



**CITY OF SUNNYVALE
REPORT
Planning Commission**

November 23, 2009

SUBJECT: **2009-0510 - Clearwire** [Applicant] **Pacific Gas and Electric Co.** [Owner]: Application for a project located at **602 Weddell Drive** in an R-0 (Low Density Residential) Zoning District.

Motion Use Permit to allow the installation of three panel antennas and three microwave dishes on existing lattice tower and cabinets, and a Variance application to allow an extension to the top of the existing lattice tower (approximately 6 feet extension).

REPORT IN BRIEF

Existing Site Conditions Pacific Gas and Electric right-of-way with high-tension power lines.

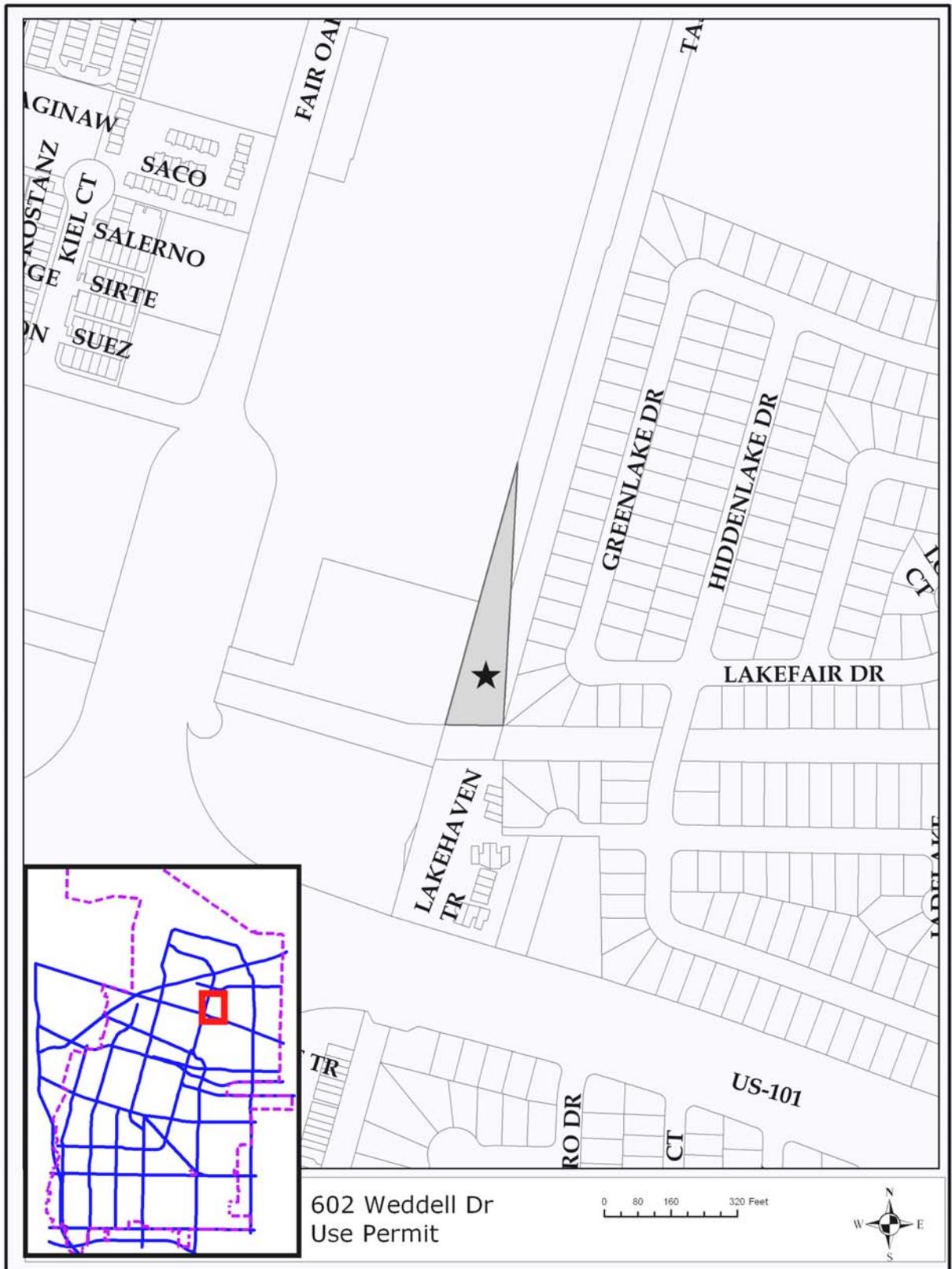
Surrounding Land Uses

North	Pacific Gas and Electric right-of-way
South	Hetch-Hetchy right-of-way
East	Single-family residential homes
West	Residential mobile homes

Issues Aesthetics

Environmental Status A Class 1 Categorical Exemption relieves this project from California Environmental Quality Act provisions and City Guidelines.

Staff Recommendation Approve with conditions.



PROJECT DATA TABLE

	EXISTING	PROPOSED	REQUIRED/ PERMITTED
General Plan	Low Density Residential	Same	Low Density Residential
Zoning District	R-0	Same	R-0
Lot Size (s.f.)	35,100	Same	6,000 min.
Height of Tower	98'	104'	55' max. w/out a Variance
Setbacks to Equipment Enclosure			
From North	400'	Same	N/A
From West	30'	Same	N/A
From East	80'	Same	N/A
From South	320'	Same	N/A

ANALYSIS**Description of Proposed Project**

The proposed project is to allow the collocation of three panel antennas and three microwave dishes on an existing 98-foot tall PG&E lattice tower. The tower is proposed to be raised six feet. Additional ground equipment will be added near the base of the tower within an existing ten-foot high fenced enclosure. No generators are proposed as part of this application.

According to Sunnyvale Municipal Code (SMC) Section 19.54.080, telecommunications projects in residential zoning districts involving three or more facilities or carriers on a single site require a major Use Permit. The proposed project would result in the third telecommunication facility on this existing tower; therefore Planning Commission review is required for this project.

The proposed project requires a Variance to exceed the maximum height requirements for the area, which is 30 feet. The existing PG&E lattice tower is 98 feet tall and the project includes a six foot extension to the top of the tower to accommodate the proposed antennas and microwave dishes. These types of extensions are commonly referred to as "top hats" and allow for a greater coverage area due to height and line of site. The microwave dishes are necessary to the wireless services that Clearwire provides, as they link all Clearwire sites together by providing point-to-point connections.

Background

Previous Actions on the Site: The following table summarizes previous planning applications related to the subject site.

File Number	Brief Description	Hearing/Decision	Date
2003-0753	Sprint six antennas	Administrative Hearing/ Approved	6/30/04
2000-0036	Nextel six antennas	Planning Commission/ Approved	3/27/00

Environmental Review

A Class 1 Categorical Exemption relieves this project from California Environmental Quality Act provisions and City Guidelines. Class 1 Categorical Exemptions include minor additions to existing facilities.

Use Permit

Site Layout: The existing tower is located on PG&E land which is located adjacent to the Hetch-Hetchy parkway and Santa Clara Valley Water District land. The existing 98 foot tower would continue to exist at the location, with the new antenna and top hat structure being added to the existing tower. This facility is leased to two other existing wireless carriers. (Attachment C, Site and Architectural Plans).

Design: The existing tower is a steel lattice, high-tension tower 98 feet tall. Attachment C shows all carriers located on the tower, with the height of each antenna array. All carrier equipment is located inside the leased compound below the tower.

Landscaping: Existing landscaping provides partial screening. No changes are proposed to the existing landscaping.

Parking/Circulation: No additional parking is required for the proposed use.

Radio Frequency (RF) Emissions Exposure: The Federal Communications Commission (FCC) is the final authority on safety of telecommunications facilities. If the facility meets FCC standards, the City is not permitted to make additional judgments on health and safety issues. An RF report was prepared by Hammett & Edison, Inc., which concludes that the individual and cumulative exposure levels for all new Clearwire and existing equipment will be under the maximum limit for general public exposure. The study also states that the microwave dishes make no significant contribution to the RF exposure (Attachment E, RF Study). The project complies with Federal requirements;

therefore the proposed application can be considered on design and location criteria only.

Visual Impacts and Project Alternatives: Although the existing tower is partially screened by existing landscaping in the right-of-way area, the proposed project would increase the visibility of the tower along the street frontage and adjacent residential properties due to the increase of six feet in height. (Attachment D, Photosimulations).

Compliance with Development Standards/Guidelines: As previously discussed, the project complies with Federal requirements for RF exposure. The project is also subject to the Sunnyvale wireless telecommunications regulations contained in SMC Section 19.54.

In addition, the Code requires that the facility be designed with sensitivity to the surrounding area. The following design standards apply to this project:

19.54.40 (b) - All facilities shall be designed to minimize the visual impact to the greatest extent feasible, considering technological requirements, by means of placement, screening, and camouflage, to be compatible with existing architectural elements and building materials, and other site characteristics. The applicant shall use the smallest and least visible antennas possible to accomplish the owner/operator's coverage objectives.

- The three proposed panel antennas and microwave dishes will be collocated on an existing PG&E tower. The visual impact of the added equipment and tower extension would be minimal.

19.54.40 (c) - SMC 19.54.040 - Colors and materials for facilities shall be chosen to minimize visibility. Facilities shall be painted or textured using colors to match or blend with the primary background

- The applicant proposes to paint all new tower equipment to match the existing tower.

19.54.40 (j) - All towers and lattice towers shall be designed to be the minimum functional height and width required to support the proposed antenna installation.

- The proposed project will modify the height of the existing tower by only six feet, which is the minimum necessary for the four foot antennas.

19.54.40 (l) - In order of preference, ancillary support equipment for facilities shall be located either within a building, in a rear yard or on a screened roofs top area. Support equipment pads, cabinets, shelters and buildings require

architectural, landscape, color, or other camouflage treatment for minimal visual impact.

- All proposed ground equipment would be placed within the existing enclosure (ten-foot high chain link fence), which is located near the center of the right-of-way. The ground equipment will not be visible from the street frontage or from adjacent properties.

Fiscal Impact

No fiscal impacts other than normal fees and taxes are expected.

Public Contact

Notice of Public Hearing	Staff Report	Agenda
<ul style="list-style-type: none"> • Published in the <i>Sun</i> newspaper • Posted on the site • 274 notices mailed to the property owners and tenants adjacent to the project site 	<ul style="list-style-type: none"> • Posted on the City of Sunnyvale's web site • Provided at the Reference Section of the City of Sunnyvale's Public Library 	<ul style="list-style-type: none"> • Posted on the City's official notice bulletin board • Posted on the City of Sunnyvale's web site

Conclusion

Findings and General Plan Goals: As conditioned, staff was able to make the required Findings based on the justifications for the Use Permit and Variance. Recommended Findings and General Plan Goals are located in Attachment A.

Conditions of Approval: Recommended Conditions of Approval are located in Attachment B.

Alternatives

1. Approve the Use Permit and Variance with the attached conditions.
2. Approve the Use Permit and Variance with modified conditions.
3. Deny the Use Permit and Variance.

Recommendation

Alternative 1: Approve the Use Permit and Variance with the attached conditions.

Prepared by:

Steve Lynch
Project Planner

Reviewed by:

Shaunn Mendrin
Senior Planner

Attachments:

- A. Recommended Findings
- B. Recommended Conditions of Approval
- C. Site and Architectural Plans
- D. Photosimulations
- E. RF Study

Recommended Findings - Variance

In order to approve the Variance the following findings must be made:

1. Because of exceptional or extraordinary circumstances or conditions applicable to the property, or use, including size, shape topography, location or surroundings, the strict application of the ordinance is found to deprive the property owner of privileges enjoyed by other properties in the vicinity and within the same zoning district, **and**

The height limitations for the subject property are for single-family use districts. The proposed project will use an existing PG&E lattice tower, which exceeds the current height requirements by 98 feet. The Variance is requested to allow a minor six-foot extension of the existing tower, which will be located 104 feet above the adjacent grade. The appearance of the extension will be minimal due to the height and location of the existing tower. The strict application of the zoning code would deprive the property owner from being able to provide additional public utility services such as wireless telecommunications.

2. The granting of the Variance will not be materially detrimental to the public welfare or injurious to the property, improvements, or uses within the immediate vicinity and within the same zoning district, **and**

The requested Variance will not be materially detrimental to the public welfare in that the location of the existing facility will minimize visual impacts and provide improved cellular service for the area.

3. Upon granting of the Variance, the intent and purpose of the ordinance will still be served and the recipient of the Variance will not be granted special privileges not enjoyed by other surrounding property owners within the same zoning district.

The project applicant will not be granted special privileges in that the proposed tower extension will use of the existing facility, which currently exceeds the allowable height in the area. In addition, the extension will not interfere with the existing public utility services and it serves the co-location intent of the Section 19.54 Wireless Telecommunication Facilities.

Recommended Findings - Use Permit

Goals and Policies that relate to this project are:

Telecommunications Policy Goal B: *Promote universal access to telecommunications services for all Sunnyvale citizens.*

Land Use and Transportation Element Action Statement N1.1 – *Limit the intrusion of incompatible uses and inappropriate development into city neighborhoods.*

Land Use and Transportation Element Policy N1.3 – *Support a full spectrum of conveniently located commercial public and quasi-public uses that add to the positive image of the city.*

1. The proposed use attains the objectives and purposes of the General Plan of the City of Sunnyvale. *[Finding met]*

The proposed project will increase telecommunications coverage, while meeting federal emissions requirements for human exposure. In addition, the project would utilize an existing tower and would eliminate the need to build a new telecommunications facility elsewhere in the City.

2. The proposed use ensures that the general appearance of proposed structures, or the uses to be made of the property to which the application refers, will not impair either the orderly development of, or the existing uses being made of, adjacent properties. *[Finding met]*

The proposed antennas would be visible from the street frontage but the new ground equipment would be located inside the existing ten feet high enclosure and would not be visible from the street or neighboring properties.

Standard Requirements

The following is a list of standard requirements. This list is intended to assist the applicant and public in understanding basic related requirements, and is not intended as an exhaustive list. These requirements cannot be waived or modified.

- A. **Testing Within 15 Days:** The applicant shall test any wireless telecommunications site installed in the City of Sunnyvale within 15 days of operating the tower. The test shall confirm that any Emergency 911 wireless call made through the wireless telecommunications site shall provide Enhanced 911 capability (including phase 2 information when available from the caller's device) and direct the call to the City of Sunnyvale Department of Public Safety dispatcher, ensuring phase 2 information is transferred. If the call is to be directed elsewhere pursuant to State and Federal law the applicant shall ensure that the Enhanced 911 information transfers to that dispatch center. This capability shall be routinely tested to ensure compliance as long as the approved wireless telecommunications site is in service.
- B. **Permit Expiration:** The Use Permit for the use shall expire if the use is discontinued for a period of one year or more.
- C. **Permit Lapse if not Exercised (Ordinance 2895-09):** The Use Permit shall be valid for three (3) years from the date of approval by the final review authority (as adopted by City Council on April 21, 2009, RTC 09-094). Extensions of time may be considered, for a maximum of two one year extensions, if applied for and approved prior to the expiration of the permit approval. If the approval is not exercised within this time frame, the permit is null and void.
- D. **Building Permits:** Obtain Building Permits.
- E. **Certification:** Before January 31 of each even numbered year following the issuance of any authorizing establishment of a wireless telecommunication facility, an authorized representative for each wireless carrier providing service in the City of Sunnyvale shall provide written certification to the City executed under penalty of perjury that (i) each facility is being operated in accordance with the approved local and federal permits and includes test results that confirm the facility meets city noise requirements and federal RF emissions standards; (ii) each facility complies with the then-current general and design standards and is in compliance with the approved plans; (iii) whether the facility is currently being used by the owner or operator; and (iv) the basic contact and site information supplied by the owner or operator is current.
- F. **Renewal:** Every owner or operator of a wireless telecommunication facility shall renew the facility permit at least every ten (10) years from the date of initial approval. If a permit or other entitlement for use is not renewed, it shall automatically become null and void without notice or hearing ten (10) years after it is issued, or upon cessation of use for more than a year and a day, whichever comes first. Unless a new use permit

- or entitlement of use is issued, within one hundred twenty (120) days after a permit becomes null and void all improvements, including foundations and appurtenant ground wires, shall be removed from the property and the site restored to its original pre-installation condition within one hundred eighty (180) days of non-renewal or abandonment.
- G. **Comply with Applicable Regulations:** The facility must comply with any and all applicable regulations and standards promulgated or imposed by any state or federal agency, including but not limited to the Federal Communications Commission and Federal Aviation Agency.
- H. **RF Emissions:** Certification must be provided that the proposed facility will at all times comply with all applicable health requirements and standards pertaining to RF emissions.
- I. **Noise Studies:** The applicant shall submit to the Director of Community Development Noise Analysis at least two reports of field measurements showing: 1.) The noise measurement before construction of the facility and 2.) The actual noise measurement after the facility is in place and operating at or near full capacity.
- J. **Business License:** The owner or operator of the facility shall obtain and maintain current at all times a business license as issued by the city.
- K. **Maintain Current Information:** The owner or operator shall maintain, at all times, a sign mounted on the outside fence showing the operator name, site number and emergency contact telephone number. The owner or operator of the facility shall also submit and maintain current at all times basic contact and site information on a form to be supplied by the city. The applicant shall notify city of any changes to the information submitted within thirty (30) days of any change, including change of the name or legal status of the owner or operator. This information shall include, but is not limited to the following:
- i. Identity, including name, address and telephone number, and legal status of the owner of the facility including official identification numbers and FCC certification, and if different from the owner, the identity and legal status of the person or entity responsible for operating the facility.
 - ii. Name, address and telephone number of a local contact person for emergencies.
 - iii. Type of service provided.
- L. **Good Repair:** All facilities and related equipment, including lighting, fences, shields, cabinets, and towers, shall be maintained in good repair, free from trash, debris, litter and graffiti and other forms of vandalism, and any damage from any cause shall be repaired as soon as reasonably possible so as to minimize occurrences of dangerous conditions or visual blight. Graffiti shall be removed from any facility or equipment as soon as practicable, and in no instance more than forty-eight (48) hours from the time of notification by the city.

- M. **Minimize Noise:** The facility shall be operated in such a manner so as to minimize any possible disruption caused by noise. Backup generators are not approved for this use.
- N. **Responsibility to Maintain:** The owner or operator of the facility shall routinely and regularly inspect each site to ensure compliance with the standards set forth in the Telecommunications Ordinance.
- O. **Hold Harmless:** The wireless telecommunication facility provider shall defend, indemnify, and hold harmless the city or any of its boards, commissions, agents, officers, and employees from any claim, action or proceeding against the city, its boards, commission, agents, officers, or employees to attack, set aside, void, or annul, the approval of the project when such claim or action is brought within the time period provided for in applicable state and/or local statutes. The city shall promptly notify the provider(s) of any such claim, action or proceeding. The city shall have the option of coordinating in the defense. Nothing contained in this stipulation shall prohibit the city from participating in a defense of any claim, action, or proceeding if the city bears its own attorney's fees and costs, and the city defends the action in good faith.
- P. **Liability:** Facility lessors shall be strictly liable for any and all sudden and accidental pollution and gradual pollution resulting from their use within the city. This liability shall include cleanup, intentional injury or damage to persons or property. Additionally, lessors shall be responsible for any sanctions, fines, or other monetary costs imposed as a result of the release of pollutants from their operations. Pollutants include any solid, liquid, gaseous or thermal irritant or contaminant, including smoke, vapor, soot, fumes, acids, alkalis, chemicals, and waste. Waste includes materials to be recycled, reconditioned or reclaimed.
- Q. **No Interference with City Communication Systems:** The facility operator shall be strictly liable for interference caused by the facility with city communication systems. The operator shall be responsible for all labor and equipment costs for determining the source of the interference, all costs associated with eliminating the interference, (including but not limited to filtering, installing cavities, installing directional antennas, powering down systems, and engineering analysis), and all costs arising from third party claims against the city attributable to the interference.
- R. **No Threat to Public Health:** The facility shall not be sited or operated in such a manner that is poses, either by itself or in combination with other such facilities, a potential threat to public health. To that end, the subject facility and the combination of on-site facilities shall not produce at any time power densities in any inhabited area that exceed the FCC's Maximum Permissible Exposure (MPE) limits for electric and magnetic field strength and power density for transmitters or any more restrictive standard subsequently adopted or promulgated by the federal government.

Recommended Conditions of Approval

In addition to complying with all applicable City, County, State and Federal Statutes, Codes, Ordinances, Resolutions and Regulations, Permittee expressly accepts and agrees to comply with the following conditions of approval of this Permit:

1. **Project Conformance:** Project shall be in conformance with the plans approved at the public hearing(s). Minor changes may be approved by the Director of Community Development, major changes may be approved at a public hearing.
2. **Execute Permit Document:** Execute a Use Permit document prior to issuance of the building permit.
3. **Conditions of Approval on Plans:** The Conditions of Approval shall be reproduced on a page of the plans submitted for a Building permit for this project.
4. **Tower Design:** All new antennas and microwave dishes shall be painted to match the existing tower.
5. **Microwave Dishes:** All new microwave dishes shall be snug against the tower as much as physically feasible, as shown in the approved plans.
6. **Ground Equipment:** All new equipment inside the ground enclosure shall not exceed the height of existing equipment.
7. **Tree Removal:** No trees shall be removed as part of this application.

clearwire®

WEDDELL DRIVE PG&E CA-SJC0103A

SAP NO.: 41167692 TOWER NO.: 10/66
TOWER LINE NAME: STANDARD 1 & 2
605 WEDDELL DRIVE SUNNYVALE, CA 94089

SIGNATURE BLOCK

ZONING MANAGER	DATE
SITE ACQ. MANAGER	DATE
RF MANAGER	DATE
CONSTRUCTION MANAGER	DATE
MICROWAVE MANAGER	DATE

clearwire®

4400 CARILLON POINT
KIRKLAND, WA 98033

PROJECT INFORMATION:

PG&E WEDDELL DRIVE
CA-SJC0103A
805 WEDDELL DRIVE
SUNNYVALE, CA 94089
SANTA CLARA COUNTY

CURRENT ISSUE DATE:

8/19/09

ISSUED FOR:

ZD (100%)

REV.: DATE: DESCRIPTION: BY:

REV.	DATE	DESCRIPTION	BY
△	08/18/09	ZD (100%)	JK
△	08/17/09	ZD (100%)	CC
△	07/13/09	ZD (100%)	CC
△	07/02/09	ZD (95%)	JK
△	07/01/09	ZD (95%)	JK
△	06/16/09	ZD (90%)	JK

PLANS PREPARED BY:

DELTA GROUPS
ENGINEERING, INC.
CONSULTING ENGINEERS

5635 WEST LAS POSITAS, SUITE 403
PLEASANTON, CA 94588
TEL: (925) 468-0115 FAX: (925) 468-0353

CONSULTANT:

SEAL OF APPROVAL:

SHEET TITLE:

TITLE SHEET

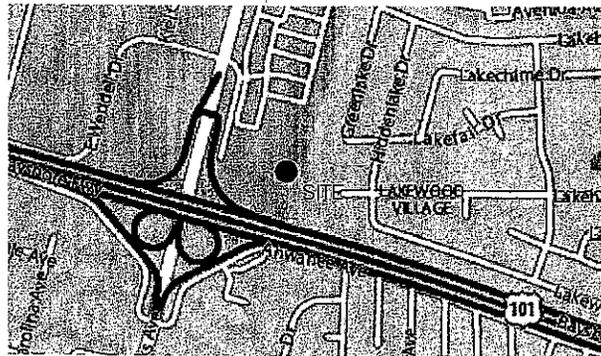
SHEET NUMBER: REVISION:

T1

6

P09CL037

VICINITY MAP - N.T.S.



CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES.

- | | |
|--|--|
| 1. CALIFORNIA ADMINISTRATIVE CODE (INCL TITLE 24 & 25) | 8. ANS/ISA-222-F LIFE SAFETY CODE NFPA-101 |
| 2. 2007 CALIFORNIA BUILDING CODE | 7. 2007 CALIFORNIA PLUMBING CODE |
| 3. CITY/COUNTY ORDINANCES | 8. 2007 CALIFORNIA ELECTRICAL CODE |
| 4. BUILDING OFFICIALS AND CODE ADMINISTRATORS (BOCA) | 9. LOCAL BUILDING CODE |
| 5. MECHANICAL 2007 CALIFORNIA CODE | |

PROJECT SUMMARY

PROPERTY OWNER:

PACIFIC GAS & ELECTRIC CO.
245 MARKET ST. - MAIL CODE N10A
SAN FRANCISCO, CA 94105
CONTACT: SHARI HOLLAND
PHONE: (415) 973-3353

ARCHITECT:

DELTA GROUPS ENGINEERING, INC.
5635 WEST LAS POSITAS, SUITE 403
PLEASANTON, CA 94588
NAME: FRANCIS CHU
CONTACT: HAROLD TRIAS
PHONE: (925) 468-0115

APPLICANT:

CLEARWIRE
2999 OAK ROAD, SUITE 10
WALNUT CREEK, CA 94597
CONTACT: TOM DERKAS
PHONE: (925) 202-3333

STRUCTURAL ENGINEER:

DELTA GROUPS ENGINEERING, INC.
5635 WEST LAS POSITAS, SUITE 403
PLEASANTON, CA 94588
CONTACT: ALBERT TENG
PHONE: (949) 622-0333

LEASING MANAGER:

GOODMAN NETWORKS
204 FOREST CREEK LANE,
SAN RAMON, CA 94583
CONTACT: TIM TASSINARI
PHONE: (214) 571-7100

CONSTRUCTION MANAGER:

GOODMAN NETWORKS
204 FOREST CREEK LANE,
SAN RAMON, CA 94583
CONTACT: MITCHELL SMITH
PHONE: (925) 585-9353

ZONING MANAGER:

GOODMAN NETWORKS
204 FOREST CREEK LANE,
SAN RAMON, CA 94583
CONTACT: GORDON BELL
PHONE: (930) 647-1932

PG&E PROJECT MANAGER:

PACIFIC GAS & ELECTRIC COMPANY
77 BEALE STREET
SAN FRANCISCO, CA 94177
CONTACT: SEAN KENNEDY
PHONE: (925) 785-3375

BUILDING/ SITE DATA LEGEND

LATITUDE:	37° 23' 54.86" N (NAD83)
LONGITUDE:	122° 00' 41.60" W (NAD83)
ELEVATION:	23.0' AMSL (NGVD 29)
A.P.N.:	110-280-003
ZONING:	RMH, RESIDENTIAL MOBILE HOME
PROPOSED USE:	U, UNMANNED
TYPE OF CONSTRUCTION:	VN
LEASE AREA:	30.0 SQ. FT.
HANDICAP REQUIREMENTS:	FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. HANDICAPPED ACCESS NOT REQUIRED.
TITLE 24 REQUIREMENTS:	FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. TITLE 24 IS EXEMPT.

PROJECT DESCRIPTION

INSTALLATION OF UNMANNED WIRELESS COMMUNICATIONS FACILITY, INCLUDING THE INSTALLATION OF NEW (1) ONE EQUIPMENT CABINET, (3) THREE MICROWAVE DISHES, (4) THREE PANEL ANTENNAS, AND (1) ONE GPS.

DRIVING DIRECTIONS

FROM: CLEARWIRE REGIONAL OFFICE
204 FOREST CREEK LANE,
SAN RAMON, CA 94583

TO: 605 WEDDELL DRIVE
SUNNYVALE, CA 94089
SANTA CLARA COUNTY

DISTANCE: 35.3 MILES

1. HEAD WEST ON FOREST CREEK LANE TOWARDS CREEKSIDE DR.
2. TURN RIGHT AT CREEKSIDE DR.
3. SLIGHT LEFT AT PARK PLACE.
4. TURN RIGHT AT CROW CANYON ROAD.
5. MERGE ONTO I-680 SOUTH VIA THE RAMP TO SAN JOSE.
6. TAKE EXIT 12 TO MERGE ONTO CA-252 SOUTH/ MISSION VIEW.
7. TAKE THE RAMP ONTO I-880 SOUTH.
8. TAKE THE EXIT ONTO CA-237 WEST TOWARD MOUNTAIN VIEW.
9. EXIT ONTO COUNTY RTE-52/LAWRENCE EXPRESSWAY.
10. TURN RIGHT AT TASMAN DRIVE.
11. TURN LEFT AT NORTH FAIR OAKS AVE.
12. TURN LEFT AT EAST WEDDELL DRIVE.
13. ARRIVE AT 605 WEDDELL DRIVE SUNNYVALE, CA 94089

ATTACHMENT
Page 1 of 8

NOTES

APN: 110-15-018
 OWNER: PACIFIC GAS & ELECTRIC COMPANY
 THE INFORMATION SHOWN HEREON IS BASED UPON A FIELD SURVEY AND A COMPILATION OF AVAILABLE RECORD AND TITLE INFORMATION, UNLESS NOTED OTHERWISE, PROPERTY LINES ARE DERIVED FROM RECORD INFORMATION. THIS IS NOT A BOUNDARY SURVEY.
 THE EASEMENTS (IF ANY) THAT APPEAR ON THIS MAP HAVE BEEN PLOTTED BASED SOLELY ON INFORMATION CONTAINED IN THE PRELIMINARY TITLE REPORT BY STEWART TITLE COMPANY, ORDER NO. 208313, DATED JULY 8, 2008, WITHIN SAID TITLE REPORT THERE ARE FOUR (4) EXCEPTIONS LISTED, OF WHICH NONE (0) ARE EASEMENTS.
 THE UNDERGROUND UTILITIES (IF ANY) THAT APPEAR ON THIS MAP HAVE BEEN LOCATED BY FIELD OBSERVATION. THE SURVEYOR MAKES NO GUARANTEE AS TO THE UNDERGROUND UTILITIES SHOWN EXCEPT ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES WARRANT THAT THE LOCATION OF THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES STATE THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE.
 THE FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD RATE MAP FOR COMMUNITY NO. 068636, PANEL NO. 2045H, DATED MAY 18, 2008, SHOWS THAT THE LOCATION OF THIS SITE FALLS WITHIN ZONE X, WHICH IS AREAS OF 2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD.
 THE LATITUDE AND LONGITUDE AS SHOWN WAS DETERMINED BY GPS OBSERVATIONS.
 LAT. 37°24'48.8" N, NAOD 83
 LONG. 122°00'34.5" W, NAOD 83
 ELEV. 6.0 NAOD 88 (BASIS OF DRAWING)
 LAT. 37°24'48.7" N, NAOD 27
 LONG. 122°00'30.8" W, NAOD 27
 ELEV. 3.3 NAOD 28

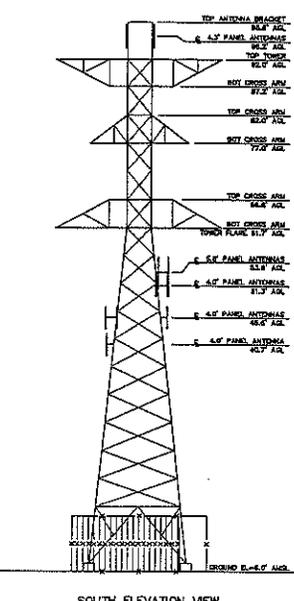
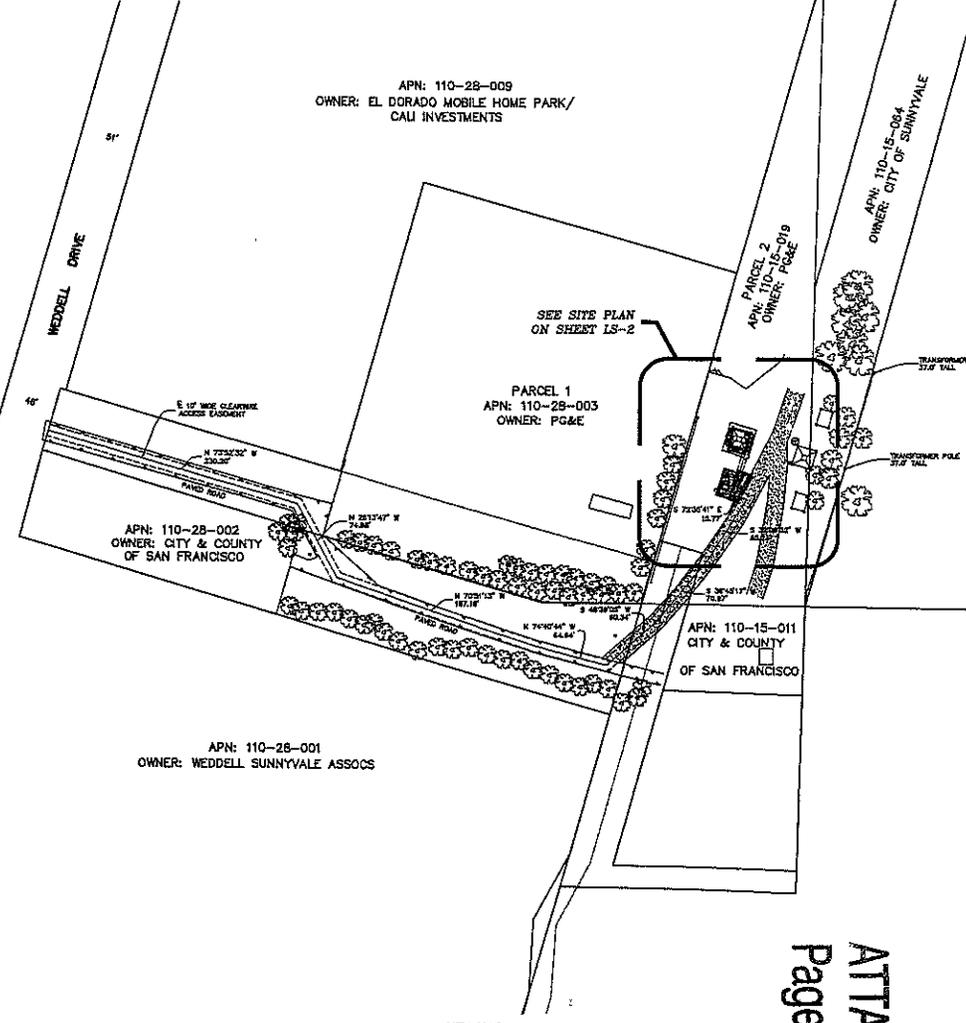
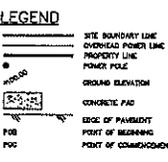
The information shown above exceeds the requirements set forth in FAA order 8260.115a for 1-A category (± 15' horizontally and ± 3' vertically). The horizontal datum (coordinates) are expressed in degrees, minutes and seconds, to the nearest tenth of a second. The vertical datum (heights) are expressed in feet and decimals thereof and are referenced to the nearest 0.1 foot.
 GROUND ELEV. = 6.0' A.M.S.L. (NAVD 88)
 TOP OF STRUCTURE ELEV. = 84.0' A.M.S.L. (NAVD 88)
 STRUCTURE HEIGHT = 82.0'
 TOP OF HIGHEST APPURTENANCE ELEV. = 104.8' A.M.S.L. (NAVD 88)
 HEIGHT OF HIGHEST APPURTENANCE = 98.8'

PARENT PROPERTY DESCRIPTION:
 PARCEL 1:
 SITUATED IN THE CITY OF SUNNYVALE
 BEGINNING AT THE MOST SOUTHERLY CORNER OF LOT 28, AS SAID LOT 28 IS SHOWN UPON THAT CERTAIN MAP ENTITLED, "MAP OF THE W.L. GROSSMAN'S SUBDIVISION NO. 3", FILED FOR RECORD IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY OF SANTA CLARA IN BOOK 8 OF MAPS AT PAGE 85, AND RUNNING THENCE NORTHWESTERLY ALONG THE SOUTHWESTERLY BOUNDARY LINE OF SAID LOT 28, A DISTANCE OF 290 FEET THENCE NORTHEASTERLY, PARALLEL WITH THE SOUTHWESTERLY BOUNDARY LINE OF SAID LOT 28, A DISTANCE OF 270 FEET, THENCE SOUTHEASTERLY, PARALLEL WITH THE NORTHEASTERLY BOUNDARY LINE OF SAID LOT 28, THENCE SOUTHWESTERLY ALONG THE SOUTHWESTERLY BOUNDARY LINE OF SAID LOT 28, A DISTANCE OF 270 FEET TO THE POINT OF BEGINNING, CONTAINING 1.8 ACRES, MORE OR LESS, AND BEING A PORTION OF SAID LOT 28.
 PARCEL 2:
 BEGINNING AT A POINT IN THE NORTHWESTERLY BOUNDARY LINE OF THE 1.837 ACRE PARCEL OF LAND DESCRIBED IN THE DEED FROM JOSEPH GOULART AND WIFE TO JOHN GAMBIA DATED SEPTEMBER 2, 1947 AND RECORDED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY OF SANTA CLARA IN BOOK 1551 OF ORIGINAL RECORDS AT PAGE 294, SAID NORTHWESTERLY BOUNDARY LINE BEING IN PART THE SOUTHWESTERLY BOUNDARY LINE OF LOT 28 AND 29, AS SAID LOT 28 AND LOT 29 ARE SHOWN UPON THE MAP OF THE GROSSMAN SUB NO. 3 FILED FOR RECORD IN THE OFFICE OF SAID COUNTY RECORDER IN BOOK 8 OF MAPS AT PAGE 85, FROM WHICH THE 3/4 INCH IRON MONUMENT MARKING THE MOST

PARENT PROPERTY DESCRIPTION, (CONTINUED):
 SOUTHERLY CORNER OF SAID LOT 28 BEARS SOUTH 14°40' 1/2" WEST 29.0 FEET DISTANT AND RUNNING THENCE NORTH 14°40' 1/2" EAST, ALONG THE NORTHWESTERLY BOUNDARY LINE OF SAID 1.837 ACRE PARCEL OF LAND, THENCE SOUTH 02°4' 1/2" WEST, ALONG THE EASTERLY BOUNDARY LINE OF SAID 1.837 ACRE PARCEL OF LAND, 571.0 FEET TO A POINT IN THE NORTHERLY BOUNDARY LINE OF THE 0.210 ACRE PARCEL OF LAND CONVEYED BY JOHN GAMBIA TO THE CITY AND COUNTY OF SAN FRANCISCO, BY DEED DATED NOVEMBER 27, 1950 AND RECORDED IN THE OFFICE OF SAID COUNTY RECORDER IN BOOK 2351 OF ORIGINAL RECORDS AT PAGE 146; THENCE SOUTH 88°28' 1/2" WEST, ALONG THE NORTHERLY BOUNDARY LINE OF SAID 0.210 ACRE PARCEL OF LAND, 104.4 FEET TO A POINT IN THE PORTION OF THE NORTHWESTERLY BOUNDARY LINE OF SAID 1.837 ACRE PARCEL OF LAND, WHICH PORTION IS ALSO THE SOUTHWESTERLY BOUNDARY LINE OF LAKENHAVEN DRIVE (FORMERLY SUTHERLAND AVENUE), THENCE ALONG THE BOUNDARY LINE OF SAID 1.837 ACRE PARCEL OF LAND THE FOLLOWING TWO COURSES AND DISTANCES, NAMELY: NORTH 14°40' 1/2" EAST 48.1 FEET; AND THENCE NORTH 72°12' 1/2" WEST 40.0 FEET, MORE OR LESS, TO THE POINT OF BEGINNING, CONTAINING 0.206 ACRE, MORE OR LESS, AND BEING A PORTION OF RANCHO PASTORA DE LAS BORREGAS.

PROPOSED CLEARWIRE LEASE AREA DESCRIPTION:
 COMMENCING AT THE SOUTHEAST CORNER OF PARCEL 2 OF THE PARENT PROPERTY DESCRIPTION; THENCE N 33°2'57" W, A DISTANCE OF 124.85 FEET TO POINT "A", BEING THE TRUE POINT OF BEGINNING;
 THENCE N 72°35'41" W, A DISTANCE OF 8.00 FEET;
 THENCE N 17°24'19" E, A DISTANCE OF 3.00 FEET;
 THENCE S 72°35'41" E, A DISTANCE OF 3.00 FEET;
 THENCE S 17°24'19" W, A DISTANCE OF 3.00 FEET TO THE POINT OF BEGINNING.
 TOGETHER WITH A 5.00 FOOT WIDE UTILITY EASEMENT, THE CENTERLINE OF WHICH BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
 COMMENCING AT POINT "A"; THENCE N 17°24'19" E, A DISTANCE OF 2.50 FEET TO THE TRUE POINT OF BEGINNING;
 THENCE S 72°35'41" E, A DISTANCE OF 3.28 FEET;
 THENCE N 16°23'34" E, A DISTANCE OF 38.24 FEET TO AN EXISTING TRANSMISSION TOWER AND THE TERMINUS OF THIS DESCRIPTION.
 TOGETHER WITH A 10.00 FOOT WIDE ACCESS EASEMENT, THE CENTERLINE OF WHICH BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
 COMMENCING AT POINT "A"; THENCE S 29°35'57" E, A DISTANCE OF 3.87 FEET TO THE TRUE POINT OF BEGINNING;
 THENCE S 72°35'41" E, A DISTANCE OF 16.77 FEET;

CONTINUED ON SHEET LS-2



clearwre, LLC.
 4400 CARILLON POINT
 KIRKLAND, WA 98033

PROJECT INFORMATION:
 PG&E WEDDELL DRIVE
 CA SUC0103A
 805 WEDDELL DRIVE
 SUNNYVALE, CA 94088
 SANTA CLARA COUNTY

CURRENT ISSUE DATE:
 08/13/09

ISSUED FOR:
 FINAL

REV. DATE: ISSUED FOR: BY:

0	07/09/09	PRELIMINARY	DL
1	08/13/09	FINAL	HJ

PLANS PREPARED BY:

DELTA GROUPS ENGINEERING, INC.
 CONSULTING ENGINEERS
 8435 WEST LAS POSITAS, SUITE 403
 PLEASANTON, CA 94588
 TEL. 925-468-0115 FAX 925-468-0355

CONSULTANT:

SMITHCO
 SURVEYING & ENGINEERING
 8701 BUCK BAKERMAN, CALIF. 95060
 714-228-2100 (949) 890-1237 FAX: (949) 294-0214

DRAWN BY: CHCK'D BY: AP'D BY:
 DL/HJ GJS GJS

LICENSURE:
 DL/HJ GJS GJS

SHEET TITLE:
 SITE SURVEY

SHEET NUMBER: REVISION:
LS-1 1
 53-199

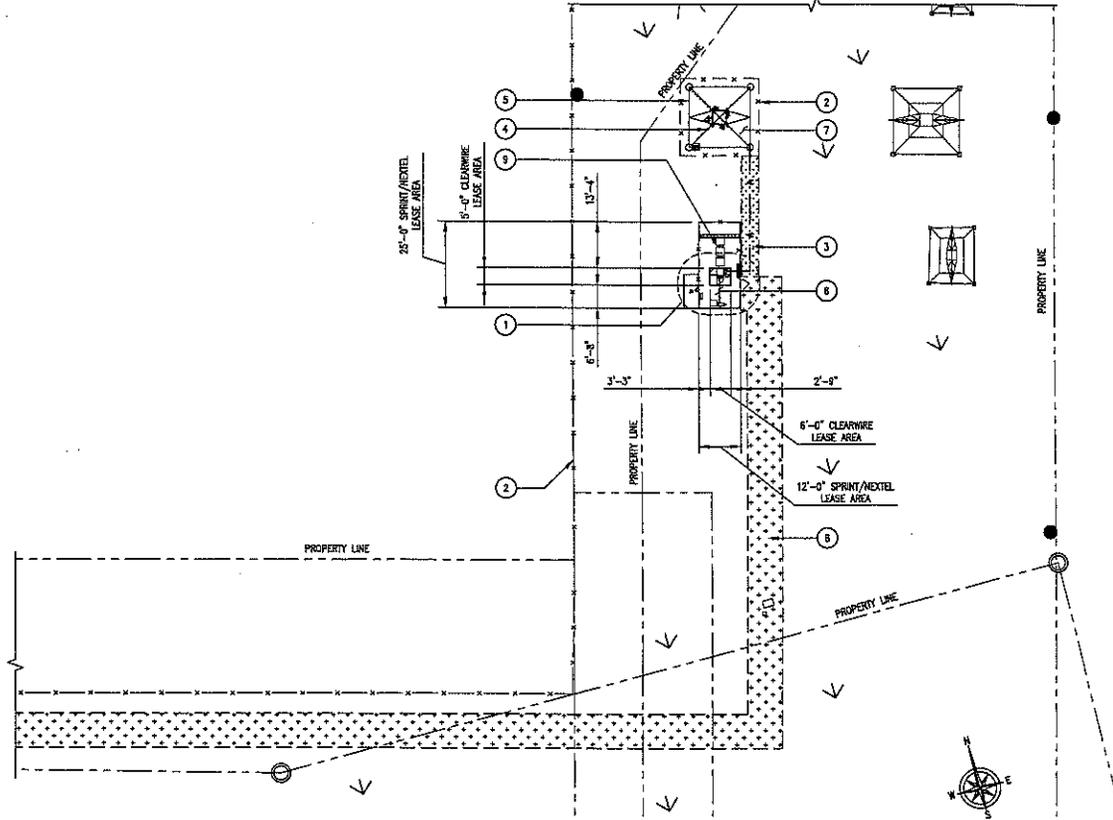
ATTACHMENT
 Page 2 of 8

KEY MAP
 1" = 50'

KEY NOTES:

- 1 PROPOSED LOCATION OF 6'-0"x5'-0" CLEARWIRE LEASE AREA (30 SQ. FT. TOTAL)
- 2 EXISTING 10'-0" WOOD FENCE
- 3 PROPOSED CLEARWIRE UNDERGROUND ANTENNA CABLES: SIX 1/2" SHIELDED COIL CABLES - WITHIN PROPOSED 5'-0" WIDE UTILITY EASEMENT
- 4 EXISTING ANTENNA SLEIGH MOUNT BY OTHER CARRIER (TYP.)
- 5 EXISTING P&E LATTICE TOWER
- 6 EXISTING SPRINT/NEXTEL 25'-0"x12'-0" LEASE AREA (300 SQ. FT. TOTAL)
- 7 EXISTING EQUIPMENT AREA BY OTHER CARRIER
- 8 PROPOSED 10'-0" WIDE ACCESS EASEMENT
- 9 EXISTING SPRINT/NEXTEL EQUIPMENT CABINET (TYP.)
- 10 EXISTING 6'-0" HIGH CHAIN LINK FENCE WITH 3 STRANDS BARBWARE ON TOP

NOTES:
 1. DO NOT SCALE DRAWINGS. ALL DIMENSIONS OF AND BETWEEN EXISTING BUILDINGS/STRUCTURES, OR RELATIVE DISTANCES AS SHOWN BETWEEN EXISTING BUILDINGS/STRUCTURES PROPERTY LINES, AND EASEMENTS, AND THE TRUE NORTH ARE TO BE CONFIRMED BY A SURVEYOR.
 2. POWER/TELCO ROUTING AND DESIGN ARE PRELIMINARY AND MUST BE VERIFIED WITH LOCAL UTILITY COMPANIES.



OVERALL SITE PLAN

SCALE: 1/16" = 1'-0"
 16' 0' 16' 32' 1

ATTACHMENT 2
 Page 4 of 8

clearw're
 4460 CARILLON POINT
 KIRKLAND, WA 98033

PROJECT INFORMATION:
PG&E WEDDELL DRIVE
CA-SJC0103A
 605 WEDDELL DRIVE
 SUNNYVALE, CA 94089
 SANTA CLARA COUNTY

CURRENT ISSUE DATE:
8/19/09

ISSUED FOR:
ZD (100%)

REV.	DATE	DESCRIPTION	BY
△	06/18/09	ZD (100%)	JK
△	06/17/09	ZD (100%)	CC
△	07/13/09	ZD (100%)	CC
△	07/02/09	ZD (95%)	JK
△	07/01/09	ZD (95%)	JK
△	06/16/09	ZD (90%)	JK

PLANS PREPARED BY:
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CONSULTANT:

SEAL OF APPROVAL:

SHEET TITLE:
OVERALL SITE PLAN

SHEET NUMBER: **A1** REVISION: **6**
POSCL037

clearw're

4408 CARILLON POINT
KIRKLAND, WA 98033

PROJECT INFORMATION:

PG&E WEDDELL DRIVE
CA-SJC0103A
605 WEDDELL DRIVE
SUNNYVALE, CA, 94089
SANTA CLARA COUNTY

CURRENT ISSUE DATE:

8/19/09

ISSUED FOR:

ZD (100%)

REV. DATE: DESCRIPTION: BY:

REV.	DATE	DESCRIPTION	BY
△	08/18/09	ZD (100%)	JK
△	08/17/09	ZD (100%)	CC
△	07/13/09	ZD (100%)	CC
△	07/02/09	ZD (95%)	JK
△	07/01/09	ZD (95%)	JK
△	06/16/09	ZD (90%)	JK

PLANS PREPARED BY:

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SEAL OF APPROVAL:

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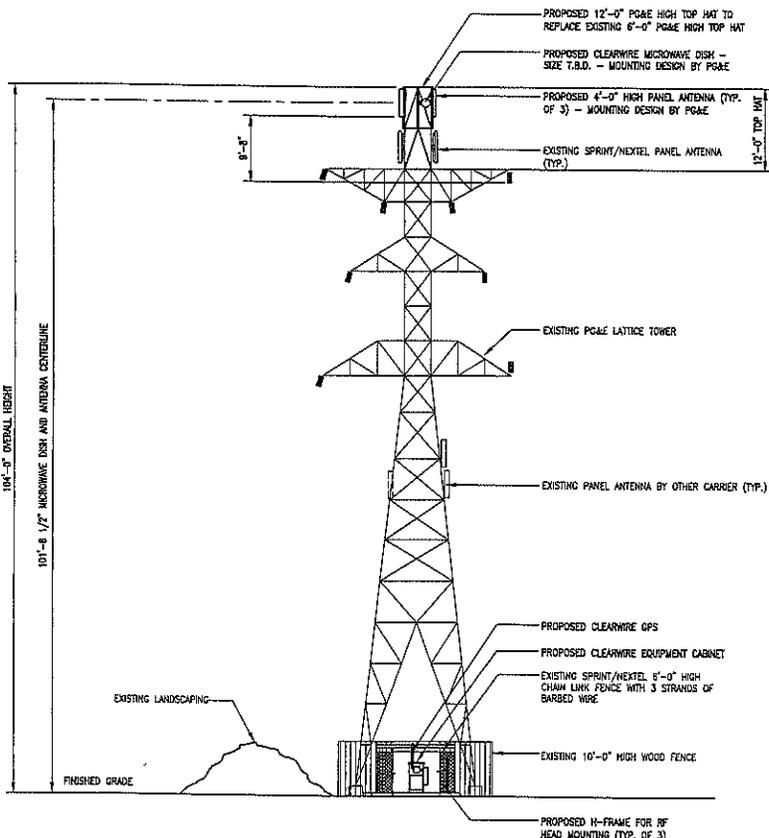
EAST & SOUTH
ELEVATIONS

SHEET NUMBER: REVISION:

A3

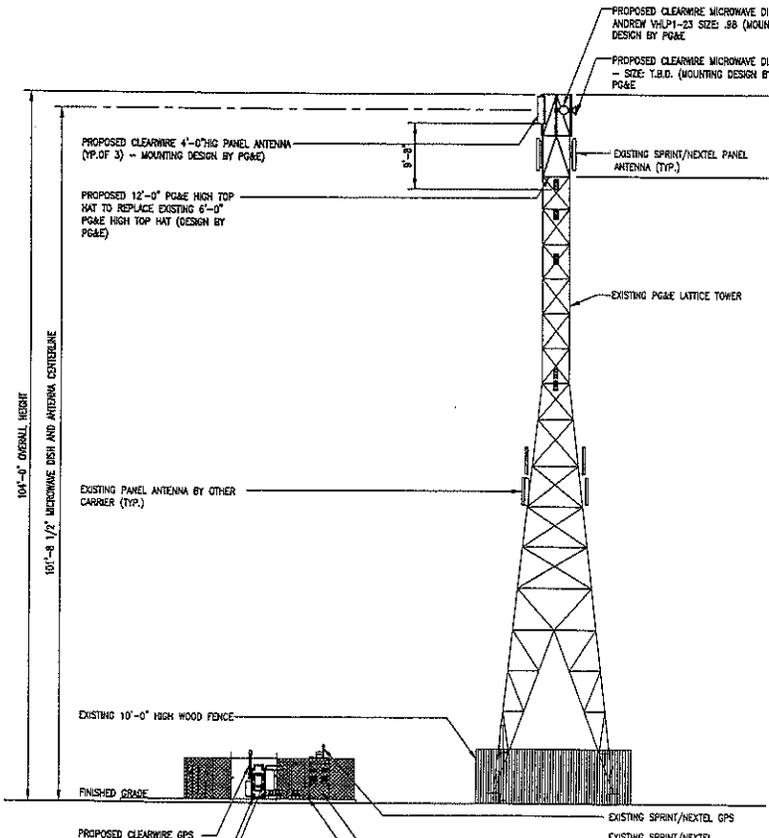
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P09CL037



SOUTH ELEVATION

SCALE: 1/8 inch = 1 ft



EAST ELEVATION

SCALE: 1/8 inch = 1 ft

ATTACHMENT
Page 6 of 8

clearw're

4403 CARILLON POINT
KIRKLAND, WA 98033

PROJECT INFORMATION:

PG&E WEDDELL DRIVE
CA-5JC0103A
605 WEDDELL DRIVE
SUNNYVALE, CA 94089
SANTA CLARA COUNTY

CURRENT ISSUE DATE:

8/19/09

ISSUED FOR:

ZD (100%)

REV.: DATE: DESCRIPTION: BY:

REV.	DATE	DESCRIPTION	BY
Δ	08/18/09	ZD (100%)	JK
Δ	08/17/09	ZD (100%)	CC
Δ	07/13/09	ZD (100%)	CC
Δ	07/02/09	ZD (95%)	JK
Δ	07/01/09	ZD (85%)	JK
Δ	06/16/09	ZD (90%)	JK

PLANS PREPARED BY:

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CONSULTANT:

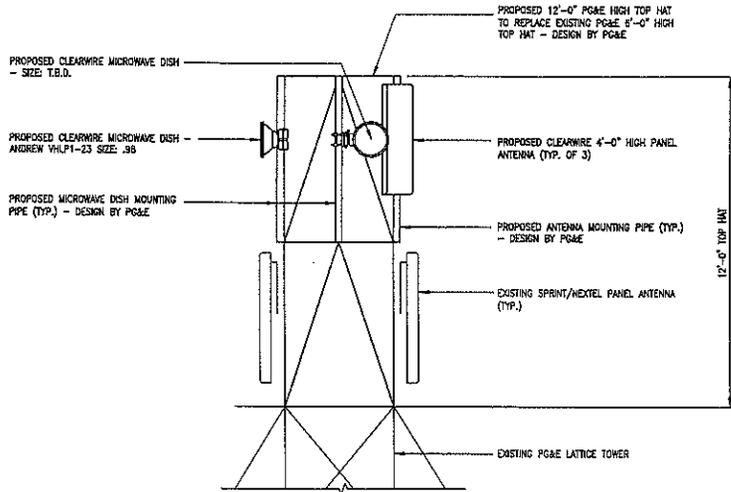
SEAL OF APPROVAL:

SHEET TITLE:

ENLARGED SOUTH, EAST,
NORTH & WEST
ELEVATIONS

SHEET NUMBER: REVISION:

A5 **6**
P09CL037

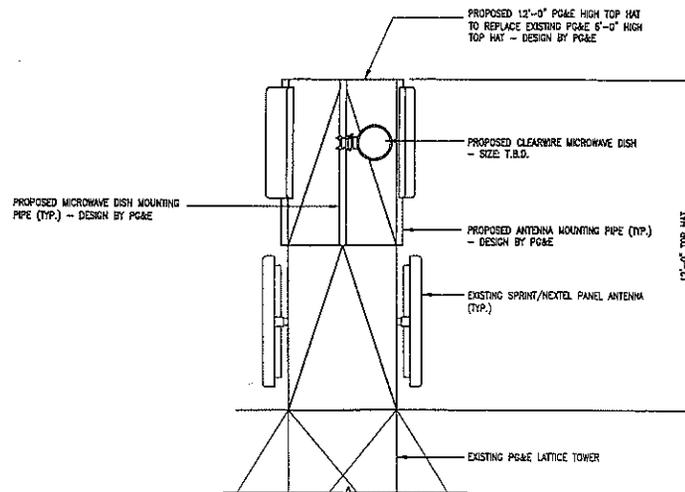


NORTH ELEVATION

SCALE:
1/2 inch = 1 ft

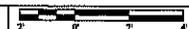


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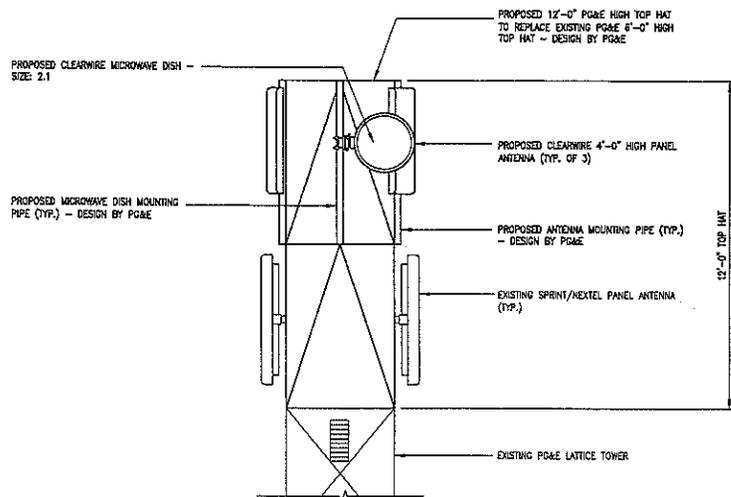


SOUTH ELEVATION

SCALE:
1/2 inch = 1 ft



1

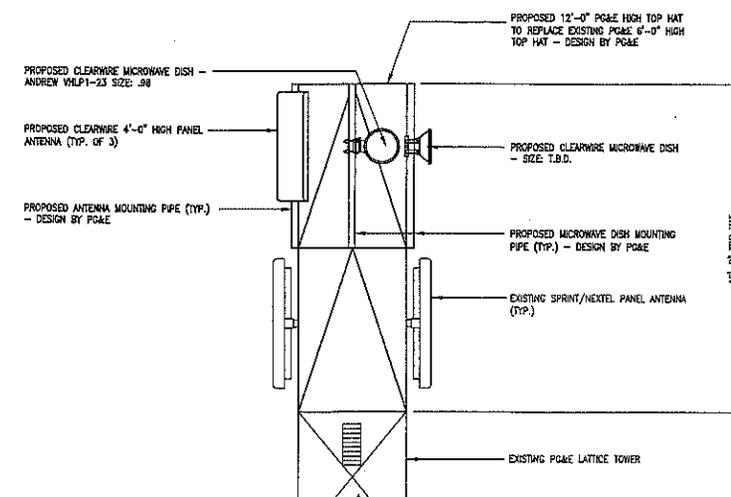


WEST

SCALE:
1/2 inch = 1 ft



2



EAST ELEVATION

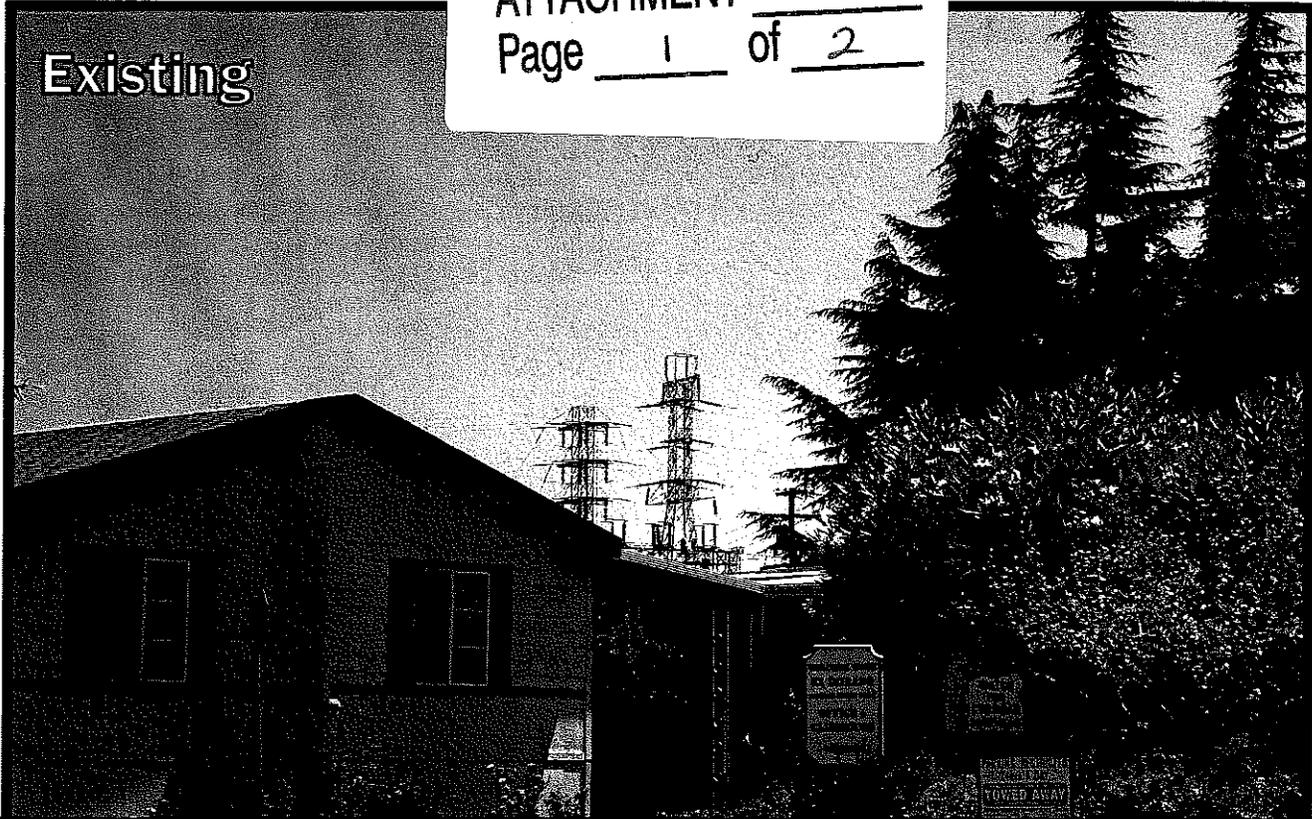
SCALE:
1/2 inch = 1 ft



2

ATTACHMENT
 Page 8 of 8

Existing



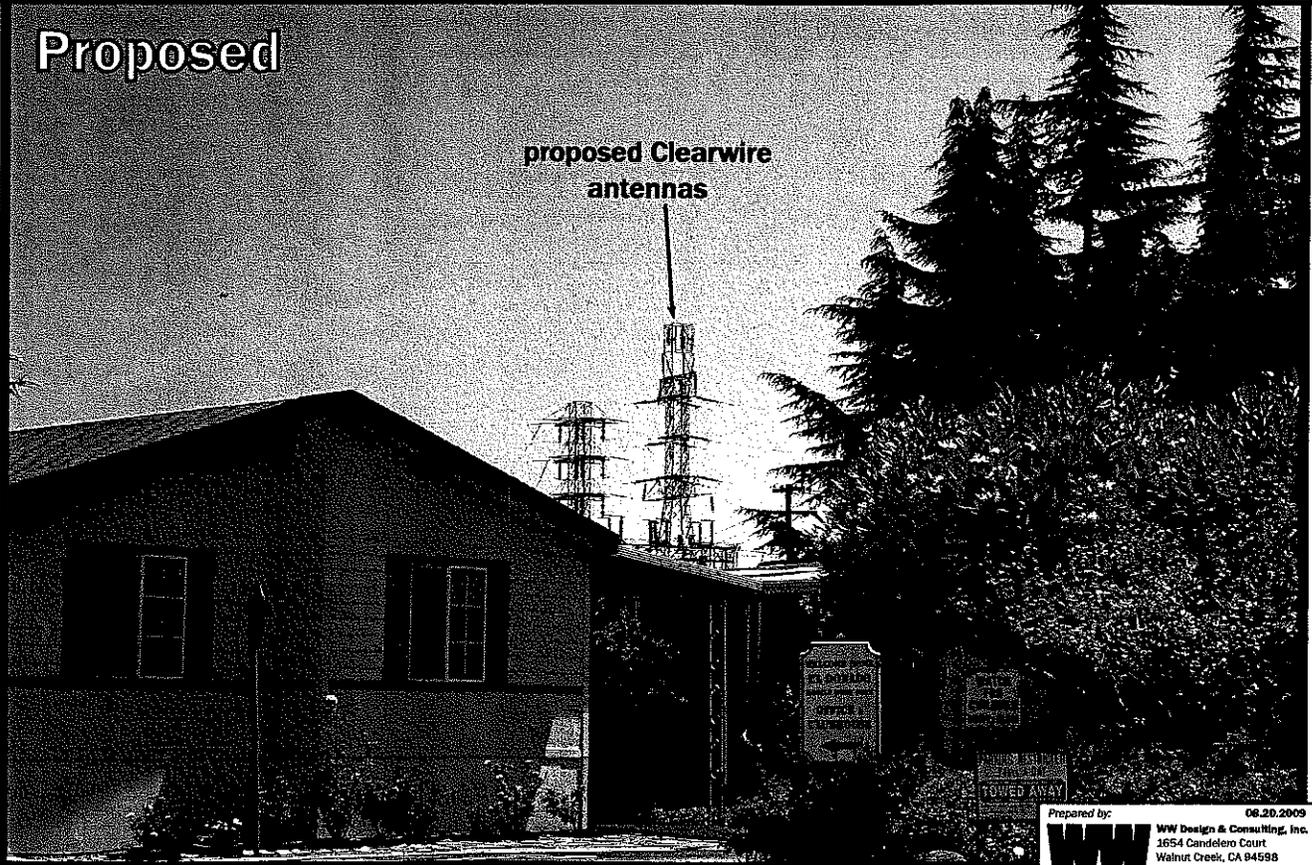
clearwire
wireless broadband

CA-SJC0103

PG&E Weddell Drive

605 Weddell Drive
Sunnyvale, CA 94089

Proposed



proposed Clearwire
antennas

Prepared by:

06.20.2009



WW Design & Consulting, Inc.
1654 Candellero Court
Walnut Creek, CA 94598
info@photosms.com

Photosimulation of the proposed telecommunication facility as seen looking southeast from Weddell & Fair Oaks

Existing



clearwire^{re}
wireless broadband

CA-SJC0103

PG&E Weddell Drive

605 Weddell Drive
Sunnyvale, CA 94089

Proposed

proposed Clearwire
antennas



Prepared by: **WW** 06.20.2009
WW Design & Consulting, Inc.
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Walnut Creek, CA 94598
Info@photolines.com

Photosimulation of the proposed telecommunication facility as seen looking northwest from Lakehaven Dr.

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained on behalf of Clearwire, LLC, a personal wireless service provider, to evaluate the base station (Site No. CA-SJC0103) proposed to be located at 605 East Weddell Drive in Sunnyvale, California, for compliance with appropriate guidelines limiting human exposure to radio frequency ("RF") electromagnetic fields.

Prevailing Exposure Standards

The U.S. Congress requires that the Federal Communications Commission ("FCC") evaluate its actions for possible significant impact on the environment. In Docket 93-62, effective October 15, 1997, the FCC adopted the human exposure limits for field strength and power density recommended in 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 exposure limits. 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: Prevailing Exposure Standards: 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.

Personal Wireless Service	Approx. Frequency	Occupational Limit	Public Limit
Broadband Radio ("BRS")	2,600 MHz	5.00 mW/cm ²	1.00 mW/cm ²
Advanced Wireless ("AWS")	2,100	5.00	1.00
Personal Communication ("PCS")	1,950	5.00	1.00
Cellular Telephone	870	2.90	0.58
Specialized Mobile Radio ("SMR")	855	2.85	0.57
Long Term Evolution ("LTE")	700	2.33	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

Base stations typically consist of two distinct parts: the electronic transceivers (also called “radios” or “channels”) that are connected to the traditional wired telephone lines, and the passive antennas that send the wireless signals created by the radios out to be received by individual subscriber units. The transceivers are often located at ground level and are connected to the antennas by coaxial cables about 1 inch thick. 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. Along with the low power of such facilities, 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 Clearwire, including drawings by Delta Groups Engineering, Inc., dated June 22, 2009, it is proposed to mount three Argus Model LLPX310R directional panel antennas on a 6-foot extension above the existing 99-foot PG&E lattice tower sited near 605 East Weddell Drive in Sunnyvale. The antennas would be mounted with 2° downtilt at an effective height of about 102½ feet above ground and would be oriented at about 120° spacing, to provide service in all directions. The maximum effective radiated power in any direction would be 970 watts. Also proposed to be mounted on the same pole are three microwave “dish” antennas, for interconnection of this site with others in the Clearwire network.

Presently located on the same tower are similar antennas for use by Sprint Nextel and MetroPCS, other wireless telecommunications carriers. For the limited purposes of this study, the transmitting facilities of those carriers are assumed to be as follows:

Carrier	Service	Maximum ERP	Antenna Model	Height
Sprint Nextel	PCS	1,000 watts	Andrew UMWD-06516	97 ft
	SMR	1,500	Andrew D844G65	35
Metro	PCS	1,890	Andrew RR65-18	31 1/2

Study Results

For a person anywhere at ground, the maximum ambient level of RF exposure due to the proposed Clearwire operation by itself would be 0.00020 mW/cm², which is 0.020% of the applicable public limit. The maximum calculated cumulative level at ground, for the simultaneous operation of all three carriers, is 1.7% of the applicable public limit; the maximum calculated cumulative level at the second-floor elevation of any nearby building* is 3.9% of the applicable public limit. It should be noted that these results include several "worst-case" assumptions and therefore are expected to overstate actual power density levels. The microwave antennas would be in point-to-point service and are so directional that they make no significant contribution to RF exposure conditions at ground.

No Recommended Mitigation Measures

Due to their mounting locations, the Clearwire antennas would not be accessible to the general public, and so no mitigation measures are necessary to comply with the FCC public exposure guidelines. It is presumed that PG&E already takes adequate precautions to ensure that there is no unauthorized access to its tower. To prevent exposures in excess of the occupational limit by authorized PG&E workers, it is expected that they will adhere to appropriate safety protocols adopted by that company.

Conclusion

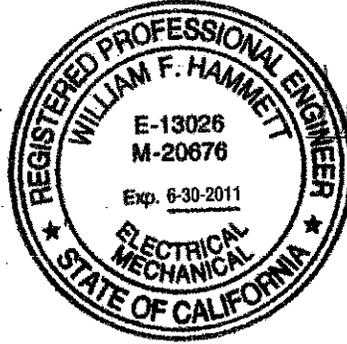
Based on the information and analysis above, it is the undersigned's professional opinion that the base station proposed by Clearwire, LLC at 605 East Weddell Drive in Sunnyvale, California, will comply with the prevailing standards for limiting public exposure to radio frequency energy and, therefore, 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 base stations.

* Located at least 100 feet away, based on aerial photographs from Google Maps.



Authorship

The undersigned author of this statement is a qualified Professional Engineer, holding California Registration Nos. E-13026 and M-20676, which expire on June 30, 2011. 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.



William F. Hammett

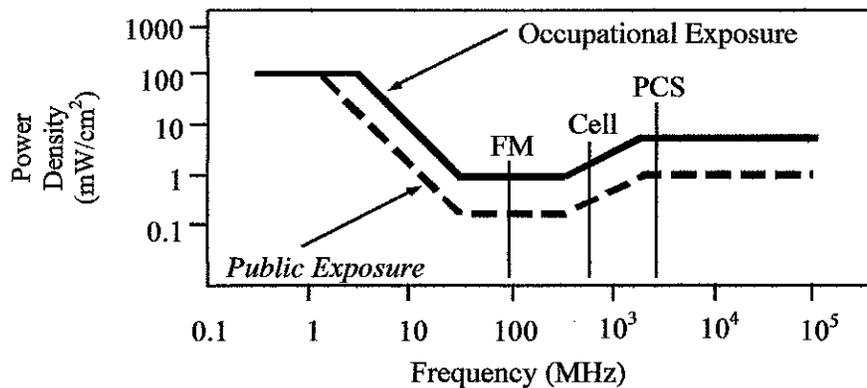
William F. Hammett, P.E.

July 28, 2009

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 Applicable Range (MHz)	Electromagnetic Fields (f is frequency of emission in MHz)					
	Electric Field Strength (V/m)		Magnetic Field Strength (A/m)		Equivalent Far-Field Power Density (mW/cm ²)	
0.3 – 1.34	614	<i>614</i>	1.63	<i>1.63</i>	100	<i>100</i>
1.34 – 3.0	614	<i>823.8/f</i>	1.63	<i>2.19/f</i>	100	<i>180/f²</i>
3.0 – 30	1842/f	<i>823.8/f</i>	4.89/f	<i>2.19/f</i>	900/f ²	<i>180/f²</i>
30 – 300	61.4	<i>27.5</i>	0.163	<i>0.0729</i>	1.0	<i>0.2</i>
300 – 1,500	3.54√f	<i>1.59√f</i>	√f/106	<i>√f/238</i>	f/300	<i>f/1500</i>
1,500 – 100,000	137	<i>61.4</i>	0.364	<i>0.163</i>	5.0	<i>1.0</i>



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.



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/cm²,

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/cm²,

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/cm²,

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 ($1.6 \times 1.6 = 2.56$). 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.