Council Agenda Report

City Council Meeting
08-24-20
Item 6.A.

To: Mayor Pierson and Honorable Members of the City Council

Prepared by: Adrian Fernandez, Principal Planner

Reviewed by: Bonnie Blue, Planning Director

Approved by: Reva Feldman, City Manager

Date prepared: August 12, 2020 Meeting Date: August 24, 2020

Subject: 5G Wireless Technology and Small Cells

RECOMMENDED ACTION: Receive and file report.

FISCAL IMPACT: There is no fiscal impact associated with the recommended action.

WORK PLAN: This item is not included in the Adopted Work Plan for Fiscal Year 2020-2021. Item 4o of the Adopted Work Plan includes updating the City's wireless communication facility ordinance.

DISCUSSION: The matter before the City Council is a brief description of 5G wireless technology and small cells due to public inquiries and questions from residents. Telecom Law firm PC (TLF) currently assists the Planning Department staff in reviewing legal and technical aspects of wireless communications facility applications. Dr. Jonathan Kramer of TLF prepared the attached memo to Council to explain 5G wireless technology and small cells. Dr. Kramer will also give a brief presentation at the City Council meeting and will be available for questions.

The Fiscal Year 2020-2021 Adopted Work Plan includes an update to the City's wireless communications facility ordinance. The update to the ordinance is expected to address new federal regulations applicable to wireless communications facilities.

ATTACHMENT: Memorandum prepared by Dr. Jonathan Kramer, dated July 28, 2020

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MEMORANDUM

TO: **City Council of the City of Malibu, California**
FROM: **Dr. Jonathan L. Kramer**
Date: **July 28, 2020**
Subject: **WHAT IS 5G WIRELESS?**

Dear Mayor Pierson, Mayor Pro Tempore Peak, and Councilmembers Farrer, Mullen, and Wagner:

This short memorandum addresses key points about the nascent deployment of 5G wireless services and provides a backdrop in which to better frame how we got to this point, and to describe likely 5G deployments in Malibu. I write memorandums as both a 30+ year telecommunications engineer, and as a telecommunications attorney working for local governments, including the City of Malibu.

I
Wireless Deployment:
1G through 4G Wireless Deployment

The first cellular network, which we know as 1G--then called Advanced Mobile Phone System ("AMPS")—was deployed in the early 1980s. By the end of the 1980s, over 2 million mobile users would opt for this voice-only service. Cell sites of this era tended to be located on mountaintops and along major transportation routes such as Interstate Highways. By the early 1990s, 2G—the first partially digital cellular service brought the number off mobile users to about 44 million in 1996. They were served by about 50,000 macrocell (large) cell sites. Two examples of cell sites of this era are shown in the Appendix at Figure 1 and Figure 2. While still an analog voice service, 2.5G also included early forms of text messaging.

3G, deployed in the early 2000s, continued the transition of analog cellular to fully digital and opened the door to the first all-digital Personal Communications Service ("PCS") competitors to the two legacy cellular providers licensed by the FCC to serve each market. PCS providers initially included T-Mobile and Sprint. Subscribership of cellular and PCS providers grew to more than 50 million subscribers from about 125,000 cell sites. Two examples of cell sites in this era are shown in the Appendix at Figure 3 and Figure 4.

Now in mid-2020 the world is standardizing on an international standard of signal modulation called "Long Term Evolution" ("LTE") which is deployed for 4G and 5G. LTE uses various signal modulation techniques to squeeze more information into the bits and bytes digitally transmitted over-the-air. In 2018 there were nearly 350,000 cell sites, and over half the wired-telephone users in the U.S. had given up their landline phones in favor of being wireless-only households. Today the number of cell site is closer to 375,000, but "small cell" cell sites are being added at brisk pace. Some examples of 4G wireless sites are shown in the Appendix at Figures 5, 6, and 7.

II
5G Wireless Deployment

A
More Bands of Services

With all of the groundwork set out, we now turn to 5G, the fifth generation of cellular wireless services. 5G most greatly differs from 4G not in the way the signals are formed (the modulation), but rather by the greater number higher-band frequencies that are allocated for carriers' use. Consider this automobile analogy: while 4G developed the 'fast engines' [digital] to put into cellular phones…the cars…, 5G adds many more parallel highway lanes for those fast cars to use. Continuing the analogy, at 8 a.m. on a (non-Covid) weekday, the eastbound lanes of I-10 nearing the I-405 interchange become jammed with too many cars and trucks trying to use too few lanes on both freeways. Metaphorically, 5G adds many more parallel lanes (bands of services) on both freeways for more cars and trucks headed in the same direction at the same time. Better yet, 5G permits wider 'vehicles' (here, for example, users downloading HD movies, which we will call wide-load trucks) to use more than one eastbound lane at a time. This sharing of two lanes is called 'signal bonding' and it is where several frequency bands can be temporarily connected to serve a high bandwidth need such a downloading a movie shot in 4K, then un-bonding the bands to return the use of the 'lanes' to lower-demand users, such as those typing emails or browsing the Internet.

Higher bandwidth users are expected to include self-driving cars using real-time data for navigation and collision avoidance; tele-medicine (heavy users of real-time video images); and ever increasing amounts of streaming videos.

The physics of higher frequency bands have a benefit of more available bandwidth (many more side-by-side highway lanes in our analogy), but they also have some downsides. Higher frequencies do not travel nearly far as do lower frequencies. For a different analogy, low frequency AM radio stations can be heard hundreds of miles away, but higher frequency FM radio stations cannot be heard nearly as far and are often limited to near-line of sight from the transmitter. For the reason, FM stations covering large geographic regions commonly use more than one transmitter. As an example, KCRW-FM is heard in Los Angeles on 89.9 MHz, but it is

heard in Oxnard on 89.1 MHz where KCRW is retransmitted to expand the coverage area of that station.

The bottom line for 5G is that it is not a new form of radio modulation, but rather a means of using modern transmission techniques on more and higher bands in varying combinations to provide greater bandwidth of the spectrum for current and new applications, and more users simultaneously accessing that spectrum for those increasing uses.

B
Small Cells, Existing Site Modifications, and the FCC Shot Clocks

To aid in the coverage and capacity demands of 4G, and the expanding 5G deployment, the wireless industry is moving to the use of 'small cells.' Those are cell sites defined by the FCC as having 28 cubic feet or less in equipment cabinet volume, and antennas that do not exceed 3 cubic feet in volume. The FCC has created special rules for small cells that make it very difficult for a municipality to deny the installation applications, and the Commission also adopted rules to force quick action on those applications by local government. Similarly, the FCC adopted rules in the "Spectrum Act" that require that local government approve certain types of qualifying modifications to existing cell sites. In June 2020, the FCC expanded on the meanings and scope of projects that constitute an application that mandates local government approval. Similarly, the Commission also requires local government to quickly act those Spectrum Act applications.

The Commission requires local governments to approve qualifying small cell applications and Spectrum Act applications within 60 days after the application is presented to the jurisdiction.

As discussed above, 5G providers require more sites to provide higher-frequency, higher speed signal coverage. A result of the use of higher frequencies is that those higher frequency transmissions require physically smaller antennas. For some examples of 5G cell sites already deployed in Santa Monica, please see the Appendix at Figure 8 and 9. For a comparison of an existing 5G site adjacent to a 4G site in Los Angeles, please the Appendix at Figure 10.

III
Municipal Responses to FCC Rules Changes

The FCC has made various rulemaking docket decisions and issued various declaratory rulings to help the wireless industry more rapidly deploy 4G and 5G. That rapid deployment is supported by Congressional direction and policy through the Spectrum Act and is operationalized by the FCC in its various Section 6409(a) rulings and its small cell rules, all of which to some degree restrict or preempt local decision making discretion in cell siting issues. For example, the Spectrum Act (as repeatedly interpreted by the FCC) takes away portions of local authority in considering whether to approve cell site modifications and expansions. The Commission's small cell rules make it very difficult for local governments to deny or condition those classes of site applications other than for some aesthetic issues. The FCC's shot clock rules, coupled with

California's Assembly Bill 57 (2015), deem almost all wireless projects automatically approved for construction if a local government fails to make a decision on a wireless site application within the shot clock windows established by the FCC.

Further, and tacking on to the FCC shot clock rules that automatic approve projects not timely acted upon by a local government, the Commission has further ruled that any attempt by a local government to impose any form of wireless siting moratorium is without effect on the shot clock. Essentially, a local government may adopt a moratorium, but the shot clocks and automatic approvals are unaffected by the local moratorium.

Together, these rules, regulations, and interpretations have caused many jurisdictions to modify their local wireless ordinances to (among other things) adopt aesthetic standards for small cells as permitted by the FCC; to add automatic safety conditions of approval to attach to projects deeded approved by operation of law; and to revamp their wireless applications to better comply with the changing wireless regulatory landscape.

IV
5G Wireless
Radio Frequency Safety Considerations

This memorandum would not be complete without commenting on public concerns for 5G radio emissions. Initially, it is vital to understand Malibu's legally-constrained and limited role in this regard.

In 1996 Congress passed and the President signed into law the Telecommunications Act of 1996 (the "1996 Act"). Within that law is Section 332(c)(7)(vi), which says in its entirety:

> No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the [Federal Communications] Commission's regulations concerning such emissions.

Congress, in the 1996 Act, delegated the sole task of creating national RF emissions safety standards to the FCC, which the FCC adopted a year later. This is called 'field preemption' inasmuch as local governments are not allowed to adopt their own RF emissions safety standards, and they cannot even adopt the FCC standards as their own. Not surprisingly, this portion of the 1996 Act came out of the fact that various local governments around the country had adopted their own patchwork of local and differing RF emissions safety standards. Radio waves do not care about jurisdictional boundaries, thus Congress's adoption of Section 332(c)(7)(vi) took local governments out of the RF emissions safety arena with a single exception: Local government can (and Malibu does) determine for each cell site project whether the proposed emissions related to a cell project are actually planned to comply with the FCC' national rules.

Malibu is barred from considering whether any current or future radio emissions are safe. A determination of RF emissions safety is a job solely assigned by Congress to the FCC. This is why, even when faced by very concerned citizens, a local jurisdiction cannot deny a cell site project if the only basis for the denial is due to public concerns about the RF emissions. That is the settled law, and it is why any opinion regarding whether 5G (or any other "G") is safe is outside the bounds for a local government. Any change to the existing RF safety rules, and limitations on local governments, requires either a change in the law by Congress, or some FCC action.

At the end of the day, under the 1996 Act (as repeatedly narrowed by FCC interpretations) a local government jurisdiction is in the business of assessing whether a cell site project meets the legally-adopted and legally-acceptable aesthetic standards of the jurisdiction, and only determining whether a cell site project complies with the national FCC RF safety rules.

/jlk

APPENDIX

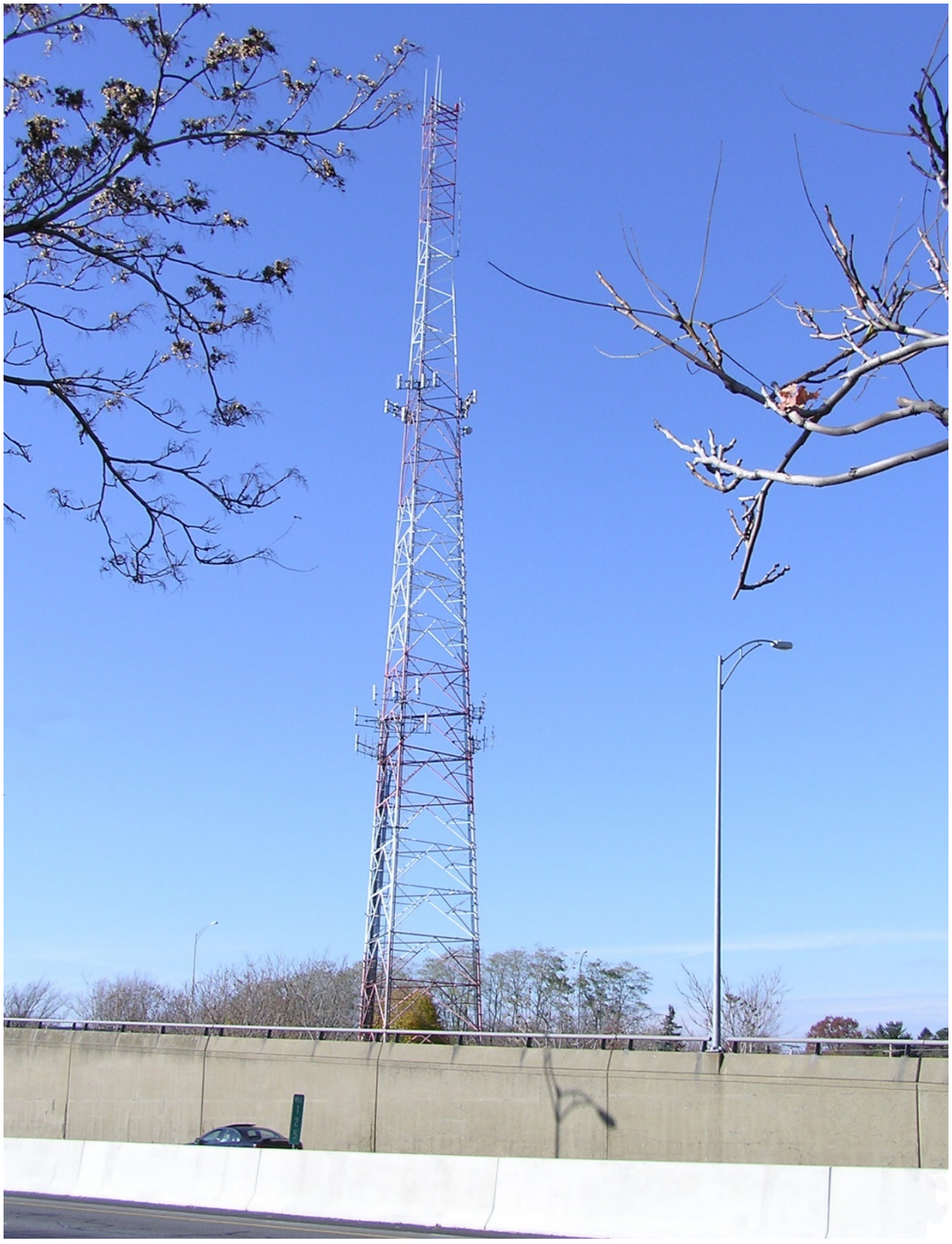

Figure 1: Self-supporting lattice tower supporting multiple cellular carriers (Newton, MA). Photograph by Dr. Jonathan Kramer.

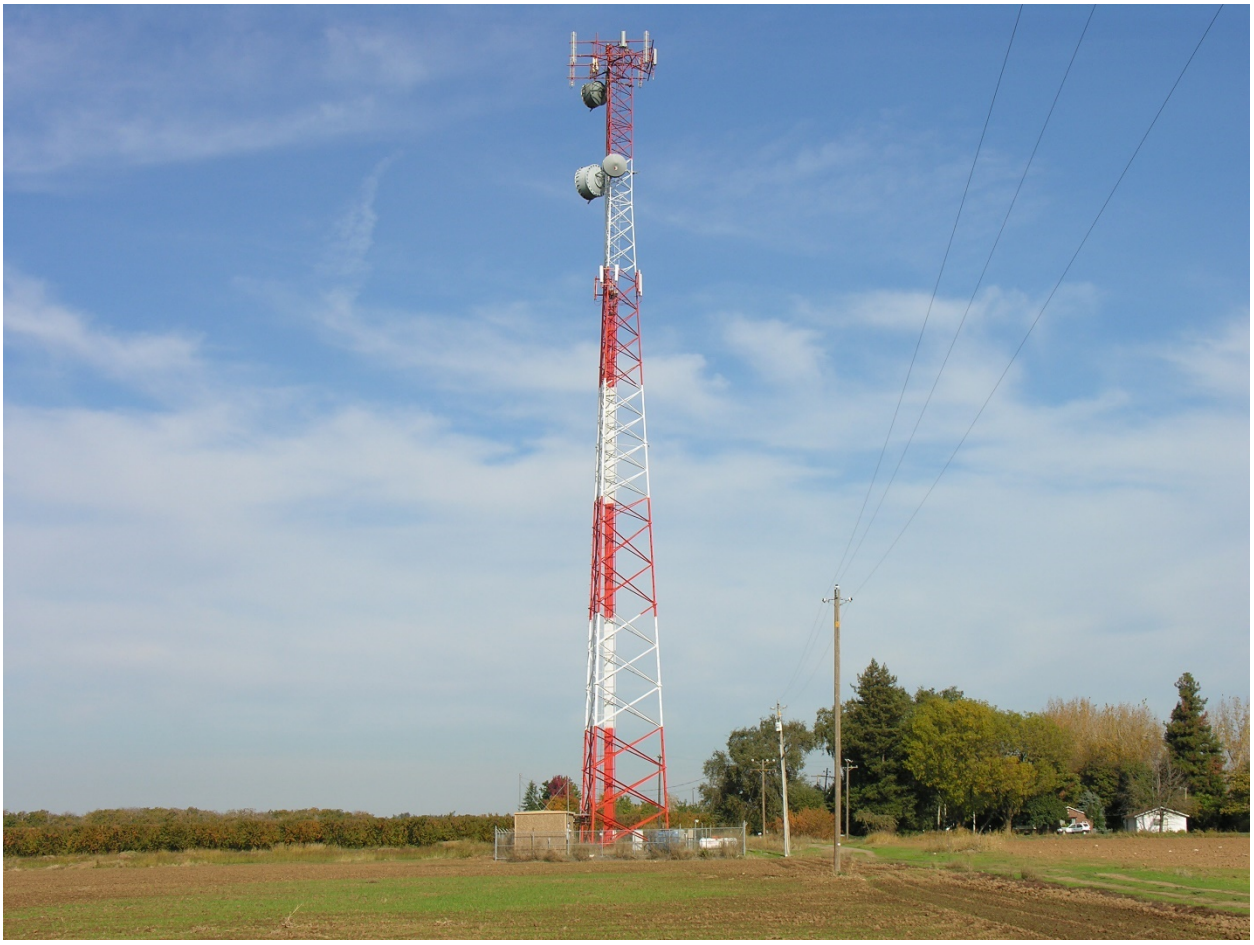

Figure 2: Self-supporting lattice tower supporting T-Mobile antennas (Gridley, CA). Photograph by Dr. Jonathan Kramer.

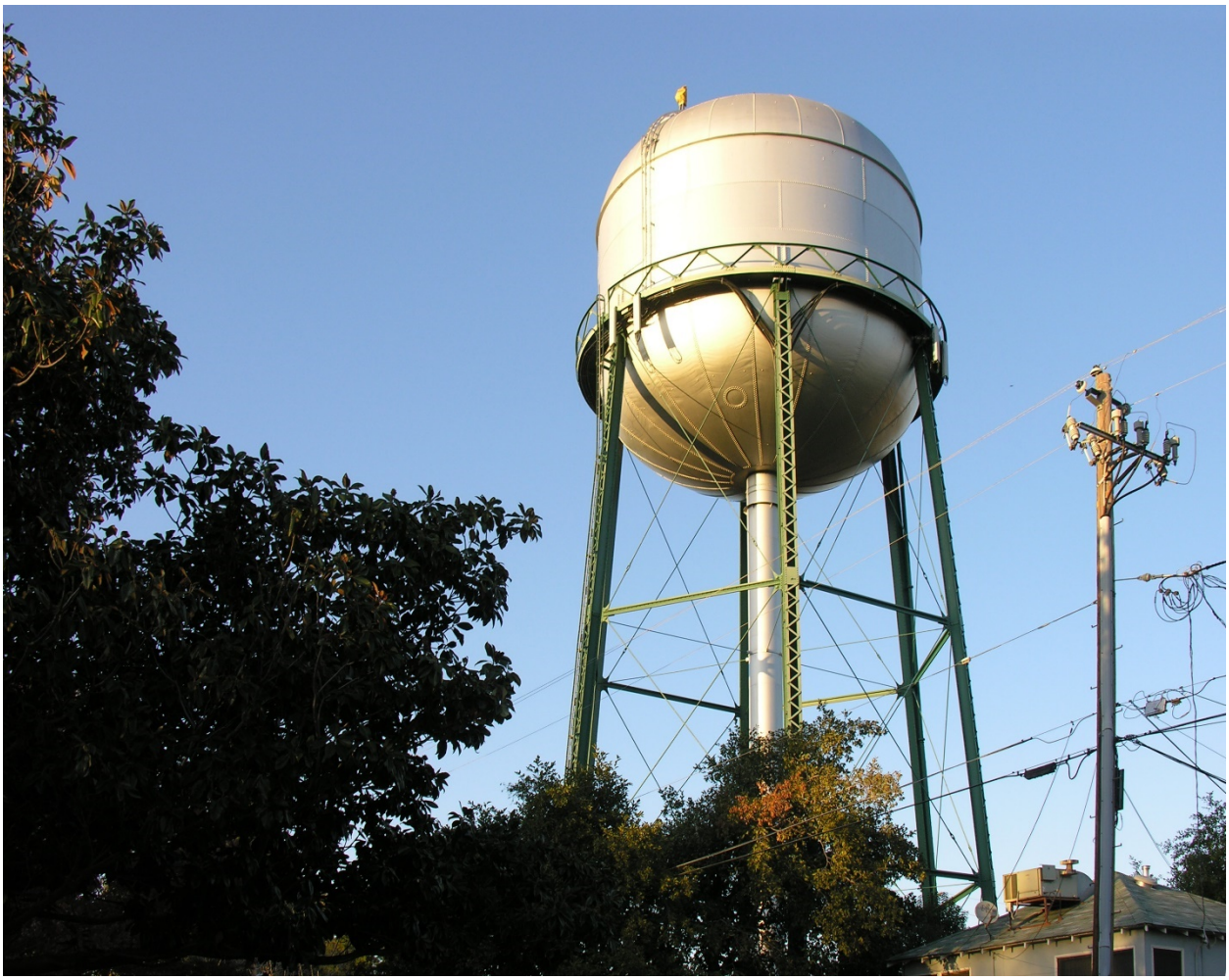

Figure 3: Lattice water tank supporting T-Mobile antennas (Chico, CA).
Photograph by Dr. Jonathan Kramer.

Figure 4: Hotel supporting various cellular antennas on the rooftop and sides (Torrance, CA). Photograph by Dr. Jonathan Kramer.

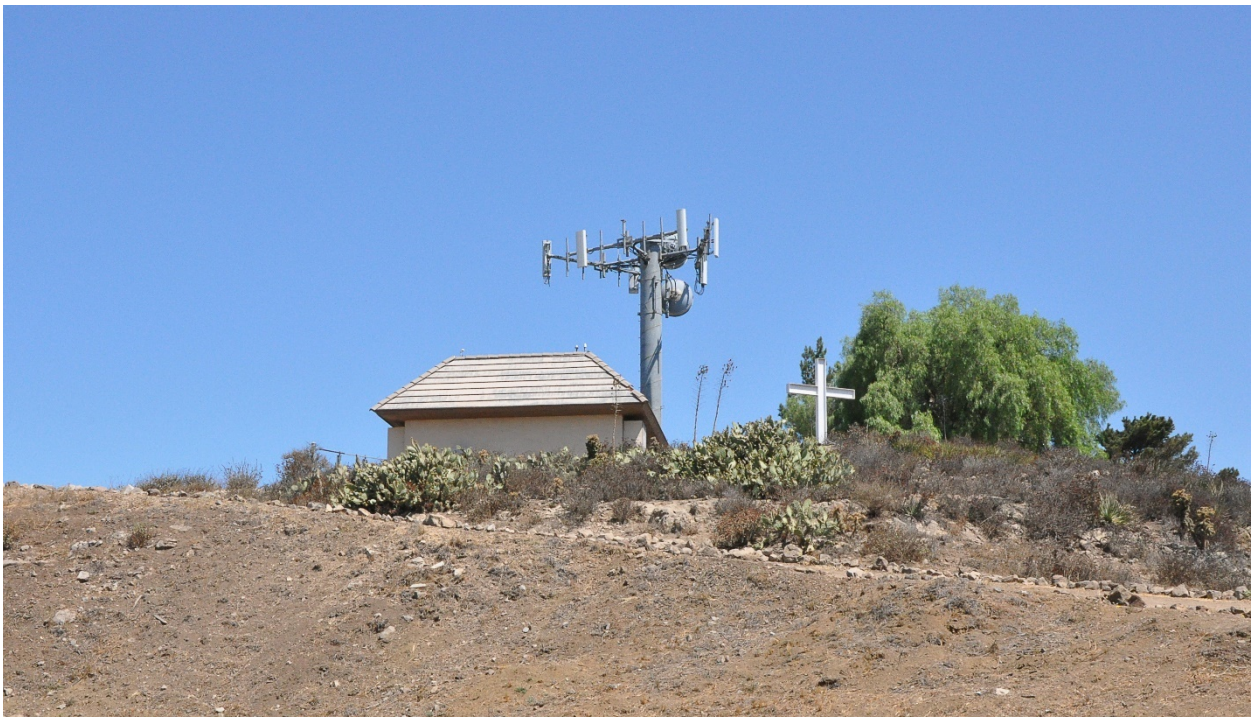

Figure 5: Multi-carrier 4G site (Thousand Oaks, CA). One carrier on the stub tower, and one with antennas inside the roof of the building. Photograph by Dr. Jonathan Kramer.

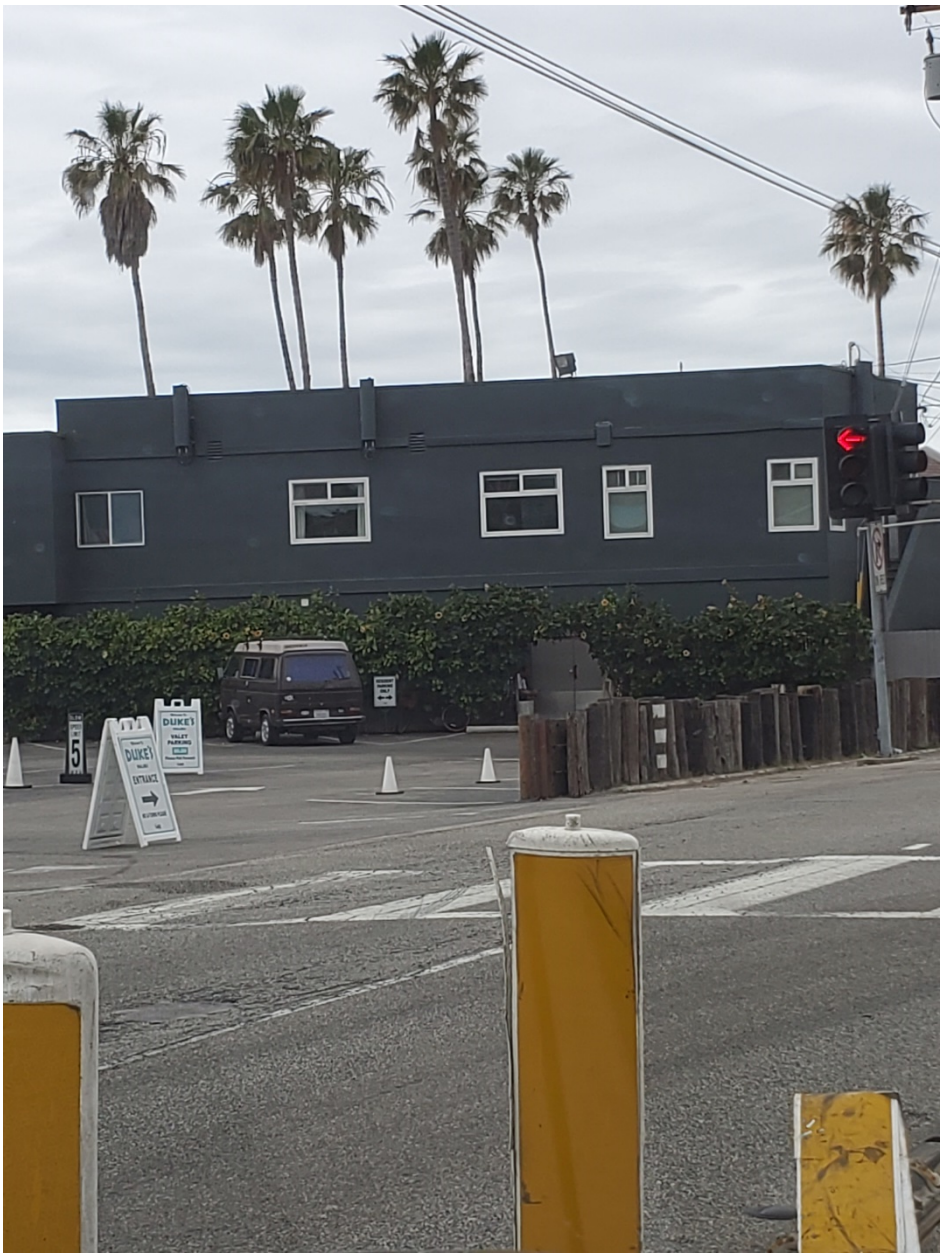

Figure 6: Single-carrier 4G site (Malibu, CA). Photograph by Dr. Jonathan Kramer.

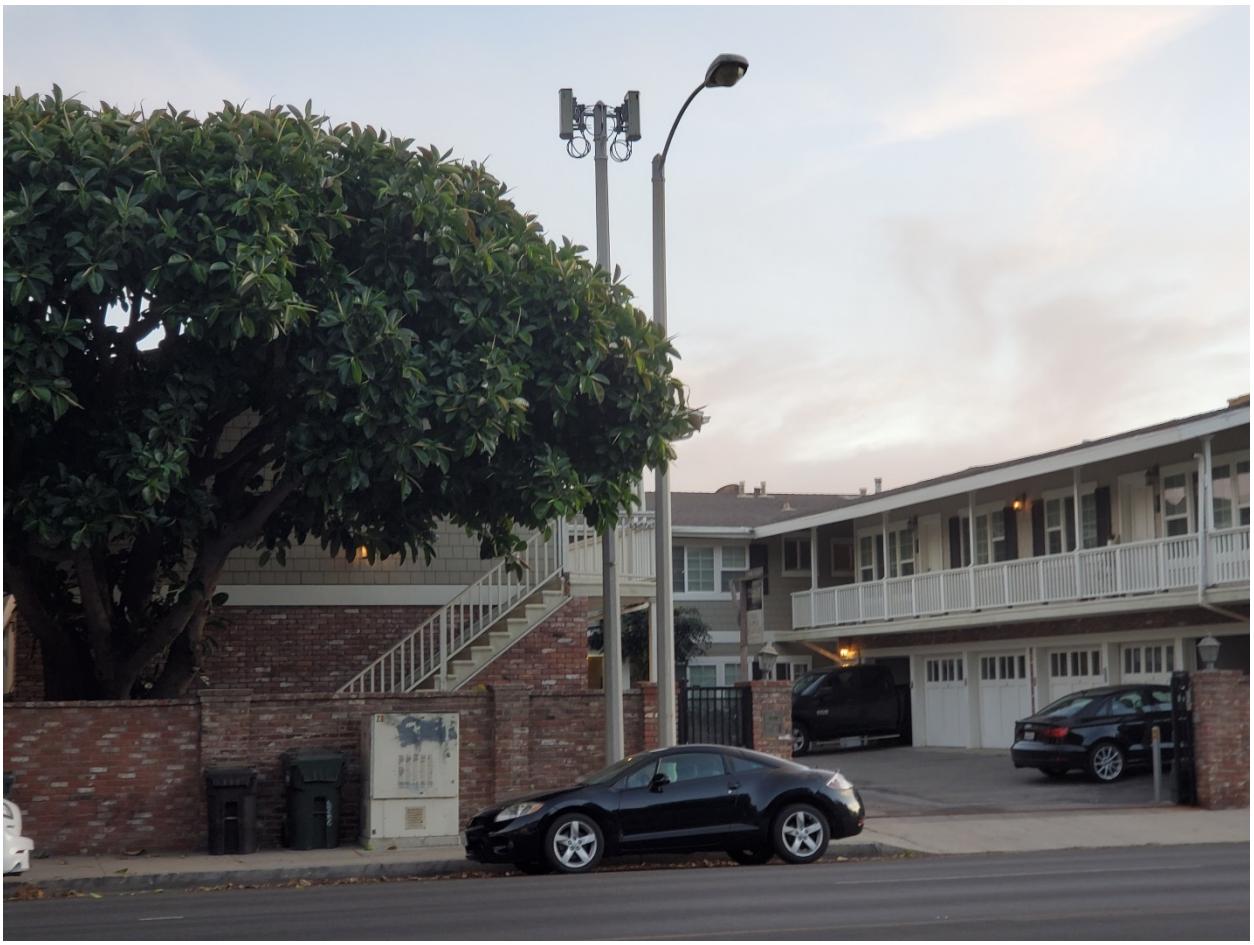

Figure 7: Single-carrier 4G site on a freestanding pole in the right of way (Malibu, CA). Photograph by Dr. Jonathan Kramer.

Figure 8: Single-carrier, single-band, three-sector 5G site on an existing traffic signal pole in the right of way (Santa Monica, CA). Photograph by Dr. Jonathan Kramer.

Figure 9: Single-carrier, single-band, two-sector 5G site on an existing traffic signal pole in the right of way (Santa Monica, CA). Photograph by Dr. Jonathan Kramer.

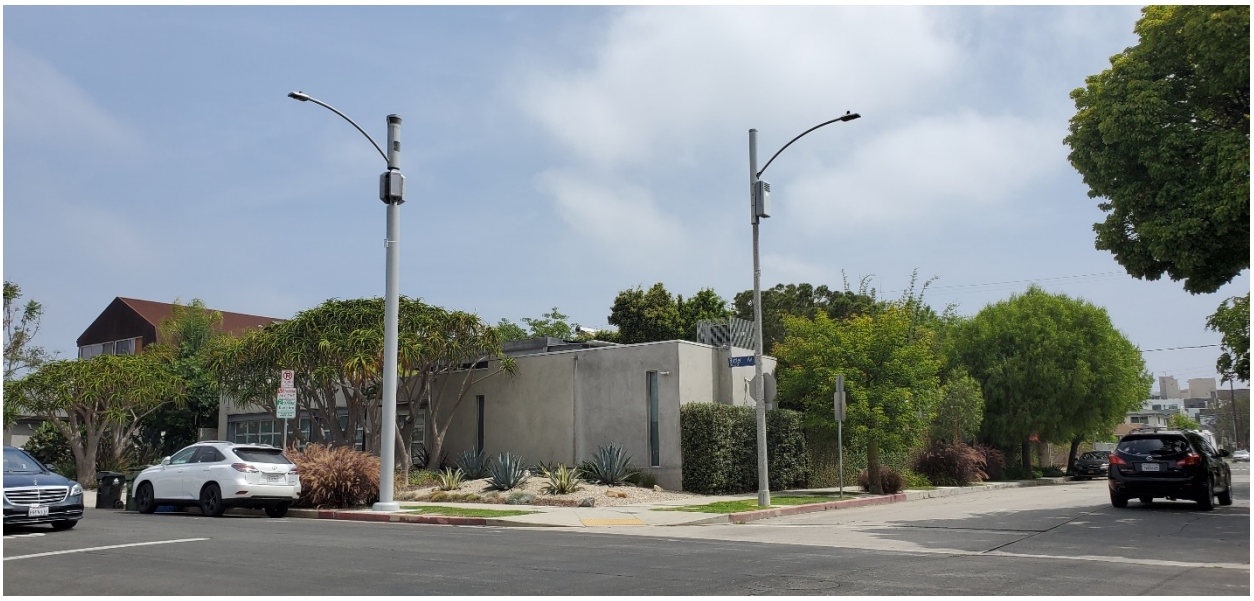

Figure 10: Single-carrier, two-band 5G site (left) on a light standard adjacent to a single-band 4G site (right) both in the right of way (Los Angeles, CA). Photograph by Dr. Jonathan Kramer.