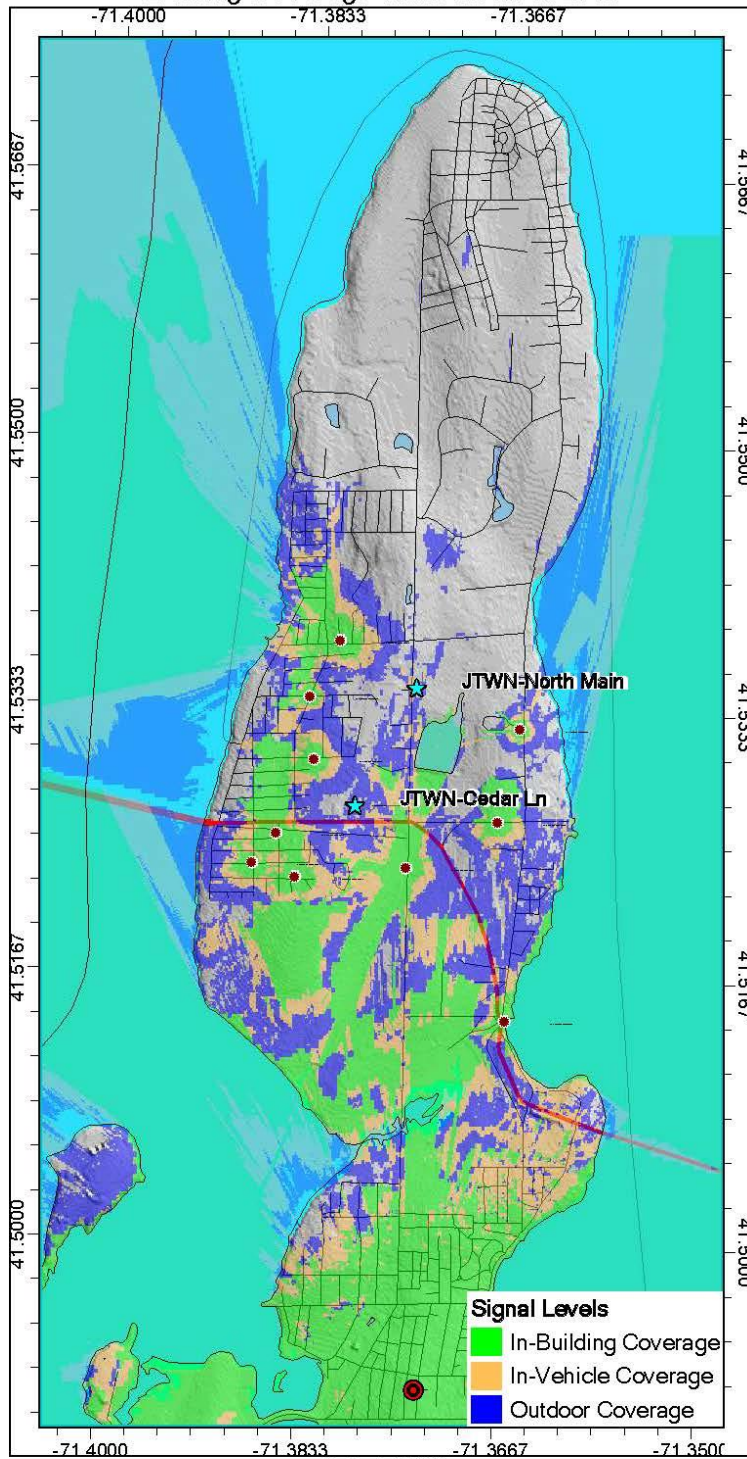
Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

Existing Coverage Jamestown w/DAS



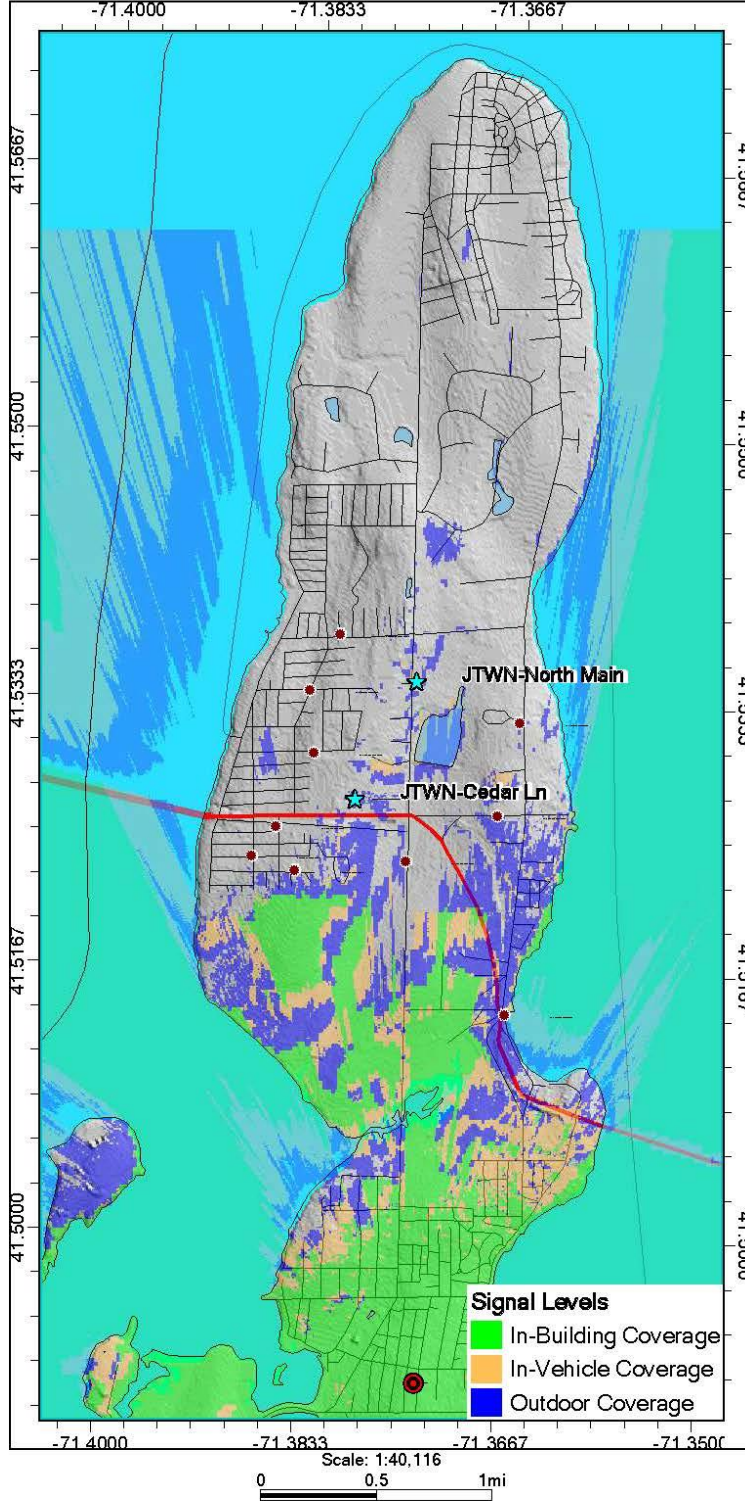
Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

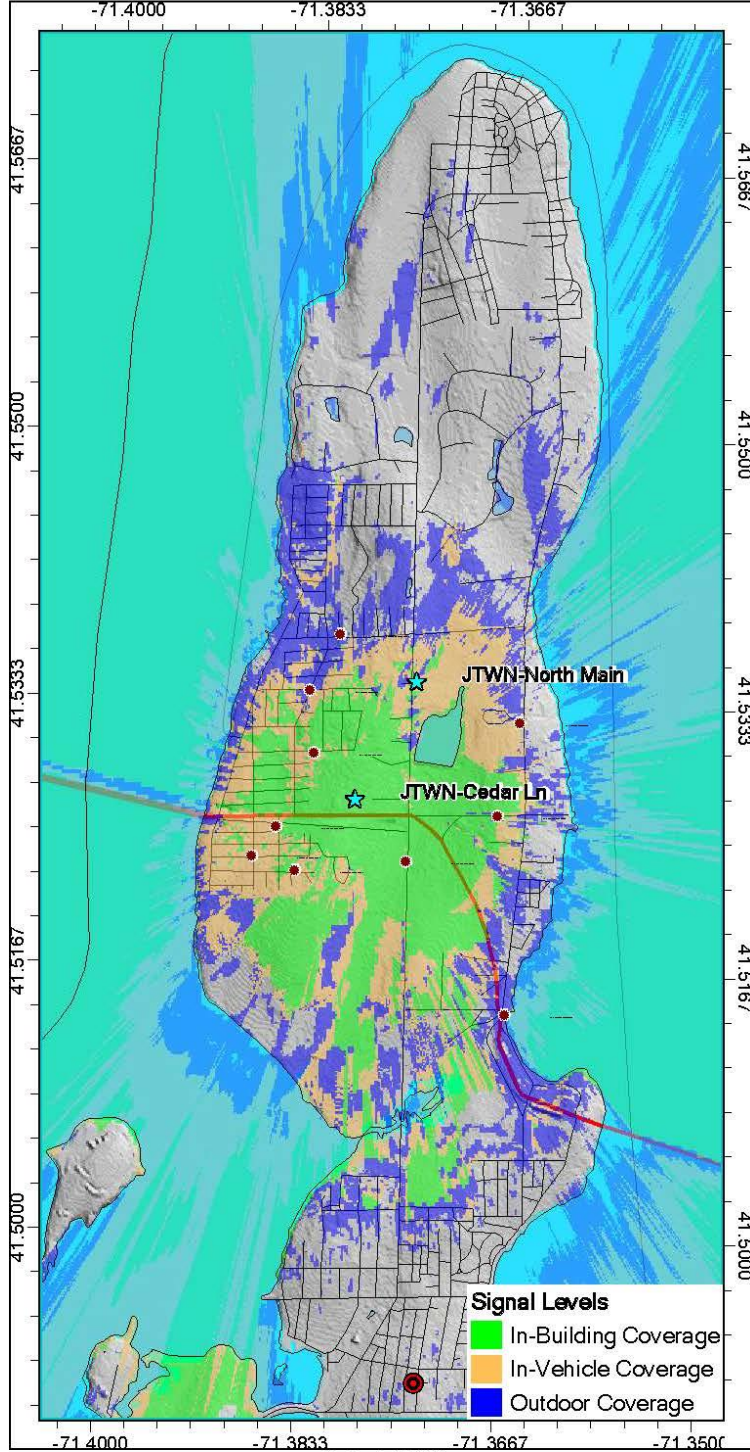
Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

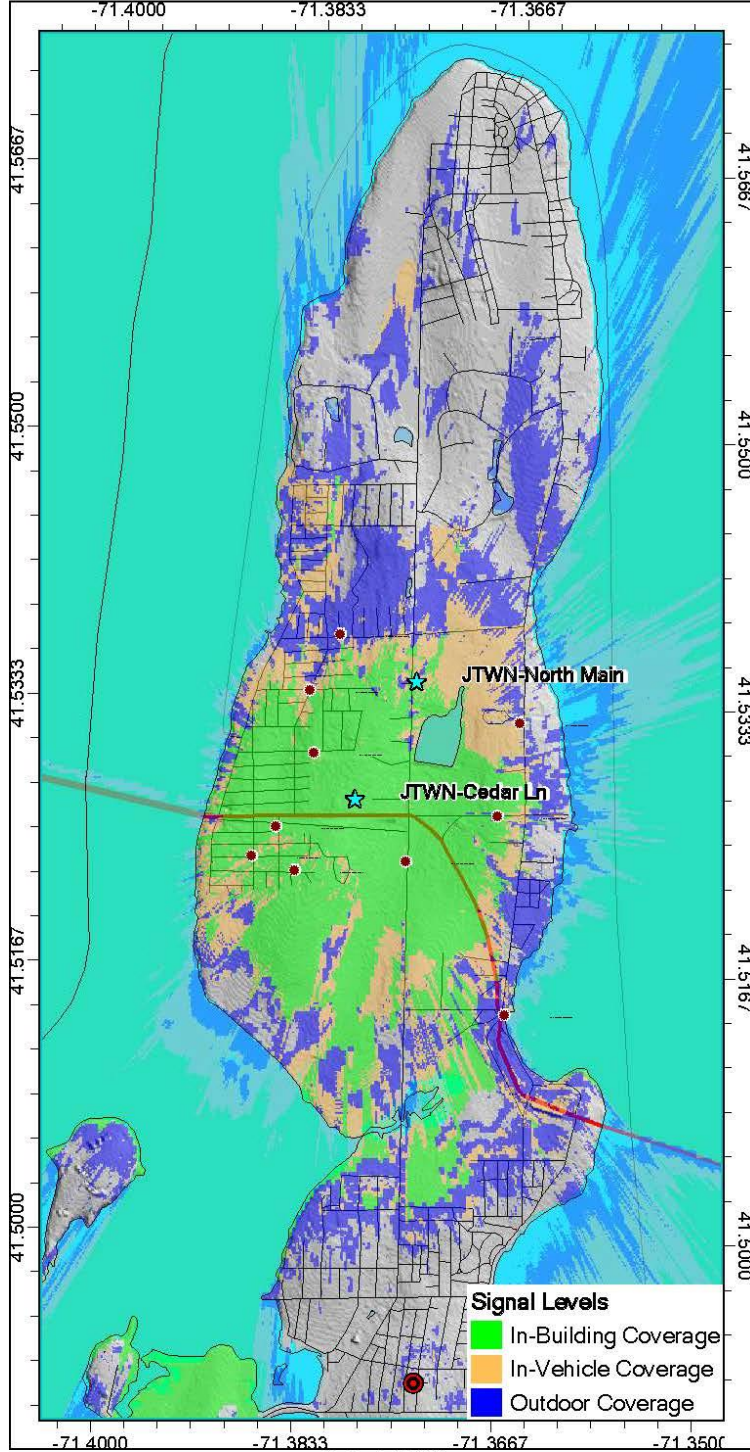
Existing Coverage Jamestown South



Cedar Lane Coverage 80 ft



Cedar Lane Coverage 100 ft



Frequency: 700 MHz LTE

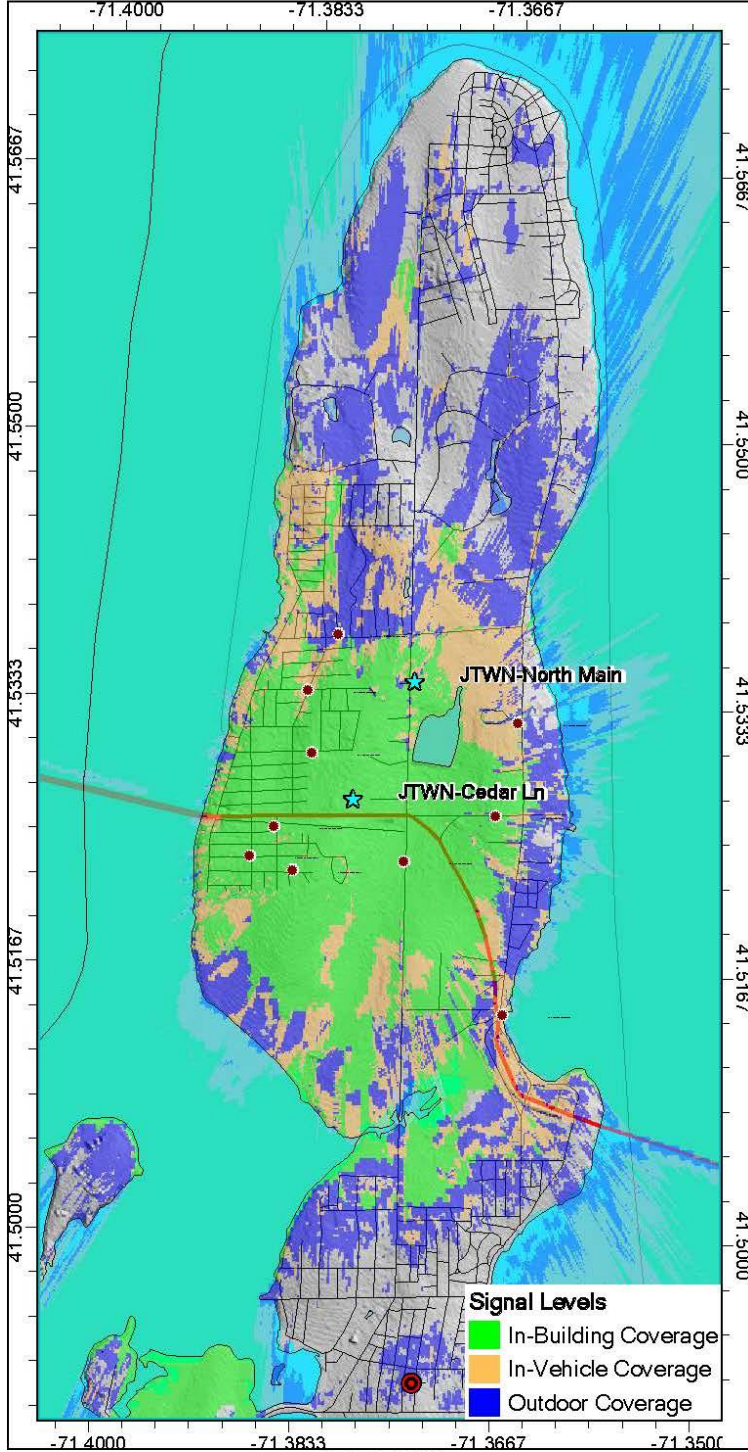
- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

Scale: 1:40,116
0 0.5 1mi

Cedar Lane Coverage 125 ft



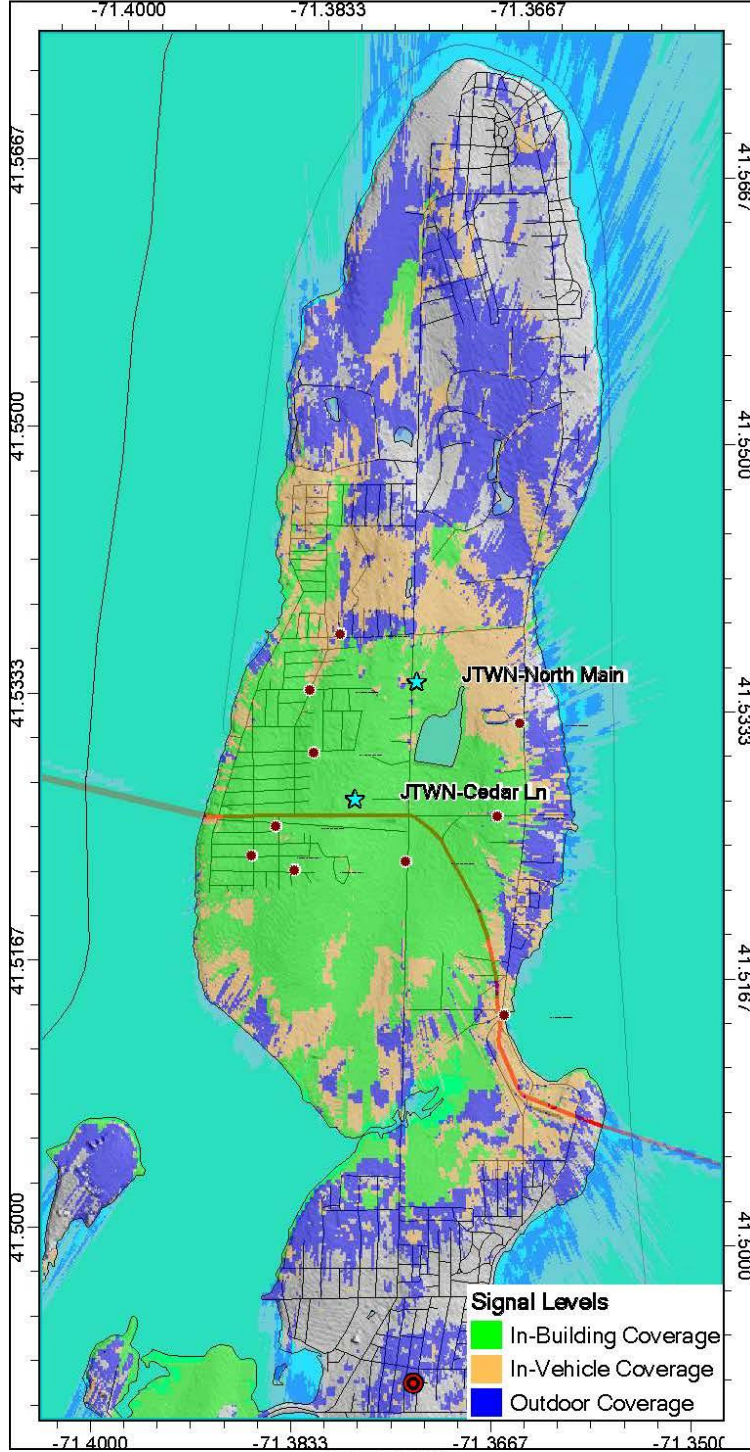
Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

Cedar Lane Coverage 150 ft

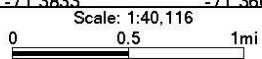


Frequency: 700 MHz LTE

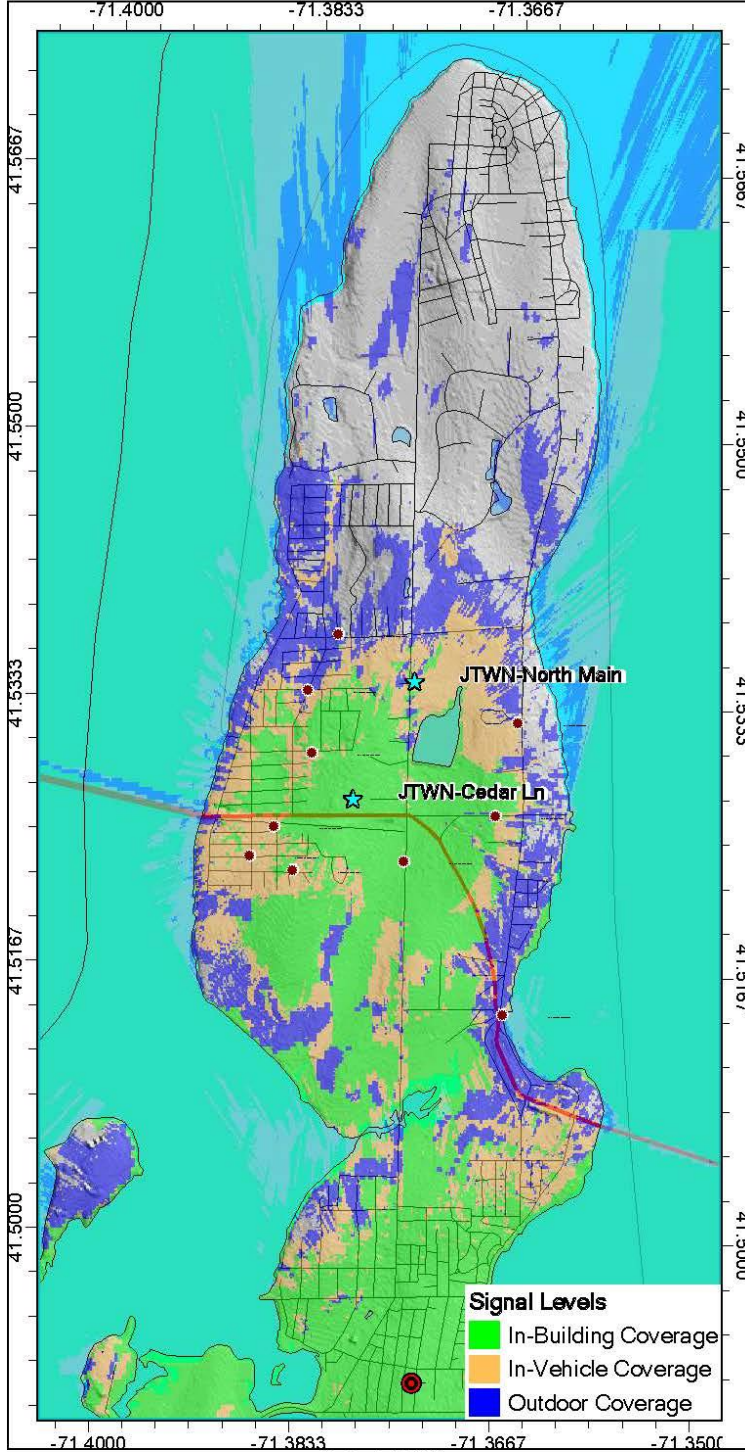
- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage



Cedar Ln Coverage 150 ft w/ South Site

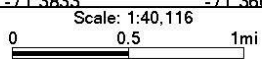


Frequency: 700 MHz LTE

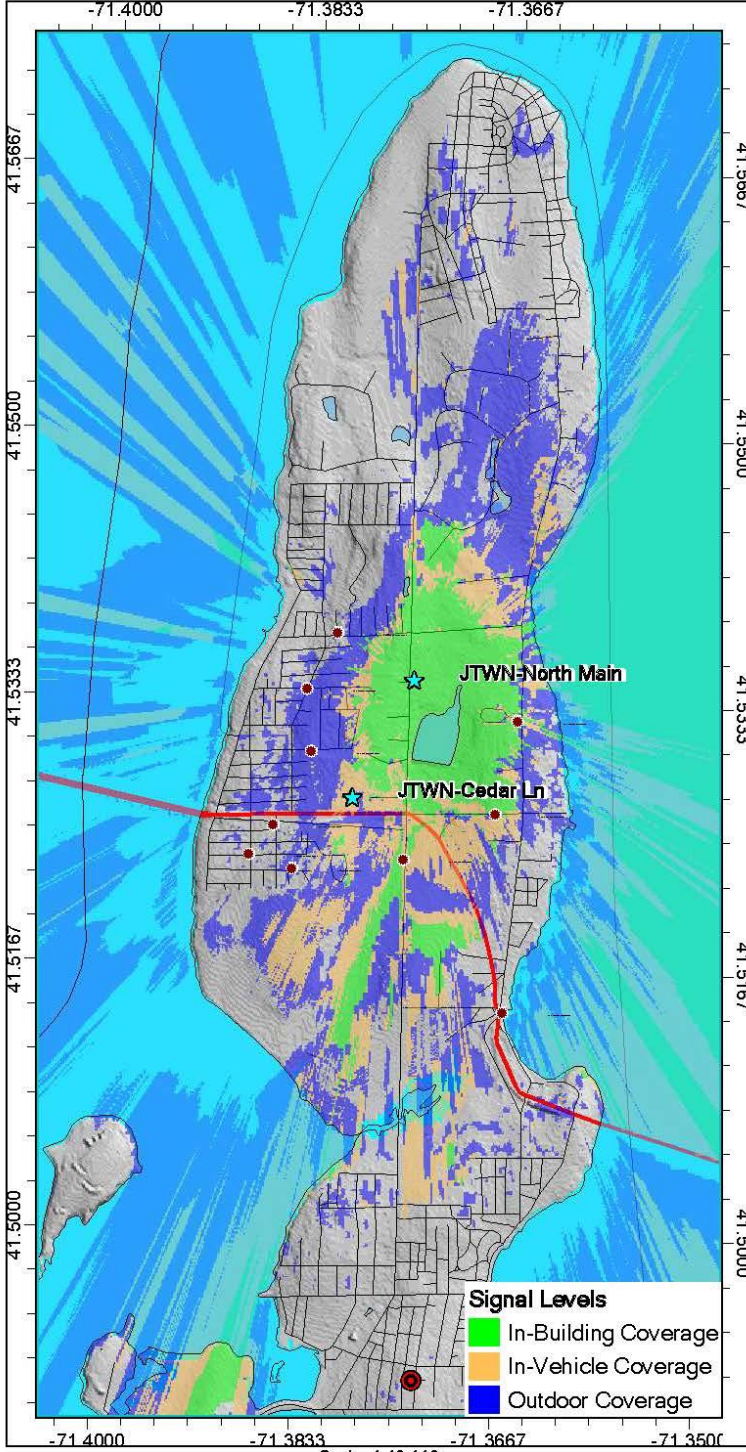
- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage



North Main Coverage 80 ft



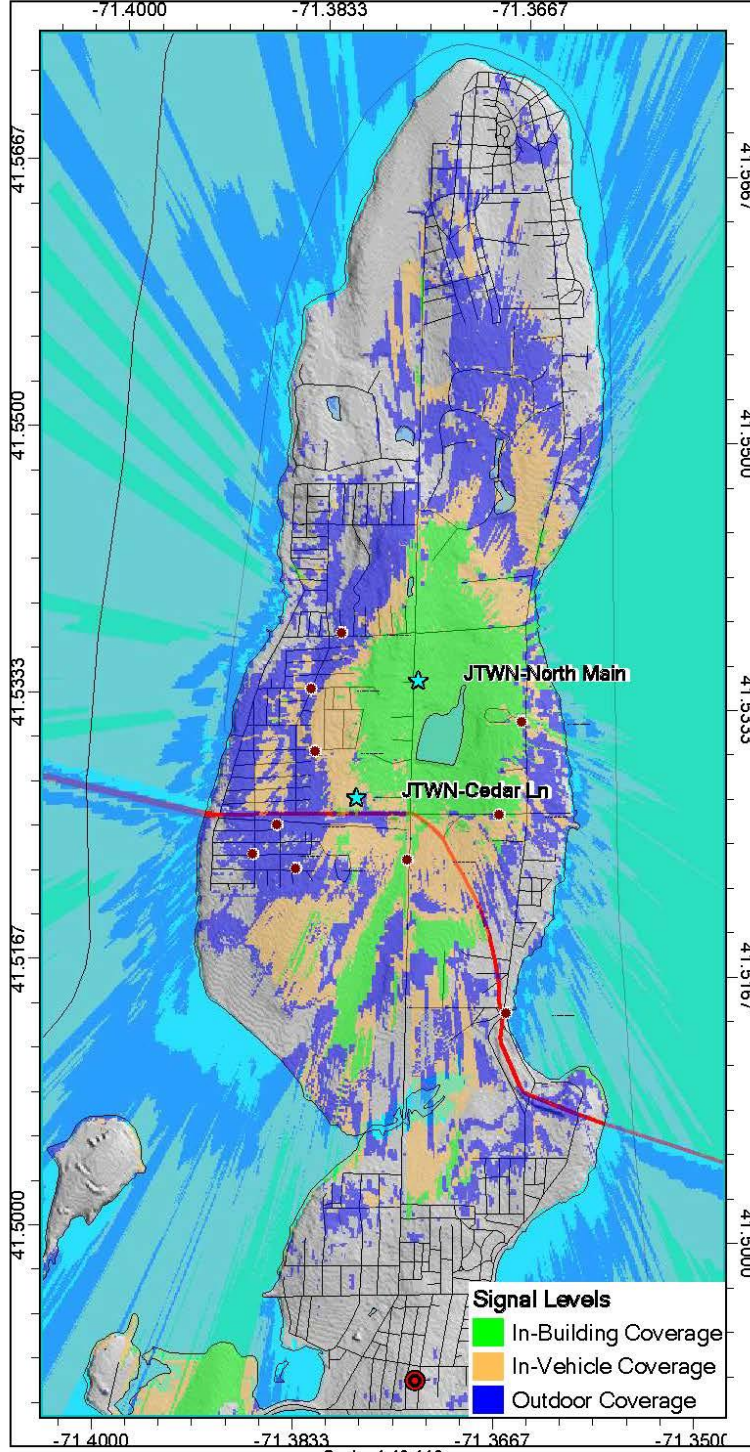
Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

North Main Coverage 100 ft



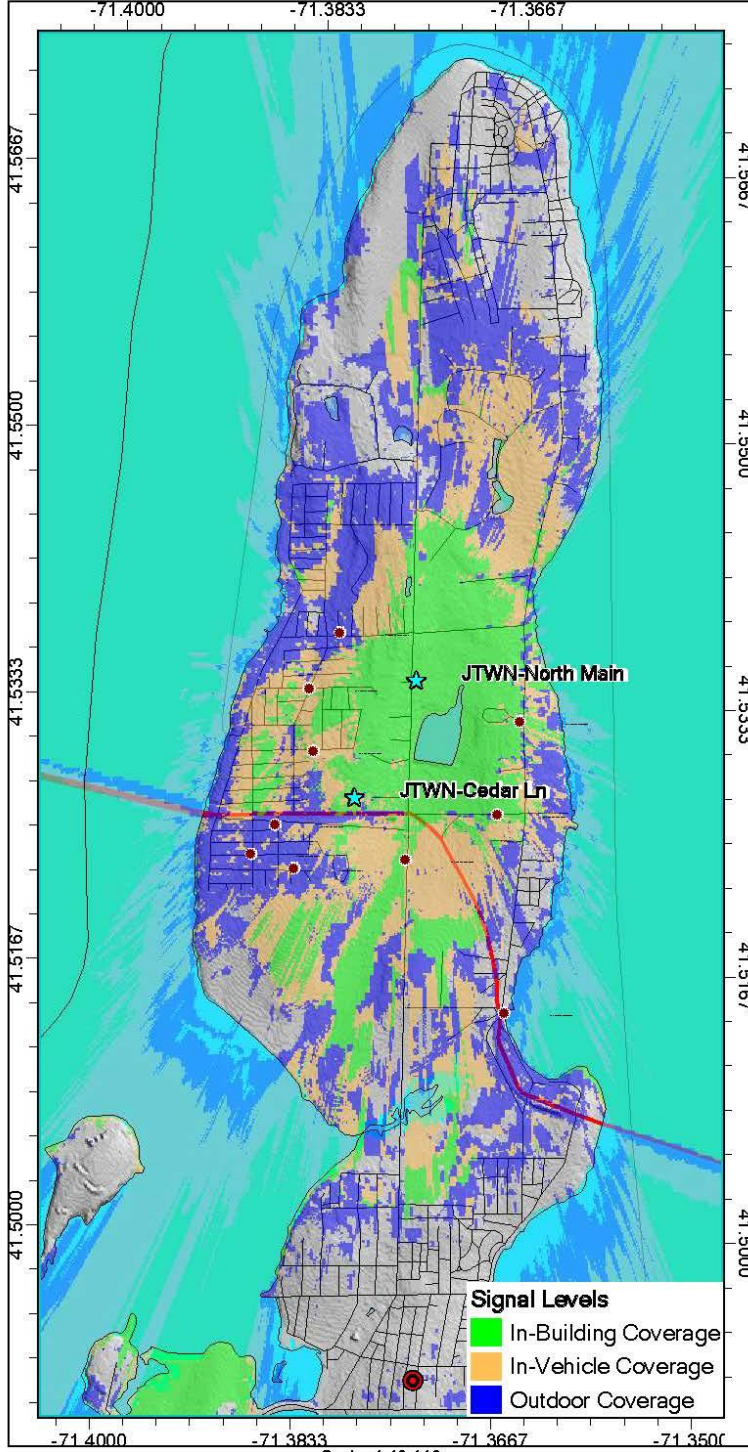
Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

North Main Coverage 125 ft



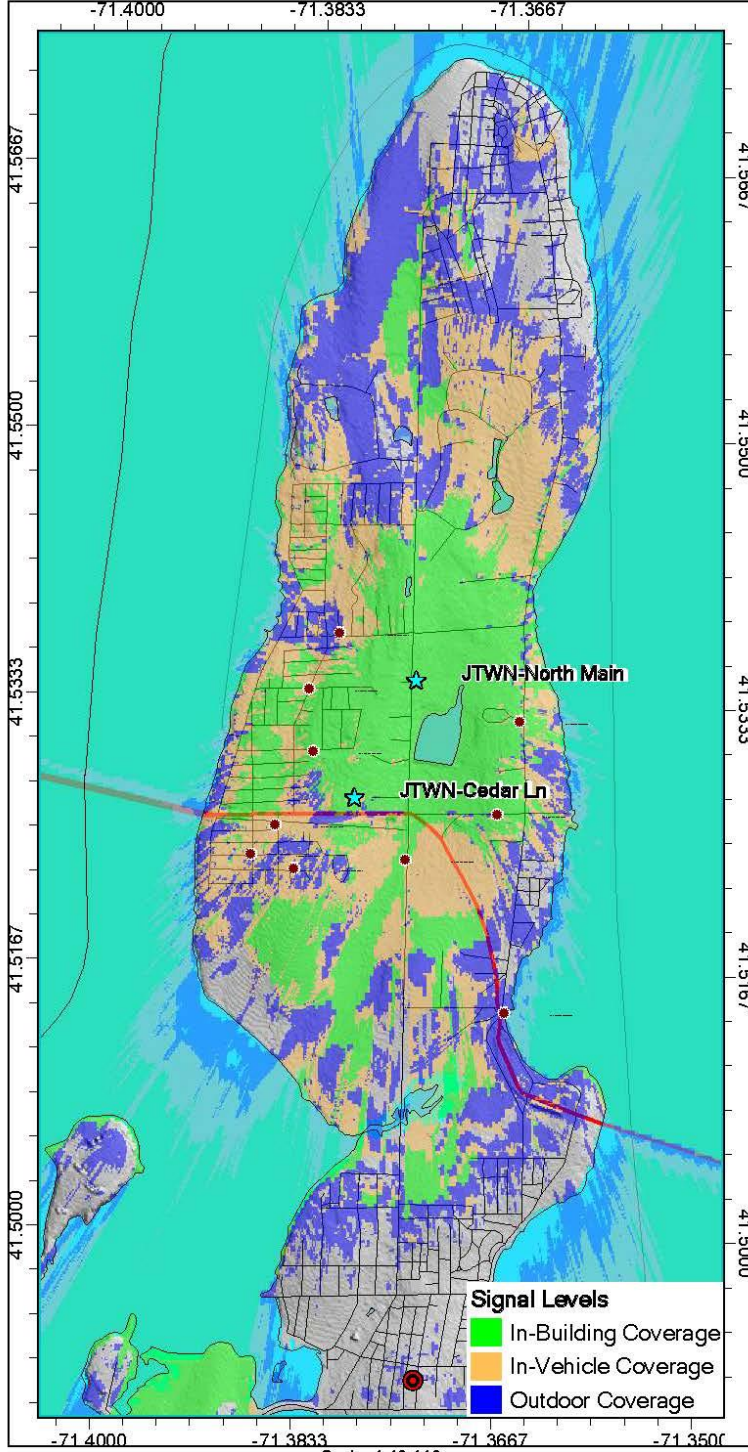
Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

North Main Coverage 150 ft



Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

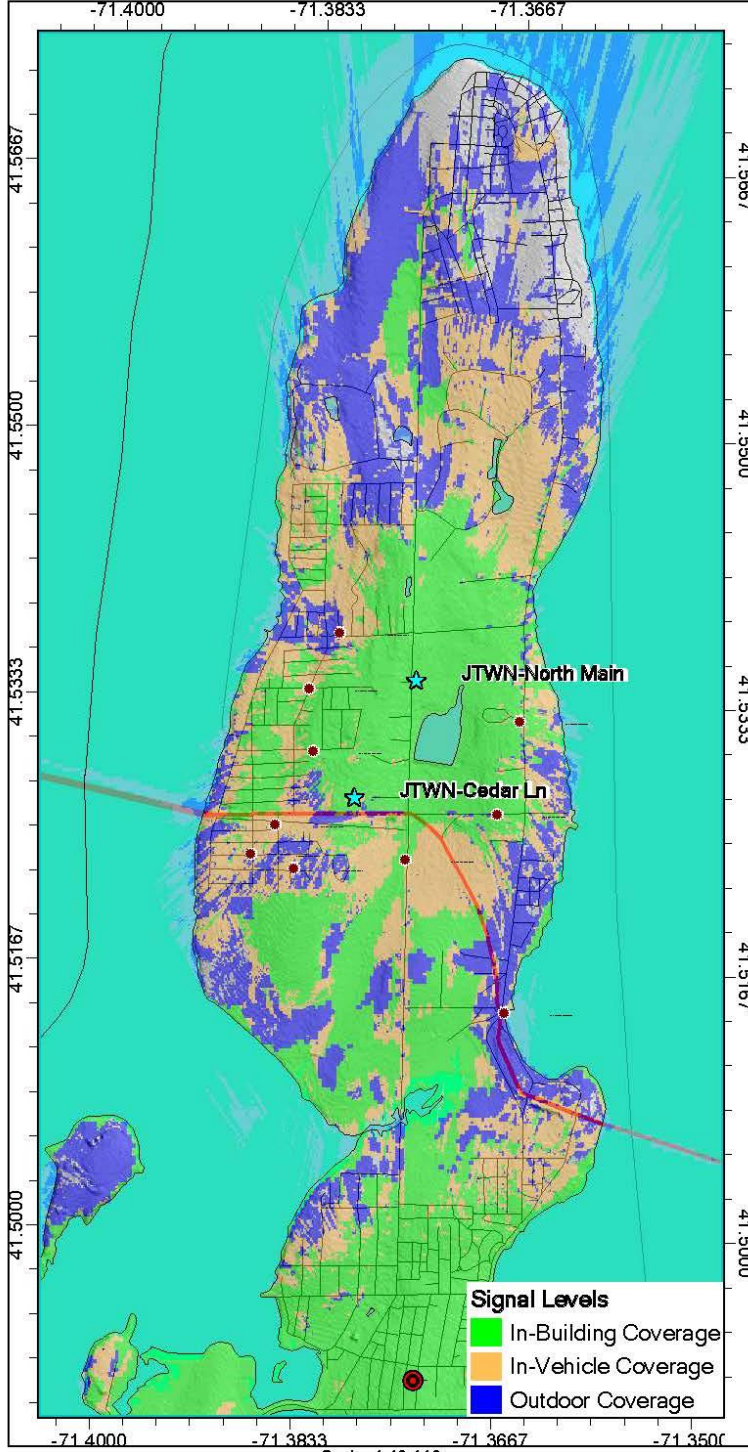
Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

Scale: 1:40,116

0 0.5 1mi

North Main Coverage 150 ft w/ South Site



Frequency: 700 MHz LTE

- ★ Proposed Towers
- Outdoor DAS
- ⊙ Existing Cell Towers

Signal Levels

- In-Building Coverage
- In-Vehicle Coverage
- Outdoor Coverage

Scale: 1:40,116

0 0.5 1mi