COUNTY OF SAN MATEO
PLANNING AND BUILDING DEPARTMENT

DATE: June 21, 2018

TO: Zoning Hearing Officer

FROM: Planning Staff

SUBJECT: Consideration of a Use Permit, pursuant to Sections 6500 and 6510 of the San Mateo County Zoning Regulations, to install a new wireless telecommunication facility on a replacement joint utility pole located in the public right-of-way in front of 2041 Monterey Avenue in the unincorporated West Menlo Park area of San Mateo County.

County File Number: PLN 2017-00464

PROPOSAL

The applicant proposes to replace an existing joint utility pole located in the public right-of-way and to install a new wireless telecommunication facility on the top of the replacement pole. The new facility will consist of adding a 7-ft. extension pole to the top of the existing pole, one cylindrical shaped antenna to be mounted on the top of the pole extension, located at a maximum height of 45 feet 7 inches above grade, two RRU's, located at a maximum height of 16 feet 9 inches above grade, and associated equipment boxes, located between 7 and 18 feet above the existing grade, all of which is to be mounted on the replacement joint utility pole. No grading or tree removal activities are proposed.

RECOMMENDATION

That the Zoning Hearing Officer approve the Use Permit, County File Number PLN 2017-00464, by making the required findings and adopting the conditions of approval as listed in Attachment A.

BACKGROUND

Report Prepared By: Angela Chavez, Project Planner, 650/599-7217

Applicant: Caitlin McLester for Modus Corp on behalf of AT&T Wireless

Land Owner: Public Right-of-Way

Pole Owner: Joint Pole Association (JPA)/California Public Utilities Commission (CPUC)

Sphere-of-Influence: City of Menlo Park

Existing Land Use: Utility Pole in the Public Right-of-Way

Location: Monterey Avenue Public Right-of-Way (in front of 2041 Monterey Avenue), West Menlo Park

APN: Public Right-of-Way in front of 074-031-300

Existing Zoning: R-1/S-72 (Single-Family Residential/5,000 sq. ft. minimum parcel size)

General Plan Designation: Medium Density Residential Urban

Flood Zone: The project site is located in Flood Zone X as defined by FEMA (Community Panel Number 06081C0312E, dated October 16, 2012), which is an area of minimal flood hazard.

Environmental Evaluation: The project is categorically exempt under provisions of Class 3, Section 15303, of the California Environmental Quality Act (CEQA) Guidelines for construction of a new small structure and installation of small new equipment and a facility in a small structure.

Setting: The project site is located approximately .86 of a mile from the intersection Alameda de las Pulgas and Santa Cruz Avenue in the unincorporated West Menlo Park area. The surrounding properties are developed with single-family residential development.

Chronology:

Date		Action
October 31, 2017	-	Use permit application, the subject of this application, submitted.
May 1, 2018	-	Application deemed complete.
June 21, 2018	-	ZHO Public Hearing date.

DISCUSSION

A. KEY ISSUES

1. Compliance with the General Plan

Staff has determined that the project complies with all applicable County General Plan policies, specifically:

Visual Quality Policies

Policy 4.21 (*Utility Structures*) requires minimizing adverse visual impacts generated by utility structures. The project site is located within the public right-of-way along a residential street in a single-family residentially zoned district. The existing pole currently stands at 38 feet 2 inches above grade and the project proposes to replace the existing pole and increase the overall height by 7 feet 5 inches. The additional height is required in order to provide the minimum 6 feet of clearance between the proposed antenna and the existing power lines as required by California Public Utilities Commission General Order 95 (GO95) engineering requirements. While the proposed antenna reaches a maximum height of 53 feet 6 inches, all of the associated equipment is mounted lower on the utility pole between 7 and 18 feet above grade. The new pole will be located immediately adjacent to the existing pole (which will be removed) adjacent to the sidewalk. There is residential landscaping and existing trees in the vicinity of the pole that provide minimal screening. However, the proposed antenna is cylindrical in shape in keeping with the profile of the utility pole and all proposed equipment is designed to attach directly to the pole to minimize added bulk. To ensure visual impacts are minimized, the equipment clusters will be similar in scale and appearance to equipment typically found on utility poles and will be painted brown to match the wood material of the joint utility pole.

2. Compliance with the Zoning Regulations

The proposed project site is within the public right-of-way in the R-1/S-72 (Single-Family Residential/5,000 sq. ft. minimum parcel size) Zoning District. The zoning district standards, with the exception of height, are not applicable since the site is located within the public right-of-way.

The maximum height allowed in the R-1/S-72 Zoning District is 28 feet. The proposed project will consist of one small cell antenna at the top of a new pole and ancillary pole mounted equipment. The existing pole is currently over the maximum allowed height by 10 feet 2 inches for a maximum height of 38 feet 2 inches. The project proposes to add an additional 7 feet 5 inches to the total height of the replacement pole to

accommodate the pole top antenna. The additional height is due to General Order No. 95 (GO95), mandated by the California Public Utilities Commission, which requires all cellular antennas to be at least 6 feet from adjacent power supply lines. The replacement pole meets the height necessary to continue the power line service with the additional height which allows for the 6 feet of required separation between the power lines and the antenna. While this results in 45 feet 7 inches, which exceeds the 28 ft. zoning height limit in this case, State regulations supersede local regulations.

Section 6512.2.l.2 (*Development And Design Standards For New Wireless Telecommunication Facilities That Are Not Co-Location Facilities*) of the San Mateo County Zoning Regulations states, in any Residential (R) District, that no monopole or antenna shall exceed the maximum height for structures allowed in that district, except that new equipment on an existing facility in the public right-of-way shall be allowed to exceed the maximum height for structures allowed in that district by 10% of the height of the existing facility, or by 5 feet, whichever is less. The new equipment for this wireless telecommunication facility will not be in compliance with this section. However, due to GO95, the project has been specially designed to meet the State's safety requirements to meet the minimum clearance of 6 feet. Therefore, the proposed project adheres to this section to the best of its ability.

3. Compliance with the Wireless Telecommunication Facilities Ordinance

Staff has reviewed the project against the provisions of the Wireless Telecommunication Facilities (WTF) Ordinance and determined that the project complies with the applicable standards discussed below:

a. Development and Design Standards

Section 6512.2.A states that new wireless telecommunication facilities shall be prohibited in a Sensitive Habitat, as defined by Policy 1.8 of the General Plan (*Definition of Sensitive Habitats*) for facilities proposed outside of the Coastal Zone.

The project is not located in a sensitive habitat, as defined by Policy 1.8 of the General Plan.

Section 6512.2.B prohibits new wireless telecommunication facilities from being located in areas zoned Residential (R), unless the applicant demonstrates that a review has been conducted of other options and no other sites or combination of sites allow feasible service or adequate capacity and coverage.

The proposed facility will be located on a joint utility pole within the public right-of-way in the R-1/S-72 Zoning District. The proposed location was chosen in an effort to adequately provide AT&T wireless voice and data coverage to the surrounding area where there is currently a gap in service coverage. Small cell facilities such as the proposed site are not meant to increase the coverage area but to assist with unloading traffic from the macro site network.
This increases data speed and decreases dropped calls. Because of this, they are placed in specific locations of need to service a specific community.

In the AT&T Site Analysis (see Attachment E), the applicant has identified and researched alternative sites. The radius of the map provided is smaller than 2.5 miles because small cell technology requires the sites to be much closer together than the larger macro sites. Because of this, a larger radius would not be an accurate representation of AT&T's site analysis process. Three other alternative sites were identified but were ruled out as viable proposed sites due to the additional impacts that may result if chosen. These impacts include tree trimming or removal, inadequate space on the existing pole, and/or visual impacts to adjacent property owners.

Among the researched locations, the proposed location is the least intrusive and will fill the coverage gap necessary to provide adequate wireless and data coverage.

Section 6512.2.C prohibits new wireless telecommunication facilities to be located in areas where co-location on existing facilities would provide equivalent coverage with less environmental impacts.

The applicant was unable to identify any existing wireless facilities within a 2.5-mile radius that would either allow co-location or provide coverage to the target area. Though monopoles and cellular towers exist within a 2.5-mile radius, these alternative sites are not feasible due to their location outside of the proposed small cell network and their inability to increase network capacity and coverage.

Section 6512.2.D requires new wireless telecommunication facilities to be constructed so as to accommodate co-location, and must be made available for co-location.

Future co-locations are technically feasible as long as the proposed facilities comply with California Public Utilities Commission General Order 95 (GO95) engineering requirements. This proposed facility will be a pole-top mounted facility and, thus, cannot be co-located per

PG&E GO95 requirements. Therefore, the applicant does not expect future co-locations.

Sections 6512.2.E and F seek to minimize and mitigate visual impacts from public views by siting new facilities outside of public views, using natural vegetation for screening, painting equipment to blend with existing landscaping, and designing the facility to blend in with the surrounding environment.

The proposed facility includes one canister antenna located at a maximum height of 45 feet 7 inches above grade, mounted to the top of a replacement joint utility pole located in the public right-of-way. In an effort to minimize visual impacts, the antenna and proposed equipment shall be painted a non-reflective brown color to match the utility pole. No trees or vegetation are proposed for removal.

Section 6512.2.G requires that the exterior of wireless telecommunication facilities be constructed of non-reflective materials.

The proposed facility will be constructed of non-reflective materials. As discussed in the section above, the facility will be painted a non-reflective brown color to match the brown wood material of the joint utility pole.

Section 6512.2.H requires that wireless telecommunication facilities comply with all the requirements of the underlying zoning district, including, but not limited to, setbacks Design Review in the DR district(s), Architectural Review in designated Scenic Corridors, and Coastal Development Permit regulations in the CZ or CD zones.

As discussed in Section A.2, Compliance with the Zoning Regulations, the existing and proposed replacement joint utility pole, where the proposed facility is to be located, are situated in the public right-of-way and are not subject to the R-1/S-72 Zoning District development standards for setbacks; compliance with the applicable height standard is discussed below. As discussed in Section 2, Compliance with Zoning Regulations, the proposed facility complies as much as is reasonably possible. The existing and proposed replacement joint utility pole are situated in the public right-of-way and are not subject to the development standards for setbacks. The project site is not located within a Design Review, Architectural Review, or Coastal Development district.

Section 6512.2.I.2 states that new equipment located on existing facilities in the public right-of-way in any Residential (R) District, shall be allowed to exceed the maximum height for structures allowed in that district by 10% of the height of the existing facility, or by 5 feet, whichever is less.

The maximum height allowed in the R-1/S-72 Zoning District is 28 feet. The proposed project involves installing a new wireless telecommunication facility on a replacement joint utility pole. As discussed in Section A.2, the proposed facility must comply with CPUC GO95 clearance regulations which requires at least 6 feet of clearance between the power lines and equipment for the wireless telecommunication facility. The replacement pole provides the height necessary to continue to support the overhead power lines and the required 6 feet of separation. Given this, the project is as nearly in compliance as is reasonably possible.

b. Performance Standards

The proposed project meets the required standards of Section 6512.3 (*Performance Standards for New Wireless Telecommunication Facilities That Are Not Co-Location Facilities*) for lighting, licensing, provision of a permanent power source, timely removal of the facility, and visual resource protection. There is no lighting proposed, proper licenses will be obtained from both the Federal Communications Commission (FCC) and the California Public Utilities Commission (CPUC), power for the facility will be provided by PG&E, visual impact will be minimal, and conditions of approval will require maintenance and/or removal of the facility when it is no longer in operation. Furthermore, road access to the proposed project site is existing and no noise in excess of San Mateo County's Noise Ordinance will be produced. Conditions of Approval Nos. 8-19 were added to ensure compliance with the performance standards of this section (see Attachment A).

4. Compliance with the Use Permit Findings

For the use permit to be approved by the Zoning Hearing Officer, the following findings must be made:

a. That the establishment, maintenance, and/or conducting of the use will not, under the circumstances of this particular case, be detrimental to the public welfare or injurious to property or improvements in said neighborhood.

Cellular communications facilities, such as the proposed project, require the submittal and review of a radio frequency (RF) report to ensure that the RF emissions from the proposed antenna do not exceed the Federal Communications Commission's public exposure limits. The applicant submitted a radio frequency report prepared by Hammett & Edison, Inc., dated June 1, 2018, confirming that the proposed facility will comply with the prevailing standards for limiting public exposure to radio frequency energy and thus, will not cause a significant impact on the environment. The report states that the maximum RF level at ground level is calculated to be 0.78% of the applicable public exposure limit. The maximum calculated level at the second-floor elevation of the nearby residences is calculated to be 1.4% of the public exposure limit. It should be noted that these results include several "worst-case" assumptions and therefore are expected to overstate actual power density levels from the proposed operation. Due to the location of the mounted antenna, it will not be accessible to the general public and therefore no mitigation measures are necessary to comply with the FCC public exposure guidelines. To ensure compliance with occupational exposure limitations, staff has included a condition of approval, as recommended by Hammett & Edison, Inc., for the posting of explanatory warning signs on the pole below the antennas, readily visible from any angle of approach to persons who may need to work within the area (see Attachment A).

Furthermore, the proposed facility will be unmanned, operate at all times, and be serviced once a year by an AT&T technician. The proposed facility will not generate significant traffic, noise, or intensification of use of the site.

With the discussion above, staff has determined that the proposed project will not have a negative environmental, health, or visual impact on persons or property within the project vicinity.

b. That this telecommunication facility is necessary for the public health, safety, convenience, or welfare of the community.

Staff has determined that installation of a cellular facility at the proposed location will allow for increased clarity, range, and capacity of the existing cellular network and will enhance services for the public. The proposed facility is the least intrusive option available to expand AT&T's network capacity and service coverage in this area of West Menlo Park. The proposed facility does not result in a new pole location and will add small equipment without disturbing the character of the neighborhood.

B. ENVIRONMENTAL REVIEW

This project is categorically exempt pursuant to Section 15303, Class 3, of the California Environmental Quality Act (CEQA) related to the construction of a new, small structure and installation of small new equipment and a facility in a small structure.

C. REVIEWING AGENCIES

San Mateo County Building Inspection Section
San Mateo County Department of Public Works
Menlo Park Fire Protection District
City of Menlo Park

ATTACHMENTS

A. Recommended Findings and Conditions of Approval
B. Vicinity Map
C. Project Plans
D. Photo Simulations
E. Alternative Site Analysis
F. Radio Frequency Radiation Report prepared by Hammett & Edison, Inc., dated September 22, 2017

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Attachment A

County of San Mateo
Planning and Building Department

RECOMMENDED FINDINGS AND CONDITIONS OF APPROVAL

Permit or Project File Number: PLN 2017-00464 Hearing Date: June 21, 2018

Prepared By: Angela Chavez
Project Planner

For Adoption By: Zoning Hearing Officer

RECOMMENDED FINDINGS

Regarding the Environmental Review, Find:

1. That this project is categorically exempt from environmental review, per Class 3, Section 15303, of the California Environmental Quality Act (CEQA) Guidelines for construction of a new, small structure and installation of small new equipment and a facility in a small structure.

Regarding the Use Permits, Find:

2. That the establishment, maintenance, and/or conducting of the use will not, under the circumstances of this particular case, be detrimental to the public welfare or injurious to the property or improvements in said neighborhood because the project will meet current Federal Communications Commission (FCC) standards as shown in the radio frequency radiation report and has been conditioned to maintain a valid FCC and California Public Utilities Commission (CPUC) license.

3. That this telecommunication facility is necessary for the public health, safety, convenience, or welfare of the community in that installing a cellular facility at this location will provide increased and improved cellular coverage in the area for residents, commuters, and emergency personnel.

RECOMMENDED CONDITIONS OF APPROVAL

Current Planning Section

1. This approval applies only to the proposal, documents, and plans described in this report and submitted to and approved by the Zoning Hearing Officer on June 21, 2018. Minor revisions or modifications may be approved by the Community Development Director if they are consistent with the intent of and in substantial conformance with this approval.

2. This use permit shall be for the proposed project only. Any change or change in intensity of use shall require an amendment to the use permit. Amendments to this use permit require an application for amendment, payment of applicable fees, and consideration at a public hearing.

3. This permit shall be valid for ten (10) years until June 21, 2028. If the applicant seeks to renew this permit, renewal shall be applied for six (6) months prior to expiration with the Planning and Building Department and shall be accompanied by the renewal application and fee applicable at that time. Renewal of this permit shall be considered at a public hearing.

4. The applicant shall paint the antenna and equipment boxes a non-reflective brown color to match the utility pole. Two copies of each color samples shall be submitted to the Current Planning Section at the time of application for an encroachment permit. Color verification will be confirmed by the Current Planning Section prior to a final inspection for the encroachment permit.

5. During project construction, the applicant shall, pursuant to Chapter 4.100 of the San Mateo County Ordinance Code, minimize the transport and discharge of stormwater runoff from the construction site into storm drain systems by:

    a. Stabilizing all denuded areas and maintaining erosion control measures continuously between October 1 and April 30. Stabilizing shall include both proactive measures, such as the placement of hay bales or coir netting, and passive measures, such as revegetating disturbed areas with plants propagated from seed collected in the immediate area.

    b. Storing, handling, and disposing of construction materials and wastes properly, so as to prevent their contact with stormwater.

    c. Controlling and preventing the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, wash water or sediments, and non-stormwater discharges to storm drains and watercourses.

    d. Avoiding cleaning, fueling, or maintaining vehicles on-site, except in a designated area where wash water is contained and treated.

    e. Delineating with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.

    f. Protecting adjacent properties and undisturbed areas from construction impacts using vegetative buffer strips, sediment barriers or filters, dikes, mulching, or other measures as appropriate.

    g. Performing clearing and earth-moving activities only during dry weather.

h. Limiting and timing application of pesticides and fertilizers to prevent polluted runoff.

i. Limiting construction access routes and stabilizing designated access points.

j. Avoiding tracking dirt or other materials off-site; cleaning off-site paved areas and sidewalks using dry sweeping methods.

k. The contractor shall train and provide instruction to all employees and subcontractors regarding the construction Best Management Practices.

6. This permit does not allow for the removal of any trees. Any tree removal will require a separate permitting process.

7. The applicant shall not enter into a contract with the landowner or lessee which reserves for one company exclusive use of structures on this site for telecommunication facilities.

8. The wireless telecommunication facility shall not be lighted or marked unless required by the Federal Communications Commission (FCC) or the Federal Aviation Administration (FAA).

9. The applicant shall file, receive, and maintain all necessary licenses and registrations from the Federal Communications Commission (FCC), the California Public Utilities Commission (CPUC), and any other applicable regulatory bodies prior to initiating the operation of this facility. The applicant shall supply the Planning and Building Department with evidence of each of these licenses and registrations. If any required license is ever revoked, the applicant shall inform the Planning and Building Department of the revocation within ten (10) days of receiving notice of such revocation.

10. Once a use permit is obtained, the applicant shall obtain an encroachment permit and build in accordance with the approved plans.

11. The project's final inspection approval shall be dependent upon the applicant obtaining a permanent and operable power connection from the applicable energy provider.

12. The wireless telecommunication facility and all equipment associated with it shall be removed in its entirety by the applicant within ninety (90) days if the FCC and/or CPUC license and registration are revoked or the facility is abandoned or no longer needed, and the sites shall be restored to blend with the surrounding area. The owner and/or operator of the wireless telecommunication facility shall notify the Planning Department upon abandonment of the facility. Restoration shall be completed within two (2) months of the removal of the facility.

13. This wireless telecommunication facility shall be maintained by the permittee(s) and subsequent owners in a manner that implements visual resource protection requirements of Sections 6512.2.E and F above (e.g., landscape maintenance and painting), as well as all other applicable zoning standards and permit conditions.

14. Noise sources associated with demolition, construction, repair, remodeling, or grading of any real property shall be limited to the hours from 7:00 a.m. to 6:00 p.m., weekdays and 9:00 a.m. to 5:00 p.m., Saturdays. Said activities are prohibited on Sundays, Thanksgiving, and Christmas (San Mateo Ordinance Code Section 4.88.360).

15. The use of diesel generators or any other emergency backup energy source shall comply with the San Mateo County Noise Ordinance.

16. If technically practical and without creating any interruption in commercial service caused by electronic magnetic interference (EMI), floor space, tower space, and/or rack space for equipment in a wireless telecommunication facility shall be made available to the County for public safety communication use.

17. To reduce the impact of construction activities within the public right-of-way and/or on neighboring properties, the applicant shall ensure that no construction-related vehicles impede through traffic along Monterey Avenue or other public right-of-ways.

18. To reduce the impact of potential traffic hazards from service visits to the facility, the applicant shall ensure that no vehicles related to the service and/or maintenance of the cellular facility impede through traffic along Monterey Avenue or other public right-of-ways.

19. Explanatory signs are required to be posted at the antennas and/or on the pole below the antennas, readily visible from any angle of approach to persons who might need to work within the project area.

<u>Department of Public Works</u>

20. No proposed construction work within the public right-of-way shall begin until County requirements for the issuance of an encroachment permit, including review of the plans, have been met and an encroachment permit issued. The applicant shall contact a Department of Public Works inspector 48 hours prior to commencing work in the public right-of-way.

Menlo Park Fire Protection District

21. The applicant shall comply with all applicable requirements of the 2016 California Building/Fire Codes and local amendments.

22. The applicant shall provide emergency contact information on AT&T equipment.

23. Approved plans and approval letter must be on-site at the time of final inspection.

24. Upon completion of work, contact Fire Inspector Bob Blach of the Menlo Park Fire Protection District at 650/688-8430 to schedule a final inspection. A 48-hour notice is required for all inspections.

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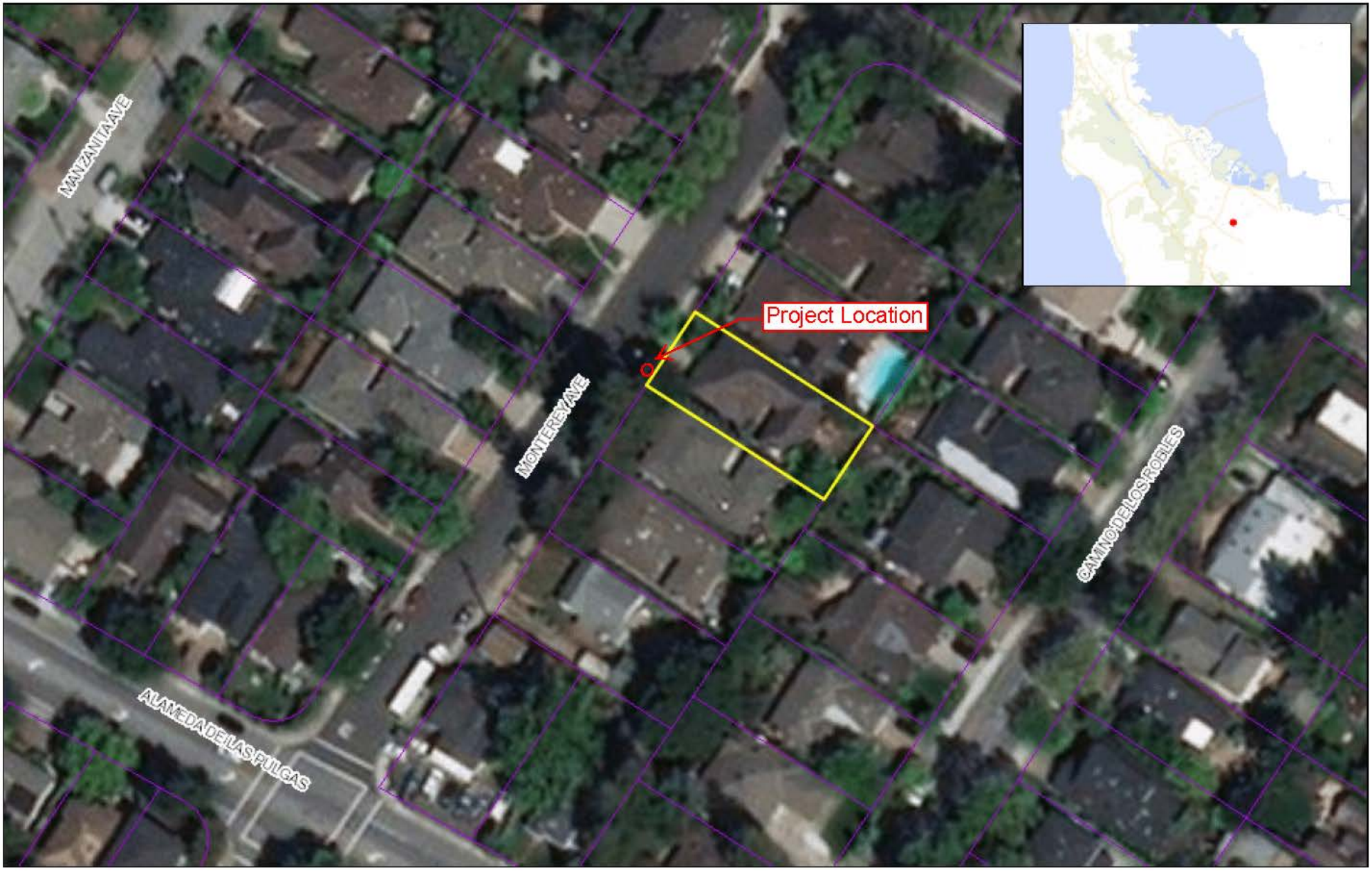
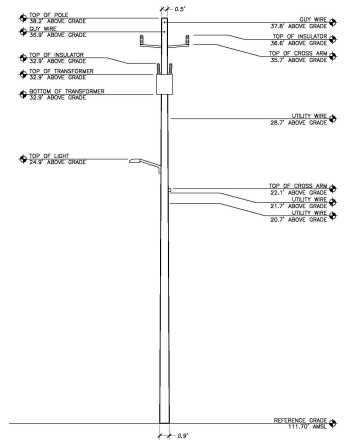


San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T** Attachment: **B**

File Numbers: **PLN2017-00464**

2 SITE PLAN
SCALE: 1"=5'



3 UTILITY POLE ELEVATION
SCALE: 1"=5'

BOUNDARY AND TITLE INFORMATION

THIS MAP IS A GRAPHIC DEPICTION OF DATA COMPILED FROM MAPS AND VARIOUS OTHER INFORMATION. IT IS NOT A BOUNDARY SURVEY. THIS MAP IS A TOPOGRAPHIC MAP SHOWING PROPERTY LINES PLOTTED FROM SAID RECORD DATA AND BEST FIT ONTO EXISTING IMPROVEMENTS. THE LIMITS OF TOPOGRAPHIC DATA AND/OR IMPROVEMENTS GATHERED AND DEPICTED ARE LIMITED TO THE CONTRACTUAL SCOPE FOR THIS PROJECT. NO MONUMENTS WERE SET OR WILL BE SET. NO TITLE RESEARCH WAS PERFORMED BY OMNI DESIGN GROUP INC. ELEVATION LINE LOCATIONS SHOWN HEREON SHALL NOT SHIFT FROM LOCATIONS SHOWN HEREON. SHOULD A BOUNDARY SURVEY BE PERFORMED, LOCATIONS OF EXISTING FEATURES RELATIVE TO PROPERTY LINES THEREFORE ARE APPROXIMATE.

DATUM:

HORIZONTAL & VERTICAL DATUMS SHOWN ON THESE PLANS WERE OBTAINED FROM GPS OBSERVATIONS USING "SMARTNET" REAL TIME NETWORK.

BASIS OF BEARINGS

THE BEARINGS ARE BASED UPON CALIFORNIA COORDINATE SYSTEM, ZONE 3, NAD 83

BENCHMARK:

THE ELEVATIONS ARE BASED UPON NAVD 88

NOTES:

1. DATE OF SURVEY: 06/24/17
2. NO UNDERGROUND UTILITIES WERE LOCATED.

LEGEND

AC = ASPHALTIC CONCRETE
EP = EDGE OF PAVEMENT
FL = FLOWLINE
FS = FINISHED SURFACE
GD = GROUND ELEVATION
TC = TOP OF CURB
AGL = ABOVE GRADE LEVEL
AMSL = ABOVE MEAN SEA LEVEL

1 BOUNDARY & LEGAL DESCRIPTIONS
SCALE: NONE

at&t
2600 CAMINO RAMON
4TH FLOOR, WEST WING
SAN RAMON, CA 94583

PROJECT INFORMATION:
SFOK3-013
2049 MONTEREY AVE
MENLO PARK, CA

CURRENT ISSUE DATE:
07/14/17

ISSUED FOR:
100% SURVEY

REV.:	DATE:	DESCRIPTION:	BY:

COORDINATING ARCHITECT:
Architecture
Civil Engineering
Surveying
Telecommunications
711 Tank Farm Road, Suite 100
San Luis Obispo, California 93401
Phone: (805) 544-9700
www.omnidesigngroup.com
email: omni@odgslo.com

SEAL:
PROFESSIONAL LAND SURVEYOR
DAVID A. MARCHELL
EXP: 12-31-18
NO. PLS8375
STATE OF CALIFORNIA

CONSULTANT:
Modus, Inc.
240 Stockton Street, 3rd Floor
San Francisco, CA 94108

DRAWN BY:	CHK.:	APV.:
SH/DKN	DM	DM

SHEET TITLE:
SITE PLAN

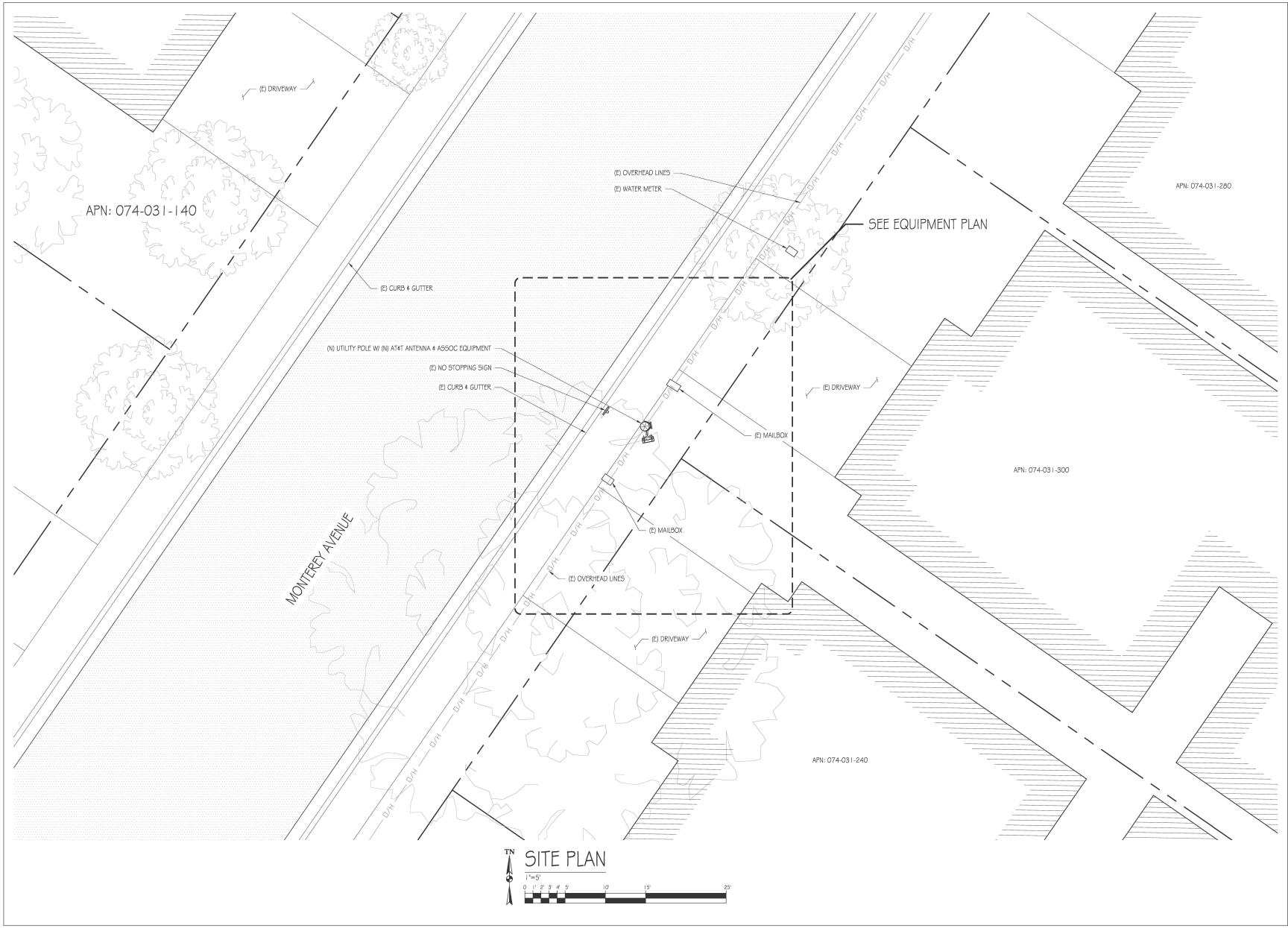
SHEET NUMBER: C-1
REVISION: 1180-68

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T**

Attachment: **C**

File Numbers: **PLN2017-00464**



at&t
AT&T MOBILITY
500 EXECUTIVE PARKWAY
SAN RAMON, CA 94583

mobi
240 STOCKTON STREET, 3RD FLOOR
SAN FRANCISCO, CA 94108

PRECISION DESIGN Drafting, INC.
Phone: (530) 823-1481 www.pddi.com
11788 Atwood Rd, Suite 201 Auburn, CA 95603

REGISTERED PROFESSIONAL ENGINEER
BRENT A. BUTLER
C 68891
EXP 09-30-18
CIVIL
STATE OF CALIFORNIA

CRAN_R5FR_5FOK3_013

ROW ADJCT TO 2049 MONTEREY AVENUE
MENLO PARK, CA 94025

ISSUE STATUS

△	DATE	DESCRIPTION
	09/11/17	CD 90%
	04/30/18	CD 100%

DRAWN BY:	T. DICARLO
CHECKED BY:	B. McCOMB
APPROVED BY:	B. McCOMB
DATE:	04/30/18

SHEET TITLE:
SITE PLAN

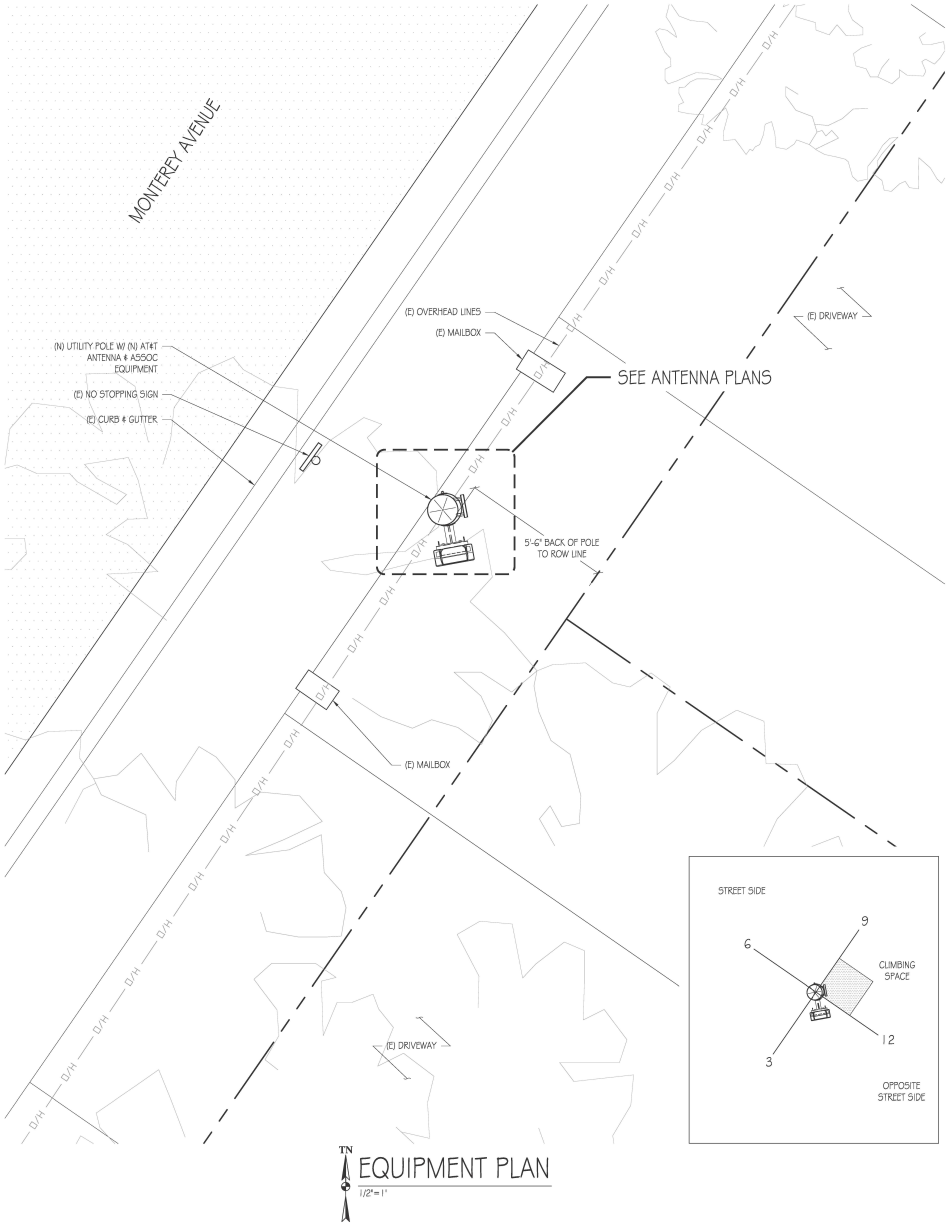
SHEET NUMBER
A-1

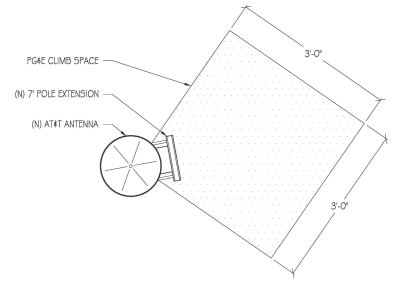
San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T**

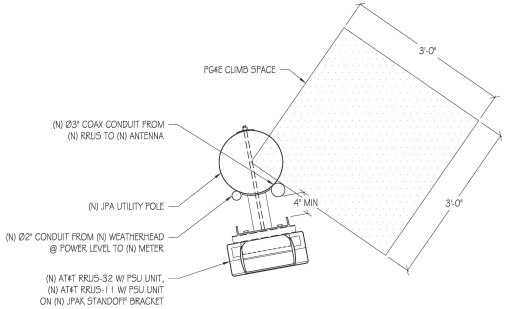
Attachment: **C**

File Numbers: **PLN2017-00464**

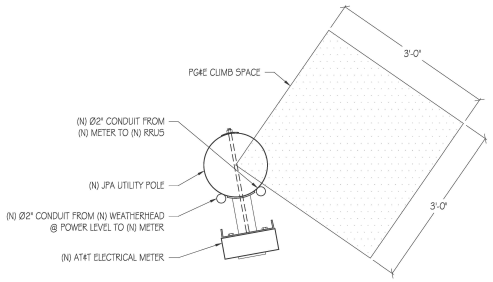




TN ANTENNA PLAN
1"=1'



TN RRH PLAN
1"=1'



TN ELECTRICAL METER PLAN
1"=1'

at&t
AT&T MOBILITY
500 CLARENDON PARKWAY
SAN RAMON, CA 94583

mobi
240 STOCKTON STREET, 3RD FLOOR
SAN FRANCISCO, CA 94108

PRECISION DESIGN & Drafting, INC.
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11769 Atwood Rd, Suite 20 Auburn, CA 95603

REGISTERED PROFESSIONAL ENGINEER
BRET A. MCCOMB
C-69991
EXP 09-30-18
CIVIL
STATE OF CALIFORNIA

CRAN_RSFR_SFOK3_013

ROW ADJCT TO 2049 MONTEREY AVENUE
MENLO PARK, CA 94025

ISSUE STATUS

△	DATE	DESCRIPTION
	09/11/17	CD 90%
	04/30/18	CD 100%

DRAWN BY:	T. DiCARLO
CHECKED BY:	B. McCOMB
APPROVED BY:	B. McCOMB
DATE:	04/30/18

SHEET TITLE:
EQUIPMENT PLAN & ANTENNA PLANS

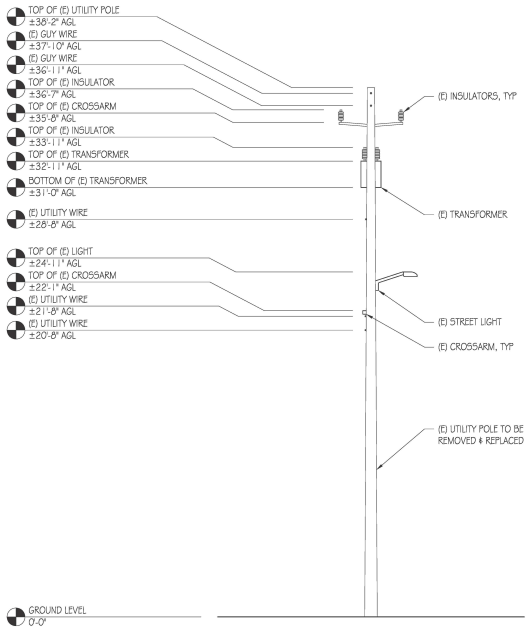
SHEET NUMBER
A-2

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T**

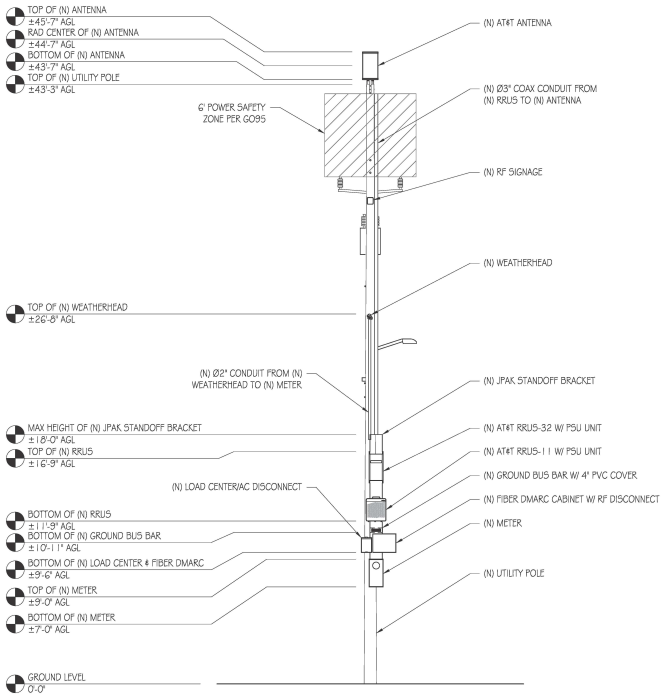
Attachment: **C**

File Numbers: **PLN2017-00464**



EXISTING SOUTHWEST ELEVATION

1/4"= 1'-0"



NEW SOUTHWEST ELEVATION

1/4"= 1'-0"

NOTES: ALL (N) EQUIPMENT TO BE PAINTED MESA BROWN. ALL (E) EQUIPMENT ON POLE TO BE MOUNTED TO (N) POLE AT SAME ELEVATION.

at&t
AT&T MOBILITY
5001 EXECUTIVE PARKWAY
SAN RAMON, CA 94583

mobu
240 STOCKTON STREET, 3RD FLOOR
SAN FRANCISCO, CA 941 08

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ROW ADJCT TO 2049 MONTEREY AVENUE
MENLO PARK, CA 94025

ISSUE STATUS

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DRAWN BY:	T. DICARLO
CHECKED BY:	B. McCOMB
APPROVED BY:	B. McCOMB
DATE:	04/30/18

SHEET TITLE:

ELEVATIONS

SHEET NUMBER

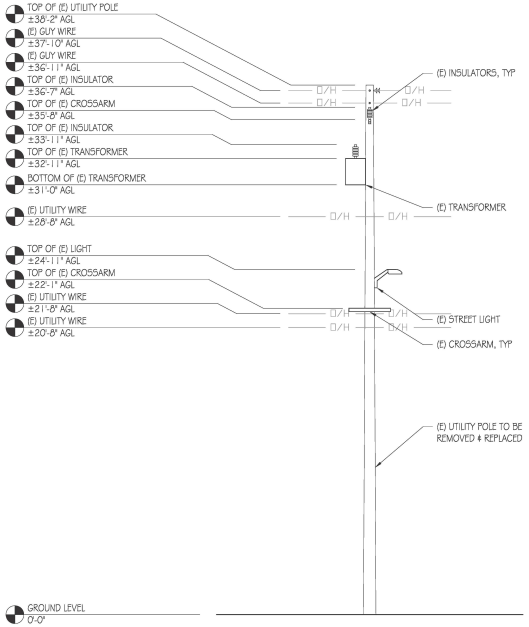
A-3

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T**

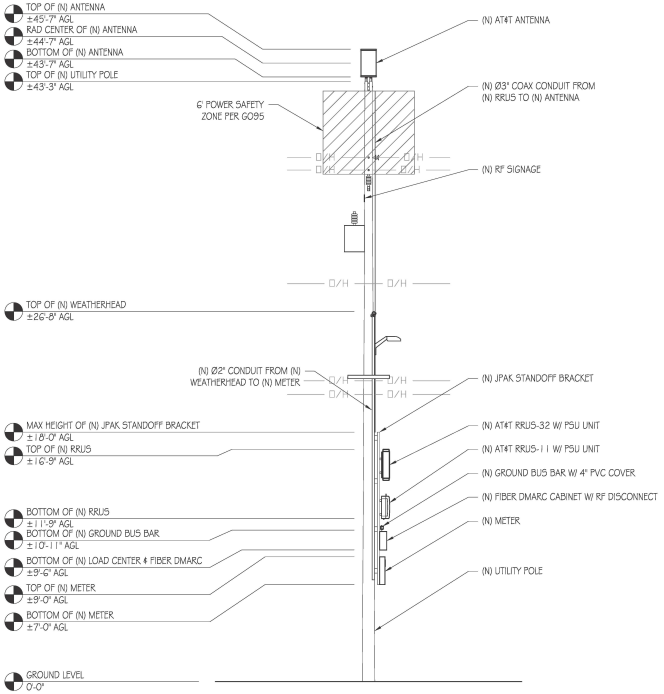
Attachment: **C**

File Numbers: **PLN2017-00464**



EXISTING NORTHWEST ELEVATION

1/4"=1'-0"



NEW NORTHWEST ELEVATION

1/4"=1'-0"

NOTES: ALL (N) EQUIPMENT TO BE PAINTED MESA BROWN. ALL (E) EQUIPMENT ON POLE TO BE MOUNTED TO (N) POLE AT SAME ELEVATION.

at&t
AT&T MOBILITY
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SAN RAMON, CA 94583

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STATE OF CALIFORNIA

CRAN_R5FR_SFOK3_013

ROW ADJCT TO 2049 MONTEREY AVENUE
MENLO PARK, CA 94025

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APPROVED BY:	B. McCOMB
DATE:	04/30/18

SHEET TITLE:

ELEVATIONS

SHEET NUMBER

A-4

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T**

Attachment: **C**

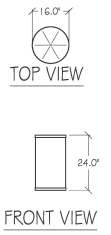
File Numbers: **PLN2017-00464**

POLE-TOP EXTENSION NOTES:

1. THIS UNIT MEETS GENERAL ORDER (G.O.) 95 REQUIREMENTS FOR STRENGTH IN CLASS 6 POLES AND THEREFORE MAY BE USED TO SUPPORT EQUIPMENT ON THESE CLASSES OF POLES. IT MAY BE USED ON LARGER CLASS POLES, BUT MAY NOT BE USED TO SUPPORT EQUIPMENT ON THEM.
2. THE UNIT MAY BE GUYED.
3. THE BRACKET IS MADE TO FIT POLES WITH DIAMETERS OF 8'-11". THEREFORE, DEPENDING UPON THE ACTUAL POLE-TOP DIAMETER, TO FIT POLES OF CLASS 3 AND SMALLER, A BRACKET ADAPTER MAY BE REQUIRED.
4. UNITS ARE SUPPLIED WITH THE WOOD BAYONET ASSEMBLED.
5. A POLE STEP KIT IS REQUIRED.
6. ATTACH THE BRACKET ASSEMBLY ACROSS THE LINE DIRECTION WITH THE CROSS ARM.
7. ALL DETAILS SHOWN ON THIS PAGE ARE FOR REFERENCE ONLY. THE POLE-TOP EXTENSION AND ANTENNA MOUNTING SYSTEMS ARE PER UTILITY COMPANY STANDARDS AND ARE SUBJECT TO CHANGE AT THEIR DISCRETION. BOTH THE POLE-TOP EXTENSION AND ANTENNA MOUNTING SYSTEM SHALL BE INSTALLED BY THE UTILITY COMPANY.

KMW FX-OM2L10H2

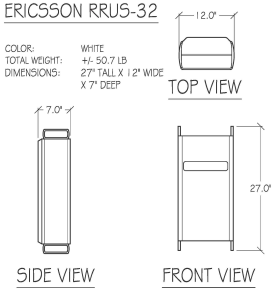
WIND AREA: 2.38 SQ FT
WEIGHT: TBD
DIMENSIONS: Ø16.0" X 24.0" TALL
RF CONNECTORS: (12) 4.3-10 FEMALE



1 ANTENNA 1/2"=1'

ERICSSON RRUS-32

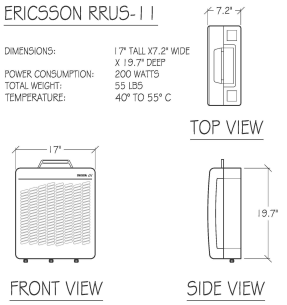
COLOR: WHITE
TOTAL WEIGHT: +/- 50.7 LB
DIMENSIONS: 27" TALL X 12" WIDE X 7" DEEP



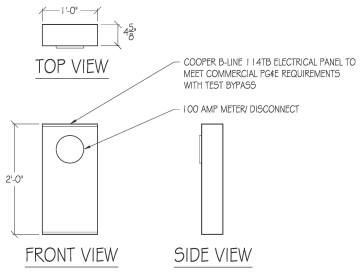
2 RRUS-32 1"=1'

ERICSSON RRUS-11

DIMENSIONS: 17" TALL X7.2" WIDE X 19.7" DEEP
POWER CONSUMPTION: 200 WATTS
TOTAL WEIGHT: 55 LBS
TEMPERATURE: 40° TO 55° C



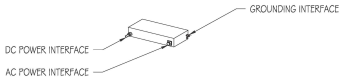
3 RRUS-11 DETAIL 1"=1'



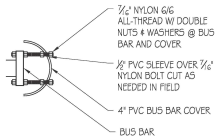
4 METER DETAIL 1"=1'

ERICSSON PSU AC 08

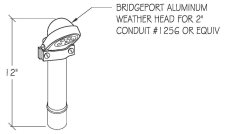
DIMENSIONS: 2.72" X 10.79" X 7.09"
WEIGHT: 11.46 LBS



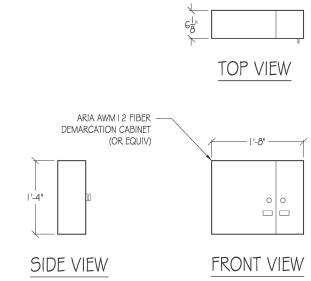
5 AC POWER MODULE NTS



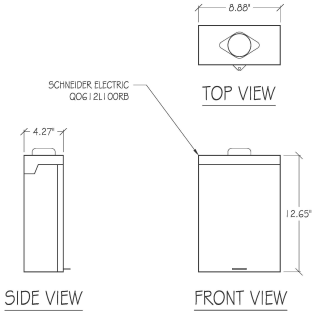
6 BUS BAR COVER 6"=1'



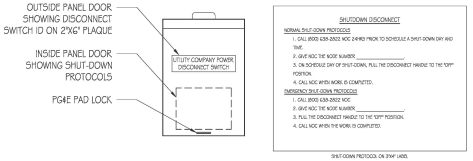
7 WEATHER HEAD NTS



8 ARIA AWM12 FIBER DMARC 1"=1'



9 LOAD CENTER/AC DISCONNECT 1"=6'



10 DISCONNECT SIGNAGE 3"=1'

NOTES:
1. SITE ID WILL BE SWITCH #, SITE # & SITE NAME
2. SIGN PROVIDED BY GC MOUNTED TO OUTSIDE OF SERVICE DISCONNECT

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REGISTERED PROFESSIONAL ENGINEER
BRETT A. MILLER
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STATE OF CALIFORNIA

CRAN_R5FR_SFOK3_013

ROW ADJCT TO 2049 MONTEREY AVENUE
MENLO PARK, CA 94025

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CHECKED BY:	B. McCOMB
APPROVED BY:	B. McCOMB
DATE:	04/30/18

SHEET TITLE:
DETAILS

SHEET NUMBER
A-5

San Mateo County Zoning Hearing Officer Meeting

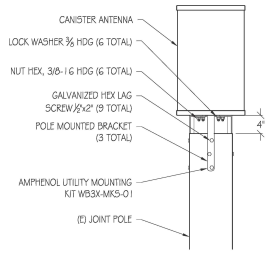
Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T**

Attachment: **C**

File Numbers: **PLN2017-00464**

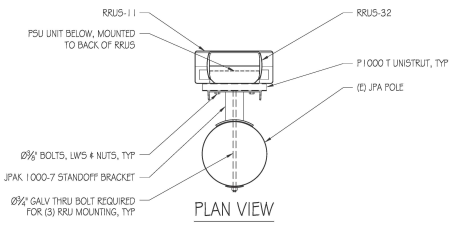
STRUCTURAL STEEL NOTES:

1. ALL STEEL CONSTRUCTION INCLUDING FABRICATION, ERECTION AND MATERIALS SHALL COMPLY WITH ALL REQUIREMENTS OF THE AISC SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS AND THE 2016 CBC.
2. ALL STRUCTURAL STEEL SHALL BE ASTM A36 UNLESS OTHERWISE NOTED. ALL WF (WIDE FLANGE) & WT (TEE) SHAPES TO BE ASTM A992 (F_y=50,000 PSI) UNLESS NOTED OTHERWISE. ALL STRUCTURAL TUBING (TS OR HSS) SHALL BE ASTM A500 GRADE B (F_y=46,000 PSI). ALL STEEL PIPE SHALL BE ASTM A53 (TYPE E OR S, GRADE B (F_y=35,000 PSI)) SCHEDULE 40 WITH OUTSIDE DIAMETERS GIVEN UNLESS OTHERWISE NOTED.
3. ALL WELDING SHALL BE PERFORMED USING E70XX ELECTRODES AND SHALL CONFORM TO AISC & AWS D1.1. WHERE FILLET WELD SIZES ARE NOT SHOWN PROVIDE THE MINIMUM SIZE PER TABLE J2.4 IN THE AISC SPECIFICATION. PAINTED SURFACES SHALL BE TOUCHED UP.
4. ALL WELDING SHALL BE PERFORMED BY QUALIFIED, CERTIFIED WELDERS.
5. BOLTS SHALL BE GALVANIZED ASTM A325 MINIMUM. BOLTED CONNECTIONS SHALL BE BEARING TYPE. SEE PLANS FOR LOCATION, NUMBER, & SIZE OF BOLTS. SPECIAL INSPECTION NOT REQUIRED U.O.N.
6. THREADED RODS SHALL BE ASTM F593 CW 304/316 STAINLESS STEEL . BOLTED CONNECTIONS SHALL BE BEARING TYPE. SEE PLANS FOR LOCATION, NUMBER, & SIZE OF BOLTS.
7. ALL HOLES FOR BOLTED CONNECTIONS SHALL BE 1/16" LARGER THAN THE NOMINAL BOLT DIAMETER. USE STANDARD AISC GAGE AND PITCH FOR BOLTS EXCEPT AS NOTED OTHERWISE. HOLES FOR ANCHOR BOLTS IN BASE PLATES MAY BE AISC "OVERSIZE" HOLES WHERE ACCOMPANIED BY OVERSIZED HARDENED HDG WASHERS.
8. ALL SHOP FABRICATED STEEL STRUCTURAL MEMBERS FOR EXTERIOR USE SHALL BE HOT DIP GALVANIZED PER ASTM A123 AFTER FABRICATION & PAINTED PER CUSTOMER SPECIFICATIONS AS REQUIRED. STEEL FOR INTERIOR USE SHALL BE SHOP COAT OR GALVANIZED & PAINTED PER PLAN.
9. ALL FIELD FABRICATED GALVANIZED STEEL THAT IS CUT, GROUND, DRILLED, WELDED OR DAMAGED SHALL BE TREATED WITH "ZINC RICH" COLD GALVANIZING SPRAY OR COATING. NO RAW STEEL SHALL BE EXPOSED.
10. AT ALL WEB STIFFENER PLATES LEAVE 3/4Ø (OR K, WHICHEVER IS LARGER) HOLE @ WEB/FLANGE INTERSECTION UNLESS NOTED OTHERWISE.

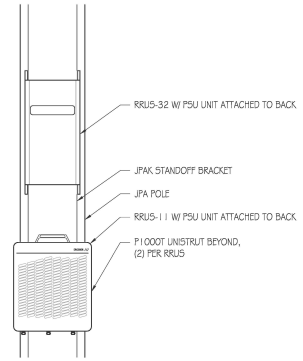


1 POLE-TOP ANTENNA MOUNT DETAIL
1"= 1'

2 NOTICE SIGNAGE
NTS

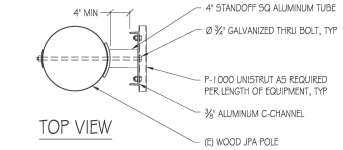


PLAN VIEW

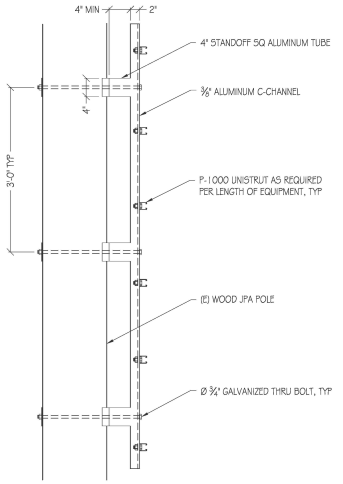


FRONT VIEW

3 RRU MOUNTING DETAIL
1"= 1'

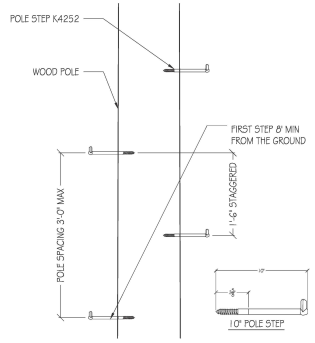


TOP VIEW



FRONT VIEW

4 JPAK STANDOFF DETAIL
1"= 1'



5 POLE STEP
1"= 1'
NOTE: POLE STEP TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS

at&t
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modus
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DATE:	04/30/18

SHEET TITLE:

DETAILS

SHEET NUMBER

A-6

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T**

Attachment: **C**

File Numbers: **PLN2017-00464**

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Photo simulation as seen looking southeast across Monterey Avenue

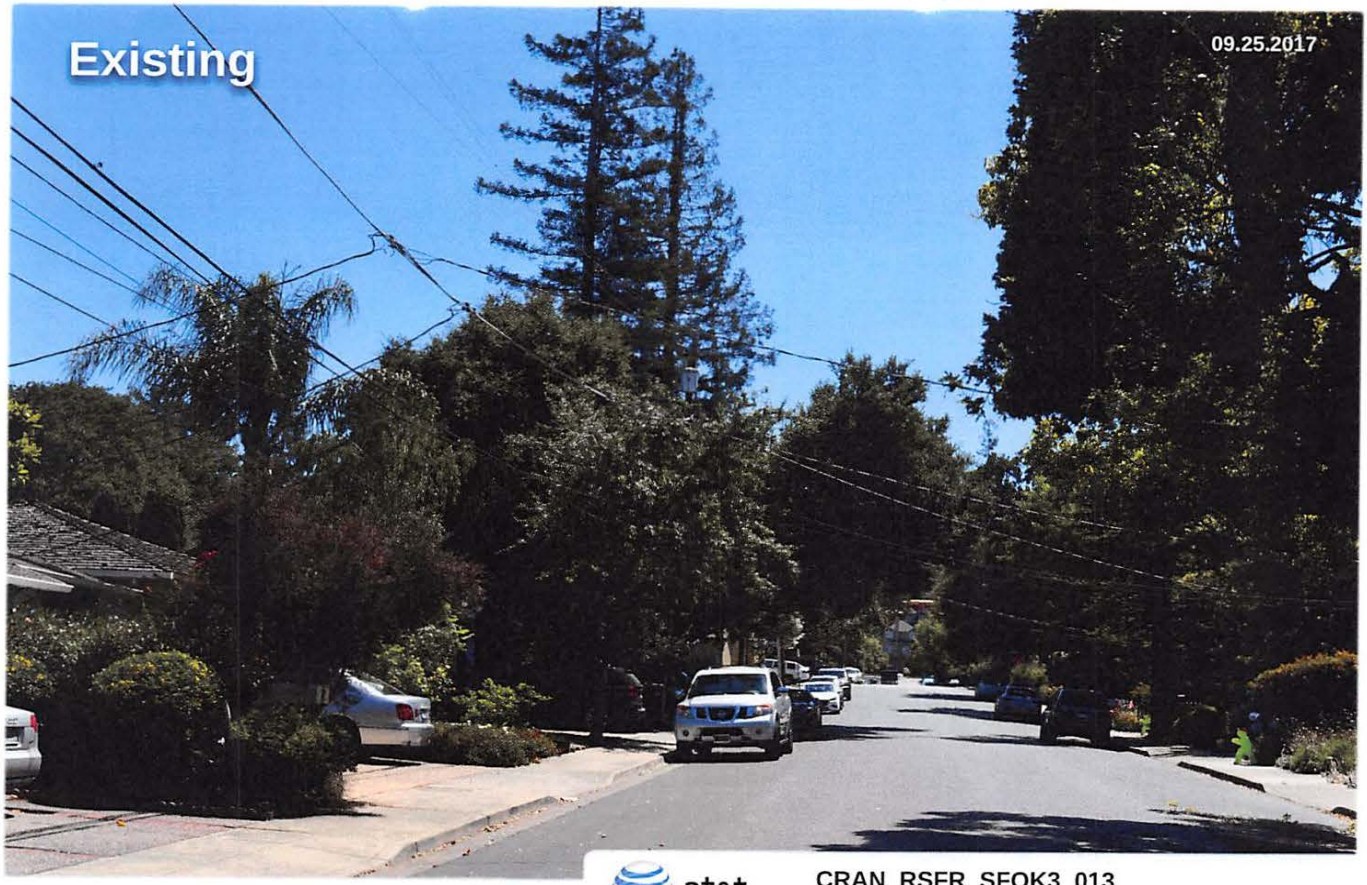
at&t

CRAN_RSFR_SFOK3_013
ROW near 2049 Monterey Avenue, Menlo Park, CA

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T** Attachment: **D**

File Numbers: **PLN2017-00464**



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CRAN_RSFR_SFOK3_013
ROW near 2049 Monterey Avenue, Menlo Park, CA

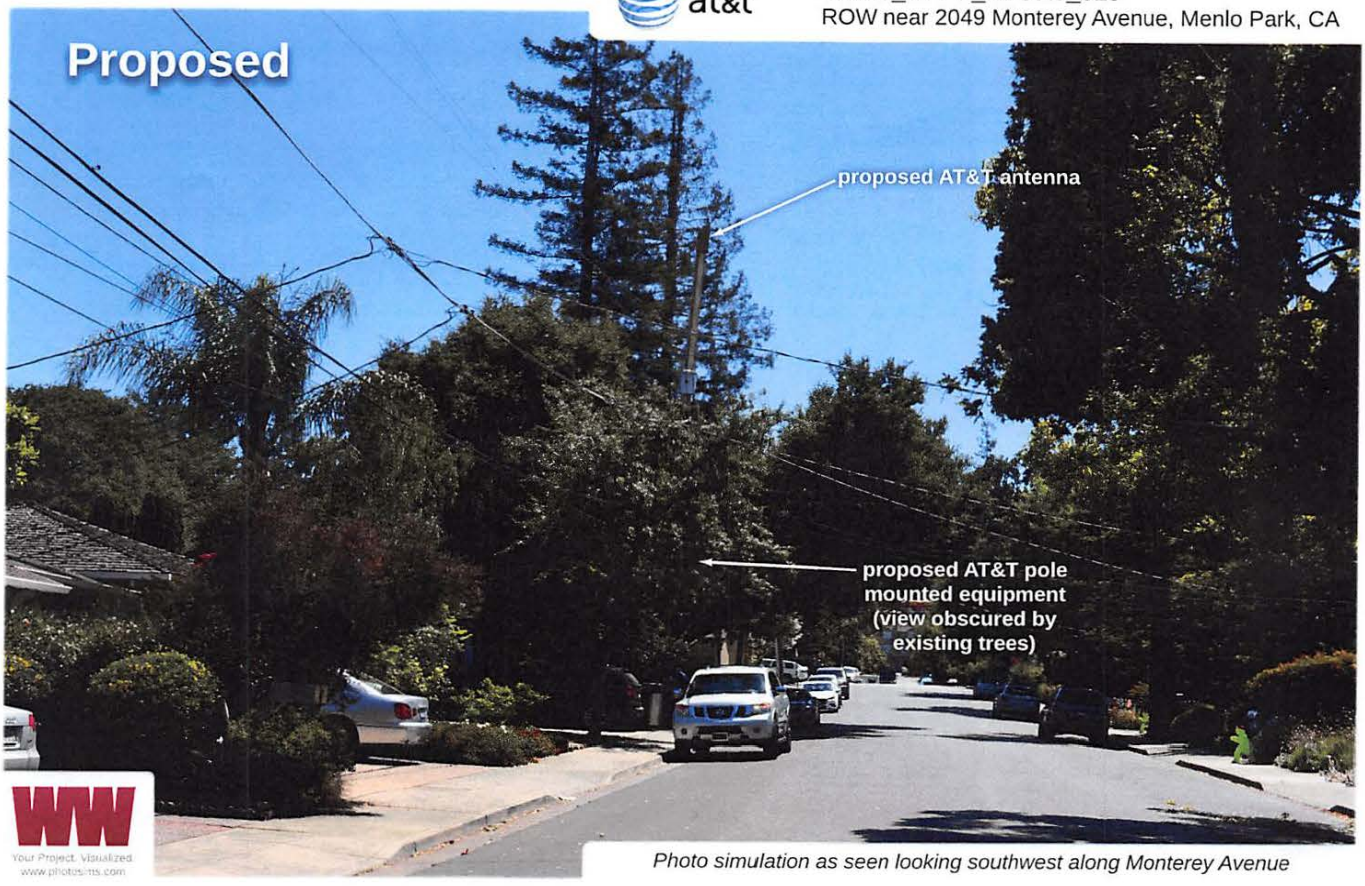


Photo simulation as seen looking southwest along Monterey Avenue

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T** Attachment: **D**

File Numbers: **PLN2017-00464**

PLN2017-00464

San Mateo County Zoning Hearing Officer Meeting

Owner/Applicant: **JPA/ Modus-Corp, LLC for AT&T** Attachment: **E**

File Numbers: **PLN2017-00464**

AT&T Mobility • Proposed DAS Node (Site No. SFOK3-013)
2049 Monterey Avenue • Menlo Park, California

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained on behalf of AT&T Mobility, a personal wireless telecommunications carrier, to evaluate the addition of Node No. SFOK3-013 to be added to the AT&T distributed antenna system ("DAS") in Menlo Park, California, for compliance with appropriate guidelines limiting human exposure to radio frequency ("RF") electromagnetic fields.

Executive Summary

AT&T proposes to install an omnidirectional antenna on a utility pole to be sited in the public right-of-way near 2049 Monterey Avenue in Menlo Park. The proposed operation will comply with the FCC guidelines limiting public exposure to RF energy.

Prevailing Exposure Standards

The U.S. Congress requires that the Federal Communications Commission ("FCC") evaluate its actions for possible significant impact on the environment. A summary of the FCC's exposure limits is shown in Figure 1. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. The most restrictive FCC limit for exposures of unlimited duration to radio frequency energy for several personal wireless services are as follows:

Wireless Service	Frequency Band	Occupational Limit	Public Limit
Microwave (Point-to-Point)	5,000–80,000 MHz	5.00 mW/cm^2	1.00 mW/cm^2
BRS (Broadband Radio)	2,600	5.00	1.00
AWS (Advanced Wireless)	2,100	5.00	1.00
PCS (Personal Communication)	1,950	5.00	1.00
Cellular	870	2.90	0.58
SMR (Specialized Mobile Radio)	855	2.85	0.57
700 MHz	700	2.35	0.47
[most restrictive frequency range]	30–300	1.00	0.20

Power line frequencies (60 Hz) are well below the applicable range of these standards, and there is considered to be no compounding effect from simultaneous exposure to power line and radio frequency fields.

General Facility Requirements

Wireless nodes typically consist of two distinct parts: the electronic transceivers (also called "radios" or "channels") that are connected to a central "hub" (which in turn are connected to the traditional wired telephone lines), and the passive antenna(s) that send the wireless signals created by the radios out to be received by individual subscriber units. The radios are often located on the same pole as the

antennas and are connected to the antennas by coaxial cables. Because of the short wavelength of the frequencies assigned by the FCC for wireless services, the antennas require line-of-sight paths for their signals to propagate well and so are installed at some height above ground. The antennas are designed to concentrate their energy toward the horizon, with very little energy wasted toward the sky or the ground. This means that it is generally not possible for exposure conditions to approach the maximum permissible exposure limits without being physically very near the antennas.

Computer Modeling Method

The FCC provides direction for determining compliance in its Office of Engineering and Technology Bulletin No. 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation," dated August 1997. Figure 2 attached describes the calculation methodologies, reflecting the facts that a directional antenna's radiation pattern is not fully formed at locations very close by (the "near-field" effect) and that at greater distances the power level from an energy source decreases with the square of the distance from it (the "inverse square law"). The conservative nature of this method for evaluating exposure conditions has been verified by numerous field tests.

Site and Facility Description

Based upon information provided by AT&T, including drawings by Precision Design and Drafting, Inc., dated April 30, 2018, it is proposed to install one KMW Model FX-OM2L10H2, 2-foot tall, omnidirectional cylindrical antenna, on top of a new utility pole to replace the existing utility pole sited in the public right-of-way in front of the residence located at 2041 Monterey Avenue in Menlo Park. The antenna would employ 6° downtilt and would be mounted at an effective height of about 44½ feet above ground. The maximum effective radiated power in any direction would be 880 watts, representing simultaneous operation of 740 watts for PCS and 140 watts for 700 MHz service. There are reported no other wireless telecommunications base stations at this site or nearby.

Study Results

For a person anywhere at ground, the maximum RF exposure level due to the proposed AT&T operation is calculated to be 0.0047 mW/cm^2, which is 0.78% of the applicable public exposure limit. The maximum calculated level at the second-floor elevation of any nearby building is 1.4% of the public exposure limit. It should be noted that these results include several "worst-case" assumptions and therefore are expected to overstate actual power density levels from the proposed operation.

Recommended Mitigation Measures

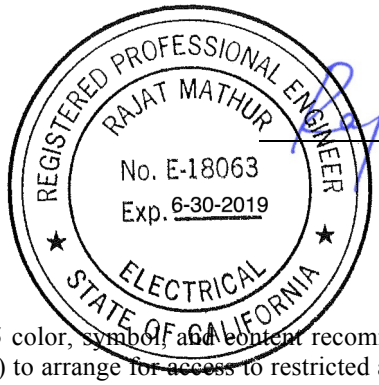
Due to its mounting location and height, the AT&T antenna would not be accessible to the general public, and so no mitigation measures are necessary to comply with the FCC public exposure guidelines. To prevent occupational exposures in excess of the FCC guidelines, it is recommended that appropriate RF safety training be provided to all authorized personnel who have access to the antenna. No access within 5 feet at the same height as the AT&T antenna, such as might occur during certain maintenance activities at the top of the pole, should be allowed while the node is in operation, unless other measures can be demonstrated to ensure that occupational protection requirements are met. It is recommended that an explanatory sign* be posted at the antenna and/or on the pole below the antenna, readily visible from any angle of approach to persons who might need to work within that distance.

Conclusion

Based on the information and analysis above, it is the undersigned's professional opinion that operation of the node proposed by AT&T Mobility, near 2049 Monterey Avenue in Menlo Park, California, will comply with the prevailing standards for limiting public exposure to radio frequency energy and, therefore, will not for this reason cause a significant impact on the environment. The highest calculated level in publicly accessible areas is much less than the prevailing standards allow for exposures of unlimited duration. This finding is consistent with measurements of actual exposure conditions taken at other operating nodes. Training authorized personnel and posting explanatory signs are recommended to establish compliance with occupational exposure limits.

Authorship

The undersigned author of this statement is a qualified Professional Engineer, holding California Registration No. E-18063, which expires on June 30, 2019. This work has been carried out under his direction, and all statements are true and correct of his own knowledge except, where noted, when data has been supplied by others, which data he believes to be correct.



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707/996-5200

June 1, 2018

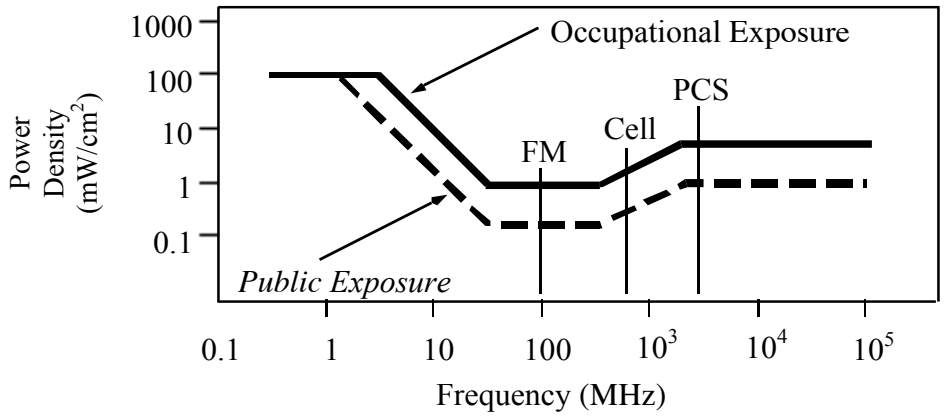
* Signs should comply with OET-65 color, symbol and content recommendations. Contact information should be provided (*e.g.*, a telephone number) to arrange for access to restricted areas. The selection of language(s) is not an engineering matter, and guidance from the landlord, local zoning or health authority, or appropriate professionals may be required. Signage may also need to comply with the requirements of California Public Utilities Commission General Order No. 95.

FCC Radio Frequency Protection Guide

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements ("NCRP"). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent standard, developed by the Institute of Electrical and Electronics Engineers and approved as American National Standard ANSI/IEEE C95.1-2006, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," includes similar limits. These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:

Frequency	Electromagnetic Fields (f is frequency of emission in MHz)					
Applicable Range (MHz)	Electric Field Strength (V/m)		Magnetic Field Strength (A/m)		Equivalent Far-Field Power Density (mW/cm^2)	
0.3 – 1.34	614	*614*	1.63	*1.63*	100	*100*
1.34 – 3.0	614	*823.8/ f*	1.63	*2.19/ f*	100	*180/ f^2*
3.0 – 30	1842/ f	*823.8/ f*	4.89/ f	*2.19/ f*	900/ f^2	*180/ f^2*
30 – 300	61.4	*27.5*	0.163	*0.0729*	1.0	*0.2*
300 – 1,500	$3.54\sqrt{f}$	*$1.59\sqrt{f}$*	$\sqrt{f}/106$	*$\sqrt{f}/238$*	f/300	*f/1500*
1,500 – 100,000	137	*61.4*	0.364	*0.163*	5.0	*1.0*



Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits. However, neither of these allowances is incorporated in the conservative calculation formulas in the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) for projecting field levels. Hammett & Edison has built those formulas into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radio sources. The program allows for the description of buildings and uneven terrain, if required to obtain more accurate projections.

RFR.CALC™ Calculation Methodology

Assessment by Calculation of Compliance with FCC Exposure Guidelines

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The maximum permissible exposure limits adopted by the FCC (see Figure 1) apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits.

Near Field.

Prediction methods have been developed for the near field zone of panel (directional) and whip (omnidirectional) antennas, typical at wireless telecommunications base stations, as well as dish (aperture) antennas, typically used for microwave links. The antenna patterns are not fully formed in the near field at these antennas, and the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) gives suitable formulas for calculating power density within such zones.

For a panel or whip antenna, power density $S = \frac{180}{\theta_{BW}} \times \frac{0.1 \times P_{net}}{\pi \times D \times h}$, in mW/cm^2,

and for an aperture antenna, maximum power density $S_{max} = \frac{0.1 \times 16 \times \eta \times P_{net}}{\pi \times h^2}$, in mW/cm^2,

where θ_{BW} = half-power beamwidth of the antenna, in degrees, and
P_{net} = net power input to the antenna, in watts,
D = distance from antenna, in meters,
h = aperture height of the antenna, in meters, and
η = aperture efficiency (unitless, typically 0.5-0.8).

The factor of 0.1 in the numerators converts to the desired units of power density.

Far Field.

OET-65 gives this formula for calculating power density in the far field of an individual RF source:

power density $S = \frac{2.56 \times 1.64 \times 100 \times RFF^2 \times ERP}{4 \times \pi \times D^2}$, in mW/cm^2,

where ERP = total ERP (all polarizations), in kilowatts,
RFF = relative field factor at the direction to the actual point of calculation, and
D = distance from the center of radiation to the point of calculation, in meters.

The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 (1.6 x 1.6 = 2.56). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 100 in the numerator converts to the desired units of power density. This formula has been built into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radiation sources. The program also allows for the description of uneven terrain in the vicinity, to obtain more accurate projections.