

## **Exhibit 5**

**“Affidavit of Radio Frequency Engineer”**



**AFFIDAVIT OF RADIO FREQUENCY ENGINEER**

The undersigned, in support of the application to install a wireless communications facility consisting of one antenna and associated radio equipment on the existing utility pole (#43216) located at 6 Fort Street in Fairhaven, Massachusetts, states the following:

1. My name is Keith Vellante. I have a Bachelor of Science degree in Electrical Engineering from the University of New Hampshire and I am employed as a Radio Frequency (RF) Engineer for C Squared Systems, LLC. C Squared Systems has entered into a contract with Verizon Wireless to provide RF consulting services on behalf of Verizon Wireless. I have reviewed the proposed site with the Radio Frequency Engineer responsible for the Verizon Wireless network design in the area of Massachusetts that includes the Town of Fairhaven, MA.
2. Verizon Wireless is a federally licensed provider of wireless communications services with a national footprint.
3. The above-mentioned location is within an area where Verizon Wireless has identified a need to install a wireless communications facility in order to provide reliable wireless service. The search area for the proposed facility was determined by the fact that wireless service needs significant improvement in western Fairhaven along Fort Street, around Fort Phoenix State Reservation and the nearby recreational parks, fields and parking areas. Furthermore, it was determined that the areas served by the proposed facility would interact well with those of existing and planned facilities in the surrounding area.

The following table provides details of the proposed site:

Site Name:	Site Address:	Utility Pole Number:	Latitude:	Longitude:	Ground Elevation (AMSL):	Antenna Centerline Height (AGL):
Fairhaven SC07 MA	6 Fort Street	43216	41.6257	-70.9008	24.4'	24.2'

4. A conventional Verizon Wireless LTE macro-site consists (in part) of RRHs (Remote Radio Heads) located near the antennas on a tower, rooftop, or other support structure, which are connected via fiber optic cables to a BBU (Baseband Unit) located at the site in an equipment shelter or other weatherproof enclosure. The BBU performs network signal processing between the RRHs at the site, and Verizon's LTE core network.
5. C-RAN (Cloud Radio Access Network) nodes and small cells also utilize RRHs at each site, however a centralized BBU capable of supporting RRHs at multiple sites is implemented to gain certain efficiencies, both from a network and environmental standpoint. The proposed location is one of multiple additional C-RAN nodes and small cells planned to address capacity and coverage deficiencies in Fairhaven and the surrounding area.



6. C-RAN and small cell deployments are intended to complement, not replace, the conventional LTE macro-network sites, and are typically used as a capacity solution targeting isolated areas of heavy network usage, a.k.a “hot spots.” In doing so, the C-RAN nodes and small cells serve to offload the demand on the existing sites serving these “hot spots.” This not only improves service to the specifically targeted area, but also improves overall system performance elsewhere in the network.
7. The purpose of the proposed facility is to provide adequate service capacity and improve coverage along Fort Street, around Fort Phoenix State Reservation, and the surrounding neighborhoods and nearby recreational parks, fields, and parking areas in the vicinity of the proposed location. Verizon Wireless does not currently provide acceptable LTE service in this area of Town.
8. To find a site that would provide adequate capacity and coverage improvement, the Verizon Wireless RF Design Group utilizes computer modeling to define a search area. The search area is designed such that a site located within the area and at a given height would have a high probability of completing the capacity and coverage objectives in the target areas. The RF Design Group develops the network by working off existing sites from which to design the network.
9. Verizon Wireless’ search of the area and subsequent analysis determined that installing the proposed facility on the existing utility pole referenced herein would be the most appropriate solution to meet its network capacity and coverage objectives to the areas immediately surrounding the proposed location.
10. I have reviewed the proposed installation to be placed on this utility pole as well as the other existing and proposed antenna site locations used in Verizon Wireless’ system in and around the surrounding areas. I have analyzed the potential benefits this site would represent to Verizon Wireless’ network and its users. I employ computer simulations, which incorporate the results of field tests of existing facilities, to determine existing radio frequency (RF) coverage for Verizon Wireless’ system. These simulations model characteristics such as antenna types, antenna height, output power, terrain, land cover, and RF propagation effects of the frequency utilized.
11. The following table details site specific information of the surrounding Verizon Wireless macro-sites used to generate the RF maps attached hereto:

Cell Name:	Latitude:	Longitude:	Street Address:	Town/State:	Antenna Centerline Height (ft AGL):	Status
Acushnet South	41.6763	-70.9115	107 South Main Street	Acushnet, MA	122	On-Air
Dartmouth	41.6397	-70.9675	29 Wilbur Avenue	Dartmouth, MA	129.5	On-Air
Dartmouth Bliss Corner	41.6132	-70.9437	54 Donald Street	Dartmouth, MA	130	On-Air
Dartmouth West	41.6619	-71.0391	968 Reed Road	Dartmouth, MA	157	On-Air
S Dartmouth	41.5807	-71.0051	1073 Russells Mill Road	Dartmouth, MA	158	On-Air
S Dartmouth 2	41.5513	-70.9502	10 Gentry Lane	Dartmouth, MA	150	On-Air
UMASS Dartmouth	41.6377	-71.0047	50 Cross Road	Dartmouth, MA	107	On-Air
UMASS Dartmouth 2	41.6269	-70.9945	111 Chase Road	Dartmouth, MA	110	On-Air
Dartmouth 3	41.6661	-70.9895	411 Faunce Corner Road	Dartmouth, MA	89	On-Air
S Dartmouth 3	41.5919	-70.9433	783 Dartmouth Street	Dartmouth, MA	44	Approved
Fairhaven	41.6501	-70.8817	200 Mill Road	Fairhaven, MA	105	On-Air
New Bedford	41.6526	-70.9355	Penniman Street	New Bedford, MA	147	On-Air
New Bedford 2	41.7199	-70.9540	121 Duchaine Blvd	New Bedford, MA	100	On-Air
New Bedford 3	41.6748	-70.9398	1024 Kings Hwy	New Bedford, MA	118	On-Air
New Bedford S	41.6335	-70.9296	430 County Street	New Bedford, MA	120	On-Air
Acushnet	41.7001	-70.8832	Mendall Road	Acushnet, MA	183	On-Air
E Freetown 2	41.7543	-70.9653	107 Braley Road	Freetown, MA	150	On-Air



Cell Name:	Latitude:	Longitude:	Street Address:	Town/State:	Antenna Centerline Height (ft AGL):	Status
Mattapoisett	41.6871	-70.807	Industrial Drive	Mattapoisett, MA	188	On-Air
Mattapoisett 2	41.666447	-70.7876	0 Marion (Route 6) Road	Mattapoisett, MA	131	On-Air
Mattapoisett 3	41.670606	-70.8297	24R Crystal Springs Road	Mattapoisett, MA	125	On-Air
Rochester	41.7336	-70.8339	98 Bowen's Lane	Rochester, MA	170	On-Air
Marion 2	41.7031	-70.7797	55 Benson Brook Road	Marion, MA	160	On-Air
Marion	41.7446	-70.7738	260 County Road	Marion, MA	150	On-Air
E Freetown	41.7762	-70.9310	182 Middleboro Road	Freetown, MA	180	On-Air

12. The signal propagation plots included as attachments were produced using deciBel Planner™, a Windows-based RF propagation computer modeling program and network planning tool. The software considers the topographical features of an area, land cover, antenna models, antenna heights, RF transmitting power and receiver thresholds to predict coverage and other related RF parameters used in site design and network expansion.
13. The RF map titled “Fairhaven SC07 MA – Existing/Approved 700 MHz LTE Sector Footprints (Macro Sites)” attached hereto depicts the areas primarily served by the sectors (a.k.a. signal “footprints”) of the “On-Air” and “Approved” Verizon Wireless macro-sites in the area, which are shown by a unique color for each particular sector of interest. For clarity, all other sectors of less interest with respect to the proposed facility are shown in grey. “On-Air” sites are existing Verizon Wireless facilities, and “Approved” sites are defined as those that are in the final stages of permitting or construction and are expected to be turned on-air soon. As demand for wireless voice and data services continues to grow, Verizon Wireless manages the footprint of each sector so that it can support the demand within the area it is primarily serving. In addition to improving coverage to the immediate area, the proposed site is also needed to serve existing and anticipated demand in the vicinity and thereby offload some of the burden experienced by the surrounding sites. In that way, those surrounding sites will be able to more adequately serve the demand for service in the areas nearer to them. Please note that the outer parts of each sector footprint may include areas that presently have signal strength below the targeted value required for reliable service to Verizon Wireless’ customers. The fact that low-level signal may reach these areas does not mean that these areas experience adequate coverage. These unreliable areas of low signal level can impose a significant capacity burden on the sites primarily serving the area.
14. The RF map titled “Fairhaven SC07 MA – Existing/Approved 700 MHz & 2100 MHz LTE Coverage (Macro-Sites)” attached hereto depicts the coverage provided from the “On-Air” and “Approved” Verizon Wireless macro-sites in the Fairhaven area. The green and yellow shaded areas represent the minimum desired level of coverage for this area for the 700 MHz and 2100 MHz network layers, respectively. Because of the superior propagation characteristics of 700 MHz relative to 2100 MHz frequencies, the 2100 MHz coverage areas (yellow) are generally contained within the 700 MHz coverage areas (green). As such, the deficient areas of 700 MHz coverage are defined by the unshaded or white areas, whereas the deficient areas of 2100 MHz coverage consist of both the green and white areas. As shown in this plot, the existing Verizon Wireless macro-sites in the area are unable to provide adequate coverage (particularly at 2100 MHz) to the targeted areas around Fort Phoenix State Reservation.
15. The map titled “Fairhaven SC07 MA – Area Terrain Map” attached hereto details the terrain features around the proposed small cell facility. These terrain features play a key role in dictating both the unique coverage achieved from a given location, and the coverage gaps within the network. The blue and green shades correspond to lower elevations, whereas the orange, red, and grey shades indicate higher elevations.



16. As shown in the aforementioned maps, the proposed facility is centrally located within the targeted area of deficient service, making it suitable to provide the intended coverage improvement and capacity relief to this “hot spot” of network usage around Fort Phoenix State Reservation. The proposed facility will offload the sectors of existing sites currently serving the area, which will in turn improve the overall system performance elsewhere within their respective service areas.
17. I have concluded that the proposed facility will satisfy the present capacity and coverage needs that motivated Verizon Wireless to establish a search ring in this vicinity. Any reduction in the proposed antenna configuration and/or equipment would limit optimal performance of the facility, which would diminish the site’s effectiveness.
18. Verizon Wireless certifies that the proposed facility will not cause interference to any lawfully operating emergency communication system, television, telephone, or radio in the surrounding area. The FCC has licensed Verizon Wireless to transmit and receive in the Upper C Block of the 700 MHz band, B Block of the Cellular (850 MHz) band, the E and F Blocks of the PCS (1900 MHz) band, and the A and B Blocks of the AWS (2100 MHz) band of the RF spectrum. As a condition of the FCC licenses, Verizon Wireless is prohibited from interfering with other licensed devices that are being operated in a lawful manner. Furthermore, no emergency communication system, television, telephone, or radio is licensed to operate on these frequencies, and therefore interference is highly unlikely.
19. Pursuant to its Federal Communications Commission (FCC) licenses, Verizon Wireless is required to ensure that all radio equipment operating at the proposed communications facility and the resulting radio frequency exposure levels are compliant with FCC requirements as well as federal and state health and safety standards.
20. Providing reliable wireless communication services is a benefit to the residents of the Town of Fairhaven, as well as to mobile customers traveling throughout the area. The proposed facility is well suited to meet Verizon Wireless’ network requirements for the intended areas. The absence of a wireless telecommunications facility at or near this immediate location will result in the continued existence of inadequate network capacity and gaps in service in this area. Without the proposed facility, Verizon Wireless will be unable to provide reliable wireless communication services in this area of the Town; therefore, Verizon Wireless respectfully requests that the Town of Fairhaven act favorably upon the proposed facility.

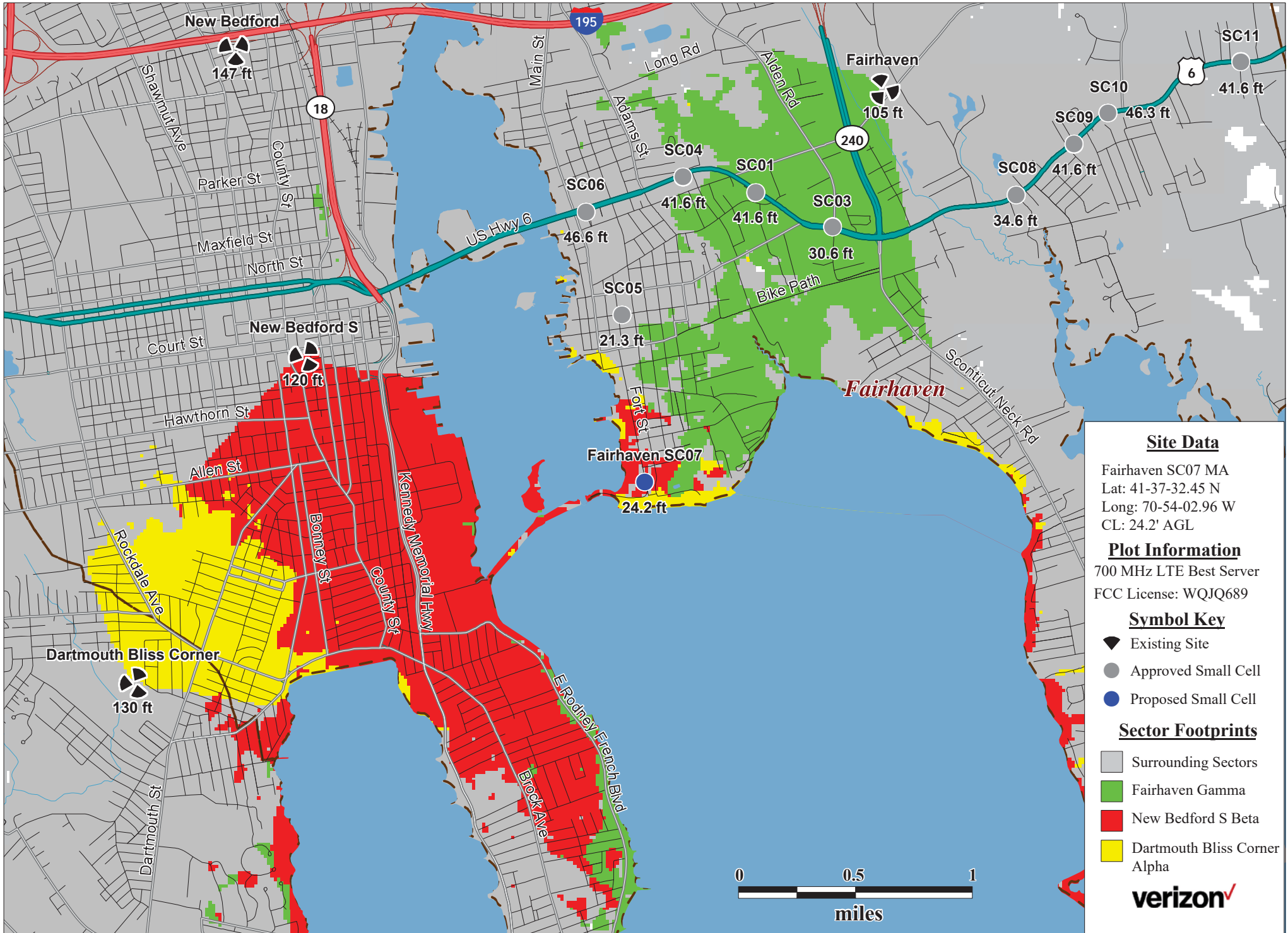
Signed and sworn under the pains and penalties of perjury February 25<sup>th</sup>, 2019.



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Keith Vellante  
Radio Frequency (RF) Engineer  
C Squared Systems, LLC  
65 Dartmouth Drive  
Auburn, NH 03032

Fairhaven SC07 MA - Existing/Approved 700 MHz LTE Sector Footprints (Macro Sites)



**Site Data**

Fairhaven SC07 MA  
 Lat: 41-37-32.45 N  
 Long: 70-54-02.96 W  
 CL: 24.2' AGL

**Plot Information**

700 MHz LTE Best Server  
 FCC License: WQJQ689

**Symbol Key**

- Existing Site
- Approved Small Cell
- Proposed Small Cell

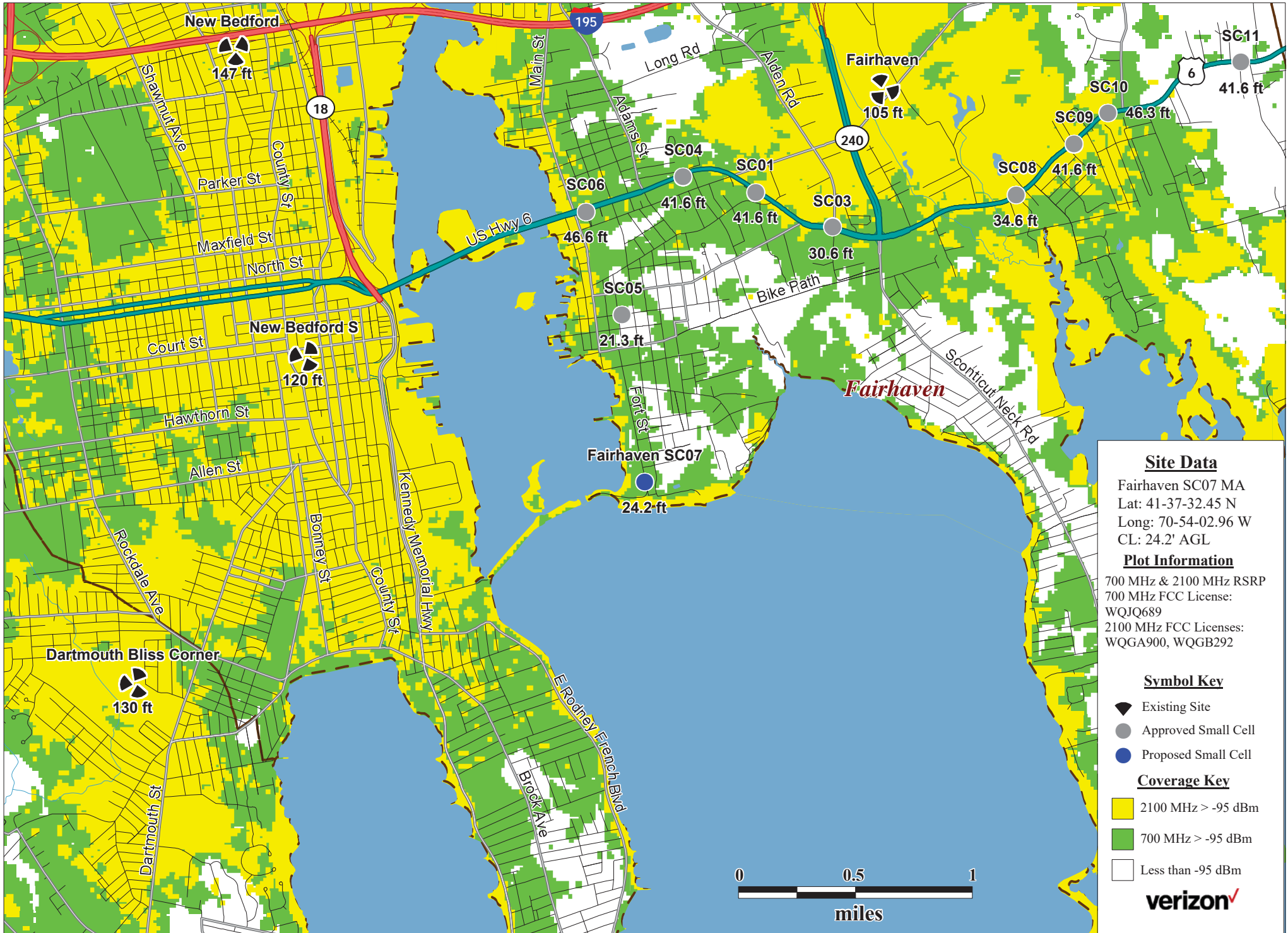
**Sector Footprints**

- Surrounding Sectors
- Fairhaven Gamma
- New Bedford S Beta
- Dartmouth Bliss Corner Alpha





Fairhaven SC07 MA - Existing/Approved 700 MHz & 2100 MHz LTE Coverage (Macro-Sites)



**Site Data**  
 Fairhaven SC07 MA  
 Lat: 41-37-32.45 N  
 Long: 70-54-02.96 W  
 CL: 24.2' AGL

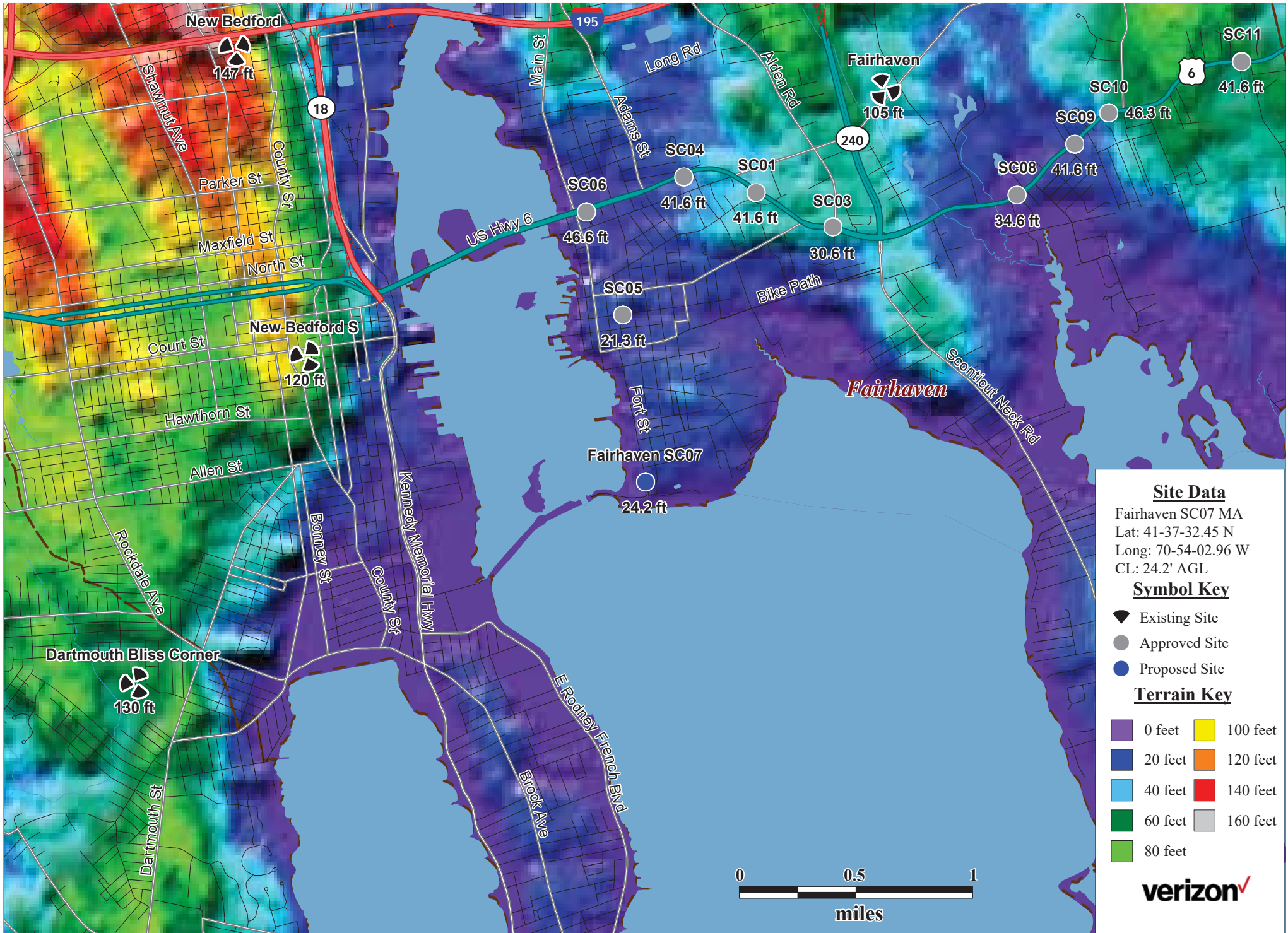
**Plot Information**  
 700 MHz & 2100 MHz RSRP  
 700 MHz FCC License: WQJQ689  
 2100 MHz FCC Licenses: WQGA900, WQGB292

**Symbol Key**  
 Existing Site  
 Approved Small Cell  
 Proposed Small Cell

**Coverage Key**  
 2100 MHz > -95 dBm  
 700 MHz > -95 dBm  
 Less than -95 dBm

**verizon**

Fairhaven SC07 MA - Area Terrain Map





## **Exhibit 6**

# **“Supplement to RF Affidavit”**



August 27, 2019

Fairhaven Planning Board  
Town Hall  
40 Center Street  
Fairhaven, MA 02719

**SUBJECT: 6 FORT STREET – VERIZON SMALL CELL ANTENNAS**

Members of the Planning Board:

This correspondence and attachments are to supplement the RF affidavit, dated 2/25/2019 and submitted with the original application, to provide additional information and RF coverage maps to help further explain the need for the proposed small cell installation at the above referenced location.

As explained in that affidavit, Verizon is licensed by the FCC to operate within multiple frequency bands – 700 MHz, 850 MHz (Cellular), 1900 MHz (PCS), and 2100 MHz (AWS). In general, and with all else being equal, the lower frequency bands (700 & 850 MHz) tend to propagate further and cover a larger area than the higher frequency bands (1900 & 2100 MHz).

At present in the Fairhaven area, Verizon has deployed its LTE network across both upper and lower frequency bands on its macro-site facilities, primarily in the 700 MHz and 2100 MHz bands. This allows for a broader base of coverage provided at 700 MHz, and additional network capacity at the 2100 MHz layer. The proposed small cell (and most other small cells in the area) are designed to operate at the higher frequency bands to leverage the greater bandwidth available at those FCC licenses. The following maps attached hereto show both the 700 MHz layer and the 2100 MHz layer of the macro-sites and proposed small cell site. It should be noted that the computer modeling tool and underlying databases are not particularly suited to accurately model small cells due to their low antenna height relative to the surrounding buildings and trees. As such, the coverage of the small cell should be considered a rough approximation. The small cell coverage modeling has been included to help demonstrate the need and benefit of this facility, with an understanding of the inherent modeling limitations.

Below is a brief description of each additional map attached hereto:

- “Fairhaven SC07 MA – Existing/Approved 2100 MHz LTE Sector Footprints” depicts the areas primarily served by the sectors of the surrounding Verizon macro-site facilities based on the 2100 MHz configurations. This map is similar to the first map included with the original RF Affidavit except that it presents the footprints of the 2100 MHz layer rather than the 700 MHz layer. As expected, since the sector footprint maps are based upon equal power boundaries, the 2100 MHz footprints appear very similar to the 700 MHz footprints. Please note that the outer parts of each sector footprint may include areas that presently have signal strength below the targeted value required for reliable service to Verizon customers. The fact that low-level signal may reach these areas does not mean that these areas experience adequate coverage. These unreliable areas of low signal level can impose a significant capacity burden on the sites primarily serving the area.
- “Fairhaven SC07 MA – 2100 MHz LTE Sector Footprints with Proposed SC07” shows the composite coverage with an approximation of the proposed small cell footprint shown in magenta. As shown here, the small cell will help to absorb/offload users located nearby the Fort Phoenix State Reservation, which is also towards the edge of the macro-site footprints. The stronger coverage and added network capacity will improve service to users located in the immediate proximity of the small cell, and in turn improve the overall



performance of the macro-sites currently trying to cover this area by enabling them to better serve users located elsewhere in their sector footprints.

- “Fairhaven SC07 MA – Existing/Approved 700 & 2100 MHz LTE Coverage (Macro-Sites)” was included with the original affidavit and again here for convenient reference. As explained in the affidavit, this map depicts the coverage provided by Verizon’s macro-sites in the Fairhaven area. The green and yellow shaded areas represent the minimum desired level of coverage for this area for the 700 MHz and 2100 MHz network layers, respectively. As indicated above, deployment of LTE across multiple frequency bands provides greater bandwidth for the LTE services and allows Verizon to deliver greater throughput and capacity on its network. Subscribers located within strong coverage areas of both frequency bands will also experience better service and faster download speeds by utilizing resources on both layers. Because of the superior propagation characteristics of 700 MHz relative to 2100 MHz frequencies, the 2100 MHz coverage areas (yellow) are generally contained within the 700 MHz coverage areas (green). As such, the deficient areas of 700 MHz coverage are defined by the unshaded or “white” areas, whereas the deficient areas of 2100 MHz coverage consist of both the green and white areas.
- “Fairhaven SC07 MA – 700 & 2100 MHz LTE Coverage with Proposed SC07” depicts the composite coverage obtained with the proposed small cell, in conjunction with the surrounding macro-sites. As shown here, the proposed site will improve the 2100 MHz coverage layer and improve overall service to the areas in the immediate vicinity of Fort Phoenix State Reservation. As noted on the map and mentioned above, the coverage areas from the small cell should be considered a rough approximation.

To the extent there are any questions related to the additional attachments and explanations of each above, we will attempt to address them at the next scheduled meeting.

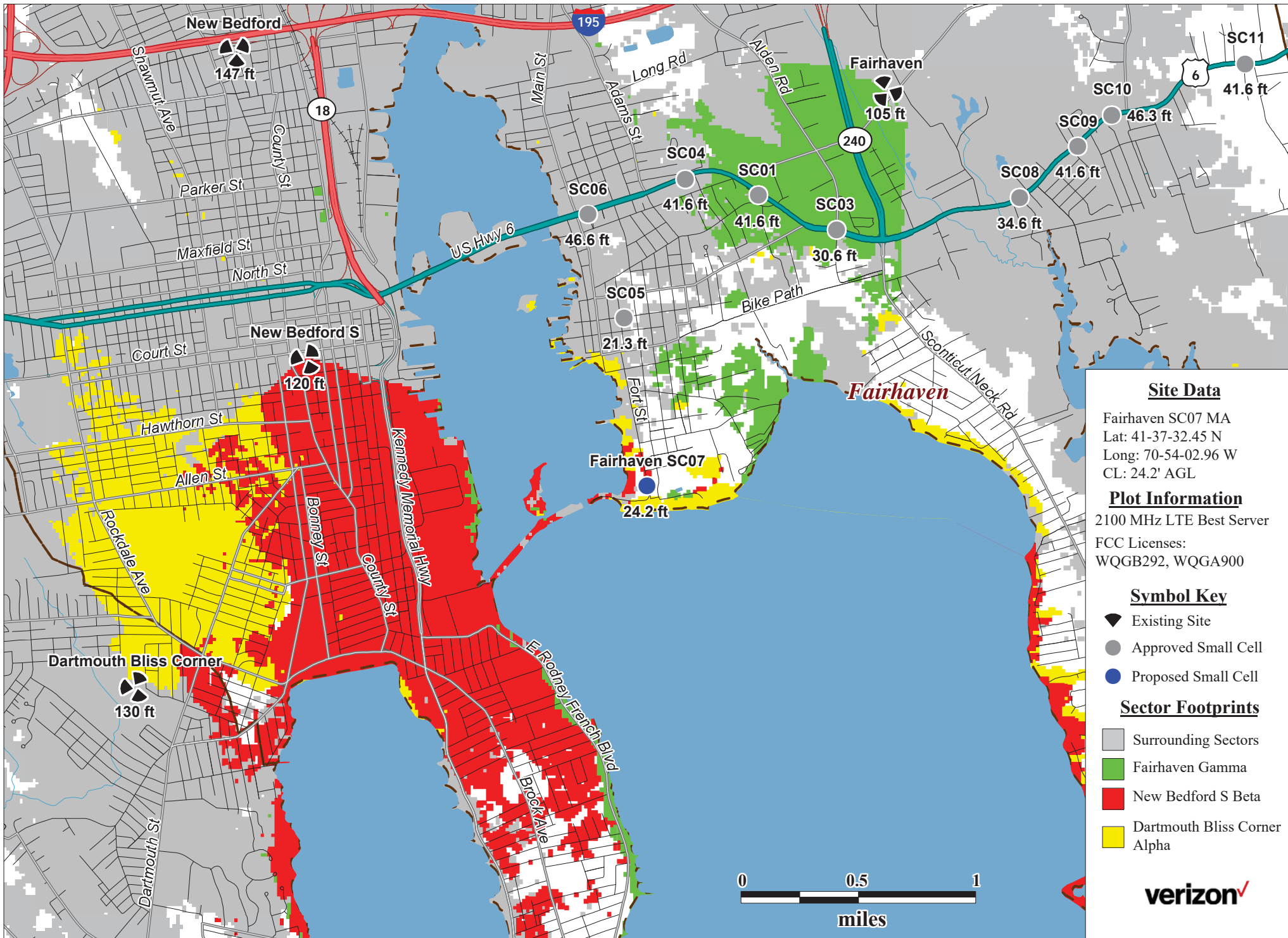
Sincerely,



Keith Vellante  
RF Engineer  
C Squared Systems, LLC  
Contractor to Verizon Wireless

Enclosures (4)

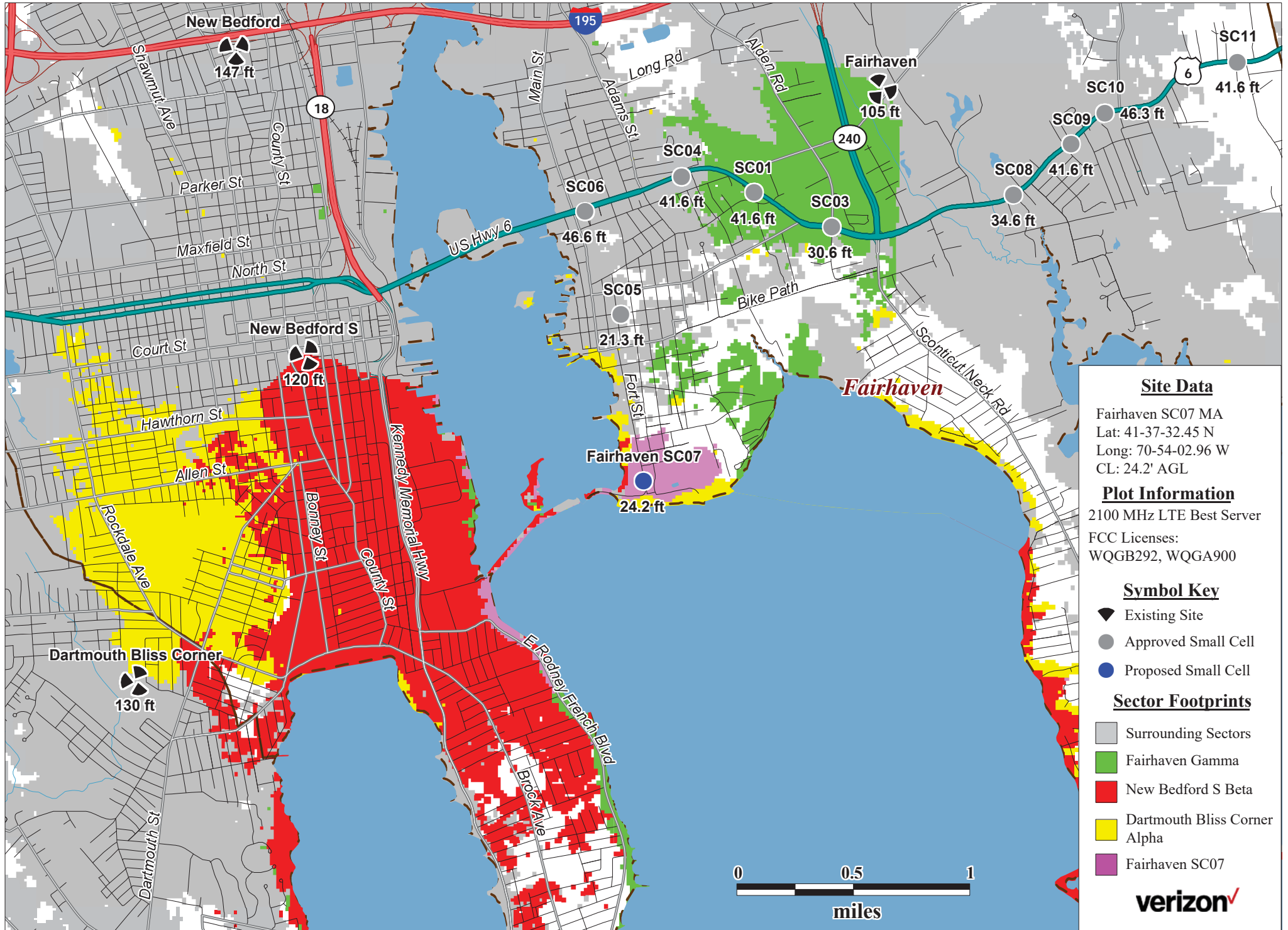
# Fairhaven SC07 MA - Existing/Approved 2100 MHz LTE Sector Footprints (Macro Sites)



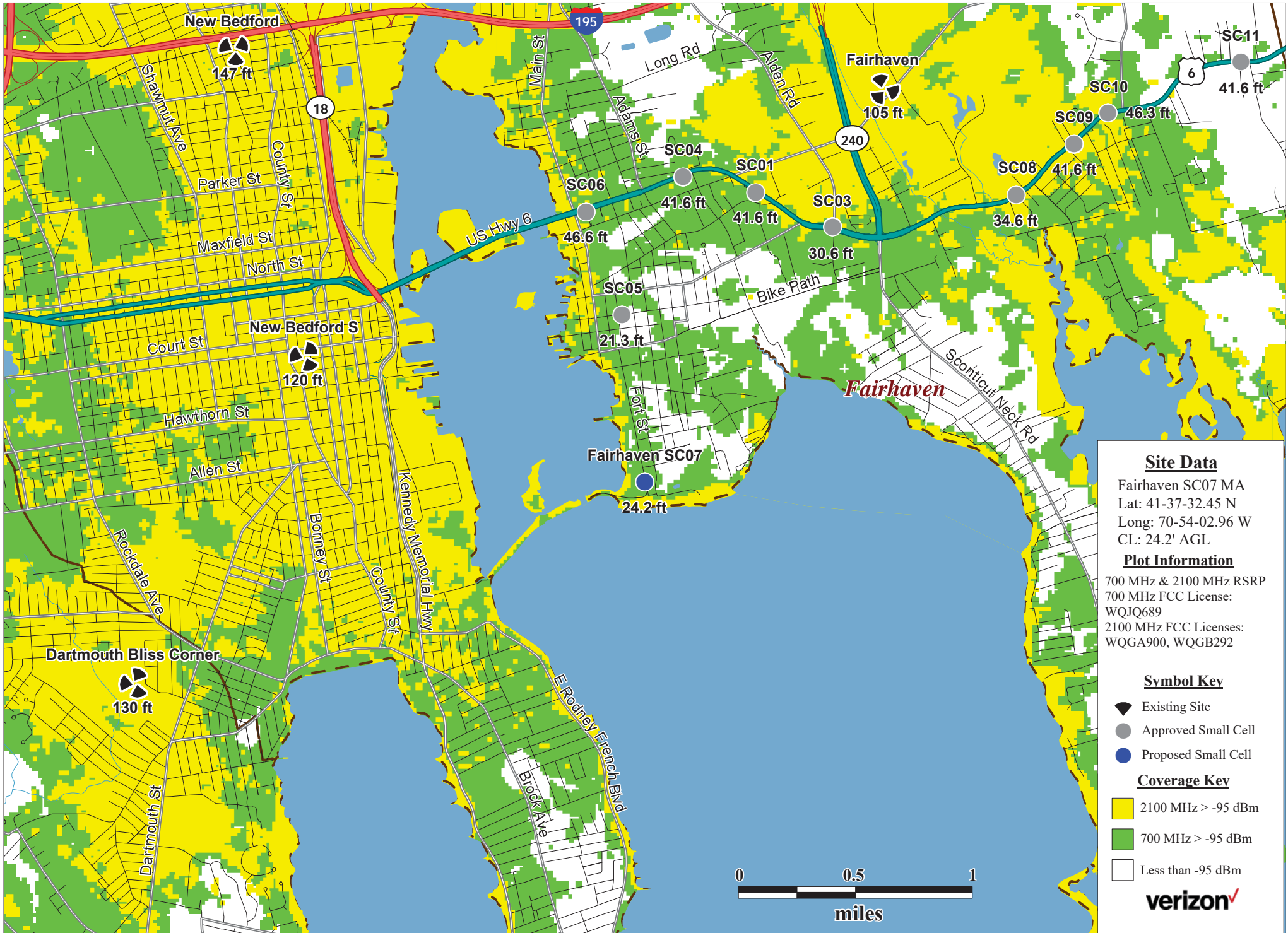


# Fairhaven SC07 MA - 2100 MHz LTE Sector Footprints with Proposed SC07

\*\*\* Small Cell coverage areas should be considered rough approximations due to modeling limitations \*\*\*



Fairhaven SC07 MA - Existing/Approved 700 MHz & 2100 MHz LTE Coverage (Macro-Sites)



**Site Data**  
 Fairhaven SC07 MA  
 Lat: 41-37-32.45 N  
 Long: 70-54-02.96 W  
 CL: 24.2' AGL

**Plot Information**  
 700 MHz & 2100 MHz RSRP  
 700 MHz FCC License: WQJQ689  
 2100 MHz FCC Licenses: WQGA900, WQGB292

**Symbol Key**

- Existing Site
- Approved Small Cell
- Proposed Small Cell

**Coverage Key**

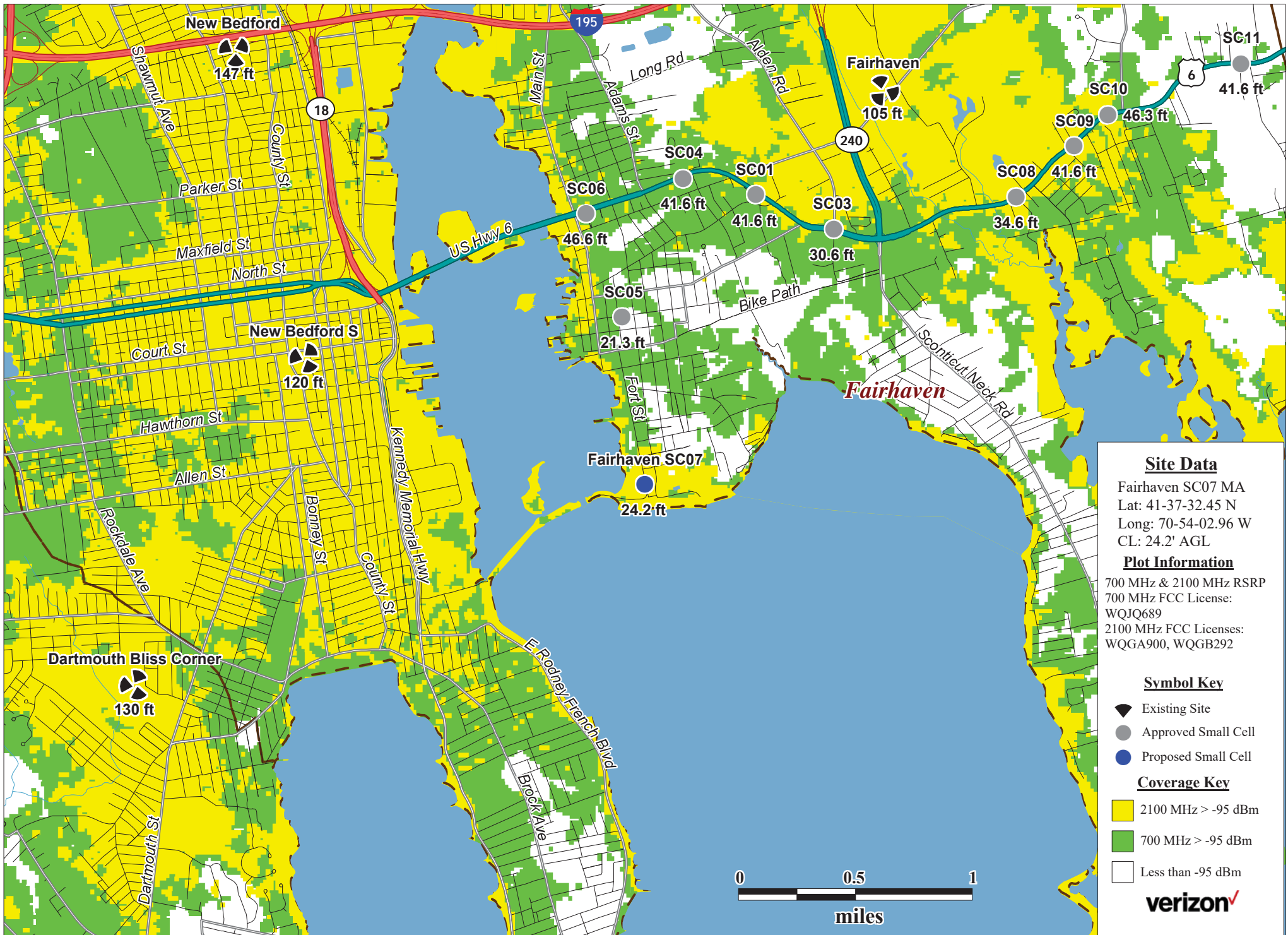
- 2100 MHz > -95 dBm
- 700 MHz > -95 dBm
- Less than -95 dBm

**verizon**



# Fairhaven SC07 MA - 700 MHz & 2100 MHz LTE Coverage with Proposed SC07

\*\*\* Small Cell coverage areas should be considered rough approximations due to modeling limitations \*\*\*



**Site Data**  
 Fairhaven SC07 MA  
 Lat: 41-37-32.45 N  
 Long: 70-54-02.96 W  
 CL: 24.2' AGL

**Plot Information**  
 700 MHz & 2100 MHz RSRP  
 700 MHz FCC License: WQJQ689  
 2100 MHz FCC Licenses: WQGA900, WQGB292

- Symbol Key**
- Existing Site
  - Approved Small Cell
  - Proposed Small Cell
- Coverage Key**
- 2100 MHz > -95 dBm
  - 700 MHz > -95 dBm
  - Less than -95 dBm

