



STAFF REPORT

TO: PLANNING COMMISSION

PREPARED BY: Anjana Mepani, Associate Planner

REVIEWED BY: Terry Blount, AICP, Planning Manager

GENERAL INFORMATION

APPLICANT: T-Mobile/Landmark Wireless – Karen Lienert

PROPERTY OWNER: Martinez United Methodist Church

LOCATION: 100 Church Street (APN 162-180-050)

GENERAL PLAN: Residential 0-6: 0 to 6 Units/Gross Acre

ZONING: R-7.5 (One-Family Residential: 7,500 sq. ft. minimum lot area)

ENVIRONMENTAL: Staff has yet to determine the level of environmental review that will be required for this project. All environmental documentation will be presented to the Planning Commission for either adoption or denial at a subsequent public hearing. Copies of the Initial Study document, if one is to be required for this project, will be made available to the general public at a date to be determined, at City Hall.

PROPOSAL: Study session to discuss and receive public input on a proposal for an installation of a new wireless telecommunications facility at 100 Church Street. The proposed project consists of adding an 85' monopine tree tower with panel antennas on top of the tower. T-Mobile will be leasing a 30'x20' area at the base of the tower for an equipment enclosure. The proposed project is located in a residential zoning district, which requires a Use Permit and Design Review approval.

RECOMMENDATION

Review proposal, accept public comment, and provide feedback and direction to staff and the applicant on the proposal. The purpose of the study session is to allow for preliminary project review. No Planning Commission action is to be taken at this time.

SITE, CONTEXT, AND PROJECT DESCRIPTION

The Martinez United Methodist Church property has a lot size of 3.39 acres (147,668 square feet), which is larger than most of the surrounding lots. The subject lot currently contains two church related buildings, a playground, patio, and parking. To the north, east, and adjacent to the subject property is Nancy Boyd Memorial Park. On the west and south are single-family residences. According to the Contra Costa County records the Church was built in 1950, prior to the construction of many of the nearby residences which were constructed in the 1960's. The subject property is located in a residential zoning district, where pursuant to Martinez Municipal Code Chapter 22.39, "Wireless Telecommunications Facilities," a Use Permit and Design Review approval is required for any wireless facility installation.

The applicant, T-Mobile, is proposing to install a new wireless telecommunications facility by adding an 85-foot monopine tree tower and panel antennas to the top of the tower. The applicant is also proposing to place an equipment enclosure at the base of the tower. T-Mobile will be leasing a 30'x20' area for the equipment enclosure. The equipment enclosure will be fenced and surrounded by oleander trees for screening. As noted in the applicant's letter dated February 5, 2010 (Attachment B), T-Mobile is seeking to improve its wireless communication network to provide adequate coverage for its customers, specifically in the residential area near Tahoe Circle.

The wireless telecommunications facility will operate unmanned and the equipment will be serviced up to two times a month. Noise from the equipment must meet the noise requirements set in Martinez Municipal Code Chapter 8.34.020 and shall not exceed 60dBA for exterior noise level. In addition, the attached Radio Frequency Radiation Report (Attachment H) demonstrates that the proposed wireless facility will be within the permissible public exposure standards set by the Federal Communications Commission (FCC). It should be noted that the Telecommunications Act of 1996 states that no state or local governmental entity may regulate the placement, construction, or modification of wireless facilities on the basis of environmental effects of radio frequency emissions to the extent that the emissions comply with FCC regulations.

DISCUSSION

Use Permit

As mentioned above, a Use Permit is required to permit a wireless telecommunications facility of this type. The Martinez Municipal Code Section 22.39, Adopting Standards and Criteria for Telecommunication Facilities – Resolution No. 071-01 (III B), does not permit wireless facilities in a residentially zoned area without information and verification that no alternative, non-residentially zoned site is available to serve the same area. According to the Resolution, residentially zoned areas are not preferred sites; therefore, evidence and documentation shall be provided by the applicant showing that other preferred sites were evaluated and dismissed. Also, in accordance with Adopting Standards and Criteria for Telecommunication Facilities, the applicant must sufficiently demonstrate that no other feasible alternative location exists.

The applicant has provided in writing (Attachment B and C) and with graphics (Attachment G) a coverage needs analysis that identifies alternative sites within the search ring that could accommodate the proposed wireless telecommunications facility

and provide similar service to the proposed coverage area. According to T-Mobile, the search ring is very small, approximately 0.3 of a mile in diameter and alternative sites considered in the search ring were collocation sites, Nancy Boyd Memorial Park, and Fire Station #13 (251 Church Street). However, within the coverage area no existing wireless telecommunications sites were available for collocation, Nancy Boyd Memorial Park sits at low elevation which would affect coverage, and both the tennis courts at the park and Fire Station #13 have limited space. The Martinez United Methodist Church site was chosen due to its elevation allowing for more coverage, large lot that allows separation from nearby residences, screening by mature trees on the lot, and its non-residential use (church use) in a residential area.

Design Review

The applicant is proposing to construct an 85-foot monopine tree tower at the northern portion of the subject property. The tower will resemble a pine tree and the antennas will be set within the branches. For screening purposes the tower will be set near existing trees. The proposed antennas will be covered in green fabric with faux pine needles to disguise the antennas on the tower. Further, the antennas proposed to be placed on the top portion of the tower hat will be approximately 55.9" in height, 13.3" in width, and 3.15" in depth. It should be noted that utility poles and towers are not subject to height limits (Martinez Municipal Code Chapter 22.34.170.B).

The proposed equipment enclosure will be located at the base of the tower and will not be visible from Church Street or Tahoe Circle. Most of the equipment within the enclosure will not be visible above the 6-foot chain-link fence. Oleander trees will surround the enclosure and will provide screening for both the equipment and enclosure. Based on the feedback received from the neighborhood outreach meeting held on May 10, 2010, two redwood trees will be planted near the western property line to provide additional screening. The applicant has provided photo simulations with various views of the monopine tree tower, antennas, and equipment enclosure (Attachment E). Additionally, should the applicant decide to move forward, the project will be reviewed by the Design Review Committee, prior to returning to the Planning Commission.

ATTACHMENTS

- A. Site Context Map
- B. Applicant's Letter Dated February 5, 2010
- C. Applicant's Letter Dated October 31, 2010
- D. Letter of Authorization from Martinez United Methodist Church
- E. Photo Simulations
- F. Antenna Cutsheet
- G. Coverage Maps
- H. Radio Frequency Radiation Report
- I. Noise Information

EXHIBITS

Survey, Site Plan and Antenna Layout, Elevations, Landscape Plan

F:\Community Development\All Projects\Wireless Facilities\Church St, 100 - T-Mobile\T-Mobile Wireless - StdySessnRpt.doc





February 5, 2010

City of Martinez
525 Henrietta Street
Martinez, CA 94553-2394

Re: Request for Planning Commission Study Session
100 Church Street
APN: # 162-180-050

Project Justification

T-Mobile is currently working to improve its wireless communications network in the Bay Area. T-Mobile is similar to other wireless communications carriers in that it relies on the installation and operation of base station antenna sites in strategic areas to provide adequate coverage for its customers. T-Mobile has a need for improved coverage in the Martinez area and specifically in the residential area around Tahoe Circle.

Requested Entitlement and Project Description

T-Mobile respectfully requests that this application be considered for the installation of an 85' tall monopine tower with 9 panel antennas to be installed at the top of the monopine. T-Mobile will install associated radio cabinets and the total lease area will be 30' x 20' and will be enclosed with a chain link fence. Oleander is proposed to be installed around the fence perimeter to screen the ground equipment. The height of the tower is proposed due to the existing mature tree coverage in the area.

Site Description

This site is located at 100 Church Street. This parcel is the site of the Martinez United Methodist Church. The site is zoned R7.5 and the parcel is 3.39 acres. This site was chosen as it is a non-residential use parcel in a residential area, the site sits at a higher elevation than the property immediately to the east, the size of the parcel allows for separation from residential and the mature trees on site provide screening of the project.

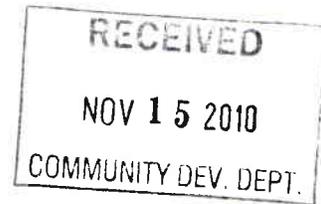
Alternative Site Analysis

T-Mobile has used existing structures whenever possible in designing their network. There are no existing structures within this search area. The search ring area is all residential. Other non-residentially used parcels within the search area include the Nancy Boyd Memorial Park. The park property was not considered as a candidate due to the lower elevation of the property. The tennis courts at the park sit behind the church at the higher elevation, however the space is limited on this part of the park property. There is also a fire station at 251 Church Street that was evaluated, however due to the small parcel size (.45 acres) the site did not seem to be a good alternative as it would not provide any separation from the existing residential properties in the area.

T-Mobile

October 31, 2010

Anjana Mepani
Associate Planner
City of Martinez
525 Henrietta Street
Martinez, CA 94553-2394



Re: Request for Planning Commission Study Session
100 Church Street
APN: # 162-180-050

Dear Ms. Mepani:

I am writing in response to your letter requesting additional information on the above referenced project:

- 1) Enclosed please find a letter from Doug Murphy, T-Mobile Development Manger authorizing Landmark Wireless to act as an authorized agent on their behalf on this application.
- 2) A neighborhood outreach meeting was held on May 10, 2010. Noticing was sent to a 300' radius to a total of 59 neighbors. Three neighbors attended the meeting as did the director of the preschool on site. Based upon neighborhood feedback at this meeting, additional trees are being added as part of this project along the western property line to provide additional screening along Tahoe Drive.
- 3) The coverage area for this site is very small and is centered on residential property. The coverage area is approximately .3 of a mile in diameter (see blue highlighted area on attached map). The larger circle on the map is a one mile radius from the proposed site and shows that within 1 mile of the site T-Mobile has three existing sites. Within this coverage area there were no existing communication sites available for collocation. The only other non-residentially used properties that were identified were the fire station located at the corner of Church Street and Pleasant Hill Road and the Nancy Boyd Memorial Park. The fire station was evaluated, however due to the small size of the lot it was determined there would not be sufficient space available for the tower, nor would this site provide any screening to the adjacent neighbors. The park was considered, however the area near the tennis courts has very limited space and the area to the east is at a significantly lower elevation (approx. 40') than the Martinez United Methodist Church and would require a much larger structure be constructed to provide the same coverage. Due to the size of the parcel and the number of trees at the Martinez United Methodist Church this site allowed for the most separation and screening from residential uses in the area.
- 4) I have attached an antenna cutsheet. The antennas will be covered with a green radio friendly fabric with faux pine needles to further disguise the antennas on the tower. This fabric will be provided by the tower vendor so the color and needles will match that which is installed on the tower.
- 5) The quality of concealment has improved dramatically since first introduced. The foliage will be manufactured using UV stabilizers to minimize fading. A mix of darker and lighter foliage strips can be combined to enhance the color and to reduce the impact of any fading over time.
- 6) Future equipment has been removed from the revised plans.

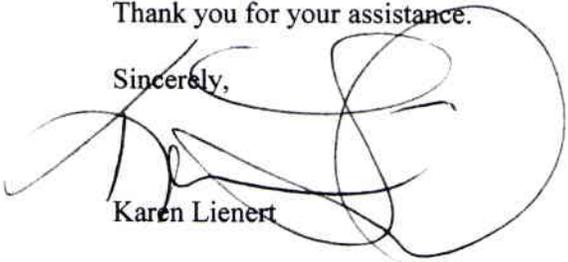
- 7) Trees will not be removed as part of this project.
- 8) Routine maintenance on the site is done 1-2 times per month and is typically done during normal business hours. However, during an outage or emergency situation the site may be visited 24 hours per day. The site access is directly across the parcel owned by Martinez United Methodist Church and access has been granted as part of the lease agreement that the Church has entered into with T-Mobile. T-Mobile's access to the site from the existing paved road will be improved with gravel. Please see page A-1 for the additional detail.
- 9) The drawings have been revised to show the natural grade of the site. The monopine as designed is 12' 6" from the top of the slope which is depicted on Page A-2 and A-3. The foundation for the tower will be a pier foundation and should not be larger than 5' in diameter and will not be impacted by the slope.

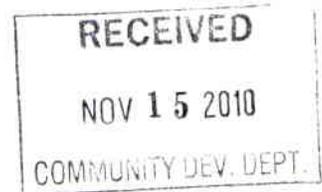
In addition to the materials referenced above, I have enclosed 10 full size sets of drawings, one 11" x 17" and one 8.5" x 11" drawing. I have also included 10 sets of the photo simulations.

Please feel free to contact me at (916) 834-0834 if you need any additional information or clarification on the information provided.

Thank you for your assistance.

Sincerely,


Karen Lienert





LETTER OF AUTHORIZATION

RECEIVED
FEB - 8 2010
COMMUNITY DEV. DEPT.

TO: CITY OF MARTINEZ
RE: APPLICATION FOR ZONING/USE PERMIT

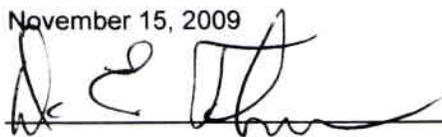
MARTINEZ UNITED METHODIST CHURCH., as owners of the below-described property, do hereby appoint T-Mobile and its employees, agents and contractors, as agent for the purpose of consummating any application and obtaining any and all governmental permits and approvals to construct, maintain and operate mobile/wireless communications facilities on the below-described property. The undersigned understand that the application may be denied, modified or approved with conditions, and that such conditions or modifications must be complied with prior to issuance of permits or approvals.

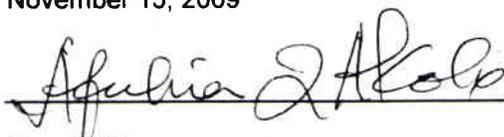
Address: 100 Church Street, Martinez, CA

Assessor's Parcel Number: 162-180-050

Signature of Property Owners:

By: 
Name: Douglas P. Sibley, Chair, Board of Trustees

Date: November 15, 2009
By: 
Name: Ernie Thomas, Chair, Administrative Council

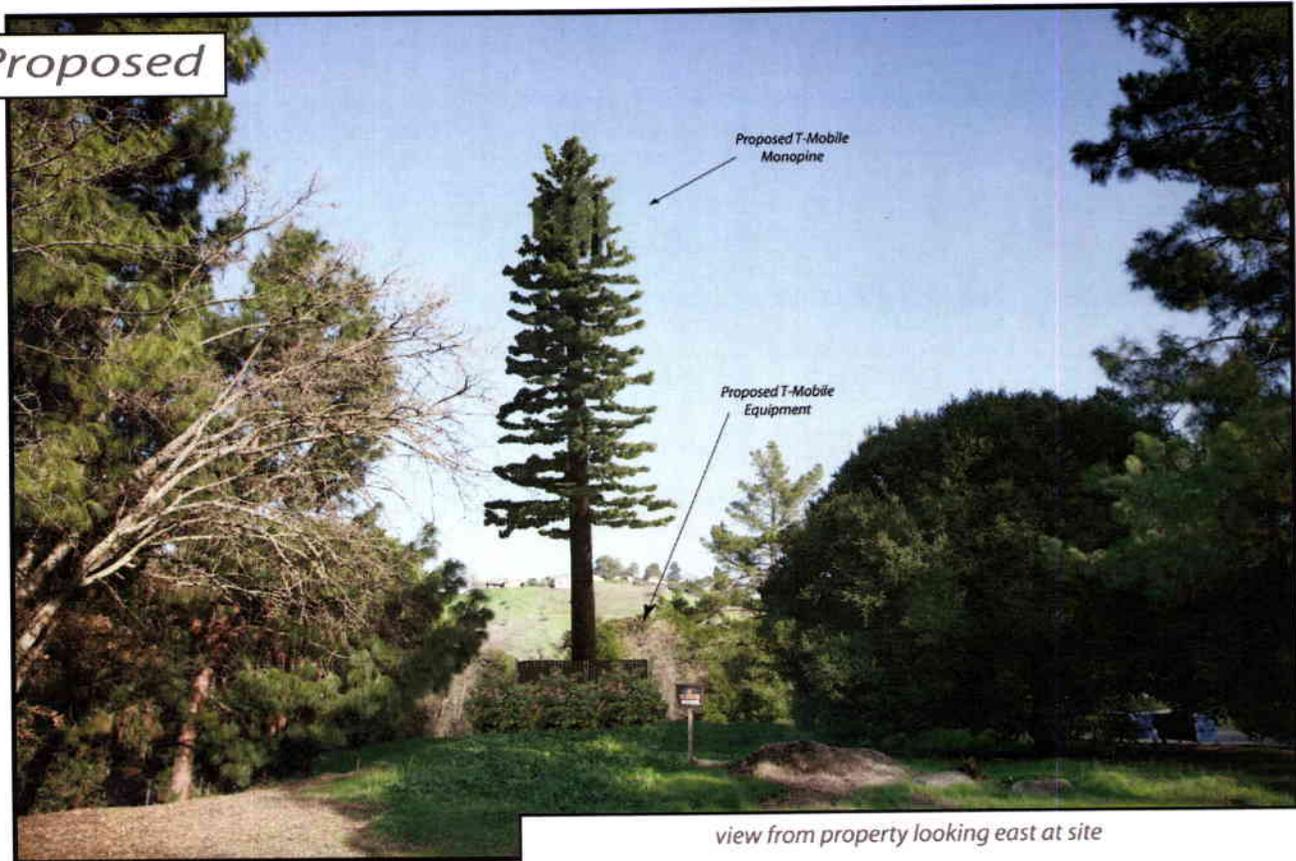
Date: November 15, 2009
By: 
Name: Rev Afuhia 'I. 'Akolo, Pastor
Date: November 15, 2009

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NOV 15 2010
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Existing



Proposed



view from property looking east at site

AdvanceSim
Photo Simulation Solutions
Contact: 925 | 202-8507

T-Mobile

BA51981B Martinez United Methodist Church
100 Church Street, Martinez, CA

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NOV 15 2010

COMMUNITY DEV. DEPT.

Existing



Proposed



view from Pleasant Hill Road East looking southwest at site

AdvanceSim
Photo Simulation Solutions
Contact | 925 | 292-8507

T-Mobile

BA51981B Martinez United Methodist Church
100 Church Street, Martinez, CA

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COMMUNITY DEV. DEPT.

Existing



Proposed



view from Church Street looking north at site

AdvanceSim
Photo Simulation Solutions
Contact | 925 | 202-8507

T-Mobile • BA51981B Martinez United Methodist Church
100 Church Street, Martinez, CA

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COMMUNITY DEVELOPMENT

Existing



Proposed



view from Tahoe Drive looking northeast at site

AdvanceSim
Photo Simulation Solutions
Contact: 925-430-8307

T-Mobile BA51981B Martinez United Methodist Church
100 Church Street, Martinez, CA

3m



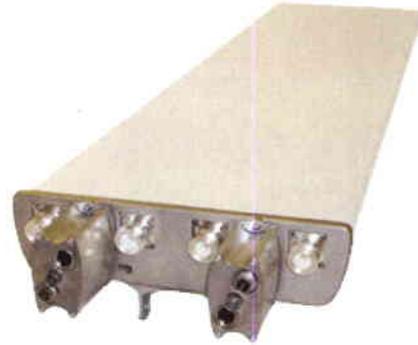
Optimizer® Side-by-Side Dual Polarized Antenna, 1710-2200, 65deg, 18.4dBi, 1.4m, VET, 0-10deg RET

Product Description

A combination of two X-Polarized antennas in a single radome, this pair of variable tilt antennas provides exceptional suppression of all upper sidelobes at all downtilt angles. It also features a wide downtilt range. This antenna is optimized for performance across the entire frequency band (1710-2200 MHz). The antenna comes pre-connected with two antenna control units (ACU).

Features/Benefits

- Variable electrical downtilt - provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.
- High Suppression of all Upper Sidelobes (Typically <-20dB).
- Gain tracking – difference between AWS UL (1710-1755 MHz) and DL (2110-2155 MHz) <1dB.
- Two X-Polarised panels in a single radome.
- Azimuth horizontal beamwidth difference <4deg between AWS UL (1710-1755 MHz) and DL (2110-2155 MHz).
- Low profile for low visual impact.
- Dual polarization; Broadband design.
- Includes (2) AISG 2.0 Compatible ACU-A20-N antenna control units.



Technical Specifications

Electrical Specifications

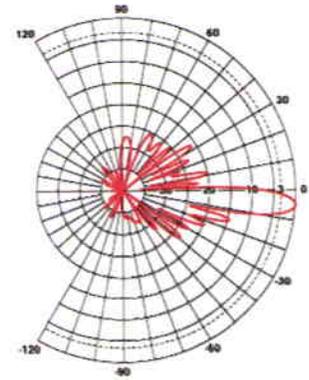
Frequency Range, MHz	1710-2200
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	5.9 to 7.7
Electrical Downtilt, deg	0-10
Gain, dBi (dBd)	18.4 (16.3)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)
Front-To-Back Ratio, dB	>26 (typically 28)
Polarization	Dual pol +/-45°
VSWR	< 1.5:1
Isolation between Ports, dB	> 30
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (155 Typical)
Impedance, Ohms	50
Maximum Power Input, W	300
Lightning Protection	Direct Ground
Connector Type	(4) 7-16 Long Neck Female

Mechanical Specifications

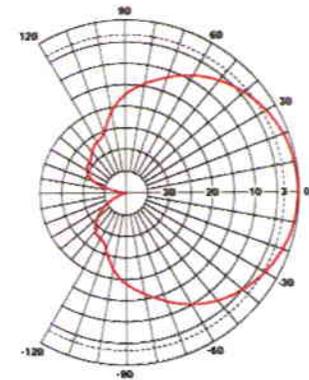
Dimensions - HxWxD, mm (in)	1420 x 331 x 80 (55.9 x 13 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	18.5 (40.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m ² (ft ²)	0.47 (5.03)
Front Thrust @ Rated Wind, N (lbf)	756 (170)
Maximum Thrust @ Rated Wind, N (lbf)	756 (170)
Wind Load - Side @ Rated Wind, N (lbf)	231 (52)
Wind Load - Rear @ Rated Wind, N (lbf)	408 (92)
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum
Shipping Weight, kg (lb)	24.5 (53.9)
Packing Dimensions, HxVxD, mm (in)	1520 x 408 x 198 (59.8 x 16 x 7.8)

Ordering Information

Mounting Hardware APM40-2 + APM40-E2



Vertical Pattern

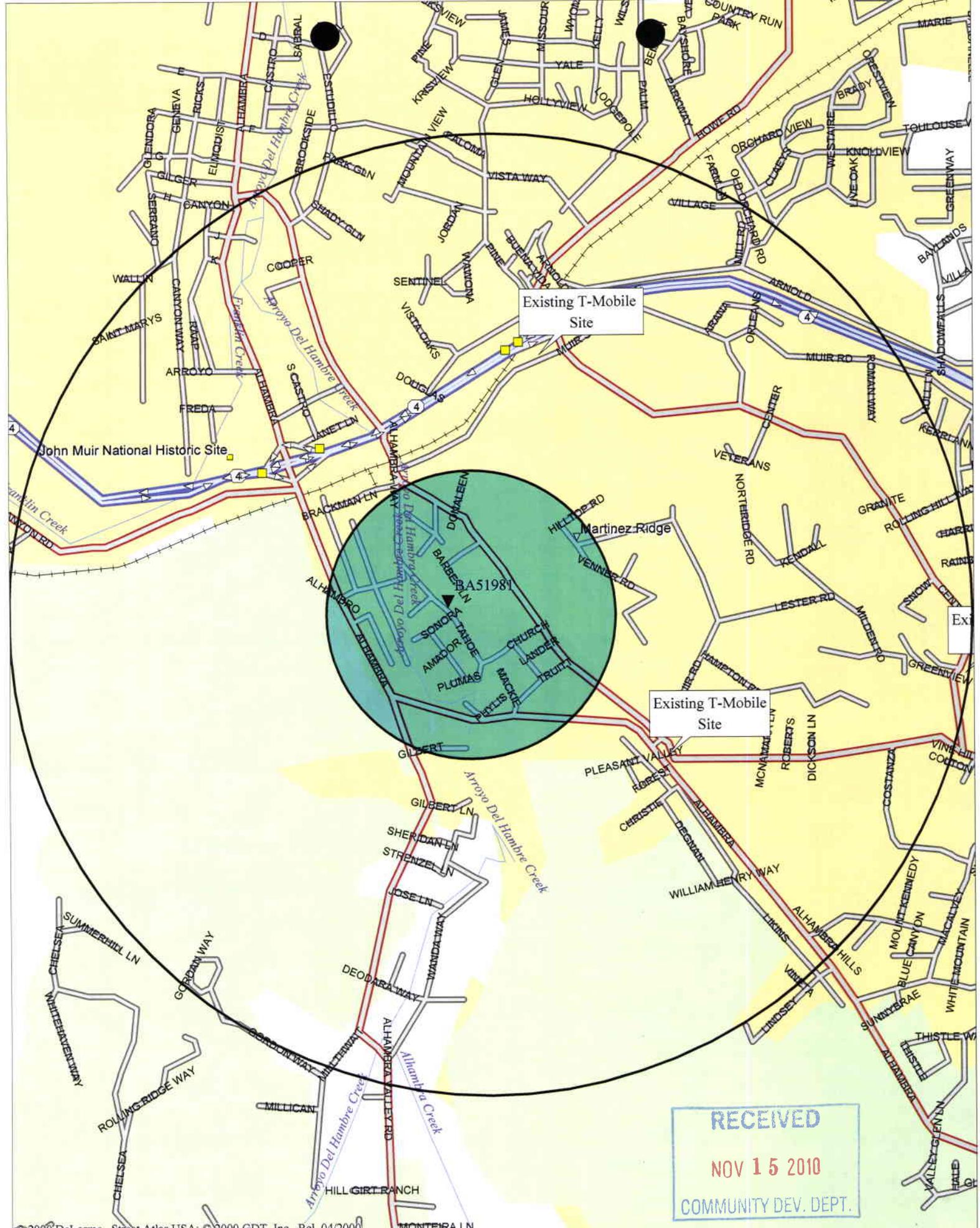


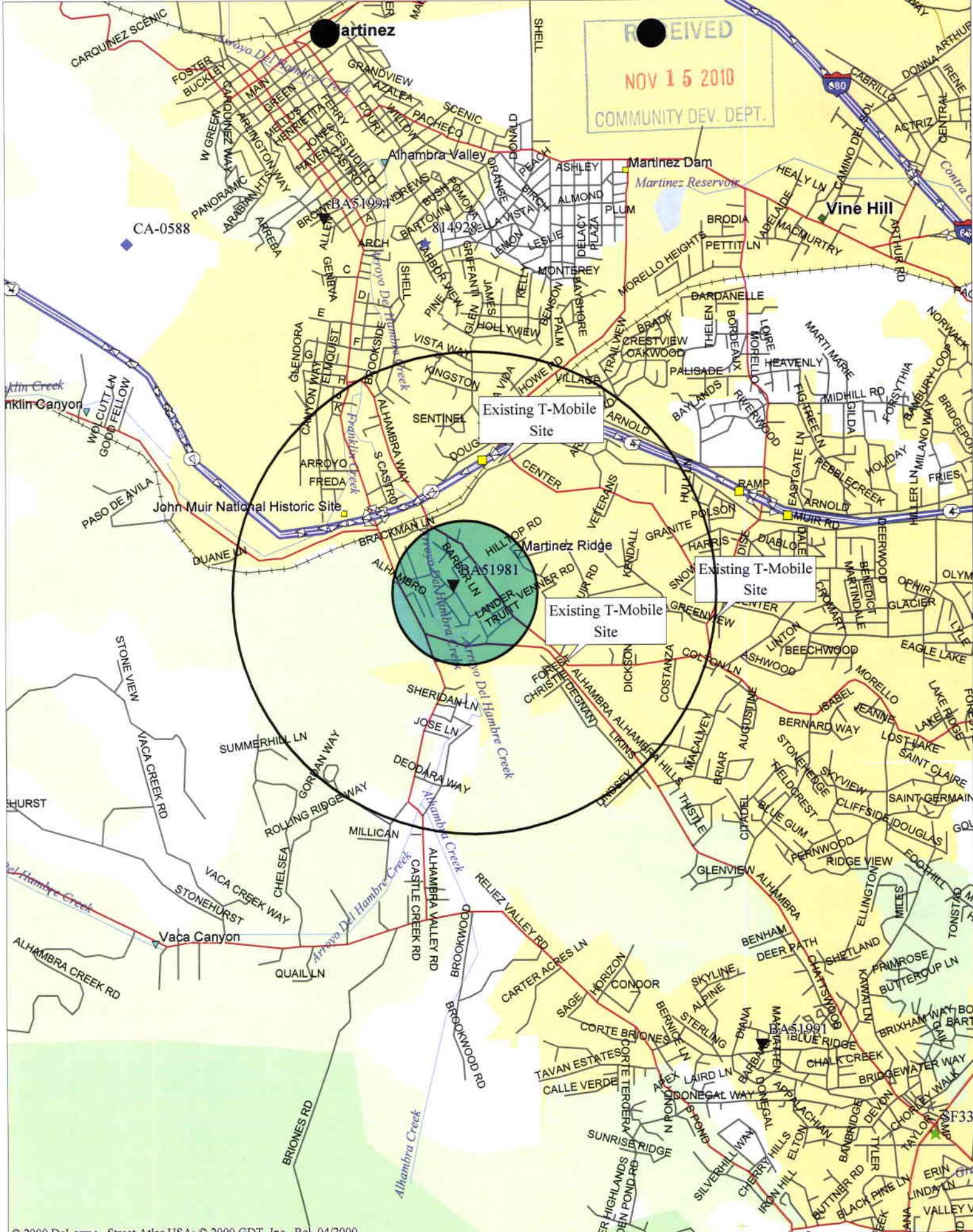
Horizontal Pattern



All information contained in the present datasheet is subject to confirmation at time of ordering

3n





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 NOV 15 2010
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Martinez

Existing T-Mobile Site

Existing T-Mobile Site

Existing T-Mobile Site

ALHAMBRA 51981
 BARBARA LN
 LANDER TRUITT

Copyright © Copyright 2000-2007 AIRCOM International Ltd.

BA51981A_Neighbours without Candidate - Existing Coverage Hole

Existing Coverage Hole

2009-06-08 16:23:40

Best Server

UL

- 76.0 <= x dBm Indoor Coverage
- 84.0 <= x < -76.0 dBm In Car Coverage
- 91.0 <= x < -84.0 dBm Outdoor Coverage

StreetPro_CA

Polygon Line 1

Line Line 1

Point

Text

Fill

Property

ID

MSC

BSC

Cell Site

Cell (GSM)

Link (PTP)

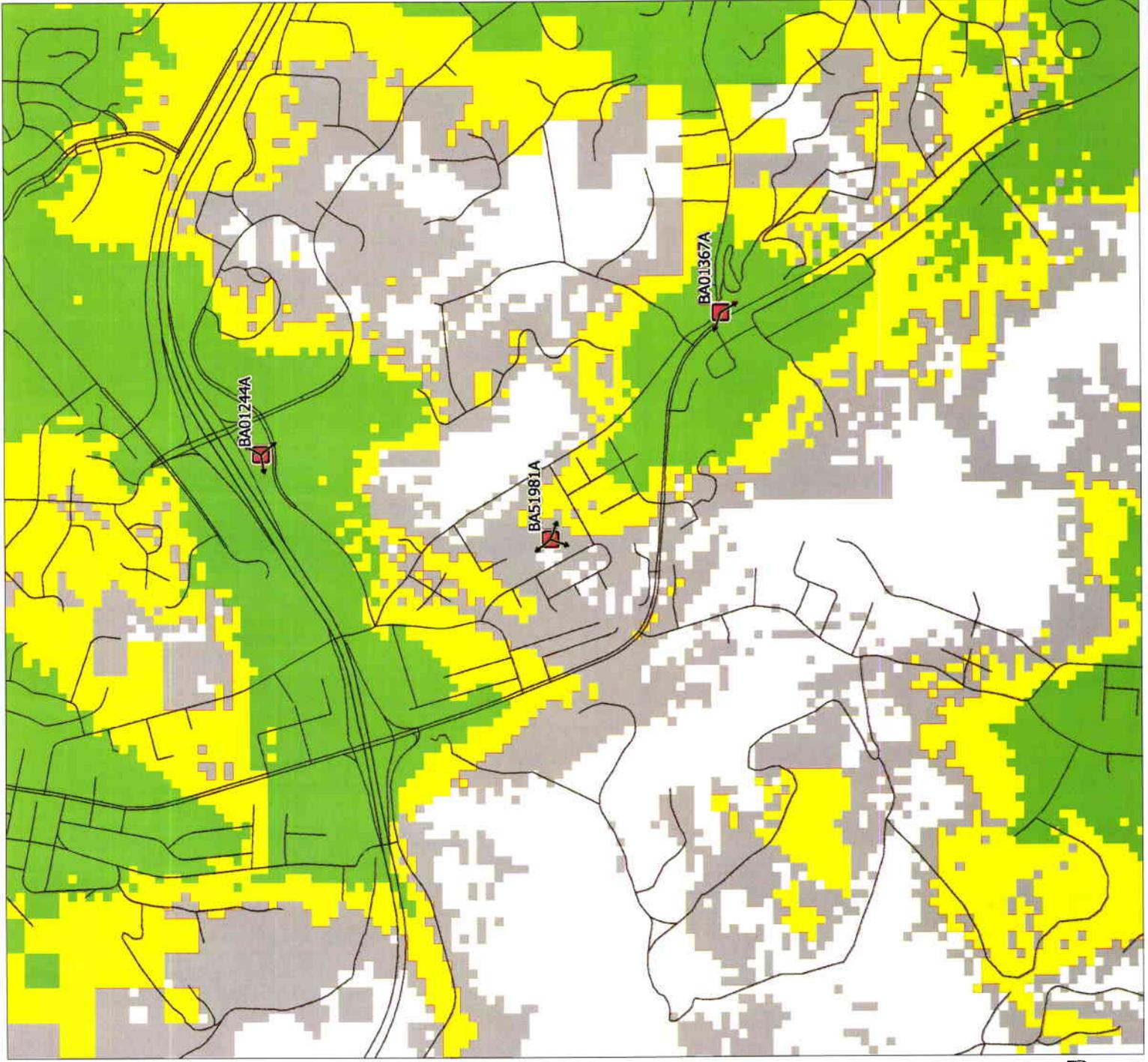
Property

ID



'System\Bay Area\Personal Filters\zzMB\SF_TOA' filter

'System\Bay Area\Personal Filters\zzMB\BA_127_rings' filter



Top Right: -122.105784 37.998313
 Bottom Left: -122.139888 37.979542
 Scale Ratio 1:15594
 0 0.125 0.250 0.375 0.500 Miles

RECEIVED
FEB - 8 2010
COMMUNITY DEV. DEPT.



SITE ANALYSIS
OF
RADIO FREQUENCY ELECTROMAGNETIC FIELDS



For Base Station: BA51981A

MPE Analysis Tool v2.7.05

ANTENNA SYSTEM 1 GSM CELL: **BA51981A_A**

- THIS CELL IS CATEGORICALLY EXCLUDED FROM THE REQUIREMENT FOR AN MPE ANALYSIS
-
-

ANTENNA SYSTEM 1 GSM CELL: **BA51981A_B**

- THIS CELL IS CATEGORICALLY EXCLUDED FROM THE REQUIREMENT FOR AN MPE ANALYSIS
-
-

ANTENNA SYSTEM 1 GSM CELL: **BA51981A_C**

- THIS CELL IS CATEGORICALLY EXCLUDED FROM THE REQUIREMENT FOR AN MPE ANALYSIS
-
-

Name:

Region: Unknown, Market: Unknown, Site: BA51981A

Site Address:

100 CHURCH ST CENTRAL CONTRA COSTA CA 94553

Submitted By:

SATENDERA SHARMA

Date:

Thursday, January 14, 2010

FCC:

COMPLIANT

REPORT SUMMARY

This report was generated based on Engineering and Design data provided by **SATENDERA SHARMA**, on behalf of T-Mobile, USA, for the cell site located at **100 CHURCH ST CENTRAL CONTRA COSTA CA 94553**. The report's technical data was derived in part by the FCC OET68B FCC Exposure Guidelines for measuring Maximum Permissible Exposure (MPE) on PCS Networks.

Based on the output power, number of radios and antenna height for this site:

Sector 'A' Antenna System(s):

- Meets 100% of the FCC general population/uncontrolled exposure limit at a horz distance of **3 ft** (0.91 m) from the nearest access point.
- Meets 100% of the FCC occupational/controlled exposure limit at a horz distance of **3 ft** (0.91 m) from the nearest access point.

Sector 'B' Antenna System(s):

- Meets 100% of the FCC general population/uncontrolled exposure limit at a horz distance of **3 ft** (0.91 m) from the nearest access point.
- Meets 100% of the FCC occupational/controlled exposure limit at a horz distance of **3 ft** (0.91 m) from the nearest access point.

Sector 'C' Antenna System(s):

- Meets 100% of the FCC general population/uncontrolled exposure limit at a horz distance of **3 ft** (0.91 m) from the nearest access point.
- Meets 100% of the FCC occupational/controlled exposure limit at a horz distance of **3 ft** (0.91 m) from the nearest access point.

For Occupational/Controlled personnel who may come in closer proximity to the antenna than **3 ft** (0.91 m) precautions must be exercised. For example, all personnel should have appropriate training on exposure limits. All T-Mobile personnel should wear exposure detecting equipment. Proper signage must be posted. Due to the mounting methods used by T-Mobile, USA, public access to the face of an antenna would be difficult.

- RF warning signs should be posted at the entrance of this site or at the entrance of the antenna locations.

Analysis Overview

T-Mobile, USA has conducted an analysis for determining the MPE compliance for the cell site located at **100 CHURCH ST CENTRAL CONTRA COSTA CA 94553** (Latitude: 37.98635555, Longitude: -122.12280277). This analysis consists of the

actual site design parameters, the number of radios transmitting and the resulting calculation of the estimated RF field strength from the antennas. The output is then compared to the FCC recommended guidelines for human exposure to RF electromagnetic fields (OET65b).

Site Description

Based on the Engineering and Design Data provided by **SATENDERA SHARMA**, the proposed site will have the following parameters:

Site Type:

Pole (this includes any non-building mounted site)

Collocation:

NO

Controlled/Uncontrolled Access to Antenna Face:

N/A

Antenna Make

Sector	GSM (2G) Antenna Make	UMTS (3G) Antenna Make
A	RFS	no make given
B	RFS	no make given
C	RFS	no make given

Antenna Model

Sector	GSM (2G) Antenna Model	UMTS (3G) Antenna Model
A	APX16DWV_16DWVS_01	no make given
B	APX16DWV_16DWVS_02	no make given
C	APX16DWV_16DWVS_02	no make given

Frequency & Orientation

Sector	GSM (2G) Freq / Azimuth	UMTS (3G) Freq / Azimuth
A	1920 MHz / 110°	-- MHz / °
B	1920 MHz / 200°	-- MHz / °
C	1920 MHz / 320°	-- MHz / °

Max Antenna Gain

Sector	GSM (2G) Max Antenna Gain	UMTS (3G) Max Antenna Gain
A	18 dBi	-- dBi
B	18 dBi	-- dBi
C	18 dBi	-- dBi

Max ERP_{chan} into Ant

Sector	GSM (2G) Max ERP _{chan} into Ant	UMTS (3G) Max ERP _{chan} into Ant
A	5.23 Watts	-- Watts
B	5.23 Watts	-- Watts
C	5.23 Watts	-- Watts

Max ERP_{chan}

Sector	GSM (2G) Max ERP _{chan}	UMTS (3G) Max ERP _{chan}

A	362.373 Watts	-- Watts
B	362.373 Watts	-- Watts
C	362.373 Watts	-- Watts

Total EIRP (ERP*1.64*Channels*Activity_factor)

(activity factor equals .65 for GSM and .95 for UMTS)

Sector	Total EIRP
A	772.579 Watts
B	1158.869 Watts
C	1158.869 Watts

No. of Channels

Sector	GSM (2G) No. of Channels	UMTS (3G) No. of Channels
A	2	--
B	3	--
C	3	--

Antenna Mounting:

[Unknown]

Distributed Antenna System (DAS):

NO

Radiation Centerline:

85 ft (25.9 m) AGL

Additional comments:

No comments for system 1. No comments for system 2.

Antenna System 1, Cell: BA51981A_A

Dist (ft)	Deg	Gain (dBi)	Power Density		Charted		Max Distance Calc			
			Far Field ($\mu\text{W}/\text{cm}^2$)	Near Field ($\mu\text{W}/\text{cm}^2$)	Power Density ($\mu\text{W}/\text{cm}^2$)	% of Limit	Power Density (ft)	>5% MPE	>100% MPE	>500% MPE
0.656	88.53	18	41.24	19.03	19.03	1.9	0.66	0	0	0
0.6561	88.53	18	41.23	19.03	19.03	1.9	0	0	0	0
0.7	88.5	18	41.23	19.03	19.03	1.9	0	0	0	0
0.8	88.42	18	41.23	19.03	19.03	1.9	0	0	0	0
0.9	88.35	18	41.23	19.03	19.03	1.9	0	0	0	0
1	88.28	18	41.23	19.03	19.03	1.9	0	0	0	0
2	87.56	18	41.21	19.02	19.02	1.9	0	0	0	0
3	86.84	18	41.18	19.02	19.02	1.9	0	0	0	0
4	86.12	18	41.13	19.01	19.01	1.9	0	0	0	0
5	85.4	18	41.08	18.99	18.99	1.9	0	0	0	0
6	84.68	18	41	18.98	18.98	1.9	0	0	0	0
7	83.97	18	40.92	18.96	18.96	1.9	0	0	0	0
8	83.25	18	40.82	18.93	18.93	1.89	0	0	0	0
9	82.54	18	40.72	18.91	18.91	1.89	0	0	0	0
10	81.83	18	40.6	18.88	18.88	1.89	0	0	0	0
11	81.12	18	40.46	18.85	18.85	1.89	0	0	0	0

12	80.42	18	40.32	18.82	18.82	1.88	0	0	0	0
13	79.71	18	40.16	18.78	18.78	1.88	0	0	0	0
14	79.01	18	40	18.74	18.74	1.87	0	0	0	0
15	78.32	18	39.82	18.7	18.7	1.87	0	0	0	0
16	77.62	18	39.63	18.66	18.66	1.87	0	0	0	0
17	76.93	18	39.43	18.61	18.61	1.86	0	0	0	0
18	76.24	18	39.23	18.56	18.56	1.86	0	0	0	0
19	75.56	18	39.01	18.51	18.51	1.85	0	0	0	0
20	74.88	18	38.78	18.46	18.46	1.85	0	0	0	0
21	74.2	18	38.55	18.4	18.4	1.84	0	0	0	0
22	73.53	18	38.3	18.34	18.34	1.83	0	0	0	0
23	72.86	18	38.05	18.28	18.28	1.83	0	0	0	0
24	72.2	18	37.79	18.22	18.22	1.82	0	0	0	0
25	71.54	18	37.53	18.15	18.15	1.82	0	0	0	0
26	70.89	18	37.25	18.09	18.09	1.81	0	0	0	0
27	70.24	18	36.97	18.02	18.02	1.8	0	0	0	0
28	69.6	18	36.69	17.95	17.95	1.79	0	0	0	0
29	68.96	18	36.39	17.88	17.88	1.79	0	0	0	0
30	68.33	18	36.1	17.8	17.8	1.78	0	0	0	0
31	67.7	18	35.8	17.73	17.73	1.77	0	0	0	0
32	67.07	18	35.49	17.65	17.65	1.77	0	0	0	0
33	66.46	18	35.18	17.58	17.58	1.76	0	0	0	0
34	65.84	18	34.86	17.5	17.5	1.75	0	0	0	0
35	65.24	18	34.54	17.42	17.42	1.74	0	0	0	0
36	64.64	18	34.22	17.34	17.34	1.73	0	0	0	0
37	64.04	18	33.9	17.25	17.25	1.73	0	0	0	0
38	63.45	18	33.57	17.17	17.17	1.72	0	0	0	0
39	62.87	18	33.24	17.08	17.08	1.71	0	0	0	0
40	62.29	18	32.91	17	17	1.7	0	0	0	0
41	61.72	18	32.57	16.91	16.91	1.69	0	0	0	0
42	61.15	18	32.24	16.83	16.83	1.68	0	0	0	0
43	60.59	18	31.9	16.74	16.74	1.67	0	0	0	0
44	60.04	18	31.57	16.65	16.65	1.67	0	0	0	0
45	59.49	18	31.23	16.56	16.56	1.66	0	0	0	0
46	58.95	18	30.89	16.47	16.47	1.65	0	0	0	0
47	58.41	18	30.56	16.38	16.38	1.64	0	0	0	0
48	57.88	18	30.22	16.29	16.29	1.63	0	0	0	0
49	57.35	18	29.88	16.2	16.2	1.62	0	0	0	0
50	56.83	18	29.55	16.11	16.11	1.61	0	0	0	0
60	51.96	18	26.27	15.19	15.19	1.52	0	0	0	0
70	47.64	18	23.23	14.28	14.28	1.43	0	0	0	0
80	43.82	18	20.49	13.41	13.41	1.34	0	0	0	0
90	40.46	18	18.07	12.6	12.6	1.26	0	0	0	0
100	37.48	18	15.97	11.84	11.84	1.18	0	0	0	0
110	34.86	18	14.15	11.15	11.15	1.11	0	0	0	0
120	32.52	18	12.58	10.51	10.51	1.05	0	0	0	0
130	30.45	18	11.22	9.93	9.93	0.99	0	0	0	0
140	28.59	18	10.06	9.4	9.4	0.94	0	0	0	0
150	26.92	18	9.04	8.91	8.91	0.89	0	0	0	0
160	25.42	18	8.17	8.47	8.17	0.82	0	0	0	0
170	24.06	18	7.4	8.06	7.4	0.74	0	0	0	0
180	22.83	18	6.73	7.69	6.73	0.67	0	0	0	0
190	21.71	18	6.14	7.35	6.14	0.61	0	0	0	0
200	20.68	18	5.63	7.03	5.63	0.56	0	0	0	0

210	19.74	18	5.17	6.74	5.17	0.52	0	0	0	0
220	18.87	18	4.76	6.47	4.76	0.48	0	0	0	0
230	18.07	18	4.4	6.22	4.4	0.44	0	0	0	0
240	17.33	18	4.08	5.98	4.08	0.41	0	0	0	0
250	16.64	18	3.79	5.77	3.79	0.38	0	0	0	0
260	16	18	3.53	5.56	3.53	0.35	0	0	0	0
270	15.41	18	3.29	5.38	3.29	0.33	0	0	0	0
280	14.85	18	3.08	5.2	3.08	0.31	0	0	0	0
290	14.33	18	2.88	5.03	2.88	0.29	0	0	0	0
300	13.84	18	2.71	4.87	2.71	0.27	0	0	0	0
310	13.38	18	2.54	4.73	2.54	0.25	0	0	0	0
320	12.95	18	2.4	4.59	2.4	0.24	0	0	0	0
330	12.54	18	2.26	4.46	2.26	0.23	0	0	0	0
340	12.16	18	2.14	4.33	2.14	0.21	0	0	0	0
350	11.8	18	2.02	4.22	2.02	0.2	0	0	0	0
360	11.45	18	1.92	4.1	1.92	0.19	0	0	0	0
370	11.13	18	1.82	4	1.82	0.18	0	0	0	0
380	10.82	18	1.73	3.9	1.73	0.17	0	0	0	0
390	10.52	18	1.65	3.8	1.65	0.16	0	0	0	0
400	10.24	18	1.57	3.71	1.57	0.16	0	0	0	0
410	9.97	18	1.49	3.62	1.49	0.15	0	0	0	0
420	9.72	18	1.43	3.54	1.43	0.14	0	0	0	0
430	9.47	18	1.36	3.46	1.36	0.14	0	0	0	0
440	9.24	18	1.3	3.38	1.3	0.13	0	0	0	0
450	9.02	18	1.25	3.31	1.25	0.12	0	0	0	0
460	8.81	18	1.2	3.24	1.2	0.12	0	0	0	0
470	8.6	18	1.15	3.17	1.15	0.11	0	0	0	0
480	8.4	18	1.1	3.11	1.1	0.11	0	0	0	0
490	8.22	18	1.06	3.05	1.06	0.11	0	0	0	0
500	8.03	18	1.02	2.99	1.02	0.1	0	0	0	0
600	6.55	18	0.71	2.5	0.71	0.07	0	0	0	0
700	5.48	18	0.53	2.15	0.53	0.05	0	0	0	0
800	4.68	18	0.4	1.88	0.4	0.04	0	0	0	0
900	4.05	18	0.32	1.67	0.32	0.03	0	0	0	0
1000	3.55	18	0.26	1.51	0.26	0.03	0	0	0	0
1100	3.13	18	0.21	1.37	0.21	0.02	0	0	0	0
1200	2.79	18	0.18	1.26	0.18	0.02	0	0	0	0
1300	2.5	18	0.15	1.16	0.15	0.02	0	0	0	0
1400	2.25	18	0.13	1.08	0.13	0.01	0	0	0	0
1500	2.03	18	0.12	1.01	0.12	0.01	0	0	0	0
1600	1.84	18	0.1	0.94	0.1	0.01	0	0	0	0
1700	1.68	18	0.09	0.89	0.09	0.01	0	0	0	0
1800	1.53	18	0.08	0.84	0.08	0.01	0	0	0	0
1900	1.4	18	0.07	0.8	0.07	0.01	0	0	0	0
2000	1.28	18	0.07	0.76	0.07	0.01	0	0	0	0

Antenna System 1, Cell: BA51981A_B

Dist (ft)	Deg	Gain (dBI)	Power Density		Charted		Max Distance Calc			
			Far Field ($\mu\text{W}/\text{cm}^2$)	Near Field ($\mu\text{W}/\text{cm}^2$)	Power Density ($\mu\text{W}/\text{cm}^2$)	% of Limit	Power Density (ft)	>5% MPE	>100% MPE	>500% MPE
0.656	87.53	18	61.85	28.54	28.54	2.85	0.66	0	0	0
0.6561	87.53	18	61.85	28.54	28.54	2.85	0	0	0	0
0.7	87.5	18	61.85	28.54	28.54	2.85	0	0	0	0

0.8	87.42	18	61.85	28.54	28.54	2.85	0	0	0	0
0.9	87.35	18	61.85	28.54	28.54	2.85	0	0	0	0
1	87.28	18	61.85	28.54	28.54	2.85	0	0	0	0
2	86.56	18	61.82	28.54	28.54	2.85	0	0	0	0
3	85.84	18	61.77	28.52	28.52	2.85	0	0	0	0
4	85.12	18	61.7	28.51	28.51	2.85	0	0	0	0
5	84.4	18	61.61	28.49	28.49	2.85	0	0	0	0
6	83.68	18	61.51	28.46	28.46	2.85	0	0	0	0
7	82.97	18	61.38	28.44	28.44	2.84	0	0	0	0
8	82.25	18	61.24	28.4	28.4	2.84	0	0	0	0
9	81.54	18	61.07	28.36	28.36	2.84	0	0	0	0
10	80.83	18	60.89	28.32	28.32	2.83	0	0	0	0
11	80.12	18	60.69	28.28	28.28	2.83	0	0	0	0
12	79.42	18	60.48	28.23	28.23	2.82	0	0	0	0
13	78.71	18	60.25	28.17	28.17	2.82	0	0	0	0
14	78.01	18	60	28.11	28.11	2.81	0	0	0	0
15	77.32	18	59.73	28.05	28.05	2.81	0	0	0	0
16	76.62	18	59.45	27.98	27.98	2.8	0	0	0	0
17	75.93	18	59.15	27.91	27.91	2.79	0	0	0	0
18	75.24	18	58.84	27.84	27.84	2.78	0	0	0	0
19	74.56	18	58.51	27.76	27.76	2.78	0	0	0	0
20	73.88	18	58.17	27.68	27.68	2.77	0	0	0	0
21	73.2	18	57.82	27.6	27.6	2.76	0	0	0	0
22	72.53	18	57.46	27.51	27.51	2.75	0	0	0	0
23	71.86	18	57.08	27.42	27.42	2.74	0	0	0	0
24	71.2	18	56.69	27.33	27.33	2.73	0	0	0	0
25	70.54	18	56.29	27.23	27.23	2.72	0	0	0	0
26	69.89	18	55.88	27.13	27.13	2.71	0	0	0	0
27	69.24	18	55.46	27.03	27.03	2.7	0	0	0	0
28	68.6	18	55.03	26.92	26.92	2.69	0	0	0	0
29	67.96	18	54.59	26.82	26.82	2.68	0	0	0	0
30	67.33	18	54.15	26.71	26.71	2.67	0	0	0	0
31	66.7	18	53.69	26.59	26.59	2.66	0	0	0	0
32	66.07	18	53.23	26.48	26.48	2.65	0	0	0	0
33	65.46	18	52.77	26.36	26.36	2.64	0	0	0	0
34	64.84	18	52.29	26.25	26.25	2.62	0	0	0	0
35	64.24	18	51.81	26.13	26.13	2.61	0	0	0	0
36	63.64	18	51.33	26	26	2.6	0	0	0	0
37	63.04	18	50.84	25.88	25.88	2.59	0	0	0	0
38	62.45	18	50.35	25.75	25.75	2.58	0	0	0	0
39	61.87	18	49.86	25.63	25.63	2.56	0	0	0	0
40	61.29	18	49.36	25.5	25.5	2.55	0	0	0	0
41	60.72	18	48.86	25.37	25.37	2.54	0	0	0	0
42	60.15	18	48.36	25.24	25.24	2.52	0	0	0	0
43	59.59	18	47.86	25.11	25.11	2.51	0	0	0	0
44	59.04	18	47.35	24.98	24.98	2.5	0	0	0	0
45	58.49	18	46.85	24.84	24.84	2.48	0	0	0	0
46	57.95	18	46.34	24.71	24.71	2.47	0	0	0	0
47	57.41	18	45.84	24.57	24.57	2.46	0	0	0	0
48	56.88	18	45.33	24.44	24.44	2.44	0	0	0	0
49	56.35	18	44.83	24.3	24.3	2.43	0	0	0	0
50	55.83	18	44.32	24.16	24.16	2.42	0	0	0	0
60	50.96	18	39.41	22.78	22.78	2.28	0	0	0	0
70	46.64	18	34.84	21.42	21.42	2.14	0	0	0	0

80	42.82	18	30.73	20.12	20.12	2.01	0	0	0	0
90	39.46	18	27.11	18.9	18.9	1.89	0	0	0	0
100	36.48	18	23.95	17.76	17.76	1.78	0	0	0	0
110	33.86	18	21.22	16.72	16.72	1.67	0	0	0	0
120	31.52	18	18.87	15.77	15.77	1.58	0	0	0	0
130	29.45	18	16.84	14.89	14.89	1.49	0	0	0	0
140	27.59	18	15.08	14.1	14.1	1.41	0	0	0	0
150	25.92	18	13.57	13.37	13.37	1.34	0	0	0	0
160	24.42	18	12.25	12.7	12.25	1.22	0	0	0	0
170	23.06	18	11.1	12.09	11.1	1.11	0	0	0	0
180	21.83	18	10.1	11.53	10.1	1.01	0	0	0	0
190	20.71	18	9.22	11.02	9.22	0.92	0	0	0	0
200	19.68	18	8.44	10.54	8.44	0.84	0	0	0	0
210	18.74	18	7.75	10.11	7.75	0.78	0	0	0	0
220	17.87	18	7.14	9.7	7.14	0.71	0	0	0	0
230	17.07	18	6.6	9.33	6.6	0.66	0	0	0	0
240	16.33	18	6.12	8.98	6.12	0.61	0	0	0	0
250	15.64	18	5.68	8.65	5.68	0.57	0	0	0	0
260	15	18	5.29	8.35	5.29	0.53	0	0	0	0
270	14.41	18	4.93	8.06	4.93	0.49	0	0	0	0
280	13.85	18	4.61	7.8	4.61	0.46	0	0	0	0
290	13.33	18	4.32	7.55	4.32	0.43	0	0	0	0
300	12.84	18	4.06	7.31	4.06	0.41	0	0	0	0
310	12.38	18	3.82	7.09	3.82	0.38	0	0	0	0
320	11.95	18	3.6	6.88	3.6	0.36	0	0	0	0
330	11.54	18	3.39	6.69	3.39	0.34	0	0	0	0
340	11.16	18	3.21	6.5	3.21	0.32	0	0	0	0
350	10.8	18	3.03	6.32	3.03	0.3	0	0	0	0
360	10.45	18	2.88	6.16	2.88	0.29	0	0	0	0
370	10.13	18	2.73	6	2.73	0.27	0	0	0	0
380	9.82	18	2.59	5.85	2.59	0.26	0	0	0	0
390	9.52	18	2.47	5.7	2.47	0.25	0	0	0	0
400	9.24	18	2.35	5.56	2.35	0.24	0	0	0	0
410	8.97	18	2.24	5.43	2.24	0.22	0	0	0	0
420	8.72	18	2.14	5.31	2.14	0.21	0	0	0	0
430	8.47	18	2.04	5.19	2.04	0.2	0	0	0	0
440	8.24	18	1.96	5.08	1.96	0.2	0	0	0	0
450	8.02	18	1.87	4.97	1.87	0.19	0	0	0	0
460	7.81	18	1.79	4.86	1.79	0.18	0	0	0	0
470	7.6	18	1.72	4.76	1.72	0.17	0	0	0	0
480	7.4	18	1.65	4.66	1.65	0.17	0	0	0	0
490	7.22	18	1.59	4.57	1.59	0.16	0	0	0	0
500	7.03	18	1.53	4.48	1.53	0.15	0	0	0	0
600	5.55	18	1.07	3.75	1.07	0.11	0	0	0	0
700	4.48	18	0.79	3.22	0.79	0.08	0	0	0	0
800	3.68	18	0.6	2.82	0.6	0.06	0	0	0	0
900	3.05	18	0.48	2.51	0.48	0.05	0	0	0	0
1000	2.55	18	0.39	2.26	0.39	0.04	0	0	0	0
1100	2.13	18	0.32	2.06	0.32	0.03	0	0	0	0
1200	1.79	18	0.27	1.89	0.27	0.03	0	0	0	0
1300	1.5	18	0.23	1.74	0.23	0.02	0	0	0	0
1400	1.25	18	0.2	1.62	0.2	0.02	0	0	0	0
1500	1.03	18	0.17	1.51	0.17	0.02	0	0	0	0
1600	0.84	18	0.15	1.42	0.15	0.02	0	0	0	0

1700	0.68	18	0.13	1.33	0.13	0.01	0	0	0	0
1800	0.53	18	0.12	1.26	0.12	0.01	0	0	0	0
1900	0.4	18	0.11	1.19	0.11	0.01	0	0	0	0
2000	0.28	18	0.1	1.13	0.1	0.01	0	0	0	0

Antenna System 1, Cell: BA51981A_C

Dist (ft)	Deg	Gain (dBi)	Power Density		Charted		Max Distance Calc			
			Far Field ($\mu\text{W}/\text{cm}^2$)	Near Field ($\mu\text{W}/\text{cm}^2$)	Power Density ($\mu\text{W}/\text{cm}^2$)	% of Limit	Power Density (ft)	>5% MPE	>100% MPE	>500% MPE
0.656	87.53	18	61.85	28.54	28.54	2.85	0.66	0	0	0
0.6561	87.53	18	61.85	28.54	28.54	2.85	0	0	0	0
0.7	87.5	18	61.85	28.54	28.54	2.85	0	0	0	0
0.8	87.42	18	61.85	28.54	28.54	2.85	0	0	0	0
0.9	87.35	18	61.85	28.54	28.54	2.85	0	0	0	0
1	87.28	18	61.85	28.54	28.54	2.85	0	0	0	0
2	86.56	18	61.82	28.54	28.54	2.85	0	0	0	0
3	85.84	18	61.77	28.52	28.52	2.85	0	0	0	0
4	85.12	18	61.7	28.51	28.51	2.85	0	0	0	0
5	84.4	18	61.61	28.49	28.49	2.85	0	0	0	0
6	83.68	18	61.51	28.46	28.46	2.85	0	0	0	0
7	82.97	18	61.38	28.44	28.44	2.84	0	0	0	0
8	82.25	18	61.24	28.4	28.4	2.84	0	0	0	0
9	81.54	18	61.07	28.36	28.36	2.84	0	0	0	0
10	80.83	18	60.89	28.32	28.32	2.83	0	0	0	0
11	80.12	18	60.69	28.28	28.28	2.83	0	0	0	0
12	79.42	18	60.48	28.23	28.23	2.82	0	0	0	0
13	78.71	18	60.25	28.17	28.17	2.82	0	0	0	0
14	78.01	18	60	28.11	28.11	2.81	0	0	0	0
15	77.32	18	59.73	28.05	28.05	2.81	0	0	0	0
16	76.62	18	59.45	27.98	27.98	2.8	0	0	0	0
17	75.93	18	59.15	27.91	27.91	2.79	0	0	0	0
18	75.24	18	58.84	27.84	27.84	2.78	0	0	0	0
19	74.56	18	58.51	27.76	27.76	2.78	0	0	0	0
20	73.88	18	58.17	27.68	27.68	2.77	0	0	0	0
21	73.2	18	57.82	27.6	27.6	2.76	0	0	0	0
22	72.53	18	57.46	27.51	27.51	2.75	0	0	0	0
23	71.86	18	57.08	27.42	27.42	2.74	0	0	0	0
24	71.2	18	56.69	27.33	27.33	2.73	0	0	0	0
25	70.54	18	56.29	27.23	27.23	2.72	0	0	0	0
26	69.89	18	55.88	27.13	27.13	2.71	0	0	0	0
27	69.24	18	55.46	27.03	27.03	2.7	0	0	0	0
28	68.6	18	55.03	26.92	26.92	2.69	0	0	0	0
29	67.96	18	54.59	26.82	26.82	2.68	0	0	0	0
30	67.33	18	54.15	26.71	26.71	2.67	0	0	0	0
31	66.7	18	53.69	26.59	26.59	2.66	0	0	0	0
32	66.07	18	53.23	26.48	26.48	2.65	0	0	0	0
33	65.46	18	52.77	26.36	26.36	2.64	0	0	0	0
34	64.84	18	52.29	26.25	26.25	2.62	0	0	0	0
35	64.24	18	51.81	26.13	26.13	2.61	0	0	0	0
36	63.64	18	51.33	26	26	2.6	0	0	0	0
37	63.04	18	50.84	25.88	25.88	2.59	0	0	0	0
38	62.45	18	50.35	25.75	25.75	2.58	0	0	0	0
39	61.87	18	49.86	25.63	25.63	2.56	0	0	0	0

40	61.29	18	49.36	25.5	25.5	2.55	0	0	0	0
41	60.72	18	48.86	25.37	25.37	2.54	0	0	0	0
42	60.15	18	48.36	25.24	25.24	2.52	0	0	0	0
43	59.59	18	47.86	25.11	25.11	2.51	0	0	0	0
44	59.04	18	47.35	24.98	24.98	2.5	0	0	0	0
45	58.49	18	46.85	24.84	24.84	2.48	0	0	0	0
46	57.95	18	46.34	24.71	24.71	2.47	0	0	0	0
47	57.41	18	45.84	24.57	24.57	2.46	0	0	0	0
48	56.88	18	45.33	24.44	24.44	2.44	0	0	0	0
49	56.35	18	44.83	24.3	24.3	2.43	0	0	0	0
50	55.83	18	44.32	24.16	24.16	2.42	0	0	0	0
60	50.96	18	39.41	22.78	22.78	2.28	0	0	0	0
70	46.64	18	34.84	21.42	21.42	2.14	0	0	0	0
80	42.82	18	30.73	20.12	20.12	2.01	0	0	0	0
90	39.46	18	27.11	18.9	18.9	1.89	0	0	0	0
100	36.48	18	23.95	17.76	17.76	1.78	0	0	0	0
110	33.86	18	21.22	16.72	16.72	1.67	0	0	0	0
120	31.52	18	18.87	15.77	15.77	1.58	0	0	0	0
130	29.45	18	16.84	14.89	14.89	1.49	0	0	0	0
140	27.59	18	15.08	14.1	14.1	1.41	0	0	0	0
150	25.92	18	13.57	13.37	13.37	1.34	0	0	0	0
160	24.42	18	12.25	12.7	12.25	1.22	0	0	0	0
170	23.06	18	11.1	12.09	11.1	1.11	0	0	0	0
180	21.83	18	10.1	11.53	10.1	1.01	0	0	0	0
190	20.71	18	9.22	11.02	9.22	0.92	0	0	0	0
200	19.68	18	8.44	10.54	8.44	0.84	0	0	0	0
210	18.74	18	7.75	10.11	7.75	0.78	0	0	0	0
220	17.87	18	7.14	9.7	7.14	0.71	0	0	0	0
230	17.07	18	6.6	9.33	6.6	0.66	0	0	0	0
240	16.33	18	6.12	8.98	6.12	0.61	0	0	0	0
250	15.64	18	5.68	8.65	5.68	0.57	0	0	0	0
260	15	18	5.29	8.35	5.29	0.53	0	0	0	0
270	14.41	18	4.93	8.06	4.93	0.49	0	0	0	0
280	13.85	18	4.61	7.8	4.61	0.46	0	0	0	0
290	13.33	18	4.32	7.55	4.32	0.43	0	0	0	0
300	12.84	18	4.06	7.31	4.06	0.41	0	0	0	0
310	12.38	18	3.82	7.09	3.82	0.38	0	0	0	0
320	11.95	18	3.6	6.88	3.6	0.36	0	0	0	0
330	11.54	18	3.39	6.69	3.39	0.34	0	0	0	0
340	11.16	18	3.21	6.5	3.21	0.32	0	0	0	0
350	10.8	18	3.03	6.32	3.03	0.3	0	0	0	0
360	10.45	18	2.88	6.16	2.88	0.29	0	0	0	0
370	10.13	18	2.73	6	2.73	0.27	0	0	0	0
380	9.82	18	2.59	5.85	2.59	0.26	0	0	0	0
390	9.52	18	2.47	5.7	2.47	0.25	0	0	0	0
400	9.24	18	2.35	5.56	2.35	0.24	0	0	0	0
410	8.97	18	2.24	5.43	2.24	0.22	0	0	0	0
420	8.72	18	2.14	5.31	2.14	0.21	0	0	0	0
430	8.47	18	2.04	5.19	2.04	0.2	0	0	0	0
440	8.24	18	1.96	5.08	1.96	0.2	0	0	0	0
450	8.02	18	1.87	4.97	1.87	0.19	0	0	0	0
460	7.81	18	1.79	4.86	1.79	0.18	0	0	0	0
470	7.6	18	1.72	4.76	1.72	0.17	0	0	0	0
480	7.4	18	1.65	4.66	1.65	0.17	0	0	0	0

490	7.22	18	1.59	4.57	1.59	0.16	0	0	0	0
500	7.03	18	1.53	4.48	1.53	0.15	0	0	0	0
600	5.55	18	1.07	3.75	1.07	0.11	0	0	0	0
700	4.48	18	0.79	3.22	0.79	0.08	0	0	0	0
800	3.68	18	0.6	2.82	0.6	0.06	0	0	0	0
900	3.05	18	0.48	2.51	0.48	0.05	0	0	0	0
1000	2.55	18	0.39	2.26	0.39	0.04	0	0	0	0
1100	2.13	18	0.32	2.06	0.32	0.03	0	0	0	0
1200	1.79	18	0.27	1.89	0.27	0.03	0	0	0	0
1300	1.5	18	0.23	1.74	0.23	0.02	0	0	0	0
1400	1.25	18	0.2	1.62	0.2	0.02	0	0	0	0
1500	1.03	18	0.17	1.51	0.17	0.02	0	0	0	0
1600	0.84	18	0.15	1.42	0.15	0.02	0	0	0	0
1700	0.68	18	0.13	1.33	0.13	0.01	0	0	0	0
1800	0.53	18	0.12	1.26	0.12	0.01	0	0	0	0
1900	0.4	18	0.11	1.19	0.11	0.01	0	0	0	0
2000	0.28	18	0.1	1.13	0.1	0.01	0	0	0	0

GSM Cell: BA51981A_A		Power Density		@ Horz Dist
Maximum Power Density:	19.029 $\mu\text{W}/\text{cm}^2$	1.903 % of limit	0.656 ft (0.2 m)	
52.5502 times lower than the MPE limit for an uncontrolled environment				
Power:	471.085 Watts (ERP), 772.579 Watts (EIRP)			
UMTS Cell: UBA51981A_A		Power Density		@ Horz Dist
Maximum Power Density:	0 $\mu\text{W}/\text{cm}^2$	0 % of limit	0 ft (0 m)	
52.5502 times lower than the MPE limit for an uncontrolled environment				
Power:	0 Watts (ERP), 0 Watts (EIRP)			

GSM Cell: BA51981A_B		Power Density		@ Horz Dist
Maximum Power Density:	28.544 $\mu\text{W}/\text{cm}^2$	2.854 % of limit	0.656 ft (0.2 m)	
35.0335 times lower than the MPE limit for an uncontrolled environment				
Power:	706.627 Watts (ERP), 1158.869 Watts (EIRP)			
UMTS Cell: UBA51981A_B		Power Density		@ Horz Dist
Maximum Power Density:	0 $\mu\text{W}/\text{cm}^2$	0 % of limit	0 ft (0 m)	
35.0335 times lower than the MPE limit for an uncontrolled environment				
Power:	0 Watts (ERP), 0 Watts (EIRP)			

GSM Cell: BA51981A_C		Power Density		@ Horz Dist
Maximum Power Density:	28.544 $\mu\text{W}/\text{cm}^2$	2.854 % of limit	0.656 ft (0.2 m)	
35.0335 times lower than the MPE limit for an uncontrolled environment				
Power:	706.627 Watts (ERP), 1158.869 Watts (EIRP)			
UMTS Cell: UBA51981A_C		Power Density		@ Horz Dist
Maximum Power Density:	0 $\mu\text{W}/\text{cm}^2$	0 % of limit	0 ft (0 m)	
35.0335 times lower than the MPE limit for an uncontrolled environment				
Power:	0 Watts (ERP), 0 Watts (EIRP)			

RF Field Strength Calculation Methodology

A generally accepted method is used to calculate the expected RF field strength. The method uses the FCC's recommended equation (*Reference Federal Communication Commission Office of Engineering Technology Bulletin 65*) which predicts field strength on a worst case basis by doubling the predicted field strength.

The power density at any distance from an isotropic antenna is simply the transmitter power P_t divided by the surface area of a sphere ($4 \times \pi \times R^2$) at that distance. The surface area of the sphere increases by the square of the radius, therefore the power density, P_D (watts/square meter), decreases by the square of the radius. For a directional antenna with a gain G (*max radiation intensity of directional antenna / radiation intensity of isotropic antenna with same power input*), the power density at a distant point is the gain of the antenna multiplied by the power density of an isotropic radiator, $P_D = (P_t \times G) / (4 \times \pi \times R^2)$. This is the basis of the far-field and near-field power density equations used in this report.

The far-field power density equation used here is:

$$S = \frac{2.56 \times N \times 1.64 \times ERP_{\theta}/\text{chan} \times 10^6}{4 \times \pi \times R^2}$$

Where:

S = power density

2.56 = reflection coefficient

N = number of RF channels

1.64 x ERP_θ/chan = EIRP per channel at the angle for the calculation point

R = horizontal distance to the center of radiation

The far-field power density is then adjusted for any miscellaneous attenuation specified by the engineer.

The near-field power density equation used is:

$$S = \frac{N \times P_{IN}/\text{chan} \times 10^6}{2 \times \pi \times R \times h \times \alpha/360}$$

Where:

S = power density

N = number of RF channels

P_{IN}/chan = Max power input to the antenna per channel = Max_ERP_{ch} / 10^(Max_Gain / 10)

R = horizontal distance to the center of radiation

h = vertical aperture of the antenna

alpha/360 = 3 dB horizontal beamwidth of the antenna pattern divided by 360

If the antenna aperture is less than 6.56 feet, the near-field power density is multiplied by the aperture height and divided by 6.56. The near-field power density is then multiplied by the cosine of the angle from the horizon to the calculation point. Finally, the power density is adjusted for any miscellaneous attenuation.

Whether the near-field or far-field equation is used depends on the distance formula $d = 1.28 \times (1.64 \times \text{Antenna Gain}) \times \text{Height of Antenna Aperture} \times (3\text{dB Beamwidth}/360)$, **note: EIRP = 1.64 x ERP**. If the distance from the face of the antenna is greater than **d** then the lesser result of the near-field and far-field equations is used. If the vertical distance from calculation point to bottom (or top) of the antenna is greater than 0.25 times the aperture height, then the lesser of the near-field / far-field equations is used. Otherwise the near-field value is used. **Note: All lengths are converted from feet to centimeters during calculations.**

Final analysis for Antenna System 1, Cell BA51981A A

Using **2** channels and a maximum effective radiated power (ERP) of **362.37 Watts** (55.59 dBm), and a downtilt of **1°**, the calculated power density for this site at the nearest controlled access point of **3 ft** (0.91 m) is **19.02 $\mu\text{W}/\text{cm}^2$** . The calculated power density for the site at the nearest uncontrolled access point of **3 ft** (0.91 m) is **19.02 $\mu\text{W}/\text{cm}^2$** . Using this result, the maximum calculated field strength at the nearest accessible point is **1.9%** of the applicable public limit for uncontrolled exposure.

- The 100% FCC general population/uncontrolled exposure minimum distance is **0 ft** (0 m).
- The 100% FCC occupational/controlled exposure minimum distance is **0 ft** (0 m).

Final analysis for Antenna System 1, Cell BA51981A B

Using **3** channels and a maximum effective radiated power (ERP) of **362.37 Watts** (55.59 dBm), and a downtilt of **2°**, the calculated power density for this site at the nearest controlled access point of **3 ft** (0.91 m) is **28.52 $\mu\text{W}/\text{cm}^2$** . The calculated power density for the site at the nearest uncontrolled access point of **3 ft** (0.91 m) is **28.52 $\mu\text{W}/\text{cm}^2$** . Using this result, the maximum calculated field strength at the nearest accessible point is **2.85%** of the applicable public limit for uncontrolled exposure.

- The 100% FCC general population/uncontrolled exposure minimum distance is **0 ft** (0 m).
- The 100% FCC occupational/controlled exposure minimum distance is **0 ft** (0 m).

Final analysis for Antenna System 1, Cell BA51981A C

Using **3** channels and a maximum effective radiated power (ERP) of **362.37 Watts** (55.59 dBm), and a downtilt of **2°**, the calculated power density for this site at the nearest controlled access point of **3 ft** (0.91 m) is **28.52 $\mu\text{W}/\text{cm}^2$** . The calculated power density for the site at the nearest uncontrolled access point of **3 ft** (0.91 m) is **28.52 $\mu\text{W}/\text{cm}^2$** . Using this result, the maximum calculated field strength at the nearest accessible point is **2.85%** of the applicable public limit for uncontrolled exposure.

- The 100% FCC general population/uncontrolled exposure minimum distance is **0 ft** (0 m).
- The 100% FCC occupational/controlled exposure minimum distance is **0 ft** (0 m).

See Table 1 for the FCC's guidelines on Maximum Permissible Exposure (MPE). Note that the RF range referenced for this analysis is the range of 1500 – 100,000 MHz shown in Table 1, which is included in Appendix A.

Signage Guidelines

Due to the type of access for this site, the following signage is required:



Posted at or near the site entrance or rooftop access

Exposure Environments

The FCC guidelines incorporate two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to exposure. The decision as to which tier applies in a given situation should be based on the application of the following definitions.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below) as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his/her exposure by leaving the area or by some other appropriate means.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public always fall under this category when exposure is not employment-related.

For purposes of applying these definitions, awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. Warning signs and labels can also be used to establish such awareness as long as they provide information, in a prominent manner, on risk of potential exposure and instructions on methods to minimize such exposure risk.

For example, a sign warning of RF exposure risk and indicating that individuals should not remain in the area for more than a certain period of time could be acceptable.

Another important point to remember concerning the FCC's exposure guidelines is that they constitute **exposure** limits (not **emission** limits), and they are relevant only to locations that are **accessible** to workers or members of the public. Such access can be restricted or controlled by appropriate means such as the use of fences, warning signs, etc., as noted above. For the case of occupational/controlled exposure, procedures can be instituted for working in the vicinity of RF sources that will prevent exposures in excess of the guidelines. An example of such procedures would be restricting the time an individual could be near an RF source or requiring that work on or near such sources be performed while the transmitter is turned off or while power is appropriately reduced.

Signed: _____

Date: *Thursday, January 14, 2010*

Appendix A

Term Definitions

GSM – Global System for Mobile communications is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 82% of the global mobile market uses the standard. GSM is used by over 2 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signaling and speech channels are digital call quality, and so is considered a second generation (2G) mobile phone system. This has also meant that data communication were built into the system using the 3rd Generation Partnership Project (3GPP).

UMTS – Universal Mobile Telecommunications System is one of the third-generation (3G) cell phone technologies. Currently, the most common form of UMTS uses W-CDMA as the underlying air interface. It is standardized by the 3GPP, and is the European answer to the ITU IMT-2000 requirements for 3G cellular radio systems.

Isotropic Antenna – a theoretical point source of waves which exhibits the same magnitude or properties when measured in all directions. It has no preferred direction of radiation. It radiates uniformly in all directions over a sphere centred on the source. It is a reference radiator with which other sources are compared.

Exposure – Exposure occurs whenever and wherever a person is subjected to electric, magnetic or electromagnetic fields other than those originating from physiological processes in the body and other natural phenomena.

Exposure, partial body - Partial-body exposure results when RF fields are substantially non-uniform over the body. Fields that are non-uniform over volumes comparable to the human body may occur due to highly directional sources, standing-waves, re-radiating sources or in the near field.

General population/uncontrolled exposure – For FCC purposes, applies to human exposure RF fields when the general public is exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public always fall under this category when exposure is not employment-related.

Maximum permissible exposure (MPE) – The rms and peak electric and magnetic field strength, their squares, or the plane-wave equivalent power densities associated with these fields to which a person may be exposed without harmful effect and with an acceptable safety factor.

Occupational/controlled exposure – For FCC purposes, applies to human exposure to RF fields when persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see definition above), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his/her exposure by leaving the area or by some other appropriate means.

Appendix B

Collocation Sites

Special rules apply at sites with multiple transmitters on buildings. Regardless of the categorical exemption rules detailed about for single carriers, if a T-Mobile, USA site's emissions:

1. are more than 5% above the emissions limits in an "accessible area;" and

2. contribute at least 5% of all the emissions at any site which together result in an overall effect of more than 100% of the emission limits then we, and each carrier meeting this definition, are individually and collectively responsible for compliance. The FCC expects each carrier to make a good faith effort to consider emissions from other carriers and make the determination.

That said, the FCC Office of Engineering and Technology has supported the following exception:

- Within a controlled environment at a multi-transmitter site, if a carrier can physically elevate its antenna so that, as a practical matter, the volume of space where the RF field exceeds 5 percent of the controlled environments limits in Table of Section 1.1310 is 2 meters or more above any rooftop walkways (i.e., the volume where the fields exceed 5 percent of the limit are practically inaccessible), that carriers would be relieved of any responsibility for ensuring compliance of all transmitters at the site. This assumes, of course, that the carrier does not exceed 5 percent of the general public exposure limit in any uncontrolled areas.

Regulatory Compliance recommends conducting the routine environmental analysis whenever collocating on a rooftop. Although the need for analysis usually arises when we are first installing equipment or upgrading a site, we are responsible for total emissions at the site even when a new carrier collocates at our existing site. If after the analysis, the total emissions exceed 100% of the limit, all carriers on the site should be contacted to work out a joint solution to the problem [however, if the last carrier pushes the site over the limit, there is support in the rules that the last carrier should bear the burden of addressing compliance].

Professionally Managed Sites

As noted above, the carrier is always responsible for the RF compliance of its equipment. The FCC OET, however, does realize that some site managers undertake the responsibility for RF compliance (and that carriers likewise may rely on consultants to document compliance. The OET has stated that:

- As with other licensee responsibilities, while ultimate responsibility for compliance rests with the licensee, compliance with the RF exposure regulations can be delegated to specialized consultants, site managers, or specific individuals within a company, and, as long as the delegation itself is reasonable a licensee may certify compliance on the basis of the delegate's report. In either case, a copy of the site manager or RF consultant's report should be maintained in the site file.

Table 1. LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz

*Plane-wave equivalent power density

NOTE 1: **Occupational/controlled** limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he/she is made aware of the potential for exposure.

NOTE 2: **General population/uncontrolled** exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

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Acoustic Dispersion, Heat Exchanger

The cabinet noise dispersion for an RBS 2106 with Heat Exchanger Climate Unit is shown in the two figures below. The figures show the noise dispersion generated by a free-standing cabinet, and by a cabinet mounted against a wall.

Note: The acoustic noise dispersion values for a free-standing cabinet and a cabinet installed against a wall were tested according to the ISO 9614-2 standard. Deviations from these values can occur depending on the materials used in the environment where the cabinet is installed. Objects near the cabinet can reflect or absorb sound and thus affect acoustic dispersion.

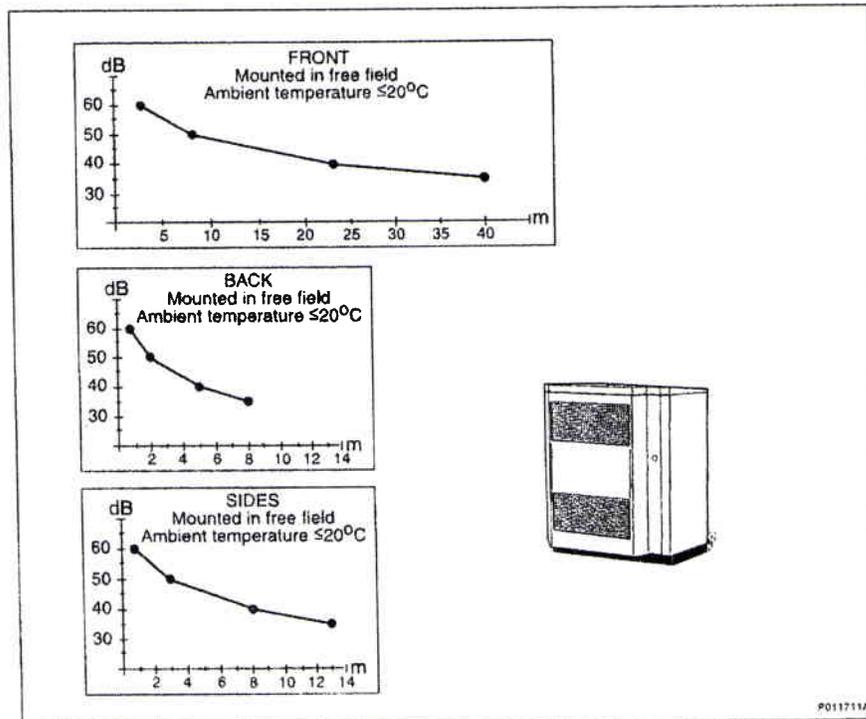


Figure 5 Acoustic Dispersion for a Free-standing RBS 2106 with Heat Exchanger Climate Unit

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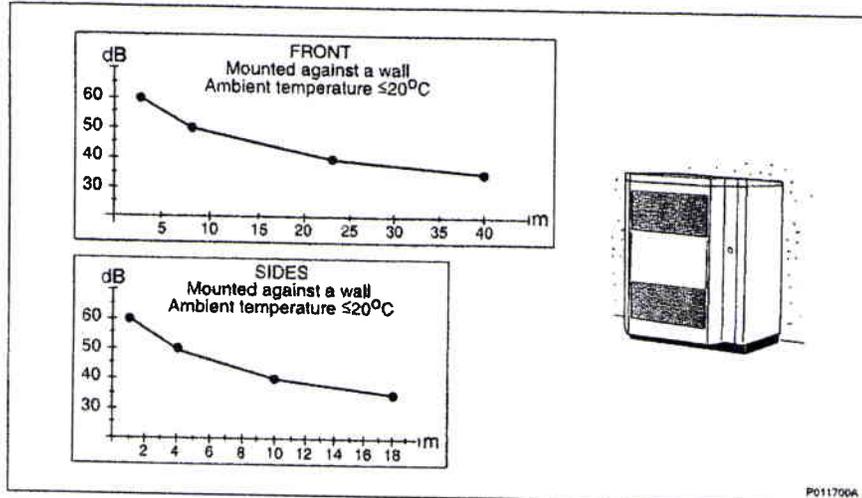


Figure 6 Acoustic Dispersion for a Wall-mounted RBS 2106 with Heat Exchanger Climate Unit

Acoustic Dispersion, Combined Climate Unit

The cabinet noise dispersion for an RBS 2106 with Combined Climate Unit is shown in the two figures below. The figures show the noise dispersion generated by a free-standing cabinet and by a cabinet mounted against a wall.

Note: The acoustic noise dispersion values for a free-standing cabinet and a cabinet installed against a wall were tested according to the ISO 9614-2 standard. Deviations from these values can occur depending on the materials used in the environment where the cabinet is installed. Objects near the cabinet can reflect or absorb sound and thus affect acoustic dispersion.

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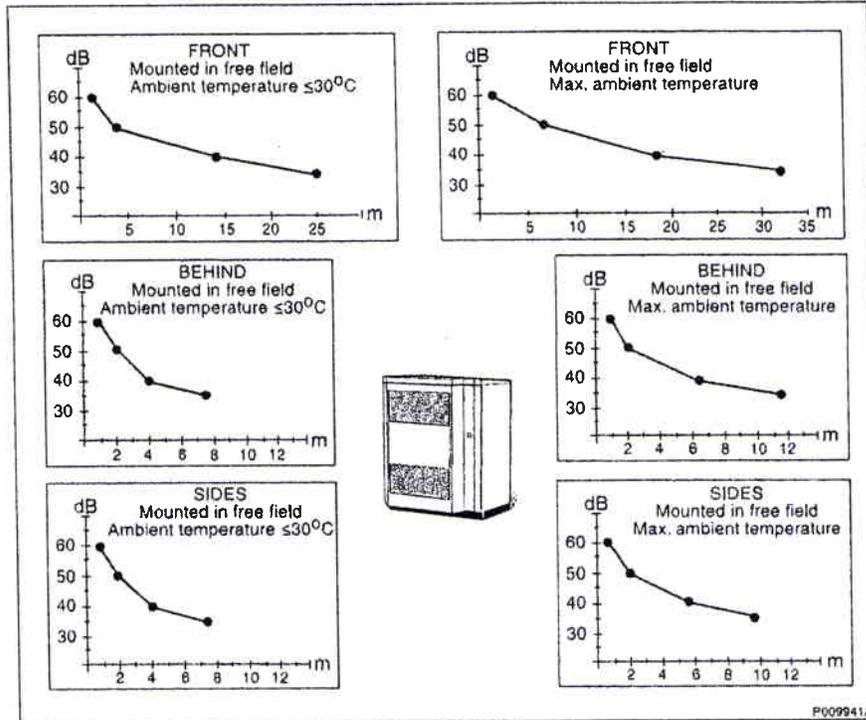


Figure 7 Acoustic Dispersion for a Free-standing RBS 2106 with Combined Climate Unit

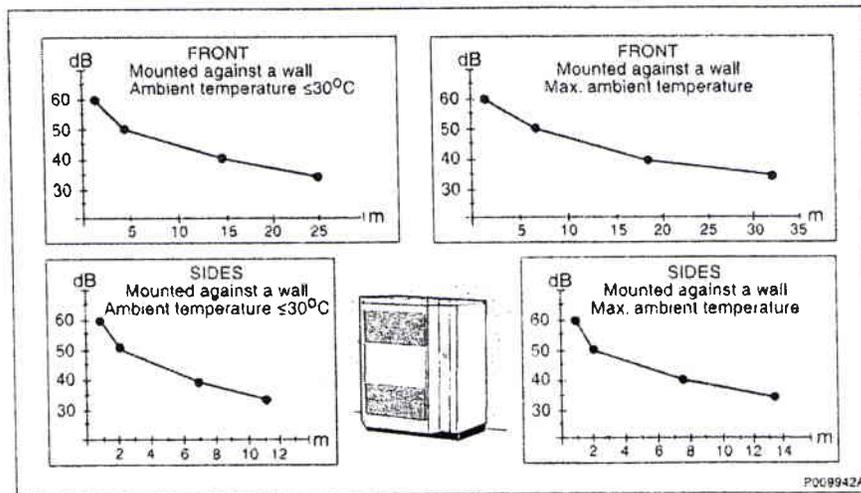


Figure 8 Acoustic Dispersion for a Wall-mounted RBS 2106 with Combined Climate Unit

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