Summary Title: Crown Castle Downtown Wireless Project

Title: Crown Castle Downtown Wireless Project [15PLN-00140]: Request by Crown Castle, on behalf of Verizon Wireless, for Architectural Review and Conditional Use Permit for a small cell distributed antenna system comprised of 19 pole-mounted wireless communications facilities (antennas and equipment) within the University Avenue downtown area. Antennas would be placed on street light poles and associated equipment would be located in above-grade cabinets on the sidewalk. Environmental Assessment: The project is categorically exempt from the provisions of the California Environmental Quality Act (CEQA) per section 15303 of the CEQA Guidelines

From: City Manager

Lead Department: Architectural Review Board

Recommendation
Staff recommends the Architectural Review Board (ARB) recommend approval of the application for 19 wireless communication facility (WCF) installations, based upon the findings and conditions of approval described in the Attachments B and C.

Background
On April 14, 2015, Crown Castle submitted an application on behalf of Verizon Wireless for Architectural Review of a small cell distributed antenna system comprised of 19 wireless communications facilities, comprised of streetlight pole-mounted antennas and at-grade equipment cabinets, within the University Avenue downtown area. For purposes of the review requirements, the project was determined to be a new installation and, according to Palo Alto Municipal Code (PAMC) Section 18.42.110, requires approval of both an Architectural Review application and a Conditional Use Permit (CUP), followed by issuance of encroachment permits.

Crown Castle is subject to a master license agreement that allows them to locate antennas and equipment on City street light poles and utility poles. The Council approved the standard license agreement on July 25, 2011 (CMR #1756).¹

¹ In its “proprietary capacity” as owner of the street light poles, the City has
Prior to the submittal of this application, Crown Castle conducted a community outreach meeting on April 6, 2015 at the Garden Court Hotel on Cowper Street. The applicant reported that few members of the community showed up.

Project Description
The proposed design of a typical installation includes two antennas placed on a light pole, just below the light arm, and the installation of an at-grade cabinet box. The typical proposed design is shown in Figure 1. Each antenna would be 12” wide x 24” tall x 7” deep. The light poles range in height from 22’-4” to 26’-9”, with the majority (approximately 80%) being 22’-4” tall. The proposed equipment cabinet is designed to look like a U.S. postal storage box and is 4’-8” tall and 2’-9” square. The placement of the equipment box is dependent upon the existing infrastructure, proximity to street trees and other street elements, and location of on-street parking spaces. Each site has been carefully reviewed by staff to assure there are no conflicts with existing sidewalk conditions and access to parking spaces.

The antennas placed on each pole will be finished to match the respective light pole color and each cabinet proposed would be dark green.

Each installation is designed to accommodate two wireless service providers, with one currently being Verizon Wireless; a second carrier has not been established yet. The design to accommodate two carriers was pursued by Crown Castle after receiving that direction from the ARB at an earlier Study Session.

Installation sites are located on street light poles within City-owned sidewalks adjacent to the following locations listed below and are shown on the attached location map (Attachment A).

1. 150 University Ave/on High
2. 185 University Ave/on Emerson
3. 235 University Ave/on Ramona
4. 281 University Ave/on Bryant
5. 339 University Ave/on Florence
6. 400 University Ave/on Waverley
7. 400 Hamilton Ave
8. 300 Hamilton Ave
9. 635 Bryant St
10. 158 Hamilton Ave
11. 100 Hamilton Ave
12. 379 Lytton Ave
13. 181 Lytton Ave
14. 245 Lytton Ave
15. 265 Lytton Ave
16. 325 Lytton Ave
17. 451 Lytton Ave
18. 380 Hamilton Ave
19. 220 Hamilton Ave

additional ability to direct which light poles may be utilized for this project.
Installations #10 and #19 include an alternative design that places all the equipment on the pole and is shown in Figure 2. Staff asked for this design alternative because the sidewalks in these two areas may feel too narrow with the installation of the at-grade equipment boxes; the placement of the boxes provides a five foot minimum sidewalk clearance as required by Public Works Engineering. The pole-mounted equipment would be housed within one 21.74” wide x 60” tall x 16” deep enclosure that would be hung 10 feet above grade and placed at 90 degrees to the street (it would not face the street or the building, but “look” down the street). See Sheet P10.8 of the plans for more details (Attachment H).

Previous Review
In a Study Session review, Crown Castle has presented design concepts to the ARB once on June 19, 2014 and again on February 2, 2015. At the last review, the ARB was presented with three design concepts, one that had the equipment concealed within an expanded pole base, a 100% pole-mounted installation, like Figure 2, and lastly, a design like the current proposal shown above in Figure 1. The five ARB members expressed various opinions on the three designs, but the mailbox design appeared to have stronger support.

Discussion

The Spectrum Act and Future Build-Out
The latest federal law governing wireless communications facilities (WCF) was adopted in 2012 as part of the 2012 Middle Class Tax Act. This federal legislation contained Section 6409, now referred to as the Spectrum Act, and codified at 47 U.S.C. § 1455. The Spectrum Act was intended to facilitate the telecommunication industry’s rapid deployment of wireless infrastructure by requiring local governments to approve any application that seeks to modify an existing wireless telecommunication facility that does not “substantially change” the existing facility. In April 2015, additional FCC (Federal Communications Commission) procedural rules went into effect that included necessary definitions, processing requirements, timelines and remedies for applications that seek to modify an existing wireless telecommunication facility in accordance with the Spectrum Act.

Once an WCF site is approved, Section 6409 of the Spectrum Act under certain circumstances permitmodifications of an existing wireless base station that does not substantially change the physical dimensions of such tower or base station or defeat camouflage requirements.² In the

² The Spectrum Act does not currently apply to city owned light poles, but this area is still evolving and in an abundance of caution, City staff believes it is prudent to understand the build out potential of this project.
case of this project, each existing installation could be allowed to expand with additional antennas to up to 10’ taller and up to 6’ horizontally from the pole; and additional equipment boxes could be added, but not to exceed four total. With this permitted potential build-out in mind, it is important to understand the aesthetic implications of the initial action to approve the project.

Crown Castle has provided drawings that illustrate what the potential build-out could look like with the implementation of Section 6409. The ARB is requested to consider the design issues of the current proposal bearing in mind how that could be expanded upon in the future. Figure 3 provides a representation of how a site could be developed. Attachment E provides more details of the design shown in Figure 3.

**Art on Cabinets**

The project includes up to 19 equipment cabinets that would be placed within the downtown core. Staff views these cabinets as opportunities for incorporating public art into the project that would enhance the community. Due to the project type, it is not subject to the mandatory art requirement, but as a discretionary project located on City property, the project can be required to include an art component. Staff has asked the applicant to consider two approaches to include art in the project, the first is to propose designs for each cabinet and follow-through with completing the art work once approved by the City, or provide appropriate funding that would cover the City’s effort to complete the art projects. Staff requests feedback from the ARB regarding the inclusion of art in this project. Staff will include the appropriate conditions of approval to incorporate art into the project, if directed, and will include the allowance to complete the art after the wireless installations are up and running, but within a specific timeline.

**City Purview for Wireless Telecommunications Facilities**

After the application submittal, staff received some inquiries about the project, and a few expressed concerns about the potential health risks of the project. Staff explained the limitations of the City’s review, as described below.

The Federal Telecommunications Act (TCA) of 1996 limits the City’s authority in the review of wireless telecommunications projects. The City may only focus on the aesthetic qualities of a project and, by law, may not consider potential health issues and any perceived related consequences (e.g. drop in property value). Under federal law, a local agency’s wireless facility siting decisions may not have the effect of prohibiting the provision of wireless service or
unreasonably discriminating among wireless service providers. Under federal law, the City may not regulate the placement, construction or modification of wireless communications facilities on the basis of the environmental effects of radio frequency (RF) emissions, so long as the facilities comply with the Federal Communications Commission (FCC) regulations concerning such emissions.

As part of the review of the proposed project, the City hired a third-party consultant to review the applicant’s RF report to assure that the project meets the FCC regulations. In addition to the standard review of the project’s RF emissions, the consultant also specifically reviewed the installations with regards to impacts to the occupants of adjacent multi-story buildings, as applicable. The consultant’s report made the findings that the proposed project is compliant with the FCC regulations, with regards to RF emissions, and there are no impacts to people working in the adjacent multi-story commercial buildings (see Attachments F and G for details).

**Noise**
The project does not include the need for fans within the equipment cabinets; passive cooling would be utilized. With this scenario, the equipment will not produce any substantial noise. It is a standard condition of approval that the project shall be in conformance with the City’s Noise Ordinance (PAMC 9.10) and, therefore, noise would not be an issue for this project.

**Policy Implications**
The proposed project is consistent with the Comprehensive Plan and staff believes there are no other substantive policy implications. The project is supported by the following Comprehensive Plan Policies: (B-13) Support the development of technologically-advanced communications infrastructure and other improvements that will facilitate the growth of emerging telecommunications industries; (B-14) Work with electronic information network providers to maximize potential benefits for Palo Alto businesses, schools, residences, and other potential users.

**Resource Impacts**
The cost of project review by all staff and consultants is recovered by fees paid by Crown Castle. Pursuant to the City’s standard license agreement, Crown Castle will pay the City $270 per year per installation, or a total of $5,130 per year for the 19 sites.

**ENVIRONMENTAL REVIEW**
The project is categorically exempt from the provisions of the California Environmental Quality Act (CEQA) per section 15303 of the CEQA Guidelines. This exemption consists of construction and location of limited numbers of new, small facilities or structures; and installation of small new equipment and facilities in small structures.

Prepared by: Clare Campbell, Senior Planner

Reviewed by: Jodie Gerhardt, Current Planning Manager
Attachments:
- Attachment A: Location Map (DOCX)
- Attachment B: Draft ARB Findings (DOCX)
- Attachment C: Draft Conditions of Approval (DOCX)
- Attachment D: Applicant's Project Description (PDF)
- Attachment E: Design of Possible Maximum Buildout Per Section 6409 (DOCX)
- Attachment F: Peer Review of Applicant's RF Report (PDF)
- Attachment G: Applicant's RF Report (PDF)
- Attachment H: Project Plans (TXT)
Crown Castle Downtown Wireless Project

19 Installations

VICINITY MAP

SITE: P10m
SITE: P11m
SITE: P12m2
SITE: P13m
SITE: P14m
SITE: P15m
SITE: P16m
SITE: P17m
SITE: P18m
SITE: P01m
SITE: P02m2
SITE: P03m
SITE: P04m
SITE: P05m
SITE: P06m2
SITE: P07m2
SITE: P08m
SITE: P09m2

El Camino Park
Dr Edith Eugenie Johnson Park
El Camino Real
Palo Alto Ave
Hawthorne Ave
Bryant
Everett Ave
Kipling St
Lytton Ave
Florence
Hamilton Ave
Emerson St
Univesity Ave
High St
Forest Ave
Ramona St
Gillman St
Sowper St
Downing Ln
Webster
N.I.T.S.
ATTACHMENT B
ARB FINDINGS FOR APPROVAL
Crown Castle Wireless Project
15PLN-00140 (250 Hamilton Ave)

The design and architecture of the proposed improvements, as conditioned, complies with the Findings for Architectural Review as required in Chapter 18.76 of the PAMC.

Comprehensive Plan and Purpose of ARB:
Finding #1: The design is consistent and compatible with applicable elements of the Palo Alto Comprehensive Plan.
Finding #16: The design is consistent and compatible with the purpose of architectural review, which is to:
- Promote orderly and harmonious development in the city;
- Enhance the desirability of residence or investment in the city;
- Encourage the attainment of the most desirable use of land and improvements;
- Enhance the desirability of living conditions upon the immediate site or in adjacent areas; and
- Promote visual environments which are of high aesthetic quality and variety and which, at the same time, are considerate of each other.

The project is consistent with Findings #1 and #16 because:

The project incorporates a streamlined design that conforms with policies that encourage quality development that is compatible with surrounding development and public spaces (Policy L-48). The project is also supported by the following Comprehensive Plan Policies: (B-13) Support the development of technologically-advanced communications infrastructure and other improvements that will facilitate the growth of emerging telecommunications industries; (B-14) Work with electronic information network providers to maximize potential benefits for Palo Alto businesses, schools, residences, and other potential users.

The project design promotes visual environments that are integrated into the aesthetics of the immediate environment of a utility facility (light pole) and the downtown commercial setting.

Compatibility and Character:
Finding #2: The design is compatible with the immediate environment of the site.
Finding #4: This finding of compatibility with unified or historic character is not applicable to the project (there is no unified design or historic character along this portion of El Camino Real).
Finding #5: The design promotes harmonious transitions in scale and character in areas between different designated land uses.
Finding #6: The design is compatible with approved improvements both on and off the site.
The project is consistent with Findings #2, #4, #5 and #6 because:

The design is compatible with the immediate environment and will have a unifying character in that the design of the pole-mounted antennas and equipment boxes easily blend in with the existing utilitarian functions within the Downtown sidewalks. The antennas are designed to be placed near the tops of the poles and are not in the natural line of sight for pedestrians and vehicle drivers, and will not be very noticeable; antennas and all related hardware shall be painted to match the pole. The proposed equipment boxes will look like existing U.S. Postal Service storage mail boxes and would not be viewed as something out of the ordinary within a public sidewalk.

Functionality and Open Space:

Finding #3: The design is appropriate to the function of the project.
Finding #7: The planning and siting of the building on the site creates an internal sense of order and provides a desirable environment for occupants, visitors and the general community.
Finding #8: The amount and arrangement of open space are appropriate to the design and the function of the structures.

The project is consistent with Findings #3, #7, and #8 because:

The design of the installation, both antennas and equipment box, is not excessive for the intended utility use. The project components are the minimum sizes needed to provide service and have a compact design to reduce the project’s footprint/impact.

Findings #7 and #8 do not apply to this project.

Circulation and Traffic:

Finding #9: Sufficient ancillary functions are provided to support the main functions of the project and the same are compatible with the project’s design concept.
Finding #10: Access to the property and circulation thereon are safe and convenient for pedestrians, cyclists and vehicles.

The project is consistent with Findings #9 and #10 because:

The circulation under and around the light pole is not impacted by the installation of the antennas. Additionally, the placement of the equipment box has been sited so the pedestrians and vehicle access to parked cars is not impeded and remains safe and convenient.

Finding #10 does not apply to this project.

Landscaping and Plant Materials:

Finding #11: Natural features are appropriately preserved and integrated with the project.
Finding #12: The materials, textures and colors and details of construction and plant material are an appropriate expression to the design and function and compatible with the adjacent and neighboring structures, landscape elements and functions.
Finding #13: The landscape design concept for the site, as shown by the relationship of plant masses, open space, scale, plant forms and foliage textures and colors create a desirable and functional environment on the site and the landscape concept depicts an appropriate unit with the various buildings on the site.
Finding #14: Plant material is suitable and adaptable to the site, capable of being properly maintained on the site, and is of a variety that would tend to be drought-resistant and to reduce consumption of water in its installation and maintenance.

The project is consistent with Findings #11- #14 because:

This project does not include any landscape components and therefore these findings do not apply to this project.

Sustainability:

Finding #15: The design is energy efficient and incorporates renewable energy design elements including, but not limited to:
   a. Careful building orientation to optimize daylight to interiors
   b. High performance, low-emissivity glazing
   c. Cool roof and roof insulation beyond Code minimum
   d. Solar ready roof
   e. Use of energy efficient LED lighting
   f. Low-flow plumbing and shower fixtures
   g. Below grade parking to allow for increased landscape and stormwater treatment areas

The project is consistent with Finding #15 because:

This finding is not applicable to this project. The scope of the project is small and there is limited opportunity to incorporate green building design into the project.
ATTACHMENT C

Draft CONDITIONS OF APPROVAL

Crown Castle Wireless Project
15PLN-00140 (250 Hamilton Ave)

PLANNING DIVISION

The Architectural Review Board (date) recommended approval of the application referenced above, and the Director of Planning and Community Environment (Director) approved the project on date, 2015.

Project Planner: Clare Campbell

PLANNING DIVISION

1. The project shall be in substantial conformance with the approved plans and related documents received October 1, 2015, except as modified to incorporate these conditions of approval.

2. All conditions of approval shall be printed on the cover sheet of the plan set submitted to obtain any permit through the Building Inspection Division.

3. Any modifications/additions to the approved plans shall be approved by Planning prior to construction and installation.

4. The project approval shall be valid for a period of one year from the original date of approval. In the event a building permit(s), if applicable, is not secured for the project within the time limit specified above, the approval shall expire and be of no further force or effect.

5. The pole-mounted antennas and all associated hardware shall be painted to match the light pole color and finish on which they are mounted.

6. All project associated wiring shall be fed through the street light pole; there shall be no exposed mounting hardware or wires visible from the public right of way.

7. The color of the equipment cabinet boxes shall be dark green to match the typical U.S. Postal Service’s mail storage boxes, unless the cabinet has been designated for an art project.

8. Within one year of the installation of the 19 wireless communication sites, the applicant shall contact the Planning Department and the Public Art Program Manager to determine which equipment boxes are appropriate for art work. Once the designated cabinets have been selected and approved by the City for art work, the applicant shall submit the
proposed designs for the individual cabinets. The review of the cabinet art shall be subject to Public Art Commission review, as deemed appropriate by the Public Art Program Manager. In lieu of this requirement, the applicant can work with the Public Art Program Manager to determine an in-lieu fee amount that can be paid to the City in order to fund public art for this project, or other temporary public art downtown as appropriate.

9. The project shall be reviewed by the Public Works Engineering, Public Works Urban Forestry, and Utilities Department to confirm feasibility of the project. If these City departments do not support the proposed installations, the applicant shall submit for review to the Planning department the alternative pole selection and design. This review may require additional fees and submittal of planning entitlement applications.

10. The project shall not exceed the noise standard specified in Municipal Code 9.10.050 (i.e. +15dB over ambient at 25 feet).

11. The applicant shall submit a sound analysis of an operating installation within two months of the project installation/operation. The analysis shall clearly delineate how the installation complies with the previously listed condition regarding noise. Applicant may be required to submit these reports periodically for the life of the project, as determined by the Director of Planning.

12. Applicant shall hire a radio engineer licensed by the State of California to measure the actual radio frequency emission of each installation and determine if it meets FCC’s standards. A report, certified by the engineer, of all calculations, required measurements, and the engineer's findings with respect to compliance with the FCC’s radio frequency emission standards shall be submitted to the Planning Division within one year of commencement of operation. Applicant may be required to submit these reports periodically for the life of the project, as determined by the Director of Planning.

13. If for any reason the project requires modification from the approved plans in any way, the applicant shall contact Planning staff for a determination on whether the change requires a new planning entitlement to be submitted.

14. All cost recoverable charges related to this Planning entitlement process, per the cost recovery agreement, shall be paid in full and in a timely manner; these include charges for consultants hired for peer review of this project. Non-payment may result in the withholding of other City required permits and or approvals required for the project to move forward to the construction phase.

15. The applicant shall comply with all applicable provisions of the Code, any permit issued under this Code, and all other applicable federal, state and local laws (including without limitation all building code, electrical code and other public safety requirements). Any failure by the City to enforce compliance with any applicable laws shall not relieve any applicant of its obligations under this code, any permit issued under this code, or all other applicable laws and regulations.
16. Impact Fees: Development Impact fees are not applicable to this project.

17. The applicant shall submit to the Director an as-built set of plans and photographs depicting the each of the 19 installations as modified, including all Transmission Equipment and all utilities, within ninety (90) days after the completion of construction.

18. A wireless communication facility (WCF) or a component of that WCF that ceases to be in use for more than ninety (90) days shall be removed by the applicant, Wireless Communications Service provider, or property owner within ninety (90) days of the cessation of use of that WCF; and notification to the Planning Director shall be provided. A new conditional use permit shall not be issued to an owner or operator of a WCF or a Wireless Communications Service provider until the abandoned WCF or its component is removed.

19. The Director may revoke any WCF permit if the permit holder fails to comply with any condition of the permit. The Director's decision to revoke a permit shall be appealable pursuant to the process for architectural review set forth in Section 18.77.070 and the process for conditional use permits set forth in Section 18.77.060.

20. Indemnity: To the extent permitted by law, the Applicant shall indemnify and hold harmless the City, its City Council, its officers, employees and agents (the “indemnified parties”) from and against any claim, action, or proceeding brought by a third party against the indemnified parties and the applicant to attack, set aside or void, any permit or approval authorized hereby for the Project, including (without limitation) reimbursing the City for its actual attorneys’ fees and costs incurred in defense of the litigation. The City may, in its sole discretion, elect to defend any such action with attorneys of its own choice.

21. Judicial Review: This matter is subject to the California Code of Civil Procedures (CCP) Section 1094.5; the time by which judicial review must be sought is governed by CCP Section 1094.6.

22. 90-day Protest Period: California Government Code Section 66020 provides that a project applicant who desires to protest the fees, dedications, reservations, or other exactions imposed on a development project must initiate the protest at the time the development project is approved or conditionally approved or within ninety (90) days after the date that fees, dedications, reservations or exactions are imposed on the Project. Additionally, procedural requirements for protesting these development fees, dedications, reservations and exactions are set forth in Government Code Section 66020. IF YOU FAIL TO INITIATE A PROTEST WITHIN THE 90-DAY PERIOD OR FOLLOW THE PROTEST PROCEDURES DESCRIBED IN GOVERNMENT CODE SECTION 66020, YOU WILL BE BARRED FROM CHALLENGING THE VALIDITY OR REASONABLENESS OF THE FEES, DEDICATIONS, RESERVATIONS, AND EXACTIONS.
PERMITTING PROCEDURE

23. STREET WORK PERMIT following planning entitlement, the applicant is required to submit and obtain an approved Street Work Permit from Public Works Engineering prior to starting construction. Additional permits may be required from other departments depending on the extent of work. The Street Work Permit submittal shall include the following:
   a. PLANS: Scaled plans shall show the locations of all work within the city right of way, including but not limited to: sidewalk, curb and gutter work; potholing locations for bore pits and utility depth verification; locations of existing utilities and proposed conduits, vaults, and cabinets. Show the locations of doors to adjacent buildings which open to the sidewalk and may be impacted by the proposed work. All work shall conform to Public Works Engineering and City of Palo Alto utility standards unless otherwise authorized by city officials.
   b. TRAFFIC CONTROL PLANS: The planset shall include site-specific traffic control plans for each location which conform to the latest version of the California Manual of Uniform Traffic Control Devices (CAMUTCD). Impact to sidewalks, adjacent businesses, bike lanes, travel lanes, and parking shall be minimized to the maximum extent feasible. Please note that many entryways in the Downtown Area are located at the back of the sidewalk and provisions will need to be made to maintain access at all times.
   c. SCHEDULE: Include a horizontal bar chart schedule displaying anticipated start and completion dates for the construction of each location. Construction of multiple locations may be undertaken simultaneously but work shall be staggered to minimize impact from multiple traffic control and sidewalk closures. Please be advised that work impacting the city right of way is generally not allowed during the winter holiday period from November 26 through January 1.

24. ENCROACHMENT PERMIT: Prior to Street Work Permit final, the applicant may be required to submit an Encroachment Permit documenting the as-built location of the communications infrastructure affixed to the city-owned and maintained light fixtures and stipulations consistent with the final Master License Agreement.

PUBLIC WORKS URBAN FORESTRY

PRIOR TO DEMOLITION, BUILDING OR GRADING PERMIT ISSUANCE

25. PLAN SET REQUIREMENTS. The final Plans submitted for building permit shall include the following information and notes on relevant plan sheets:
   a. SHEET T-1, BUILDING PERMIT. The building permit plan set will include the City’s full-sized, Sheet T-1 (Tree Protection-it’s Part of the Plan!), available on the Development Center website at http://www.cityofpaloalto.org/civicax/filebank/documents/31783. The Applicant shall complete and sign the Tree Disclosure Statement and recognize the Urban Forestry field inspections.
b. Plans to show protective tree fencing notes. For all work (including open trench, any excavation, demolition or replacement of any sidewalk, curb & gutter, asphalt) within 10-feet of a publicly owned tree in the right-of-way, the Plan Set (esp. site, demolition, civil, sidewalk, utility sheets, etc.) shall delineate/show the installation of the Modified Type III fencing around each Regulated Tree, (Standard Dwg. #605, Sheet T-1; City Tree Technical Manual, Section 6.35-Site Plans); or by using a Project Arborist’s unique diagram for each Tree Protection Zone enclosure.

26. SITE PLAN REQUIREMENTS: In addition to showing TPZ fencing, add the following Notes on the specified Plan Sheets.

c. Note #1. All civil plans, grading plans, irrigation plans, site plans and utility plans and relevant sheets shall add a note applying to the trees to be protected, including neighboring trees stating: "Regulated Tree--before working in this area contact the City Arborist at 650-496-5953";

d. Note #2. Utility (sanitary sewer/gas/water/backflow/electric/storm drain) plan sheets shall include the following note: “Utility trenching shall not occur within the TPZ or 10’ of a regulated tree. Contractor shall be responsible for ensuring that no trenching occurs within the TPZ of the protected tree by contractors or City crews. See sheet T-1 for instructions.”

e. Note #3. Directional boring used to tunnel beneath or near roots. Table 2-1, Trenching and Tunneling Distance, shall be printed on the final plans to be implemented by Contractor. (Specification Reference: Tree Technical Manual, Section 2.00, Table 2-1).

f. Note #4 “Pruning Restrictions. No pruning or clearance cutting of branches is permitted on City trees. Contractor shall obtain a Public Tree Permit from Urban Forestry (650-496-5953) for any work on Public Trees”

DURING CONSTRUCTION

27. TREE PROTECTION VERIFICATION. Prior to any site work a written verification from the contractor that the required protective fencing (Type III) is in place shall be submitted to the Urban Forestry Section (derek.sproat@cityofpaloalto.org). The fencing shall contain required warning sign and remain in place until final inspection of the project.

28. EXCAVATION RESTRICTIONS APPLY (TTM, Sec. 2.20 C & D). Any approved grading, digging or trenching beneath a tree canopy shall be performed using ‘air-spade’ method as a preference, with manual hand shovel as a backup. For utility directional boring, access pits exposing roots with diameter of 1.0 inches and greater shall remain intact and not be damaged. For directional boring used to tunnel beneath roots, then Table 2-1, Trenching and Tunneling Distance, shall be printed on the final plans to be implemented by Contractor.
29. PLAN CHANGES. Revisions and/or changes to plans before or during construction shall be reviewed and responded to by the Urban Forestry field inspector (derek.sproat@cityofpaloalto.org-650-496-5953.)

30. CONDITIONS. All Planning Department conditions of approval for the project shall be printed on the plans submitted for building permit.

31. TREE PROTECTION COMPLIANCE. The owner and contractor shall implement all protection and inspection schedule measures, design recommendations and construction scheduling as stated in the TPR & Sheet T-1, and is subject to code compliance action pursuant to PAMC 8.10.080. The required protective fencing shall remain in place until final landscaping and inspection of the project. Project arborist approval must be obtained and documented in the monthly activity report sent to the City. The mandatory Contractor and Arborist Monthly Tree Activity Report shall be sent monthly to the City (pwps@cityofpaloalto.org) beginning with the initial verification approval, using the template in the Tree Technical Manual, Addendum 11.

32. TREE DAMAGE. Tree Damage, Injury Mitigation and Inspections apply to Contractor. Reporting, injury mitigation measures pursuant to Tree Technical Manual, Section 2.20-2.30. Contractor shall be responsible for the repair or replacement of any publicly owned or protected trees that are damaged during the course of construction, pursuant to Title 8 of the Palo Alto Municipal Code, and city Tree Technical Manual, Section 2.25.

33. GENERAL. The following general tree preservation measures apply to all trees to be retained: No storage of material, topsoil, vehicles or equipment shall be permitted within the tree enclosure area. The ground under and around the tree canopy area shall not be altered. Trees to be retained shall be irrigated, aerated and maintained as necessary to ensure survival.

PRIOR TO COMPLETION OF EACH SITE AREA

34. PLANNING INSPECTION. Prior to final sign off, contractor or owner shall contact the city planner (650-329-2441) and Urban Forestry field inspector (650-496-5953) to inspect each cell site improvement area, regulated trees for any damage assessment and mitigation that may be necessary.

POST CONSTRUCTION

35. MAINTENANCE. Before conducting any maintenance requiring demolition or removal of sidewalk, structures, connecting conduit trenching or hardscape repair shall be subject to the above tree protection requirements, including Urban Forestry field inspector approval prior to any demolition.

ELECTRICAL ENGINEERING

36. Applicant shall tap electric service to the small cell distributed antenna system from the locations jointly identified during the field investigation.
37. Service voltage to all the proposed locations may not be the same. Applicant shall design their system to operate at the available voltage in the vicinity.

38. Applicant shall be responsible for installing all the substructure (boxes/conduits etc.) that is required to obtain the electric service. Substructure shall be in compliance with City’s standards: http://www.cityofpaloalto.org/gov/depts/utl/eng/electric/requirements.asp

39. Applicant shall install an inner duct of suitable size inside the street lighting pole, if any hard wiring is to be done for the antenna system/facilities. *Applicant must keep antenna/proposed equipment’s electric circuitry completely separate from utility’s street lighting circuit. Distributed antenna system must have a disconnect/fuse for isolating its electric circuit. Applicant’s equipment wiring should be separate and not to be mixed with street light wiring.

40. Applicant to inform the Utilities if there is any requirement for fiber.

41. Applicant must provide structural calculations certified by a Professional Engineer registered in the State of California before installing any equipment/s on the existing street lighting poles. Majority of the street lighting poles in the down town area are very old (probably 40-50 years) and Utilities Engineering does not have any historical details.

42. Installing “Multi Radio Unit Cabinets” in the sidewalks may reduce the walking space as well as restrict the wheel chair movement. Applicant to check with Building Department and ensure that installation is in compliance with Building Codes/ADA requirements.

43. If the applicant proposes to install brand new poles for their system then the poles must be identical to what we have in the down town area as well as the new foundations must match with the existing ones.

44. Utilities Engineering will provide cost estimate for each location once the plans are approved by ARB and submitted to the Building Department.

45. Applicant must submit electric wiring drawing for all the proposed installations/locations. Wiring diagram must show connectivity between Utility’s designated electric service point to the antenna that is mounted on the existing street lighting pole.

46. After excavation is completed on the public right of way, existing streets including sidewalks/curb/gutter or any decorative paths must be brought to its original condition and must be approved by Public Works Engineering Department’s inspector. Potholing must be done and all the utilities must be identified prior to commencing excavation.

47. Excavation and restoration work must be in compliance with Public Works Engineering standards and specifications that are available on the following website: http://www.cityofpaloalto.org/news/displaynews.asp?NewsID=1834&TargetID=145
48. Applicant/s shall be responsible for maintaining their system including substructure. In case of knock downs, the City will re-install its street lighting poles but NOT applicant’s equipment on or off the pole.

49. A field meeting is recommended with Utilities Engineering prior to commencing the work.
ARB Submittal for MINOR PROJECT

- Written Project Description: summary of the project proposal, which shall include: scope of work; existing and proposed uses; purpose of proposed changes; materials, colors, and construction methods to be used.

RE: Crown Castle – 19 Small Cell Node Project in Downtown Palo Alto

Crown Castle (formerly NextG Networks) has a Master License Agreement with the City of Palo Alto that allows for use of city controlled space on utility poles and streetlight poles and in conduits.

As a result this 19 site (node), small cell project is designed to be installed in the public right of way on existing utility poles. The small cell wireless sites provide capacity coverage to the larger cell site or cell tower in the area. In this case that larger cell site exists at 525 University Avenue.

There are no other small cell sites in the downtown area of Palo Alto that Crown can collocate on. However, we are not proposing adding new structures but rather “collocating” on the city owned light poles.

The scope of work involves the addition of 1-2 small antennas on an existing city light pole and the installation of an equipment box on the sidewalk nearby to hold radios and other equipment. The antennas are 23”x12”x7” and will be added at the top, or on the top, of the existing light pole. The antennas will be painted to match the pole in order to minimize visual impact. The equipment box (24.75” square x 48.63” high) will be fashioned similar to a mail box staging box and will be painted Kelly Moore Lone Pine, KM4798-5.

Currently the 19 locations in the design are city owned light poles and will continue that use but will, with the approval of this project, also function as a small cell site that will augment the existing cell site at 525 University by adding much needed capacity service to the downtown area.

Construction methods are addressed in the plan sets, pages D1-5. At each site the light pole will need to be removed temporarily to enable conduit for fiber to be installed in the pole. Where trenching is required for the new conduit the trench will either be underground using a bore pit and each end of the conduit run and boring from one point to the other. The bore pit will be a 3’x5’. The alternative trenching method is to dig a trench that is 48” deep and 2’ wide. The conduit will still be underground. In order to trench, segments of the sidewalk will be removed.
in squares and will be replaced completely after the trenching is complete. Any disturbance to the asphalt in the street to accommodate these short runs of conduit will also be completely repaired. The equipment cabinet will be bolted to the sidewalk.

Pages D1-5 include City of Palo Alto standards as well as detail for setting Crown Castle utility boxes on sidewalks and in the roadway, directional boring and bore pits, breakout of concrete in order to trench for new underground conduits, followed by complete restoration of disturbed asphalt and concrete. All installed Crown Castle equipment will be painted to match housing structure & every effort will be made to minimize visual impact.

Sharon James
Government Relations Manager
Crown Castle NG West LLC
408-426-6629
April 14, 2015

Conditional Use Permit (CUP) Application

- Project Request Letter.

RE: Crown Castle – 19 Small Cell Node Project in Downtown Palo Alto

Request of Sharon James, representative of the applicant, Crown Castle NG West LLC for a Conditional Use Permit to allow installation and operation of a Small Cell network for Verizon Wireless capacity service in the downtown area of Palo alto consisting of telecommunication facilities, or “node sites” on existing city owned light poles in public right-of-ways and connected by a network of underground fiber-optic cable.

Crown Castle is an independent owner of shared wireless infrastructure. They own, operate, and build infrastructure that is leased to wireless carriers such as Verizon Wireless, Verizon, AT&T, Sprint and T-Mobil. In April of 2012 Crown Castle purchased NextG networks, a similar wireless infrastructure company, that specialized in the construction and leasing of Small Cell Network/Distributed Antenna System (SCN/DAS) on utility poles. Under Public Utilities code Sections 7901 and 7901.1, Crown Castle has a statutory right to construct its facilities within the City rights-of-way, subject to City approval and regulation.

In the case of Downtown Palo Alto the Distributed Antenna System (DAS)/Small Cell Network (SCN) will be a system of interconnected small facilities with antennas that provide coverage or capacity service to a specific area identified by the Carrier that Crown Castle represents. In this project coverage is provided to the downtown area by an existing cell site at 525 University Avenue; however the Carrier (Verizon) has advised that the current cell site cannot support wireless users with an acceptable experience because of the volume of mobile users in the area. The telecommunications industry sees small cell networks as a necessary evolutionary path to address the capacity challenge as data usage continue to grow at such a fast pace. Crown is applying to add 19 of these small cell nodes in the downtown area to address the overload of the cell site and to improve the service level in the area.

Crown Castle (formerly NextG Networks) has a Master License Agreement with the City of Palo Alto that allows for use of city controlled space on utility poles and streetlight poles and in conduits.

Each of the 19 nodes will utilize one or two antennas not exceeding 24” in length, additionally each site will have an equipment cabinet within 10 feet of the existing pole and within the public-right-of-way, that will hold the radio equipment.
The proposed project has had preliminary review by the ARB and they preferred the equipment cabinet on the ground as opposed to having the radio equipment in a cabinet attached to the pole. The light poles are located in the City rights-of-way and are visible to residents and to those traveling or walking on the street. Utility poles, more specifically in this case, are by their nature used for equipment, light, transformers, cameras, meters, therefore the addition of the proposed service would be consistent with the existing aesthetic. To minimize the visibility of the equipment, the antennas will be painted to match the utility/light pole. The equipment box will be designed as a staging mail box and will be painted Lone Pine KM4798-5 to match other similar boxes.

As discussed above, the project proposed to utilize relatively small equipment components. Rather than erecting new antenna support structures and introducing new vertical elements into the existing setting, the project would collocate with existing utility/light poles. The proposed equipment would blend with the existing utility structure in the rights-of-way and will not be detrimental or injurious to the property or improvements in the vicinity.

Nor will the project be detrimental to public health or safety. The proposed nodes would provide cellular service by transmitting and receiving radiofrequency (RF) signals from cellular customers and converting the transmissions to fiber optic signals. As a wireless telecommunications facility, Federal law requires that the antennas operate within the Federal health and safety limits for radiofrequency exposure limits at all times. Local jurisdictions are prohibited from setting their own limits and standards and regulating telecommunications facilities on the basis of radio frequency emissions (see 47 U.S.C. Paragraph 332©(7)(B)(iv)).

The public exposure limit assumes continuous exposure of all publicly accessible locations nearby, including occupants in proximity to the site. Additionally, the public exposure limit is a cumulative limit for all telecommunications facilities nearby.

To ensure that the proposed project will operate within the limits, a report prepared by a qualified third party (Jerrold T. Bushberg, Ph.D., DABMP, DABSNM) is included in the application. The reports looks at the antennas and equipment proposed as part of this project and analyzes emissions. The report concluded that maximum RF exposure is well below the FCC establish standard.

It should also be noted in regard to the health and safety of the residents of Palo Alto that over 70% of 911 calls are made from mobile devices. Also, that more than 40% of residences no longer have a wired line and depend completely on the ability to have cellular service for business and personal use of their mobile device.

This system will consistent with the Palo Alto Comprehensive Plan because it will support essential services, in this case allowing improved cellular service in downtown Palo Alto. These small cell wireless sites provide capacity coverage that augments the larger cell site or cell tower in the area. In this case that larger cell site exists at 525 University Avenue.
Further this project supports the purposes of Title 18 for several reasons e.g. promotes and protects the public health by providing critical cellular service. Additionally, the design minimizes the visual impact by using the smallest equipment possible and making every effort to blend it in with the street furniture and light pole design.

Please approve this project for the betterment of the residents, businesses and visitors to the downtown area of Palo Alto.

Sharon James
Government Relations Manager
Crown Castle NG West LLC
408-426-6629
Design of Possible Maximum Buildout, per Section 6409 of the Spectrum Act
Wireless Facility
Radio Frequency Emissions
Compliance Review

Crown Castle Application for DAS
Palo Alto, CA

9/11/2015
Crown Castle Application for DAS  
Palo Alto, CA

Introduction
Preiser Consulting has been engaged by the City of Palo Alto to conduct a peer review, consistent with recognized industry standard practices, of a radio frequency (RF) compliance report by Jerrold T. Bushberg, dated March 27, 2015, addressing RF safety aspects of a proposed installation of a 19-node distributed antenna system (DAS) in Palo Alto, CA, by Crown Castle.

System Description
The system consists of a total of 19 nodes, each transmitting one carrier in the 1900MHz band and one carrier in the 2100 MHz band using an Amphenol HTXCWW63111414Fx00 panel antenna mounted to an existing light pole or similar structure. The panel antenna dimensions are 23.2” (L) x 12.0” (W) x 7.1” (D), weighing approximately 13 pounds without mounting brackets. The installed mounting height to the antenna centerline varies by node from 20’ 4” to 24’ 2” above ground level.

The Model HTXCWW63111414Fx00 antenna is a Triband panel antenna which can support operation in the 696-806 MHz and between 1710 and 2170 MHz. The antenna has directional radiation pattern with a horizontal beamwidth of 63 degrees at 1900 MHz and 61 degrees at 2100 MHz. This type antenna is designed to concentrate its radiated energy toward the horizon in the direction of orientation, with very little energy wasted toward the sky or the ground. The vertical beamwidth in this case is 18 degrees at both 1900 MHz and 2100 MHz. Figure 1 below shows the antenna patterns in the vertical and horizontal plane for each of the two bands of proposed operation.
A detailed specification sheet, including radiation patterns, is provided in Attachment 1.
Each antenna is to be driven with a power input of 6.32 watts for an effective radiated power (ERP) of 97 watts in each of the two bands of operation. A summary of the main operations parameters is provided below in Table 1.

<table>
<thead>
<tr>
<th>Transmitter Frequency Band</th>
<th>Maximum Power Input</th>
<th>Antenna Gain</th>
<th>Effective Radiated Power (ERP)</th>
<th>Horizontal Beamwidth</th>
<th>Vertical Beamwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,900 MHz</td>
<td>6.32 watts</td>
<td>11.86 dBi</td>
<td>97 watts</td>
<td>63 deg</td>
<td>18 deg</td>
</tr>
<tr>
<td>2,100 MHz</td>
<td>6.32 watts</td>
<td>11.86 dBi</td>
<td>97 watts</td>
<td>61 deg</td>
<td>18 deg</td>
</tr>
</tbody>
</table>

Table 2 – Antenna Operating Parameters

Methodology

In conducting a peer review, relevant site application documents are reviewed and analyzed against current FCC regulations and guidelines, wireless industry standards and best practices. In this case, the project construction drawings by Coastal Communications and the RF study by Jerrold T. Bushberg, dated March 27, 2015 were reviewed relative to the RF safety aspects to determine compliance with Federal Communications Commission guidelines. RF exposure levels were independently calculated using methods detailed in their Office of Engineering & Technology Bulletin No. 65, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,” August 1997 (“OET Bulletin 65”). Based on the OET Bulletin 65, the Maximum Permissible Exposure (“MPE”) for the general population/uncontrolled exposure is 1 mW/cm² in the PCS and AWS spectrum. Permissible levels for exposure under occupational conditions, such as may be encountered by maintenance personnel, are five times higher.

Findings Relating to Radio Frequency Emissions Safety

Based on independent calculations of potential RF emission levels consistent with FCC guidelines, the maximum calculated exposure at ground level would not exceed 2.39% of the
applicable public exposure limit. These results are based on very conservative modeling assumptions; actual levels are expected to be significantly lower.

It is noted that the Bushberg report states a maximum level of 1.14% MPE at ground level. While this discrepancy does not materially affect the compliance aspect of the proposed system, it is recommended that the City request the applicant to review its report and issue an update if appropriate.

Exposure levels when spatially averaged may exceed the public MPE limits within a 3-foot zone directly in front of the antenna in the direction of orientation, as indicated in the Bushberg report. However, this zone would only be accessible by maintenance personnel working at an elevated position directly in front of the antenna. This can be mitigated by RF safety awareness and training of personnel that may work within this defined zone, as well as notification signage as indicated in Appendix A-2 of the Bushberg report.

A review of the proposed antenna locations in relation to adjacent buildings indicates that none of the buildings are within the identified exclusion zone. Moreover, the orientation of the proposed antennas is such that adjacent buildings do not fall within the main beam of the antenna. It should also be noted that most buildings provide between 10 to 20 dB of attenuation of RF signals in the proposed bands of operation depending upon the construction materials used. This would provide an additional reduction in the power levels by a factor of 10 to 100.

It is my opinion that the wireless facility as proposed will comply with FCC guidelines for levels of radio frequency exposure.
Summary and Conclusions

Preiser Consulting is of the opinion that:

- The conclusions reached in the Bushberg report regarding FCC compliance are correct although there are minor, but immaterial, computational differences compared to my independent calculations. The proposed installation, based on the initial deployment of a single antenna per node as indicated in the construction drawings, will meet Federal Communications Commission guidelines pertaining to radio frequency emissions exposure to the general public.

- In the event of future changes to the installations, including addition of RF carriers, additional antennas, or other changes that may result in changes to radio frequency emissions, a new RF study should be conducted prior to approval by the City.
Certification

1. I have read and fully understand the FCC regulations concerning RF safety and the control of human exposure to RF fields (47 CFR 1.1301 et seq).

2. To the best of my knowledge, the statements and information disclosed in this report are true, complete and accurate.

3. The analysis of site RF compliance provided herein is consistent with the applicable FCC regulations, additional guidelines issued by the FCC, and industry practice.

Date: September 11, 2015

Dieter J. Preiser, PMP
Attachment 1
Antenna Specifications Sheet
**HTX CW 6311414 Exy0**

Tri Band | FET Panel | XXX-Pol | 65°/65°/65° | 110.0/140.0/140.0 dB | Fixed Tilt

- Tri Band, fixed tilt panel antenna, 6 connectors
- Wide band performance
- Ideal solution for Small cell applications

### Ordering Options

When ordering, replace 'XY' in the model number with the desired low band electrical downtilt and 'Z' with the desired high band electrical downtilt (same tilt for both bands). Tilt options are shown below under Electrical Tilt (Z).

<table>
<thead>
<tr>
<th>Electrical Characteristic</th>
<th>Low Band @600 MHz</th>
<th>High Tilt @1710-2170 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Bands (MHz)</td>
<td>496-506</td>
<td>806-816</td>
</tr>
<tr>
<td>Polarization</td>
<td>25° dual 25°</td>
<td>25° dual 25°</td>
</tr>
<tr>
<td>Horizontal Beamwidth</td>
<td>75°</td>
<td>70°</td>
</tr>
<tr>
<td>Vertical beamwidth</td>
<td>45°</td>
<td>16°</td>
</tr>
<tr>
<td>Gain</td>
<td>10.5 dBi</td>
<td>16.0 dBi</td>
</tr>
<tr>
<td>Electrical Downtil (Z)</td>
<td>0° 0.5° 1° 2° 2.5°</td>
<td>0° 2° 2.4° 4° 6°</td>
</tr>
<tr>
<td>Impedance</td>
<td>500Ω</td>
<td>500Ω</td>
</tr>
<tr>
<td>VSWR</td>
<td>1.3:1</td>
<td>1.3:1</td>
</tr>
<tr>
<td>Front to Back Ratio</td>
<td>&gt;20 dB</td>
<td>&gt;25 dB</td>
</tr>
<tr>
<td>Isolation Between Ports</td>
<td>&gt;25 dB</td>
<td>&gt;25 dB</td>
</tr>
<tr>
<td>IM3 (20 dB)</td>
<td>&lt;150 dB</td>
<td>&lt;150 dB</td>
</tr>
<tr>
<td>Input Power</td>
<td>500 W</td>
<td>300 W</td>
</tr>
</tbody>
</table>

**Lightning Protection**

- Direct Ground

**Dimensions**

- 4 ports / 7/16 DIN / Female / Female

### Mechanical Characteristics

<table>
<thead>
<tr>
<th>Dimension: Height x Width x Depth</th>
<th>509 x 300 x 100 mm</th>
<th>20.0 x 12.0 x 4.0 in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight without Mounting Brackets</td>
<td>5.9 lbs</td>
<td>11 lbs</td>
</tr>
<tr>
<td>Terminal Wind Speed</td>
<td>95 km/hr</td>
<td>60 mph</td>
</tr>
<tr>
<td>Wind Area</td>
<td>9.0 m²</td>
<td>96 ft²</td>
</tr>
<tr>
<td>Wind Load (160 mph or 100 mph)</td>
<td>275 lb</td>
<td>45 lb</td>
</tr>
</tbody>
</table>

**Mounting Options**

<table>
<thead>
<tr>
<th>Mounting Options</th>
<th>Model Number</th>
<th>Image</th>
<th>Fits Pipe Diameter</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Point Mounting Bracket Kit</td>
<td>MCX040403</td>
<td><img src="image" alt="Image" /></td>
<td>45.115 mm (1.745 in)</td>
<td>2.9 lb (6.4 lbs)</td>
</tr>
<tr>
<td>2-Point Mounting &amp; Downrad Kit</td>
<td>MCX040402</td>
<td><img src="image" alt="Image" /></td>
<td>45.115 mm (1.745 in)</td>
<td>4.1 lb (9.0 lbs)</td>
</tr>
</tbody>
</table>

---

Quoted performance parameters provided in table above, are typical, peak or mega values only and may vary as a result of normal testing, manufacturing and operational conditions. Extreme operational conditions and other structural supports is beyond our control. Such conditions may void the warranty to the product. Improvements to products may be made without notice.

REV 080418 SN  www.amphenol-antennas.com
HTXCWW63111414Fxy0
Tri Band | FET Panel | XXX-Pol | 65° / 65° / 65° | 11.0 / 14.0 / 14.0 dBi | Fixed Tilt

Highband #1 and #2: 1710-2170 MHz

Horizontal | 1800 MHz | 0° | Vertical | 1800 MHz | 2° | Vertical | 1800 MHz | 4° | Vertical | 1800 MHz | 6° | Vertical | 1800 MHz

Horizontal | 1900 MHz | 0° | Vertical | 1900 MHz | 2° | Vertical | 1900 MHz | 4° | Vertical | 1900 MHz | 6° | Vertical | 1900 MHz

Horizontal | 2100 MHz | 0° | Vertical | 2100 MHz | 2° | Vertical | 2100 MHz | 4° | Vertical | 2100 MHz | 6° | Vertical | 2100 MHz

Quoted performance parameters are provided to offer typical, peak or range values only and may vary as a result of normal testing, manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to products may be made without notice.
The Federal Communications Commission (FCC) has established limits for maximum continuous human exposure to RF fields as directed by the Telecommunications Act of 1996.

The FCC maximum permissible exposure (MPE) limits represent the consensus of federal agencies and independent experts responsible for RF safety matters. Those agencies include the National Council on Radiation Protection and Measurements (NCRP), the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the American National Standards Institute (ANSI), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA). In developing its guidelines, the FCC also considered input from the public and technical community – notably the Institute of Electrical and Electronics Engineers (IEEE). The FCC’s RF exposure guidelines are incorporated in Section 1.301 et seq of its Rules and Regulations (47 CFR 1.1301-1.1310). Those guidelines specify MPE limits for two types of exposures to RF energy:

1. **Occupational / Controlled Exposure** – persons who are exposed as a consequence of their employment and are fully aware of the potential for exposure and have the ability to exercise control over their exposure.

2. **General Population/Uncontrolled Exposure** – apply when one is exposed and may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

The specified continuous exposure MPE limits are based on known variation of human body susceptibility in different frequency ranges, and a Specific Absorption Rate (SAR) of 4 watts per kilogram, which is universally considered to accurately represent human capacity to dissipate incident RF energy (in the form of heat).

The occupational MPE guidelines incorporate a safety factor of 10 or greater with respect to RF levels known to represent a health hazard, and an additional safety factor of five is applied to
the MPE limits for general population exposure. Thus, the general population MPE limit has a built-in safety factor of more than 50. The limits were constructed to appropriately protect humans of both sexes and all ages and sizes and under all conditions – and continuous exposure at levels equal to or below the applicable MPE limits is considered to result in no adverse health effects or even health risk. The reason for two tiers of MPE limits is based on an understanding and assumption that members of the general public are unlikely to have had appropriate RF safety training and may not be aware of the exposures they receive; occupational exposure in controlled environments, on the other hand, is assumed to involve individuals who have had such training, are aware of the exposures, and know how to maintain a safe personal work environment.

The FCC’s RF exposure limits are expressed in two equivalent forms, using alternative units of field strength (expressed in volts per meter, or V/m), and power density (expressed in milliwatts per square centimeter, or mW/cm²). The table below lists the FCC limits for both occupational and general population exposures, using the mW/cm² reference, for the different radio frequency ranges.

<table>
<thead>
<tr>
<th>Frequency Range (F) (MHz)</th>
<th>Occupational Exposure (mW/cm²)</th>
<th>General Public Exposure (mW/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 - 1.34</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1.34 - 3.0</td>
<td>100</td>
<td>180 / F²</td>
</tr>
<tr>
<td>3.0 - 30</td>
<td>900 / F²</td>
<td>180 / F²</td>
</tr>
<tr>
<td>30 - 300</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>300 - 1,500</td>
<td>F / 300</td>
<td>F / 1500</td>
</tr>
<tr>
<td>1,500 - 100,000</td>
<td>5.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

The diagram below provides a graphical illustration of both the FCC’s occupational and general population MPE limits.
Because the FCC’s RF exposure limits are frequency-shaped, the exact MPE limits applicable for a particular system installation depend on the frequency range used by the systems of interest.

The most appropriate method of determining RF compliance is to calculate the RF power density attributable to a particular system and compare that to the MPE limit applicable to the operating frequency in question. The result is usually expressed as a percentage of the MPE limit.

For potential exposure from multiple systems, the respective percentages of the MPE limits are added, and the total percentage compared to 100 (percent of the limit). If the result is less than 100, the total exposure is in compliance; if it is more than 100, exposure mitigation measures are necessary to achieve compliance.
Attachment 3
Ground Level Exposure Calculation Results

Per FCC OET65.
SUMMARY OF EXPERIENCE:

Over 35 years experience in all facets of telecommunications, with specialization in wireless technologies, including six years as an independent consultant for state and local government agencies on wireless and wireline telecommunications technologies. Areas of expertise include:

- Mobile radio technologies for public-safety agencies
- Wireless site development and operation
- Tower design and implementation
- Cellular voice and data technologies
- In-building coverage solutions
- Distributed Antenna Systems (DAS)
- Fiber optic and microwave backhaul transmission
- Next Generation 9-1-1 systems design and implementation
- Satellite voice and data transmission

CLIENTS SERVICED:

Wireless Site Development and Evaluation:
- City of San Diego, CA
- City of Martinez, CA
- City of Berkeley, CA
- City of Belmont, CA
- County of Santa Barbara, CA
- City of Burlingame, CA
- City of San Jose

Other Wireless Projects:
- County of Los Angeles, CA
- County of Riverside, CA
- Salt Lake City, UT
- North-Slope Borough, AK
- Clark County, WA
- Chelan County PUD, WA
- Fresno Fire Department

ADDITIONAL INFORMATION:

- BS Degree in Electronic Technology, MBA in Information Systems
- Certified Telecommunications Engineer - RF Endorsement (NARTE)
- First Class FCC Radio Telephone license
- Project Management Professional (PMP) certification from the Project Management Institute (PMI)
- Certified Cost Engineer (AACE), volunteer certification course instructor.
- Served as chairman of the Engineering Sub-Committee of the California Public-Safety Radio Association. (CPRA) a local chapter of the Association of Public Safety Officials (APCO).
- Member of the Associated Public-Safety Communications Officials International (APCO)
- FCC Amateur Radio License, N6DGS
- Served as a Computer and Communications Specialist with the California Air National Guard, Combat Communications Squadron
Ernesto Figueroa
Sr. RF Engineer
Crown Castle
695 River Oaks Parkway
San Jose, CA 95134

March 27, 2015

Introduction

At your request, I have reviewed the technical specifications and calculated the maximum radiofrequency, (RF), power density from the proposed Crown Castle nodes to be located in the public right-of-way. These nodes will be used for wireless telecommunications transmission and reception utilizing one Amphenol antennae model #HTXCWW63111414Fx00 mounted to a street light, traffic light or similar structure. The antenna used in this network is directional and is designed to transmit with a maximum input power of up to 6.32 watts, with a gain of up to 11.86 dBi at approximately 1,900 MHz and 6.32 watts with a gain of up to 11.86 dBi at approximately 2,100 MHz. The distance from the antenna center to the ground for all nodes will be at least 20.0 feet. An example of site configurations is shown in attachment one. The antenna specification details are depicted in attachment two. This analysis represent the worst case of any of the proposed nodes that are utilizing these transmission and antennae specifications. There will be 19 nodes of this configuration proposed for Palo Alto, CA (see Appendix A-0).

Calculation Methodology

Calculations at the level of the antenna were made in accordance with the cylindrical model recommendations for near-field analysis contained in the Federal Communications Commission, Office of Engineering and Technology Bulletin 65 (OET 65) entitled "Evaluating Compliance with FCC-Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields." RF exposure calculations at ground level were made using equation 10 from the same OET document. Several assumptions were made in order to provide the most conservative or "worse case" projections of power densities. Calculations were made assuming that all channels were operating simultaneously at their maximum design effective radiated power. Attenuation (weakening) of the signal that would result from surrounding foliage or buildings was ignored. Buildings or other structures can reduce the signal strength by a factor of 10 (i.e., 10 dB) or more depending upon the construction material. In addition, for ground level calculations, the ground or other surfaces were considered to be perfect reflectors (which they are not) and the RF energy was assumed to overlap and interact constructively at all locations (which they would not) thereby resulting in the calculation of the maximum potential exposure. In fact, the accumulations of all these very conservative assumptions, will significantly overestimate the actual exposures that would typically be expected from such a facility. However, this method is a prudent approach that errs on the side of safety.
RF Safety Standards

The two most widely recognized standards for protection against RF field exposure are those published by the American National Standards Institute (ANSI) C95.1 and the National Council on Radiation Protection and measurement (NCRP) report #86.

The NCRP is a private, congressionally chartered institution with the charge to provide expert analysis of a variety of issues (especially health and safety recommendations) on radiations of all forms. The scientific analyses of the NCRP are held in high esteem in the scientific and regulatory community both nationally and internationally. In fact, the vast majority of the radiological health regulations currently in existence can trace their origin, in some way, to the recommendations of the NCRP.

All RF exposure standards are frequency-specific, in recognition of the differential absorption of RF energy as a function of frequency. The most restrictive exposure levels in the standards are associated with those frequencies that are most readily absorbed in humans. Maximum absorption occurs at approximately 80 MHz in adults. The NCRP maximum allowable continuous occupational exposure at this frequency is 1,000 μW/cm$^2$. This compares to 5,000 μW/cm$^2$ at the most restrictive of the PCS frequencies (~1,800 MHz) that are absorbed much less efficiently than exposures in the VHF TV band.

The traditional NCRP philosophy of providing a higher standard of protection for members of the general population compared to occupationally exposed individuals, prompted a two-tiered safety standard by which levels of allowable exposure were substantially reduced for "uncontrolled " (e.g., public) and continuous exposures. This measure was taken to account for the fact that workers in an industrial environment are typically exposed no more than eight hours a day while members of the general population in proximity to a source of RF radiation may be exposed continuously. This additional protection factor also provides a greater margin of safety for children, the infirmed, aged, or others who might be more sensitive to RF exposure. After several years of evaluating the national and international scientific and biomedical literature, the members of the NCRP scientific committee selected 931 publications in the peer-reviewed scientific literature on which to base their recommendations. The current NCRP recommendations limit continuous public exposure at PCS frequencies to 1,000 μW/cm$^2$.

The 1992 ANSI standard was developed by Scientific Coordinating Committee 28 (SCC 28) under the auspices of the Institute of Electrical and Electronic Engineers (IEEE). This standard, entitled "IEEE Standards for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz" (IEEE C95.1-1991), was issued in April 1992 and subsequently adopted by ANSI. A complete revision of this standard (C95.1-2005) was completed in October 2005 by SCC 39 the IEEE International Committee on Electromagnetic Safety. The current version, including minor revisions, was published in March 2010. Their recommendations are similar to the NCRP recommendation for the maximum permissible exposure (MPE) to the public PCS frequencies (950 μW/cm$^2$ for continuous exposure at 1,900 MHz) and incorporates the convention of providing for a greater margin of safety for public as compared with occupational exposure. Higher whole body exposures are allowed for brief periods provided that no 30 minute time-weighted average exposure exceeds these aforementioned limits.

On August 9, 1996, the Federal Communications Commission (FCC) established a RF exposure standard that is a hybrid of the current ANSI and NCRP standards. The maximum permissible exposure values used to assess environmental exposures are those of the NCRP (i.e., maximum public continuous exposure at PCS frequencies of 1,000 μW/cm$^2$ ). The FCC issued these standards in order to address its responsibilities under
the National Environmental Policy Act (NEPA) to consider whether its actions will "significantly affect the quality of the human environment." In as far as there was no other standard issued by a federal agency such as the Environmental Protection Agency (EPA), the FCC utilized their rulemaking procedure to consider which standards should be adopted. The FCC received thousands of pages of comments over a three-year review period from a variety of sources including the public, academia, federal health and safety agencies (e.g., EPA & FDA) and the telecommunications industry. The FCC gave special consideration to the recommendations by the federal health agencies because of their special responsibility for protecting the public health and safety. In fact, the maximum permissible exposure (MPE) values in the FCC standard are those recommended by EPA and FDA. The FCC standard incorporates various elements of the 1992 ANSI and NCRP standards which were chosen because they are widely accepted and technically supportable. There are a variety of other exposure guidelines and standards set by other national and international organizations and governments, most of which are similar to the current ANSI/IEEE or NCRP standard, figure one.

The FCC standards “Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation” (Report and Order FCC 96-326) adopted the ANSI/IEEE definitions for controlled and uncontrolled environments. In order to use the higher exposure levels associated with a controlled environment, RF exposures must be occupationally related (e.g., PCS company RF technicians) and they must be aware of and have sufficient knowledge to control their exposure. All other environmental areas are considered uncontrolled (e.g., public) for which the stricter (i.e., lower) environmental exposure limits apply. All carriers were required to be in compliance with the new FCC RF exposure standards for new telecommunications facilities by October 15, 1997. These standards applied retroactively for existing telecommunications facilities on September 1, 2000.

The task for the physical, biological, and medical scientists that evaluate health implications of the RF data base has been to identify those RF field conditions that can produce harmful biological effects. No panel of experts can guarantee safe levels of exposure because safety is a null concept, and negatives are not susceptible to proof. What a dispassionate scientific assessment can offer is the presumption of safety when RF-field conditions do not give rise to a demonstrable harmful effect.

Summary & Conclusions

All Crown Castle antenna systems operating with the characteristics as specified above and observing a 3 foot public exclusion zone directly in front of and at the same elevation as the antenna, will be in full compliance with FCC RF public and occupational safety exposure standards. These transmitters, by design and operation, are low-power devices. Even under maximal exposure conditions in which all the channels are operating at full power, the maximum exposure next to and at the elevation of the antenna will not result in RF exposures in excess of 42.0% of the FCC occupational RF safety standard for these frequencies, (see appendix A-1). At 3 feet or more directly in front and at the same elevation of the antenna, the maximum RF exposure will not exceed the FCC public RF safety standard. An RF safety notice sign, as depicted in appendix A-2, containing appropriate contact information and indicating that RF exposures at 3 feet or closer to the face of the antenna may exceed the FCC public exposure standard and thus only qualified RF workers may work in this 3foot exclusion zone, should be placed near the antenna. The maximum RF exposure at ground level will not be in excess of 1.14% of the FCC public safety standard, (see appendix A-3). A chart of the electromagnetic spectrum and a comparison of RF power densities from various common sources is presented in figures two and three respectively in order to place exposures from wireless telecommunications systems in perspective.
Given the low levels of radiofrequency fields that would be generated from all Crown Castle directional antenna installations of this configuration, (e.g., antenna specification and input power); where the center of the antenna is 20.0 or more feet above grade, and the 3 foot public exclusion zone directly in front and at the same elevation as the antenna are observed, there is no scientific basis to conclude that harmful effects will attend the utilization of these proposed wireless telecommunications facilities. This conclusion is supported by a large numbers of scientists that have participated in standard-setting activities in the United States who are overwhelmingly agreed that RF radiation exposure below the FCC exposure limits has no demonstrably harmful effects on humans. These findings are based on my professional evaluation of the scientific issues related to the health and safety of non-ionizing electromagnetic radiation and my analysis of the technical specification as provided by Crown Castle Networks. The opinions expressed herein are based on my professional judgement and are not intended to necessarily represent the views of any other organization or institution. Please contact me if you require any additional information.

Sincerely,

Jerrold T. Bushberg Ph.D., DABMP, DABSNM, FAAPM
Diplomate, American Board of Medical Physics (DABMP)
Diplomate, American Board of Science in Nuclear Medicine (DABSNM)
Fellow, American Association of Physicists in Medicine (FAAPM)

Enclosures: Figures 1-3; Attachment 1, 2; Appendix A-0, A-1, A-2, A-3 and Statement of Experience.
National and International Public RF Exposure Standards (DAS @ 1,950 MHz)

*International Commission on Non-Ionizing Radiation Protection (ICNIRP) Public Safety Exposure Standard. ICNIRP standard recommended by the World Health Organization (WHO). Members of the ICNIRP Scientific Committee were from:

- Australia
- Finland
- France
- Germany
- Hungary
- Italy
- Japan
- United Kingdom
- United States

© HAMPC 2008 All Rights Reserved
The Electromagnetic Spectrum

Figure 2
Typical Exposure from Various Radio Frequency / Microwave Sources

![Bar chart showing exposure levels in microwatts/cm² for various devices and environments.]

- **Cordless Phone**: 250
- **Bluetooth Headset**: 100
- **CB Mobile Radio**: 30
- **Outside Microwave Oven**: 20
- **WiFi Laptop**: 15
- **Baby Monitor**: 1
- **Typical Max. Public Exposure from a DAS Transmission Site**: 1
- **Typical DAS Public Exposure in Neighborhood**: 0.1

**Figure 3**
Attachment 1

Site Configuration Examples
Attachment 2

Antenna Specifications
CROWN CASTLE TO INSTALL THE FOLLOWING:

- SMALL CELL ANTENNA(S) AND ITS ANCILLARY EQUIPMENT ON STREET LIGHT POLE.

1. STREET USE PERMIT SHALL BE OBTAINED BY CONTRACTOR PRIOR TO COMMENCING WORK.
2. ALL WORK TO BE CONDUCTED IN THE RIGHT OF WAY.
3. ALL DISTURBED LANDSCAPING SHALL BE REPLACED TO SIMILAR EXISTING CONDITION.
4. ANY SIDEWALK CLOSURE SHALL BE COORDINATED WITH THE CITY AND PROPER SIGNING WILL BE PLACED.
5. NO MATERIALS OR EQUIPMENT SHALL BE STORED ON PRIVATE PROPERTY OR BLOCK ACCESS TO PRIVATE PROPERTY.
6. CLEANUP OF SITE WILL BE COMPLETED EACH EVENING AND THE SITE WILL BE RETURNED TO EXISTING CONDITIONS AT THE COMPLETION OF CONSTRUCTION AT EACH SITE.

CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR RESPONSIBLE FOR SAME.

GENERAL CONTRACTOR NOTES

SITE Plan

SITE: P11m
100 HAMILTON AVE
PALO ALTO, CA
**Erosion and Sediment Control Notes:**

Temporary erosion sediment control devices and erosion control blankets shall be placed and maintained in accordance with the following:

1. All requirements of the City’s Land Development Manual, Storm Water Erosion Control Manual, and Erosion Control Manual must be followed and enforced during the design and construction of the proposed public improvements consistent with the erosion control plans, associated water pollution control plans (WPCP), and rainfall.
2. For underground utilities, provide a gravel bag around immediate vicinity of inlet as indicated in details.
3. The contractor orlayout design shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
4. The contractor shall remove silt and debris after each major rainfall.
5. NOT APPLICABLE IN AREAS WITH HIGH SILTS AND CLAYS WITHOUT FILTER FABRIC.
6. All erosion control blankets shall be removed after adjacent operation is completed.
7. Storm drain inlet protection shall be placed as indicated.
8. Adjacent to the edge of pavement, follow with a gravel bag immediately.

**Row Ground Construction Notes:**

1. Landscape and erosion sediment control provisions may be modified by the architect or engineer and shown on the plans submitted to the City of Palo Alto for approval.
2. All work is to be performed by the contractor or qualified person as indicated.
3. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
4. The contractor shall remove silt and debris after each major rainfall.
5. Adjacent to the edge of pavement, follow with a gravel bag immediately.
6. Storm drain inlet protection shall be placed as indicated.
7. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
8. All erosion control blankets shall be removed after adjacent operation is completed.
9. All erosion control blankets shall be placed as indicated.

**Normal Location of Underground Utilities Notes:**

1. All work is to be performed by the contractor or qualified person as indicated.
2. All work is to be performed by the contractor or qualified person as indicated.
3. All work is to be performed by the contractor or qualified person as indicated.
4. All work is to be performed by the contractor or qualified person as indicated.
5. All work is to be performed by the contractor or qualified person as indicated.
6. All work is to be performed by the contractor or qualified person as indicated.
7. All work is to be performed by the contractor or qualified person as indicated.
8. All work is to be performed by the contractor or qualified person as indicated.
9. All work is to be performed by the contractor or qualified person as indicated.
10. All work is to be performed by the contractor or qualified person as indicated.

**Abbreviations:**

- A/C: Asphalt Curb
- B/C: Back of Curb
- BOP: Back of Pavement
- C/C: Center of Curb
- C/L: Center Line
- E/N: Existing
- E/P: Edge of Pavement
- E/F: Face of Edge of Pavement
- Fl: Property Line
- N/W: Right of Way
- S/D: Erosion Boundary

**California State Code Compliance:**

All work, materials, and services shall be performed and installed in accordance with the current edition of the following codes as adopted by the local governing authorities. Regarding in these plans in to construct the element without conflicting with the codes:

- California Administrative Codes (Including Title 24 & 25)
- California Title 10, Building Code
- California Title 11, Uniform Fire Code
- California Title 12, General Code
- California Title 15, Plumb Code
- California Title 16, Electrical Code
- California Title 17, Solar Code
- California Title 18, Gas Code
- Title 20, Local Building Code
- City/County Ordinance

**ACCESSIBILITY REQUIREMENTS: FURNITURE IS UNMANNED AND NOT FOR HUMAN HABITATION. RADIUS, CAP/CAP ACTIVITY REQUIREMENTS DO NOT APPLY IN ACCORDANCE WITH THE 2010 CALIFORNIA BUILDING CODE.**

**ROW GROUND CONSTRUCTION NOTES:**

1. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
2. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
3. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
4. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
5. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
6. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
7. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
8. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
9. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
10. The contractor shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.

**Erosion and Sediment Control Notes:**

Temporary erosion sediment control devices and erosion control blankets shall be performed by the contractor or qualified person as indicated below:

1. All requirements of the City’s Land Development Manual, Storm Water Erosion Control Manual, and Erosion Control Manual must be followed and enforced during the design and construction of the proposed public improvements consistent with the erosion control plans, associated water pollution control plans (WPCP), and rainfall.
2. For underground utilities, provide a gravel bag around immediate vicinity of inlet as indicated in details.
3. The contractor or layout design shall be responsible for the clean up of all debris and mud on adjacent streets and storm drain systems due to construction activity.
4. The contractor shall remove silt and debris after each major rainfall.
5. NOT APPLICABLE IN AREAS WITH HIGH SILTS AND CLAYS WITHOUT FILTER FABRIC.
NOTES:

1. CONTRACTOR TO POTHOLE ALL UTILITY CROSSINGS.
2. CONTRACTOR TO PLACE SANDBAGS AROUND ANY/ALL STORM DRAIN INLETS TO PREVENT CONTAMINATED WATER.
3. SPOILS PILE WILL BE COVERED AND CONTAINED AND STREET WILL BE SWEPT AND CLEANED AS NEEDED.
4. CONTRACTOR TO REPAIR DAMAGED PUBLIC IMPROVEMENTS TO THE SATISFACTION OF THE CITY ENGINEER.
5. CURB & GUTTER TO BE PROTECTED IN PLACE. SIDEWALK TO BE REPLACED TO THE SATISFACTION OF THE CITY ENGINEER.
6. THE CONTRACTOR SHALL RESTORE THE ROADWAY BACK TO ITS ORIGINAL CONDITION SATISFACTORY TO THE CITY ENGINEER INCLUDING, BUT NOT LIMITED TO PAVING, STRIPING, BIKE LANES, PAVEMENT LEGENDS, SIGNS, AND TRAFFIC LOOP DETECTORS.

All utilities as shown per City of Palo Alto Maps.
- INSTALL (2) 24" AMPHENOL (HTXCGW63111414FX00) ANTENNAS AT 21' 4".
- INSTALL 2' X 3' CROWN CASTLE VAULT WITH CONDUITS.
- INSTALL CROWN CASTLE CABINET.
- ANTENNA(S) & EQUIPMENT TO BE PAINTED TO MATCH POLE.

### STREET LIGHT # 12
- TOP OF EXISTING POLE: 22' 4"
- TOP OF ANTENNA(S): 21' 4"
- RAD CENTER: 20' 4"
- AZIMUTH(S): 330° / TBD
- PROFILE VIEW: 9 O’CLOCK

![Diagram](image.png)

- INSTALL (2) 24" AMPHENOL (HTXCGW63111414FX00) ANTENNAS AT 21' 4".
- INSTALL 2' X 3' CROWN CASTLE VAULT WITH CONDUITS.
- INSTALL CROWN CASTLE CABINET.
- ANTENNA(S) & EQUIPMENT TO BE PAINTED TO MATCH POLE.

### NEW CONSTRUCTION NOTES

- EXISTING OCTAGONAL STEEL STREET LIGHT #45
- LUMINAIRE AT 23' 4"
- TOP OF POLE AT 22' 4"
- TOP OF ANTENNA 21' 4"
- RAD CENTER 20' 4"
- EXISTING SIGNS AT 7' 2" - 8' 10"
- GROUND LEVEL
Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.
Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.
Appendix A-0

Node IDs, Configuration & Locations
# Appendix A-0
Node IDs, Configuration & Locations

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Antenna Config</th>
<th>Pole Number</th>
<th>Antenna Rad Center</th>
<th>Azimuths</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Street Address</th>
<th>City, State</th>
<th>Jurisdiction</th>
<th>Antenna Type</th>
<th>Node Equipment</th>
<th>Ground Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01m</td>
<td>1-Panel</td>
<td>51</td>
<td>20' 4&quot;</td>
<td>330</td>
<td>37.443972</td>
<td>-122.163107</td>
<td>513 High St</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>62'</td>
</tr>
<tr>
<td>P02m</td>
<td>1-Panel</td>
<td>51</td>
<td>23' 8&quot;</td>
<td>325</td>
<td>37.444585</td>
<td>-122.162500</td>
<td>Across 500 Emerson St</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>60'</td>
</tr>
<tr>
<td>P03m</td>
<td>1-Panel</td>
<td>2580</td>
<td>24' 2&quot;</td>
<td>80</td>
<td>37.445424</td>
<td>-122.162545</td>
<td>470 Ramona St</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>58'</td>
</tr>
<tr>
<td>P04m</td>
<td>1-Panel</td>
<td>3066</td>
<td>20' 4&quot;</td>
<td>95</td>
<td>37.446084</td>
<td>-122.162035</td>
<td>450 Bryant St</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>55'</td>
</tr>
<tr>
<td>P05m</td>
<td>1-Panel</td>
<td>44</td>
<td>24' 2&quot;</td>
<td>80</td>
<td>37.446787</td>
<td>-122.161376</td>
<td>460 Florence St</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>55'</td>
</tr>
<tr>
<td>P06m2</td>
<td>1-Panel</td>
<td>51</td>
<td>20' 4&quot;</td>
<td>310</td>
<td>37.447003</td>
<td>-122.160117</td>
<td>Across 502 Waverley St</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>52'</td>
</tr>
<tr>
<td>P07m2</td>
<td>1-Panel</td>
<td>N/A</td>
<td>20' 4&quot;</td>
<td>15</td>
<td>37.448490</td>
<td>-122.158864</td>
<td>Across 439 Hamilton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>51'</td>
</tr>
<tr>
<td>P08m</td>
<td>1-Panel</td>
<td>32</td>
<td>24' 2&quot;</td>
<td>350</td>
<td>37.445320</td>
<td>-122.160030</td>
<td>300 Hamilton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>56'</td>
</tr>
<tr>
<td>P09m</td>
<td>1-Panel</td>
<td>01</td>
<td>21' 8&quot;</td>
<td>0</td>
<td>37.443722</td>
<td>-122.160634</td>
<td>Across 600 Ramona St</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>56'</td>
</tr>
<tr>
<td>P10m</td>
<td>1-Panel</td>
<td>N/A</td>
<td>20' 4&quot;</td>
<td>325</td>
<td>37.443502</td>
<td>-122.161809</td>
<td>160 Hamilton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>57'</td>
</tr>
<tr>
<td>P11m</td>
<td>1-Panel</td>
<td>N/A</td>
<td>20' 4&quot;</td>
<td>330</td>
<td>37.442877</td>
<td>-122.162484</td>
<td>100 Hamilton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>60'</td>
</tr>
<tr>
<td>P12m2</td>
<td>1-Panel</td>
<td>39</td>
<td>20' 4&quot;</td>
<td>145</td>
<td>37.447814</td>
<td>-122.161922</td>
<td>379 Lytton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>58'</td>
</tr>
<tr>
<td>P13m</td>
<td>1-Panel</td>
<td>2575</td>
<td>20' 4&quot;</td>
<td>175</td>
<td>37.453388</td>
<td>-122.164394</td>
<td>181 Lytton Avenue</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>63'</td>
</tr>
<tr>
<td>P14m</td>
<td>1-Panel</td>
<td>2388</td>
<td>20' 4&quot;</td>
<td>135</td>
<td>37.45944</td>
<td>-122.163782</td>
<td>245 Lytton Avenue</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>60'</td>
</tr>
<tr>
<td>P15m</td>
<td>1-Panel</td>
<td>57</td>
<td>20' 4&quot;</td>
<td>180</td>
<td>37.465272</td>
<td>-122.163199</td>
<td>265 Lytton Avenue</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>60'</td>
</tr>
<tr>
<td>P16m</td>
<td>1-Panel</td>
<td>2120</td>
<td>24' 1&quot;</td>
<td>120</td>
<td>37.441728</td>
<td>-122.162571</td>
<td>320 Lytton Avenue</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>58'</td>
</tr>
<tr>
<td>P17m</td>
<td>1-Panel</td>
<td>2220</td>
<td>23' 8&quot;</td>
<td>165</td>
<td>37.448026</td>
<td>-122.161120</td>
<td>451 Lytton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>55'</td>
</tr>
<tr>
<td>P18m</td>
<td>1-Panel</td>
<td>36</td>
<td>20' 4&quot;</td>
<td>340</td>
<td>37.445888</td>
<td>-122.159486</td>
<td>380 Hamilton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>54'</td>
</tr>
<tr>
<td>P19m</td>
<td>1-Panel</td>
<td>N/A</td>
<td>20' 4&quot;</td>
<td>330</td>
<td>37.440956</td>
<td>-122.161270</td>
<td>220 Hamilton Ave</td>
<td>Palo Alto, CA</td>
<td>City of Palo Alto</td>
<td>Amphenol: HTXCWW63111414Fx00</td>
<td>Two 2x5W mRU</td>
<td>58'</td>
</tr>
</tbody>
</table>
Appendix A-1

RF EXPOSURE AT THE LEVEL OF THE ANTENNA
RF EXPOSURE AT ELEVATION OF ANTENNA
PERCENTAGE OF FCC MAXIMUM PUBLIC & OCCUPATIONAL EXPOSURE (MPE) LIMIT

Maximum RF Exposure
42% Occupational MPE
210% Public MPE

Utility Pole

1 Antenna

10 feet

Red: Greater than 100% Public MPE
Yellow: Less than 100% Public MPE
Blue: Less than 20% Public MPE
Green: Less than 1% Public MPE
Appendix A-2

RF CAUTION SIGN
The radio frequency (RF) emissions at this site have been evaluated for potential RF exposure to personnel who may need to work near these antennae.

RF EXPOSURE AT 3 FEET OR CLOSER TO THE FACE OF THE ANTENNA MAY EXCEED THE FCC PUBLIC EXPOSURE STANDARD AND THUS ONLY QUALIFIED RF WORKERS MAY WORK IN THIS 3 FOOT EXCLUSION ZONE. OTHERS WHO NEED TO WORK IN THE EXCLUSION ZONE SHOULD CALL: ____________ FOR INSTRUCTIONS PRIOR TO COMMENCING WORK. REFER TO SITE: ________________________________

Appendix A-3

Amphenol HTXCGW63111414Fx00 Panel
Exposure Calculation Ground Level (AGL)

Antenna Center 20.0 ft AGL
RF Exposure Ground Level
Antennae Center 20.0 feet AGL

Horizontal Distance From Base of Antenna Location in Feet

% FCC Public Exposure Standard
Dr. Jerrold Bushberg has performed health and safety analysis for RF & ELF transmissions systems since 1978 and is an expert in both health physics and medical physics. The scientific discipline of Health Physics is devoted to radiation protection, which, among other things, involves providing analysis of radiation exposure conditions, biological effects research, regulations and standards as well as recommendations regarding the use and safety of ionizing and non-ionizing radiation. In addition, Dr. Bushberg has extensive experience and lectures on several related topics including medical physics, radiation protection, (ionizing and non-ionizing), radiation biology, the science of risk assessment and effective risk communication in the public sector.

Dr. Bushberg’s doctoral dissertation at Purdue University was on various aspects of the biological effects of microwave radiation. He has maintained a strong professional involvement in this subject and has served as consultant or appeared as an expert witness on this subject to a wide variety of organizations/institutions including, local governments, school districts, city planning departments, telecommunications companies, the California Public Utilities Commission, national news organizations, and the U.S. Congress. In addition, his consultation services have included detailed computer based modeling of RF exposures as well as on-site safety inspections and RF & ELF environmental field measurements of numerous transmission facilities in order to determine their compliance with FCC and other safety regulations. The consultation services provided by Dr. Bushberg are based on his professional judgement as an independent scientist, however they are not intended to necessarily represent the views of any other organization.

Dr. Bushberg is a member of the main scientific body of International Committee on Electromagnetic Safety (ICES) which reviews and evaluates the scientific literature on the biological effects of non-ionizing electromagnetic radiation and establishes exposure standards. He also serves on the ICES Risk Assessment Working Group that is responsible for evaluating and characterizing the risks of non-ionizing electromagnetic radiation. Dr. Bushberg was appointed and is serving as a member of the main scientific council of the National Council on Radiation Protection and Measurement's (NCRP). He is also a Scientific Vice-President of the NCRP, a member of the NCRP Board of Directors and chairs its committee on Radiation Protection in Medicine. In addition, Dr. Bushberg is a member of NCRP’s scientific advisory committee on Non-ionizing Radiation Safety. The NCRP is the nation’s preeminent scientific radiation protection organization, chartered by Congress to evaluate and provide expert consultation on a wide variety of radiological health issues. The current FCC RF exposure safety standards are based in large part on the recommendations of the NCRP. Dr. Bushberg was elected to the International Engineering in Medicine and Biology Society Committee on Man and Radiation (COMAR) which has as its primary area of responsibility the examination and interpreting the biological effects of non-ionizing electromagnetic energy and presenting its findings in an authoritative and professional manner. Dr. Bushberg is also a member of a six person U.S. expert delegation to the international scientific community on Scientific and Technical Issues for Mobile Communication Systems established by the Federal Communications Commission.

Dr. Bushberg is a full member of the Bioelectromagnetics Society, the Health Physics Society and the Radiation Research Society. Dr. Bushberg received both a Masters of Science and Ph.D. from the Department of Bionucleonics at Purdue University. Dr. Bushberg is certified by several national professional boards with specific sub-specialty certification in radiation protection and medical physics. Prior to coming to California, Dr. Bushberg was on the faculty of Yale University School of Medicine.
Link to project plans:
http://www.cityofpaloalto.org/civicax/filebank/documents/49308