Attachment 13

verizonwireless

Stefano Iachella - RF Engineer
2785 Mitchell Dr.
Walnut Creek, CA 94598

October 3rd, 2011

Jeff Bond
405 Kains Avenue
Albany, CA 94706

Re: Methodology for Alternative Analysis

Dear Mr. Bond:

The analysis conducted for determining the coverage at 48' versus 61' on the existing Albany site was determined using Verizon Wireless' propagation analysis tool. Our propagation tool is a statistical model. It uses a clutter model based on average measured values in certain types of terrain and clutter. A cutoff level of -75 dBm was used since that is the industry accepted value for adequate in-building coverage. Wireless customers expect their devices to operate inside buildings, so we attempt to design our network to this level of service.

The analysis conducted for determining the coverage of the 7 alternative locations was based on a site visit to determine the highest structures available in the commercial district of Albany along San Pablo Ave. The 7 tallest structures do not appear to be above 38' in height, therefore wireless antennas would not be allowed at heights over 48'. As a stand alone site, none of these locations would provide the coverage for our 700 MHz service that our existing site at 61' would provide. Therefore, propagation analysis was determined to be unnecessary as the size of the area covered would be similar to the size of coverage predicted by the existing Albany site at 48', which we have already said would require additional sites if we lowered from 61' to 48'.

It was unnecessary to contact landlords on the 7 alternative locations to inquire about leasing as the studies concluded that these alternative sites would not meet the coverage objectives of Verizon Wireless.

Concerning the viability of roaming agreements from other carriers in lieu of establishing our own antennas at the site; Verizon Wireless' current user devices are not yet capable of accessing other frequencies than our own. It is unknown when and if the device manufacturers will ever supply a broad enough 700 MHz device to allow that option. We cannot guarantee to our customers when that will happen nor can we, at our level, establish roaming agreements. It remains unviable to rely on roaming agreements to establish coverage to our customers.

I have attached copies of coverage maps and the alternative sites reviewed. Also attached is our original submission which has additional maps. Lastly, I have included staff's report from the original hearing as well as Mr. Kramer's report relating thereto.

If you have any questions, please let me know.

Sincerely,

Stefano Iachella

City of Albany
405 Kains Avenue
Albany, **CA** 94706
• (510) 528-5710

RE: Project 814025 Albany

Dear City of Albany,

My name is Jason Osborne and I represent Crown Castle on the attached project located at 423 San Pablo Ave. Albany Ca. 94706

Enclosed you will find the following documents:

- *Exhibit A – Project Description*
- *Exhibit B – Application with LOA*
- *Exhibit C– Supplemental Application Information*
- *Exhibit D - Photosimulations of proposed project*
- *Exhibit E – Propagation Maps*
- *Drawings* Attached

Thank you,

Jason Osborne
Project Manager
Crown Castle
701 5th Street
Petaluma, Ca 94952

CITY OF ALBANY

JUN 22 2009

COMMUNITY DEVELOPMENT DEPARTMENT

Date Received: 6/22/09
Planning Application No.:
Fee Paid: $6,110.00

City of Albany

PLANNING APPLICATION FORM (GENERAL PROJECTS)

For **PLANNING & ZONING COMMISSION** action:	For **ADMINISTRATIVE** action:
☒ Conditional Use Permit* wireless ☐ Design Review (residential, residential additions, commercial, office and multi-family*,) ☐ General Plan Amendment from _____ to _____ ☐ Parcel Map/ Tentative Map/ Vesting Tentative Map, Lot Line Relocation ☐ Parking Exceptions/Reductions ☐ Precise Development Plan ☐ Second Unit Use Permit * ☐ Variance * ☐ Zone Change from_____ to_____ ☐ Other:	☐ Admin. Lot Line Relocation ☐ Home Occupations ☐ Sign Review ☐ Other:

* *Please complete the appropriate Supplemental Questionnaire.*

The City of Albany Municipal Code has certain requirements for Planning Applications. Your answering the following questions will help staff assess how to process your application. Thus, we may have additional questions based on your responses below. Additionally, after your application is accepted for processing, staff and Planning and Zoning Commissioners will likely make at least one field visit to your house and neighborhood.

Job Site Address: 423 San Pablo Ave. Albany CA 94706		Zone: SPC
Property Owner(s) Name: Crown Castle (Victoria Peters)	Phone: 925-737-1005 Fax:	Email:
Mailing Address: 5820 Stoneridge Mall Rd #300	City: Pleasanton	State/Zip: CA 94588
Applicant(s) Name (contact person): Jason Osborne	Phone: 415-554-2121 Fax: 415-358-5766	Email: Jason-osborne@sbcglobal.net
Mailing Address: 701 5th St	City: Petaluma	State/Zip: CA 94952

Attachment 13

ALBANY 814

CITY OF ALBANY COMMUNITY DEVELOPMENT DEPARTMENT

DATE: 6/22/09 COMPLETED BY: JC

PAYOR: Osborne & Assoc. ADDRESS / LOCATION: 423 San Pablo Ave.

APPLICANT: ____ CONTRACTOR ____ OWNER X AGENT VALUE OF PROJECT: $ N/A

	ACCOUNT NO.		AMOUNT DUE
A. PLANNING AND ZONING APPLICATION	100-4601-440	A.	$ 6110
Single Family Res.: Design Review ($400 admin) or ($560 P&Z); CUP ($1,110); parking exception ($620); Home Occupation ($68)			
Commercial: Design Review ($560); CUP ($620 minor) or ($1,110 major); parking exception ($620); parking survey ($1,110); Signage ($183 admin), ($400 P&Z) or ($1,110 sign program)			
Other Projects: See Master Fee Schedule			
B. BUILDING APPLICATION			
1. Initial Plan Check Fee	100-4603-440	B.1	$
2. Final Plan Check Fee ($89.92 min)	100-4603-440	B.2	$
3. Fire Plan Check for Detection and/or Ext System (Fire Dept. calculates fee)	100-4817-134	B.3	$
C. BUILDING PERMIT*			
1. Application Fee ($41.00)	100-4303-440	C.1	$
2. Building Fees ($41.00 min. for EACH applicable category)			
a. Construction fee $			
b. Plumbing fee $			
c. Electrical fee $			
d. Mechanical fee $			
e. Energy Calculation fee $			
Subtotal Building Fees	100-4303-440	C.2	$
3. Surcharge			
Micro-Film & Code Compliance Surcharge - 7% (of Subtotal Building Fees) (If value of project is greater than $25,000 surcharge only on Construction fee)	100-4813-440	C.3	$
4. SMIP--Strong Motion Instrumentation Program--if Construction fee only			
Residential (.0001 x Valuation) $ .50 min	100-4932-440	C.4	$
Commercial (.00021 x Valuation) $ .50 min	100-4934-440		$
D. FIRE (RE: ROOFING PERMITS)			
1. Tar Kettles Permit (Any hot tar application) - $100.00 / $200.00 yearly	100-4802A-134	D.3	$
2. Open Flame Permit (Any torch application) - $50.00 / $100.00 yearly	100-4802A-134	D.4	$
E. PUBLIC WORK			
1. Encroachment Fee - $131.09 min. (typ.) (Oversized Transport - $16.00)	100-4605-440	E.1	$
2. Tree Planting Request	730-4812-969-Q37	E.2	$
3. In-Lieu Slurry Seal (all street cuts @ $1.00/ sq. ft.)	100-4679-402	E.3	$
4. Storm Drain Impact Fee ($ .10 sq ft)	620-4312 C-420	E.4	$
F. OTHER			
1. Blue Prints - cost + 16.1%	100-4814-440	F.1	$
2. Copies ($.10 each) & Microfiche prints ($2.25 ea.)	100-4814-440	F.2	$
3. Facilities Equipment Rental	100-4802D-415	F.3	$
4. Field check insp. (Charge by actual City cost)	100-4303-440	F.4	$
5. Documents & Publications	100-4602-440	F.5	$
6. Postage	100-4648-108	F.6	$
7. Sewer/Connection Fee ($180.95 per additional fixture; new res. units, $1,158 flat fee)	710-4646-402	F.7	$
8. Trust & Deposits	110-2066-____	F.8	$
G. SCHOOL FACILITIES FEE (residential: calc on living space only; commercial: all space)			
1. School Fee (97%)	445-2068	G.1	$
2. Administrative Fee (3%)	00-4811-108	G.2	$
H. CAPITAL FACILITIES IMPACT FEE	750-4668-402	H	$
$0.65/square foot (for new residential units, use flat fee)			
I. PUBLIC ART FEE (1.75% of Valuation if > $300,000 – see MFS for exceptions)	460-4609-402	I	$
J. Bldg. Standards Admin. Special Revolving Fund (BSARF) (90% of Fee)	100-4690-440	J.1	$
- BSARF Admin. (10% of Fee) (*Fee applies to all Building Permits)	100-4634-440	J.2	$
		SUB-TOTAL	$
CONTRACTOR'S BUS.LIC.# ____ EXP. DATE: ____ Business ID#____	100-4220-108		$
OFFICIAL RECEIPT NO: ____ CHK ____ CASH ____		TOTAL	$

01 1

OSBORNE & ASSOCIATES LLC
701 - 5TH STREET
PETALUMA, CA 94952
415-559-2121

90-7083/3211

2860

DATE JUNE 22nd 2009

PAY TO THE ORDER OF City of Albany $ 6110.00

six thousand one hundred ten + 00/100 DOLLARS

TRAVIS CREDIT UNION
P.O. Box 2069 • Vacaville, CA 95696
707-449-4000 • 800-877-8328

MEMO (PT) Albany 814025

⑆321170839⑆ 900000004073301 2860

Community Development
City of Albany
979 San Pablo Ave. 2nd Floor
Albany, CA 94706

RECEIPT

DATE 6/22/09 No. 424578

RECEIVED FROM Osborne & Associates LLC $6110.00 CK XX

Six Thousand One Hundred Ten and XX/100 DOLLARS

FOR RENT
FOR Major CUP/423 San Pablo/wireless

ACCOUNT	6110 00	CASH	FROM TO
PAYMENT	6110 00	CHECK # 2860	
BAL. DUE	-0-	MONEY ORDER	BY

1182

Attachment 13

CROWN CASTLE

Crown Castle USA
8360 N. 48th Street, Suite 305
Chandler, AZ 85226

Tel: (480) 794-2423
Fax: (724) 416-6262
www.crowncastle.com

Crown Castle Letter of Authorization

CA – City of Albany
Building Department
1000 San Pablo Avenue
Albany, CA 94706-229

Re: Application for Zoning/Building Permit

Calvin Lin is the owner of the property located at 423 San Pablo Avenue, Albany, CA 94706 hereby authorizes Crown Castle GT Company LLC ("Crown Castle") and their Agents to act as the Property Owner's Agent in the processing of all zoning applications, permits and approvals through the City of Albany for the existing wireless communications site described below:

Site Name:	**"Albany"**
Site Number:	**814025**
Site Address:	**423 San Pablo Avenue** **Albany, CA 94706**
APN:	**067-2827-012**

It is requested that the City of Albany allow Crown Castle and their Agents to submit and process all permit applications that are required by the City of Albany in connection with the proposed Verizon's installation.

Property Owner:

By: _____ Date: 6/25/09
Calvin Lin

June 22, 2009 ****************** Receipt #..: 58061
Monday 4:26 pm * City of Albany * Register #.: 000
By: Oakley ****************** Terminal ID: T7
1000 San Pablo Ave. Albany, CA. 94706

I.D. Number	Amount Paid
04601 GF PLAN & ZONING	6110.00
Cmt: CUP-WIRELESS/423 SAN PABLO	

Check #	Check Amount	Cash	Amt Tendered	Total Paid	Change
002860	6110.00	.00	6110.00	6110.00	.00

Paid By.: OSBORNE & ASSOCIATES LLC (AH)

Project Description

Nature of Request

Crown Castle of behalf of Verizon Wireless seeks approval of a Conditional Use Permit, and maintain our facility by removing and replacing (4) panel antennas and adding (2) additional panel antennas for a total of (6) new antennas. Verizon Wireless also proposes to add (8) new coax lines to be housed within the existing monopole.

Property Description

The subject property is located at 423 San Pablo Ave. Albany Ca. 94706. The property is located within the jurisdiction of the City of Albany.

Project Description

The (e) facility is a (65') sixty five foot monopole, wherein Verizon Wireless currently has (4) panel antennas installed on the monopole which is operated by Crown Castle. We are proposing to remove (4) panel antennas and replace with (4) panel antennas as well as add an additional (2) panel antennas at (59') fifty-nine feet (See page A-2) on the existing monopole. The proposed installation will not increase the overall height or diameter. The coaxial cable will be housed within the existing monopole frame to mitigate any potential visual impact. The purpose of these "antennas" will be to enhance the overall Verizon network.

Statement of Operations

The existing Crown Castle communication facility only requires electrical services and telephone services which are readily available to the building/site. No nuisances will be generated by the proposed facility modifications, nor will the facility injure the public health, safety, morals or general welfare of the community. Verizon technology does not interfere with any other forms of communication devices whether public or private. The additions/maintenance of this facility will actually enhance wireless communications for residents or motorists traveling by providing seamless service to numerous customers.

As mentioned before, upon completion of construction, fine-tuning of the Crown Castle facility may be necessary, meaning the site will be adjusted once or twice a month by a service technician for routine maintenance. No additional parking spaces are needed at the project site for maintenance activities. The site is entirely self-monitored and connects directly to a central office where sophisticated computers alert personnel to any equipment malfunction or breach of security.

Because Crown Castle facility will be un-staffed, there will be no regular hours of operation and no impact to existing traffic patterns. An existing dirt road will provide ingress and egress allowing access to the technician who arrives infrequently to service the site. No on-site water or sanitation services will be required as a part of this proposal.

Zoning Analysis

The proposed equipment modification will be located on an (e) Cellular facility. Therefore, the "usage" is allowed, as we are merely "upgrading" the facility to eliminate the need for an additional cell site in the area.

As mentioned above, the proposal includes the placement of electronic equipment which Crown Castle / Verizon has designed in the "least visual obtrusive manner".

Compliance with Federal Regulations

Crown Castle will comply with all FCC rules governing construction requirements, technical standards, interference protection, power and height limitations, and radio frequency standards. In addition, the company will comply with all FAA rules on site location and operation.

Verizon Wireless Base Station Site No. 116603 "Albany"
Crown Castle Site No. 814025 • 423 San Pablo Avenue • Albany, California

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained on behalf of Verizon Wireless, a personal wireless telecommunications carrier, to evaluate proposed modifications to its existing base station (Site No. 116603 "Albany," Crown Castle No. 814025) located at 423 San Pablo Avenue in Albany, 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:

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

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 Verizon, including drawings by Omni Design Group, dated April 8, 2009, that carrier presently has installed four directional panel antennas – two Andrew Model 931LG65VTE-B antennas for PCS and two Andrew Model LBX-6513DS-VTM antennas for cellular service – on a 65-foot pole located at 423 San Pablo Avenue in Albany. It is proposed to install two Andrew Model LNX-6512DS-VTM antennas for LTE service next to the existing antennas, mounted at an effective height of about 59 feet above ground and oriented in groups of three (one of each model) toward 30°T and 130°T. The maximum effective radiated power in any direction would be 2,080 watts, representing the simultaneous operation of two PCS channels at 240 watts each, six cellular channels at 200 watts each and one LTE channel at 400 watts.

Presently installed at an effective height of about 49 feet above ground on the same pole are similar antennas for use by MetroPCS, another wireless telecommunications carrier. For the purposes of this study, it is assumed that MetroPCS has installed Kathrein Model 742-213 directional panel antennas and operates with a maximum effective radiated power of 1,890 watts.

Verizon Wireless Base Station Site No. 116603 "Albany"
Crown Castle Site No. 814025 • 423 San Pablo Avenue • Albany, California

Study Results

For a person anywhere at ground, the maximum ambient RF exposure level due to the proposed Verizon operation by itself is calculated to be 0.0073 mW/cm^2, which is 1.3% of the applicable public limit. The maximum calculated cumulative level of RF exposure, for the simultaneous operation of both carriers, is 1.4% of the applicable public limit. The maximum calculated cumulative level at the third-floor elevation of any nearby building would be 3.6% 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.

No Recommended Mitigation Measures

Due to their mounting location, the Verizon antennas are not accessible to the general public, and so no mitigation measures are necessary to comply with the FCC public exposure guidelines. It is presumed that Verizon and MetroPCS will, as FCC licensees, take adequate steps to ensure that their employees or contractors comply with FCC occupational exposure guidelines whenever work is required near the antennas themselves.

Conclusion

Based on the information and analysis above, it is the undersigned's professional opinion that the base station proposed by Verizon Wireless at 423 San Pablo Avenue in Albany, 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.

Verizon Wireless Base Station Site No. 116603 "Albany"
Crown Castle Site No. 814025 • 423 San Pablo Avenue • Albany, California

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, 2009. This work has been carried out by him or 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, P.E.

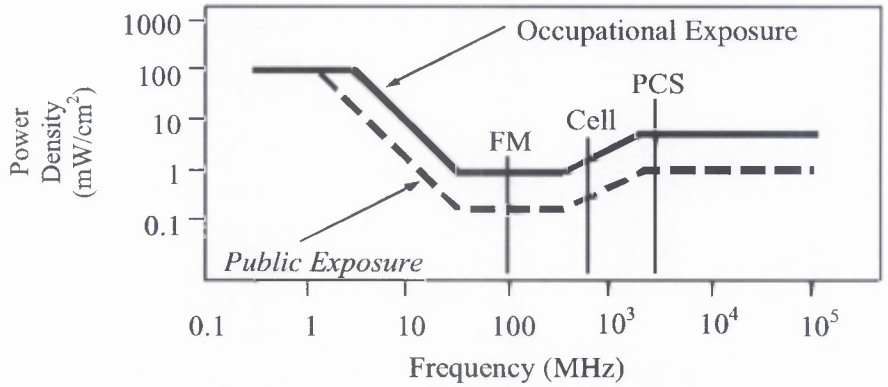
June 5, 2009

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.

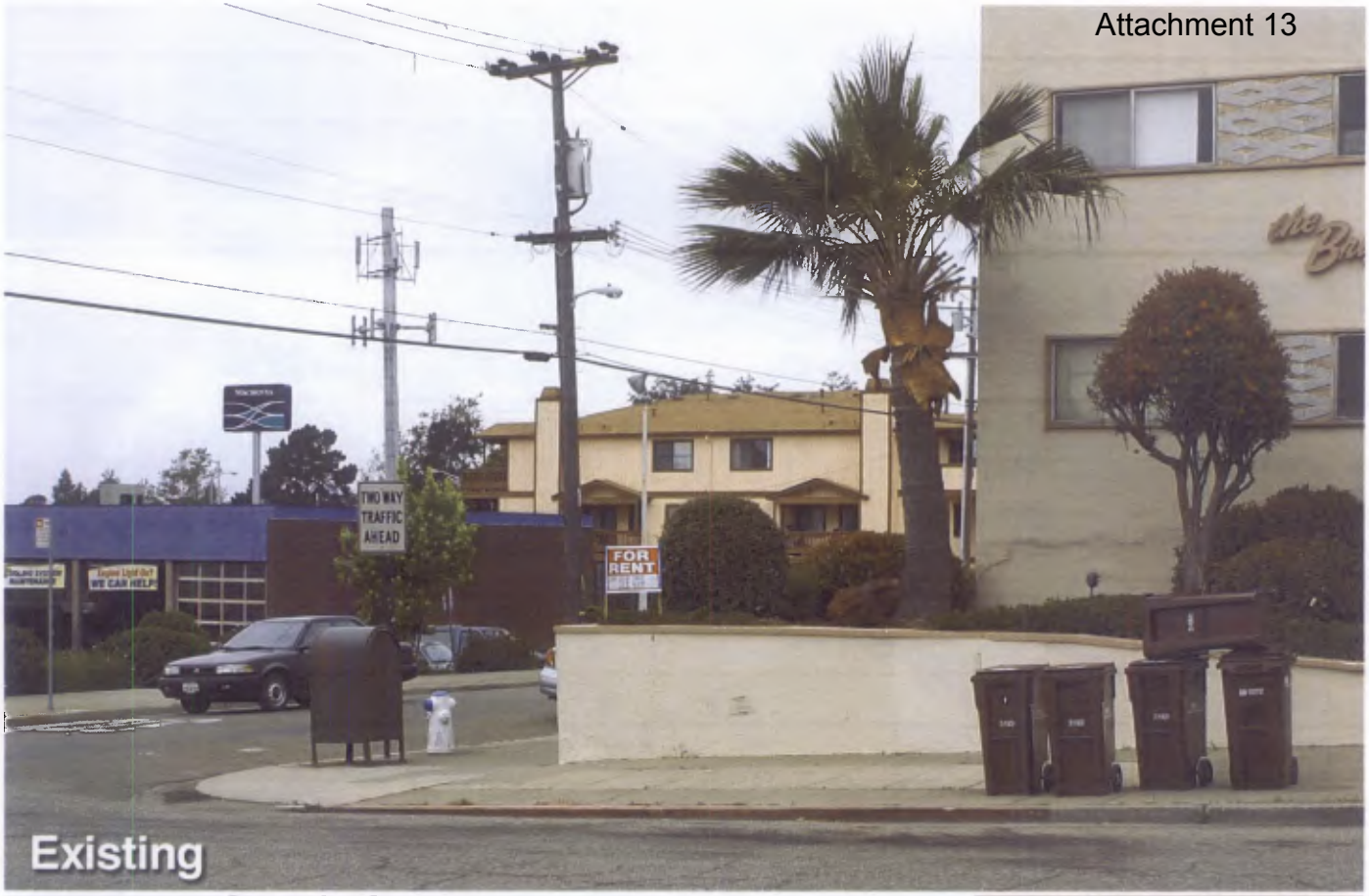
Far Field.
OET-65 gives this formula for calculating power density in the far field of an individual RF source:

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

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.

Attachment 13



CROWN CASTLE INTERNATIONAL

Albany Site # 814025

Looking Northwest from Kains Avenue

423 San Pablo Avenue
Albany, CA 94706

5/19/09

Applied Imagination 510 914-0500

CROWN CASTLE

Albany **Site # 814025** **Looking East from San Pablo Avenue**

423 San Pablo Avenue
Albany, CA 94706

5/19/09

Applied Imagination 510 914-0500

CROWN CASTLE INTERNATIONAL

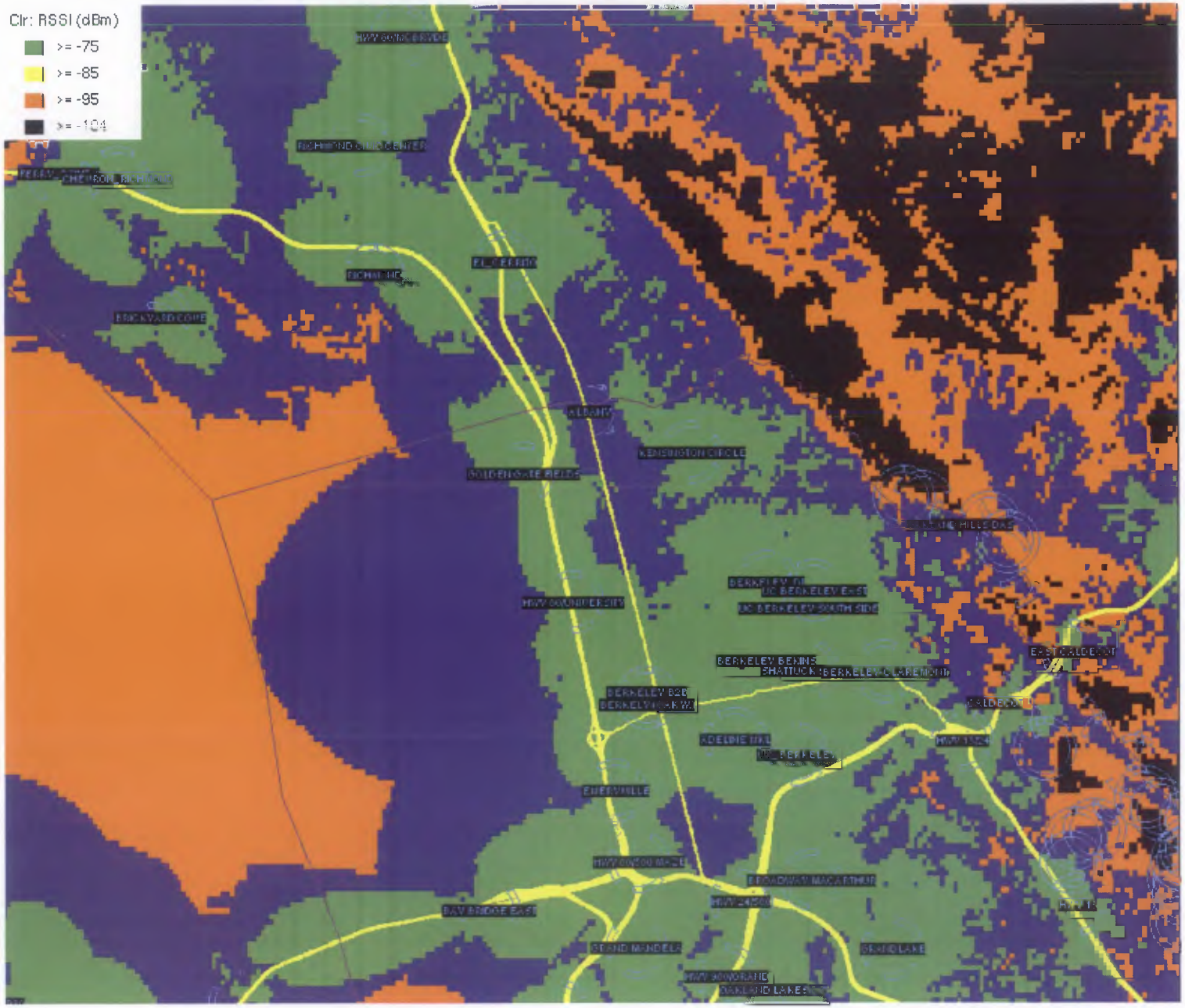
Albany **Site # 814025** **Aerial Map**

423 San Pablo Avenue
Albany, CA 94706

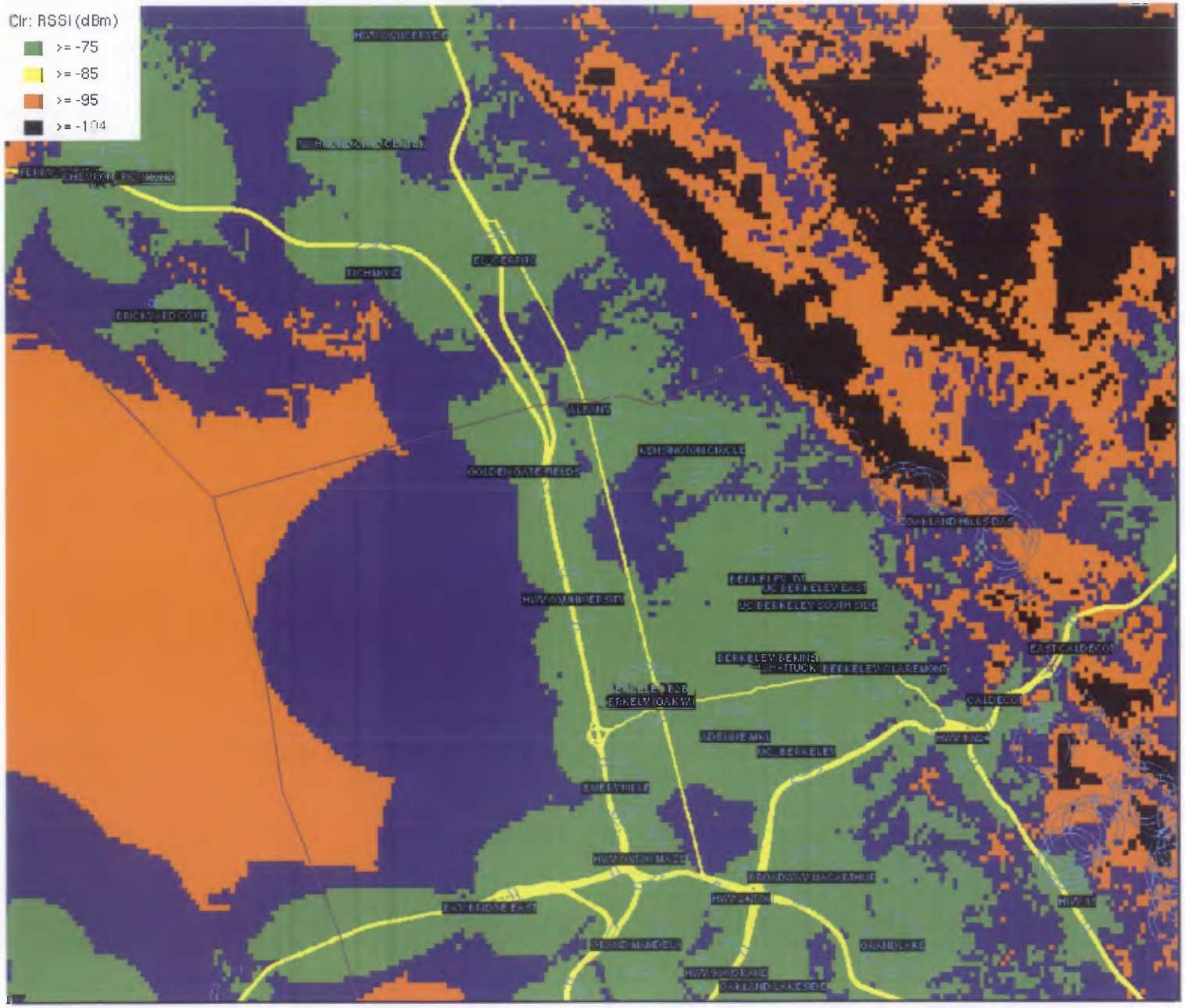
5/19/09

Applied Imagination 510 914-0500

Cellular coverage - Before



Cellular coverage - After



LTE coverage