clearwire®

PG&E SUBSTATION CA-SF00116A

HIGHWAY 13 & 24 SUBSTATION PG&E, OAKLAND, CA

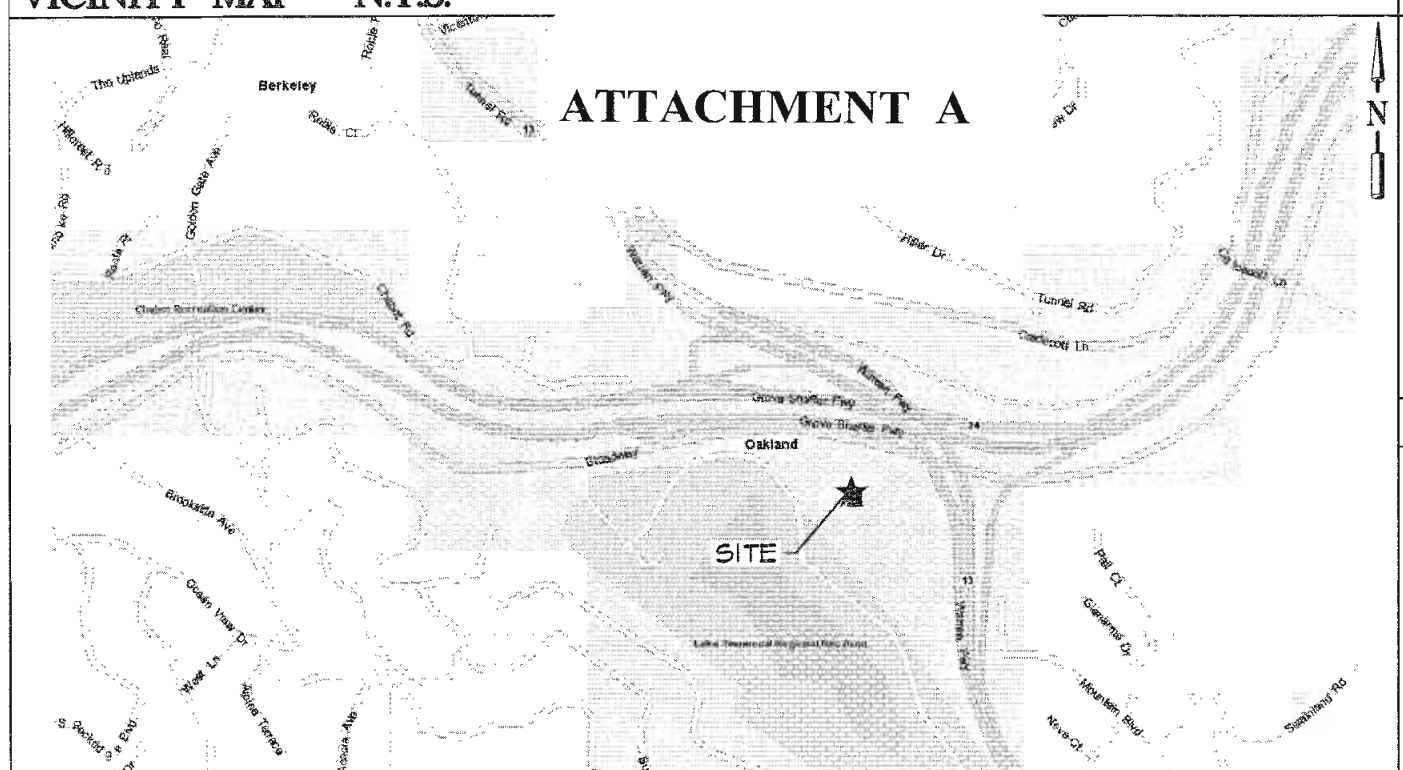
CROWN CASTLE SITE ID: 815027

SIGNATURE BLOCK

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

VICINITY MAP - N.T.S.

ATTACHMENT A



DRIVING DIRECTIONS

FROM: CLEARWIRE REGIONAL OFFICE
2999 OAK ROAD, SUITE 110
WALNUT CREEK, CA 94597

TO: PG&E SUBSTATION
HIGHWAY 13 & 24 SUBSTATION PG&E
OAKLAND, CA

DISTANCE: 13.8 MILES

DEPART 2999 OAK RD, WALNUT CREEK, CA 94597 ON OAK RD (SOUTH-EAST)
TAKE LOCAL ROAD(S) (RIGHT) ONTO TREAT BLVD
TAKE LOCAL ROAD(S) (RIGHT) ONTO N MAIN ST
TAKE RAMP (RIGHT) ONTO I-680 (SINCLAIR FWY) FOR 1.4 MI TOWARDS I-680 / OAKLAND / SAN JOSE
TAKE RAMP (RIGHT) ONTO SR-24 (GROVE SHAFTER FWY) FOR 10.4 MI TOWARDS CA-24 / OAKLAND / LAFAYETTE
TURN RIGHT ONTO RAMP TOWARDS TUNNEL ROAD
BEAR LEFT (SOUTH-WEST) ONTO CALDECOTT LN
TURN RIGHT (SOUTH) ONTO BROADWAY
TURN LEFT (SOUTH) ONTO LOCAL ROAD(S)
TURN LEFT (EAST) ONTO LOCAL ROAD(S)
TURN LEFT (EAST) ONTO LOCAL ROAD(S)
ARRIVE AT HIGHWAY 13 & 24 SUBTSTATION PG&E

CODE COMPLIANCE

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

- CALIFORNIA ADMINISTRATIVE CODE (INCL TITLE 24 & 25)
- 2007 CALIFORNIA BUILDING CODE
- CITY/COUNTY ORDINANCES
- BUILDING OFFICIALS AND CODE ADMINISTRATORS (BOCA)
- 2007 CALIFORNIA MECHANICAL CODE
- ANSI/EIA-222-F LIFE SAFETY CODE NFPA-101
- 2007 CALIFORNIA PLUMBING CODE
- 2007 CALIFORNIA ELECTRICAL CODE
- LOCAL BUILDING CODE

BUILDING/SITE DATA LEGEND

LATITUDE:	37°50'52.6" N (NAD 83)
LONGITUDE:	122°13'46.2" W (NAD 83)
A.P.N.:	T.B.D.
ZONING:	R-30
OCCUPANCY:	U, UNMANNED
CONSTRUCTION TYPE:	V-B
CONSTRUCTION AREA:	50 SQ. FT.
ADA REQ.:	FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. ADA ACCESS NOT REQUIRED.
TITLE 24 REQ.:	FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. TITLE 24 IS EXEMPT.

PROJECT DESCRIPTION

INSTALLATION OF A WIRELESS COMMUNICATIONS FACILITY, INCLUDING THE INSTALLATION OF (1) EQUIPMENT CABINET, (1) INTERNET SERVICES EXCHANGE POINT, AND (3) PANEL ANTENNAS

PROJECT SUMMARY

PROPERTY OWNER:

PG&E

APPLICANT:

CLEARWIRE CORP.
4400 CARILLON PT
KIRKLAND, WA

LEASING MANAGER:

CORTEL, LLC
CONTACT: JOHN MERRITT
PHONE: (805) 886-0733

ZONING MANAGER:

CORTEL, LLC
CONTACT: MICHELLE WELLER
PHONE: (925) 997-1312

CONSULTANT:

TRK ENGINEERING LTD.
#201 - 17688 66TH AVE
SURREY, BC V3S 7X1, CANADA
CONTACT: DENNIS AMANTEA
PHONE: (604) 574-6432

CONSTRUCTION MANAGER:

CORTEL, LLC
CONTACT: CHRISTOPHER ROBINSON
PHONE: (510) 823-6418

RECEIVED
JAN 2 5 2010
CITY PLANNING
ZONING DIVISION

SHEET INDEX

REV	DWG	NAME
0	T-1	TITLE SHEET
0	A-1	SITE PLAN
0	A-2	COMPOUND LAYOUT
0	A-3	NORTHEAST ELEVATION
0	A-4	EQUIPMENT DETAILS
0	A-5	ANTENNA DETAILS

clearwire
4400 CARILLON PT, KIRKLAND, WA

Cortel, LLC

TRK ENGINEERING
#201 - 17688 66TH AVE
SURREY, BC V3S 7X1, CANADA
TEL: (604) 574-6432
FAX: (604) 574-6431
TOLL FREE: 1-877-345-4045
EMAIL: mail@trkeng.com
WEB: www.trkeng.com

PROJECT NO: 0940-073
DRAWN BY: A.D.
CHECKED BY: P.A.
CAD FILE: 0940-073T1

SUBMITTALS

0	NOV 10/09	ZDs REV 0
A	AUG 20/09	ZDs REV A

THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO THE CLIENT NAMED IS STRICTLY PROHIBITED.

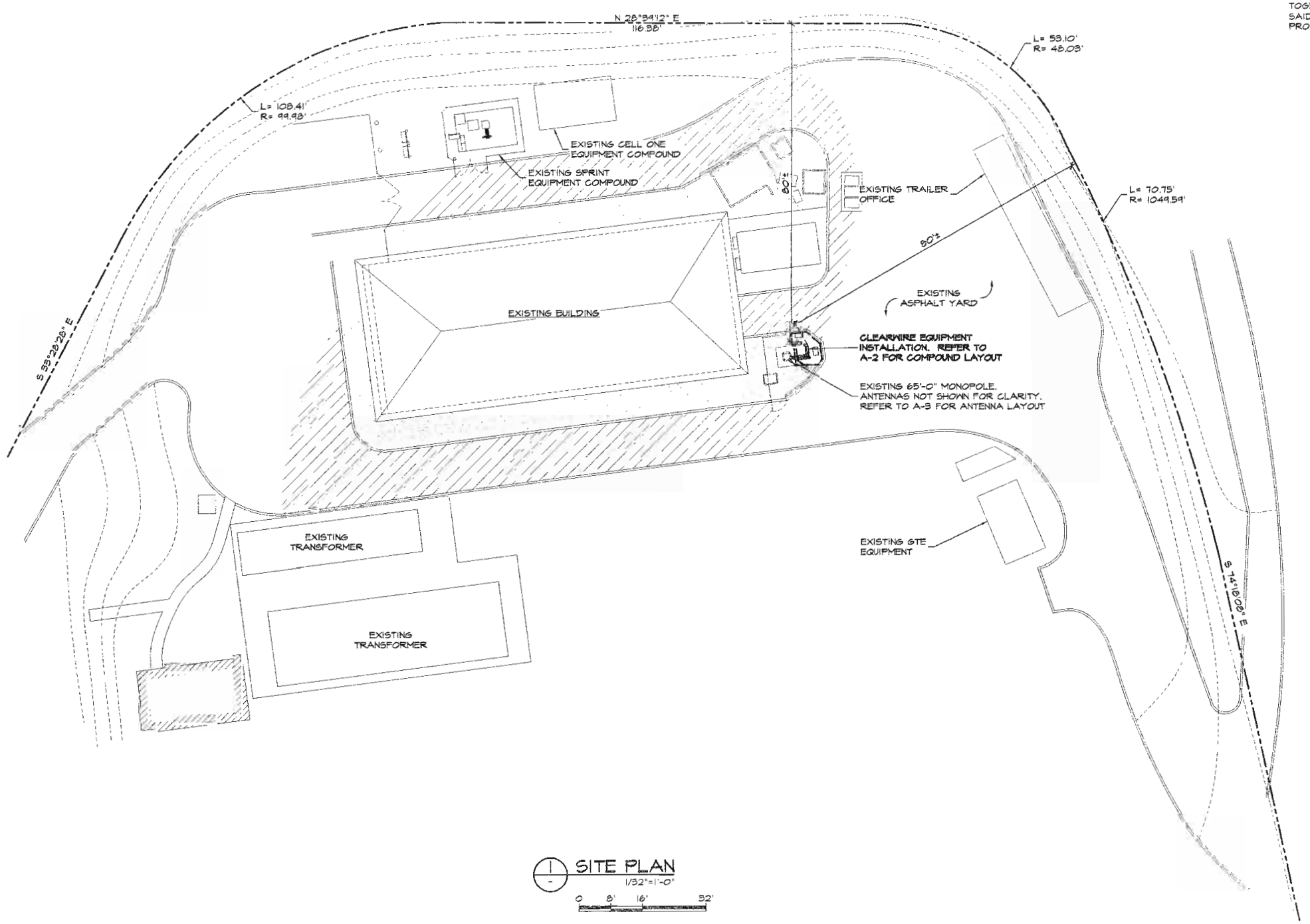
AHJ SEAL

SITE
PG&E SUBSTATION
CA-SF00116A
HIGHWAY 13 & 24
SUBSTATION PG&E
OAKLAND, CA

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1

TRUE NORTH ARROW SHOWN ON THIS DRAWING IS APPROXIMATE ONLY AND MUST BE VERIFIED BY CONTRACTOR



1 SITE PLAN
1/32"=1'-0"
0 8' 16' 32'

NOTES:

1. SITE PLAN INFORMATION WAS OBTAINED FROM A DRAWING PREPARED BY "J.E. SCHURIGHT & ASSOCIATES", DATED NOVEMBER 18, 1999. THIS DRAWING DOES NOT REPRESENT A RECENT SURVEY. ALL DIMENSIONS TO PROPERTY LINES ARE APPROXIMATE ONLY.

LEGAL DESCRIPTION:

ALL THAT REAL PROPERTY SITUATED IN THE CITY OF OAKLAND, COUNTY OF ALAMEDA, STATE OF CALIFORNIA, MORE DESCRIBED AS FOLLOWS:

DESCRIPTION OBTAINED FROM PACIFIC GAS & ELECTRIC COMPANY AS SHOWN ON S.B.E. MAP NO. 155-1-5E CALREMONT SUBSTATION REF. DWG. 217156.

ALSO BEING THAT CERTAIN PARCEL NO. 2:299-3 AS SHOWN ON CALIFORNIA STATE HIGHWAY MONUMENT MAP 4-ALA-24-P.M. 48 AND PER RIGHT OF WAY MAP RECORD, R-137.9.

TOGETHER WITH AN EASEMENT FOR INGRESS AND EGRESS AS SAID EASEMENT(S) FROM BROADWAY DRIVE TO THE PROJECT AREA.

clearwire
4400 CARILLON PT. KIRKLAND WA

Cortel, LLC

TRK ENGINEERING
#201 - 17688 66TH AVE
SURREY, BC V3S 7X1, CANADA
TEL: (604) 574-6432
FAX: (604) 574-6491
TOLL FREE: 1-877-345-4045
EMAIL: mail@trkeng.com
WEB: www.trkeng.com

PROJECT NO. 0940-073

DRAWN BY: A.D.

CHECKED BY: P.A.

CAD FILE: 0940-073A1

SUBMITTALS

0	NOV 10/09	ZDs REV 0
A	JUL 13/09	ZDs REV A

THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO THE CLIENT NAMED IS STRICTLY PROHIBITED.

A4E SEAL

SITE

PG&E SUBSTATION
CA-SF00116A
HIGHWAY 13 & 24
SUBSTATION PG&E
OAKLAND, CA

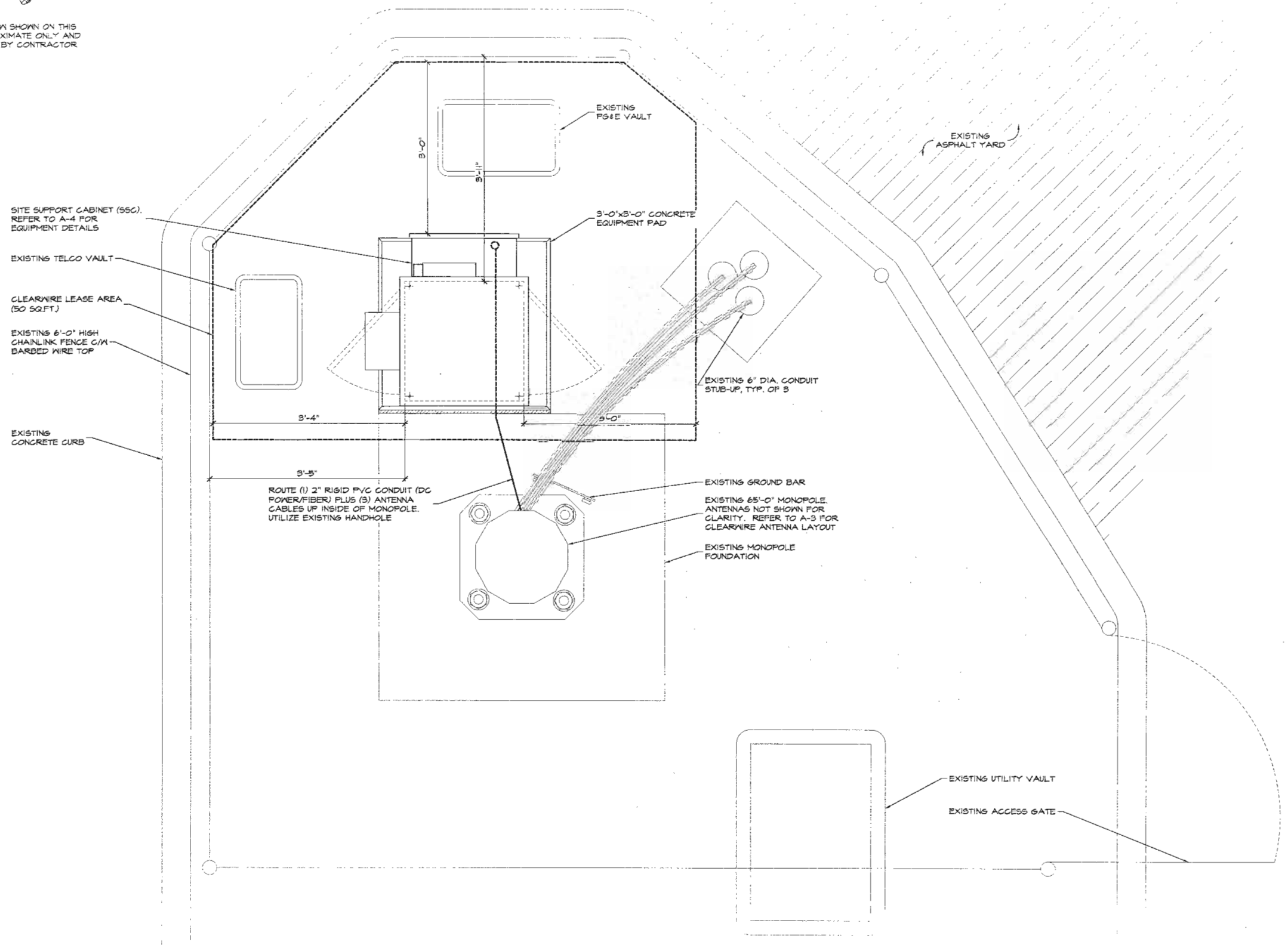
SHEET TITLE

SITE PLAN

SHEET NUMBER

A-1

TRUE NORTH ARROW SHOWN ON THIS DRAWING IS APPROXIMATE ONLY AND MUST BE VERIFIED BY CONTRACTOR



1 COMPOUND LAYOUT
1/2" = 1'-0"
0 1' 2'

clearwire
4400 CARILLON PT, KIRKLAND, WA

Cortel, LLC

TRK ENGINEERING
#201 - 17688 66TH AVE
SURREY, BC V3S 7X1, CANADA
TEL: (604) 574-6432
FAX: (604) 574-6431
TOLL FREE: 1-877-345-4045
EMAIL: mail@trkeng.com
WEB: www.trkeng.com

PROJECT NO: 0440-073

DRAWN BY: A.D.

CHECKED BY: P.A.

CAD FILE: 0440-073A2

SUBMITTALS

0	NOV 10/09	ZDs REV 0
A	JUL 13/09	ZDs REV A

THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO THE CLIENT NAMED IS STRICTLY PROHIBITED.

A&E SEAL

SITE

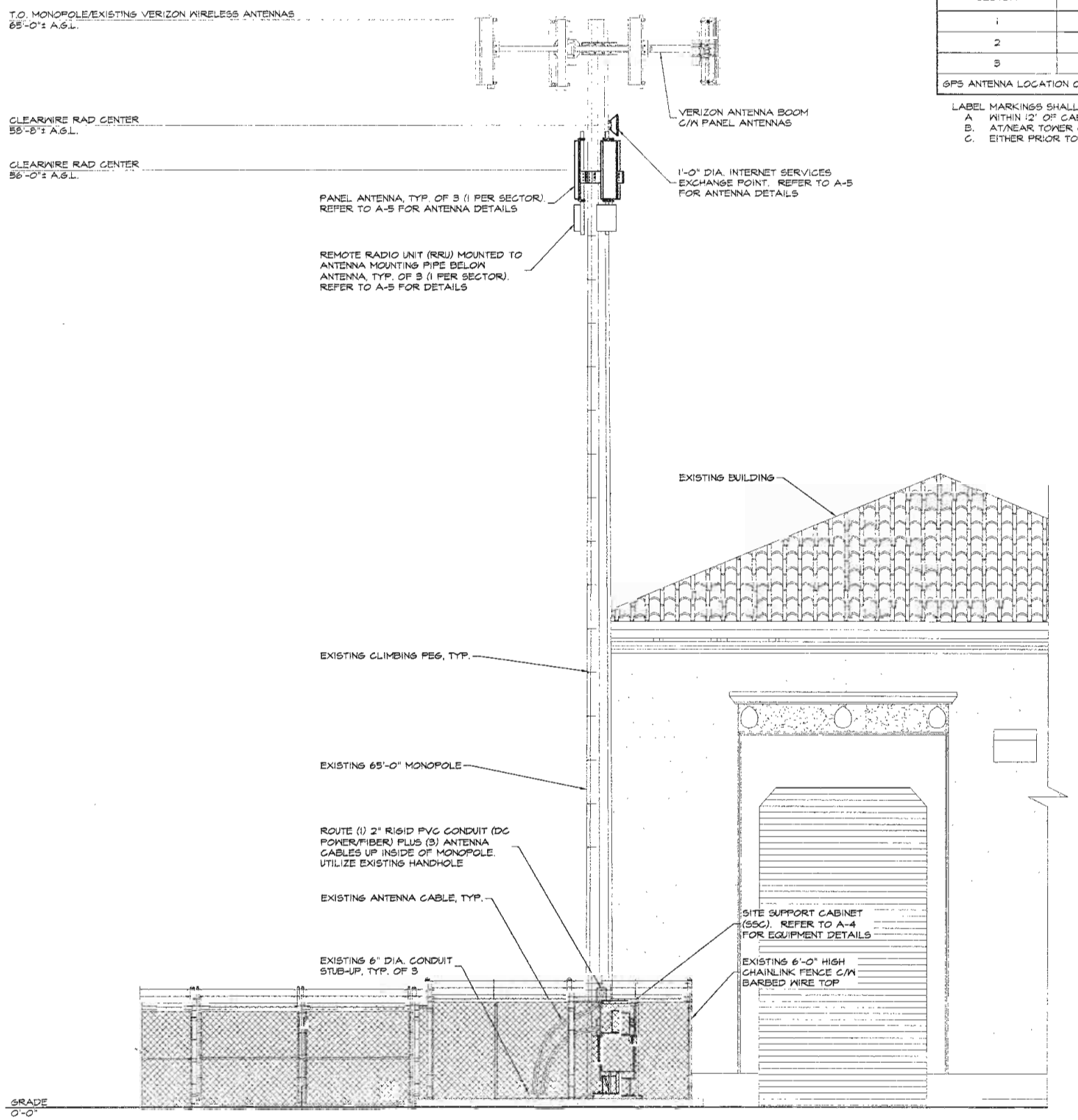
PG&E SUBSTATION
CA-SF00116A
HIGHWAY 13 & 24
SUBSTATION PG&E
OAKLAND, CA

SHEET TITLE

COMPOUND LAYOUT

SHEET NUMBER

A-2



1 NORTHEAST ELEVATION
1/8"=1'-0"

0 1' 2' 4'

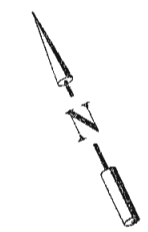
INTERNET SERVICES EXCHANGE POINT INFORMATION					
SECTOR	AZIMUTH	DISH SIZE	ANTENNA	QUANTITY	RAD CENTER
C	293.62°	1'-0" DIA.	ANDREW	1	58'-8"±

PANEL ANTENNA INFORMATION				
SECTOR	AZIMUTH	ANTENNA	QUANTITY	RAD CENTER
1	0°	KATHREIN	1	56'-0"±
2	120°	KATHREIN	1	56'-0"±
3	240°	KATHREIN	1	56'-0"±
GPS ANTENNA LOCATION OPTIONS: (1) EQUIPMENT CABINET, (2) ANTENNA MAST, (3) SUPPORT POST, FIELD VERIFY				

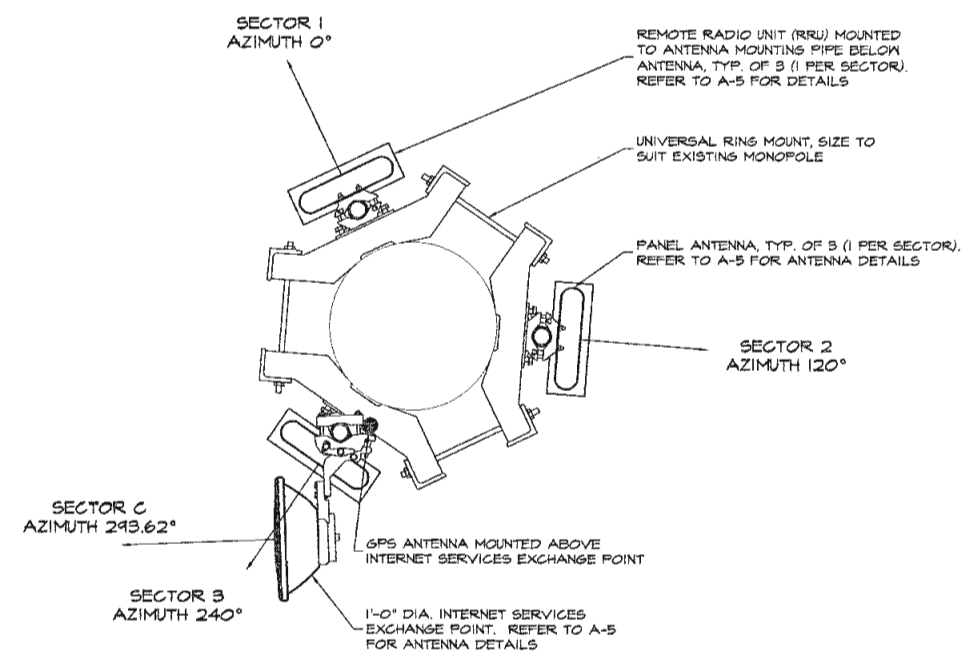
LABEL MARKINGS SHALL BE PLACED:
A. WITHIN 12" OF CABLE AT BOTH ENDS.
B. AT/NEAR TOWER GROUND BAR.
C. EITHER PRIOR TO ENTRY INTO CABINET OR AT CABLE SUPPORT BRIDGE.

NOTES:

1. ELEVATION IS DIAGRAMMATIC ONLY.
2. PAINT CLEARWIRE ANTENNAS, VISIBLE ANTENNA CABLES, CONDUITS AND MOUNTING HARDWARE TO MATCH EXISTING MONOPOLE.



TRUE NORTH ARROW SHOWN ON THIS DRAWING IS APPROXIMATE ONLY AND MUST BE VERIFIED BY CONTRACTOR



2 CLEARWIRE ANTENNA LAYOUT
N.T.S.

clearwire
4400 CARILLON PT. KIRKLAND, WA

Cortel, LLC

TRK ENGINEERING
#201 - 17688 66TH AVE
SURREY, BC V3S 7X1, CANADA
TEL: (604) 574-6432
FAX: (604) 574-6431
TOLL FREE: 1-877-345-4045
EMAIL: mail@trkeng.com
WEB: www.trkeng.com

PROJECT NO: 0940-073

DRAWN BY: A.D.

CHECKED BY: P.A.

CAD FILE: 0940-073A3

SUBMITTALS

0	NOV 10/09	ZDs REV 0
A	JUL 19/09	ZDs REV A

THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO THE CLIENT NAMED IS STRICTLY PROHIBITED.

A&E SEAL

SITE

PG&E SUBSTATION
CA-SF00116A
HIGHWAY 13 & 24
SUBSTATION PG&E
OAKLAND, CA

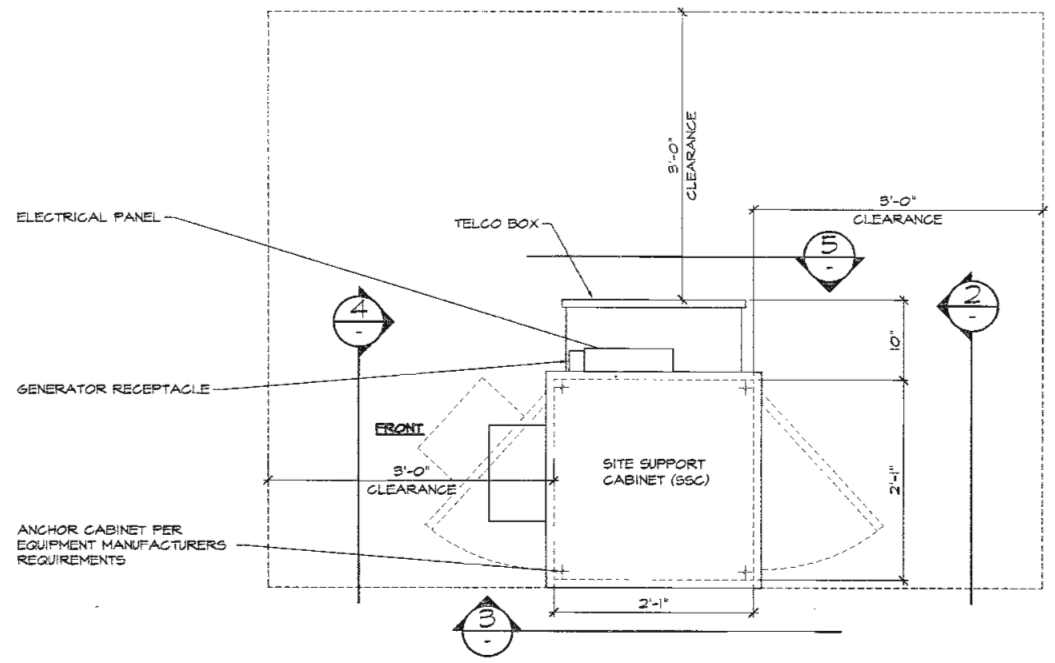
SHEET TITLE

NORTHEAST ELEVATION

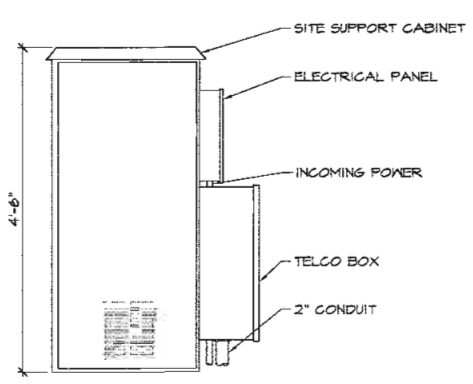
SHEET NUMBER

A-3

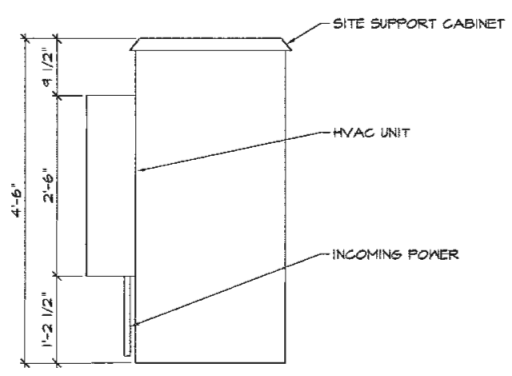
OUTDOOR	
OUTDOOR SITE SUPPORT CABINET WEIGHT = 550lbs	
CABINET DIMENSIONS	28"(W) x 29"(D) x 54.5"(H)
MIN. CLEARANCES	
CABINET REAR AND WALL	0"
CABINET RIGHT SIDE AND WALL	T.B.D.
CABINET LEFT SIDE AND WALL	36" FROM TELCO BOX
ABOVE CABINET	T.B.D.
IN FRONT OF CABINET	36"



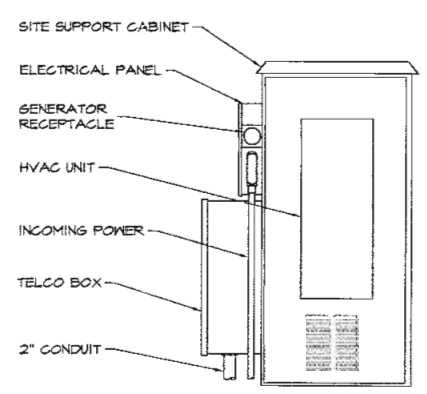
1 SSC EQUIPMENT LAYOUT
1/2"=1'-0"
0 1' 2'



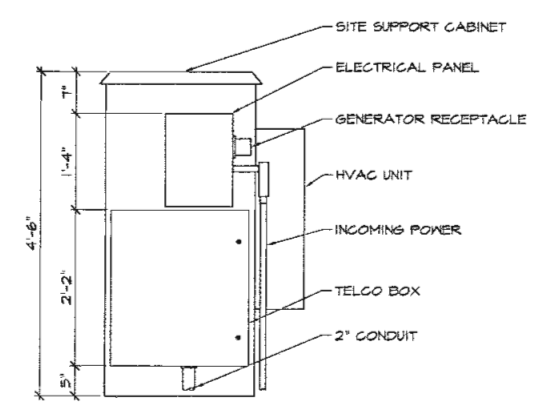
2 SSC EQUIPMENT ELEVATION
3/8"=1'-0"
0 1' 2'



3 SSC EQUIPMENT ELEVATION
3/8"=1'-0"
0 1' 2'



4 SSC EQUIPMENT ELEVATION
3/8"=1'-0"
0 1' 2'



5 SSC EQUIPMENT ELEVATION
3/8"=1'-0"
0 1' 2'

clearwire
4400 CARILLON PT. KIRKLAND, WA

Cortel, LLC

TRK ENGINEERING
#201 - 17688 66TH AVE
SURREY, BC V3S 7X1, CANADA
TEL: (604) 574-6432
FAX: (604) 574-6431
TOLL FREE: 1-877-845-4045
EMAIL: mail@trkeng.com
WEB: www.trkeng.com

PROJECT NO: 0440-073

DRAWN BY: A.D.

CHECKED BY: P.A.

CAD FILE: 0440073A4

SUBMITTALS

0	NOV 10/04	ZD's REV 0
A	JUL 13/04	ZD's REV A

THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO THE CLIENT NAMED IS STRICTLY PROHIBITED.

AHJ SEAL

SITE

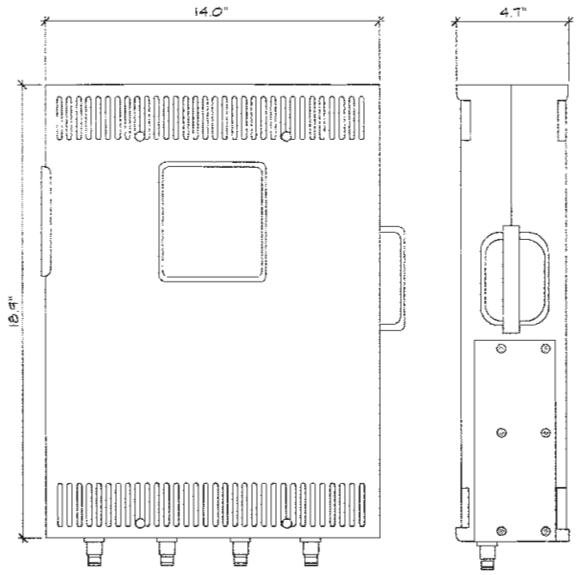
PG&E SUBSTATION
CA-SF00116A
HIGHWAY 13 & 24
SUBSTATION PG&E
OAKLAND, CA

SHEET TITLE

EQUIPMENT DETAILS

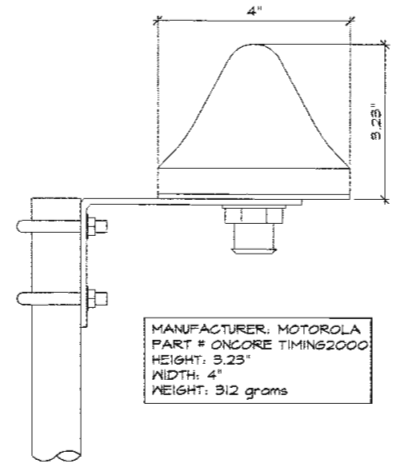
SHEET NUMBER

A-4



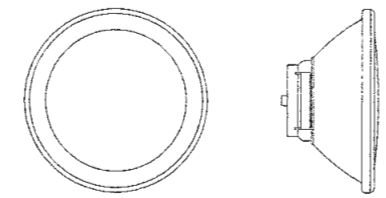
LENGTH: 18.9"
WIDTH: 14.0"
DEPTH: 4.7"
WEIGHT: 55 LBS C/W SOLAR SHIELD AND MOUNTING BRACKETS

1 - RRU SPECIFICATION
N.T.S.



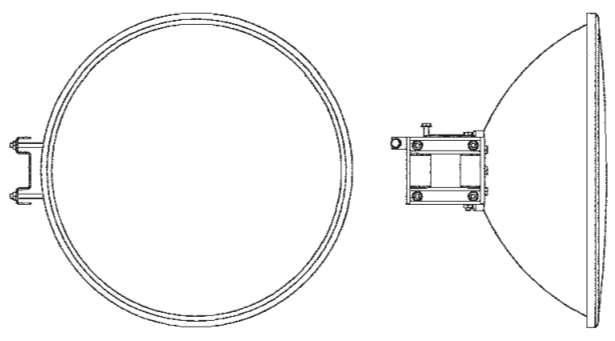
MANUFACTURER: MOTOROLA
PART # ONCORE TIMING2000
HEIGHT: 3.23"
WIDTH: 4"
WEIGHT: 312 grams

2 - GPS SPECIFICATION
N.T.S.



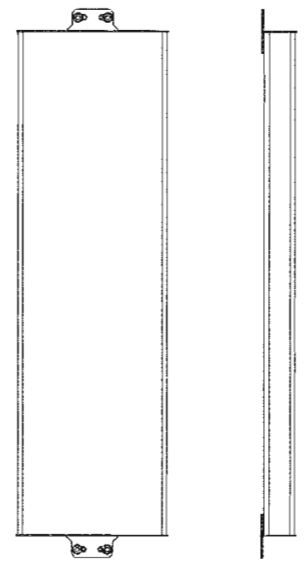
MANUFACTURER: ANDREW
DIAMETER: 15.3"
DEPTH: 8.7"
WEIGHT: 14.21 lbs

3 - I.S.E.P. SPECIFICATION
N.T.S.



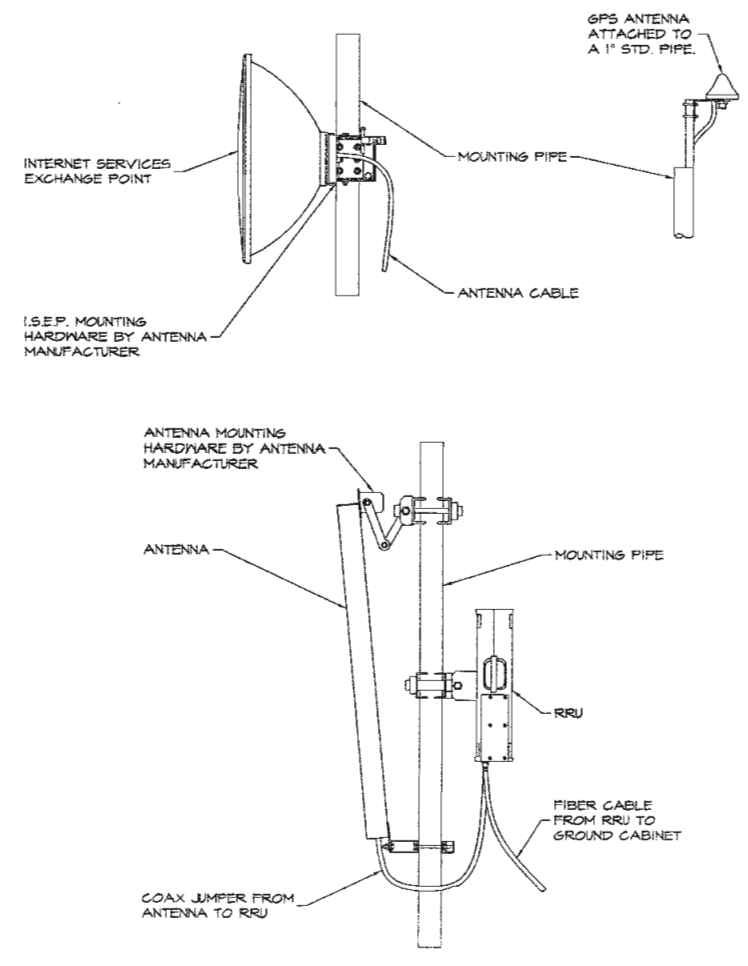
MANUFACTURER: ANDREW
DIAMETER: 26.1"
DEPTH: 19.2"
WEIGHT: 27 lbs

4 - I.S.E.P. SPECIFICATION
N.T.S.



MANUFACTURER: KATHREIN
LENGTH: 42"
WIDTH: 12.7"
DEPTH: 2.8"
WEIGHT: 39 lbs

5 - ANTENNA SPECIFICATION
N.T.S.



6 - GENERIC ANTENNA MOUNTING DETAIL
N.T.S.

clearwire
4400 CARILLON PT, KIRKLAND, WA

Cortel, LLC

TRK ENGINEERING
#201 - 17688 66TH AVE
SURREY, BC V3S 7X1, CANADA
TEL: (604) 574-6432
FAX: (604) 574-6431
TOLL FREE: 1-877-345-4045
EMAIL: mail@trkeng.com
WEB: www.trkeng.com

PROJECT NO: 0940-073
DRAWN BY: A.D.
CHECKED BY: P.A.
CAD FILE: 0940-073A5

SUBMITTALS

0	NOV 10/09	ZDs REV 0
A	JUL 13/09	ZDs REV A

THE INFORMATION CONTAINED IN THIS SET OF DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO THE CLIENT NAMED IS STRICTLY PROHIBITED.

A&E SEAL

SITE

PG&E SUBSTATION
CA-SF00116A
HIGHWAY 13 & 24
SUBSTATION PG&E
OAKLAND, CA

SHEET TITLE

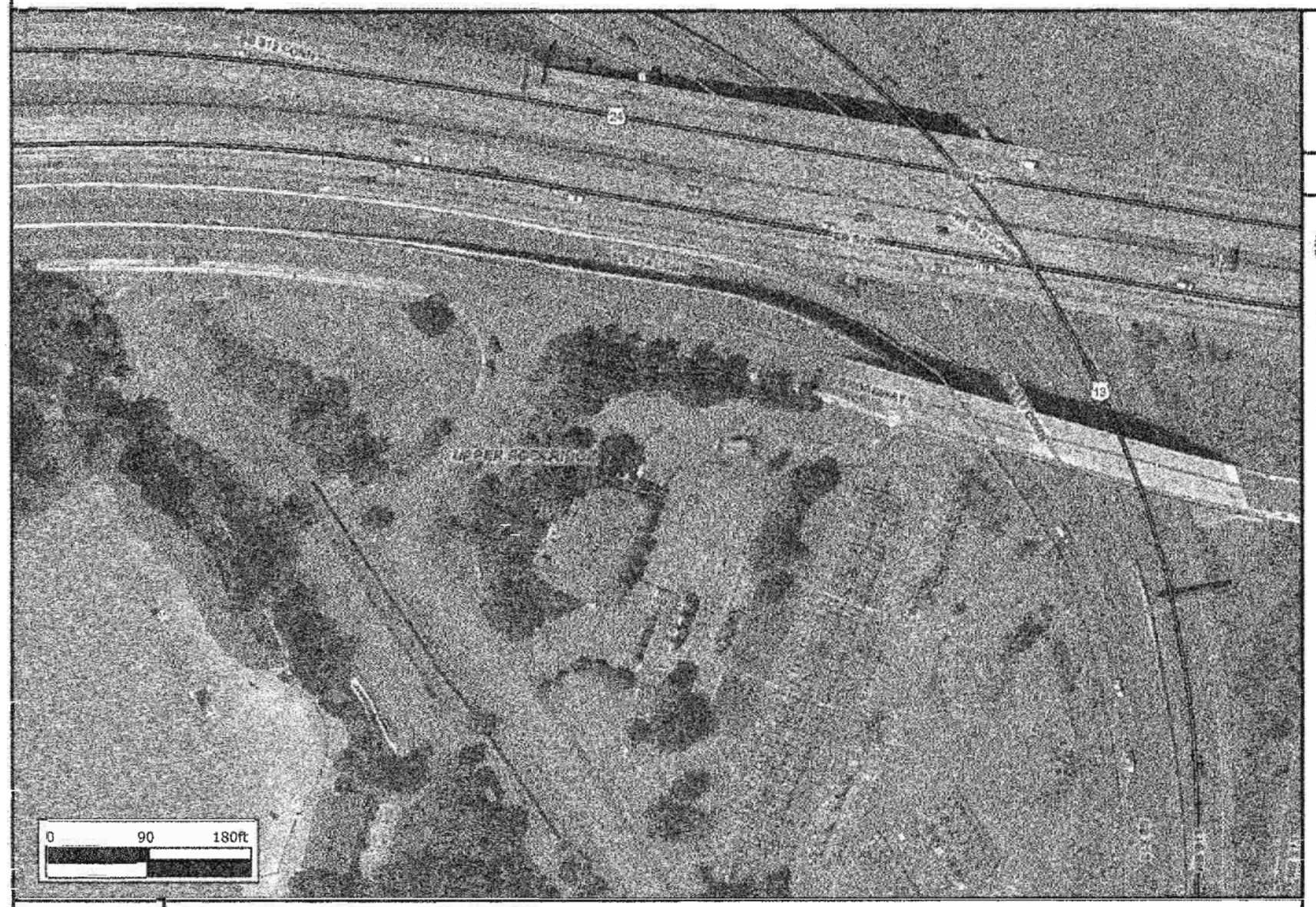
ANTENNA DETAILS

SHEET NUMBER

A-5

APN 048H759100405

SFO0116 - PG&E Substation



Legend

- Selected Features
- City Limits
- Parcels
- Freeways
- MajorSts
- Streets
- Water
- Land

N
W E
S

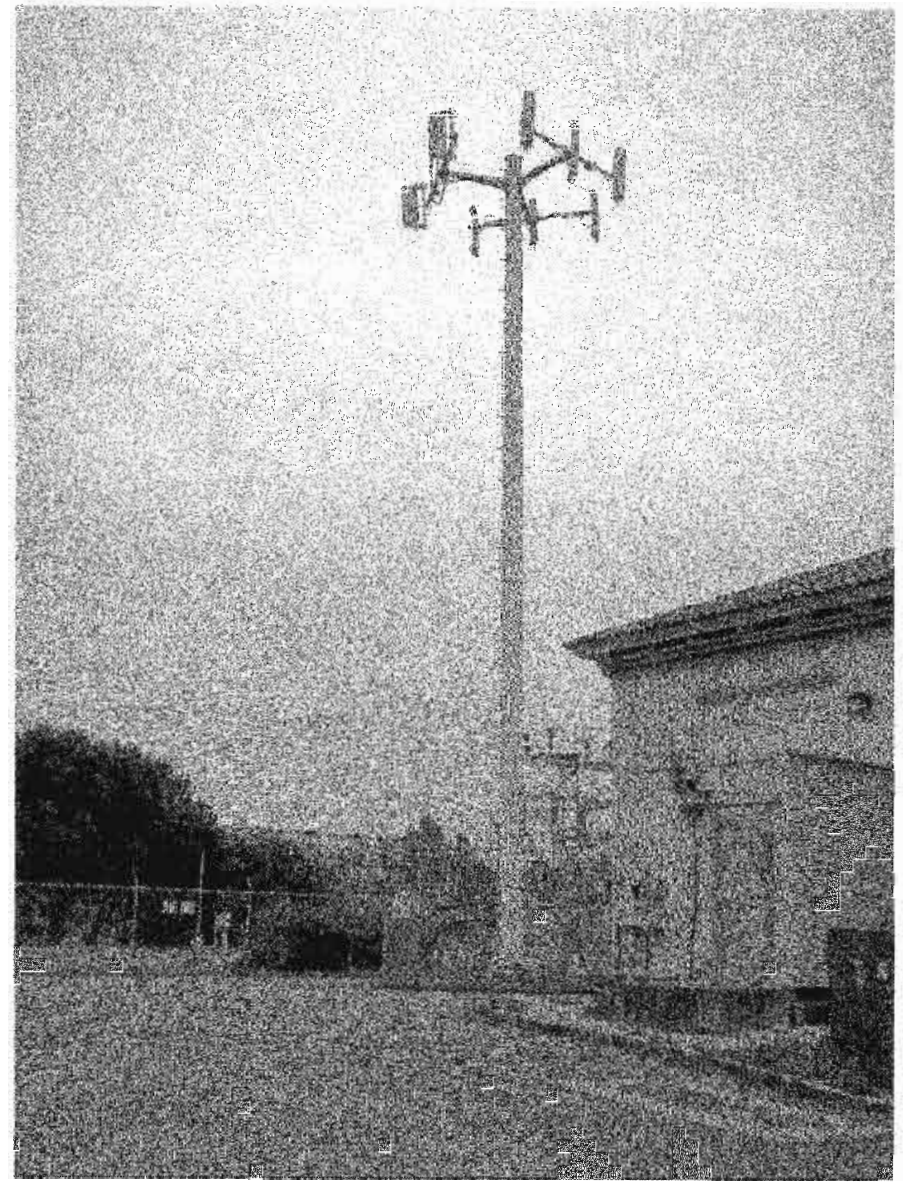
It is imperative that you obtain BOTH the Zoning and General Plan designations for the property(s) you are searching for.

Questions? Contact a planner at (510)238-3911.

Printed: 9/10/2009 1:51:11 PM

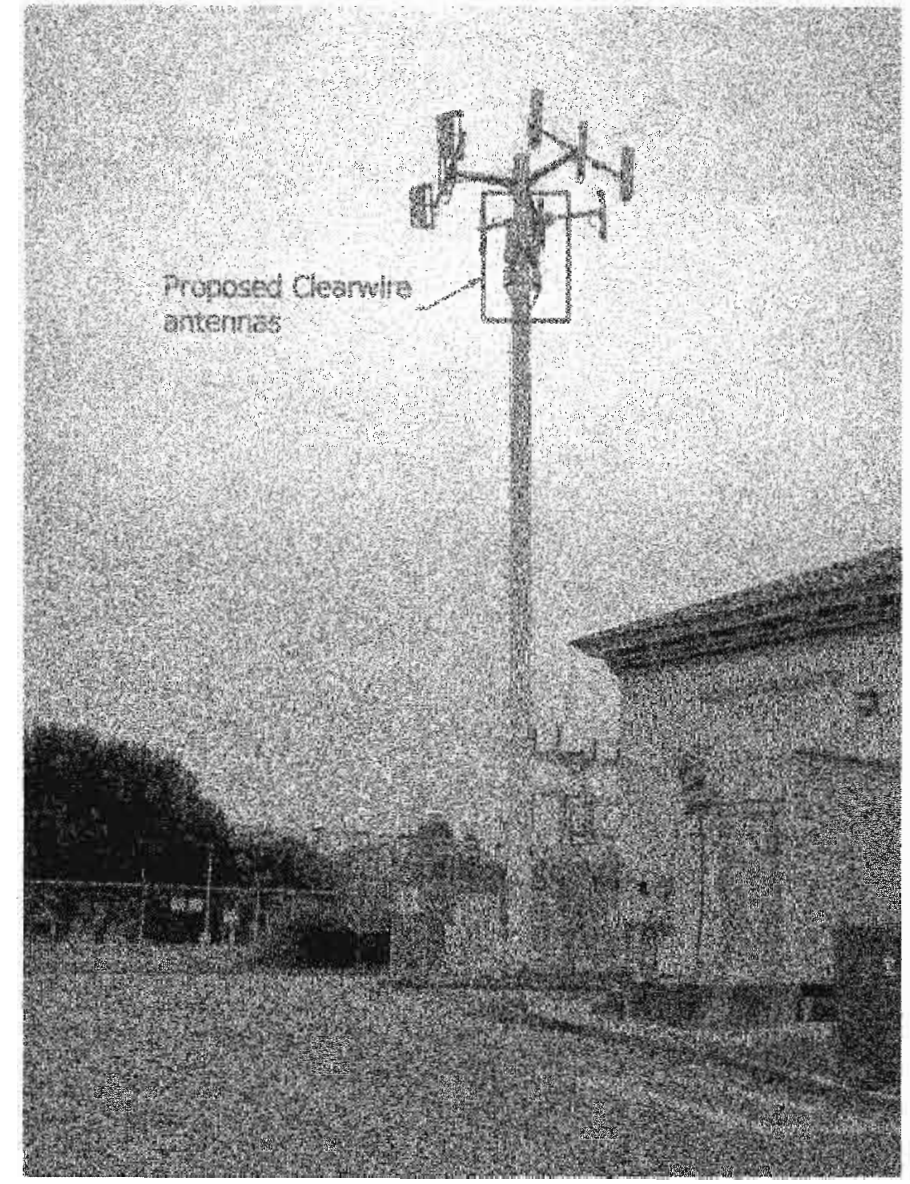
City of Oakland

Existing



Proposed

November 12, 2009



Northwest Elevation

CA-SFO0116A
PG&E Substation

ATTACHMENT B

TRK ENGINEERING

FEDERAL COMMUNICATIONS COMMISSION (FCC) COMPLIANCE STUDY ON RADIO FREQUENCY ELECTROMAGNETIC FIELDS EXPOSURE

Prepared for:

clearwire
wireless broadband

CA-SFO0116A
PG&E SUBSTATION
HIGHWAY 13 & 24 SUBSTATION PG&E
OAKLAND, CA

RECEIVED
JAN 27 2010
CITY PLANNING COMMISSION
ZONING DIVISION

DECEMBER 18/09, REV. 1

SITE DESCRIPTION:

Carrier:	Clearwire wireless broadband
Site Address:	Highway 13 & 24 Substation PG&E
Type of Service:	MMDS (Multichannel Multipoint Distribution Service)
Sectors:	0°, 120°, 240°
Antenna Type:	Kathrein 840 10054
Number of Antennas:	3
Frequencies *(GHz)*:	2.5 – 2.7
Maximum Power:	969 W ERP (per sector)
Antenna Height:	50' ± *(radiation center AGL)*

Table 1. Clearwire RF summary

Clearwire is proposing to construct a wireless broadband facility utilizing an existing monopole inside the PG&E Claremont Substation (Figure 1). Clearwire will be installing three panel antennas with horizontal beam width of 87° at 50' above ground level. An outdoor site support cabinet will be installed beside the monopole. The facility area is enclosed by chain link fence and access gate. Access is restricted to authorized personnel only.

Figure 1. Facility and surrounding area

Clearwire also proposes to install a dish antenna or Internet Service Exchange Point (ISEP) above the panel antennas. The RF power outside the main beam of this ISEP antenna is insignificant compared to the panel antennas (see calculations in Appendix A).

Verizon Wireless is the other existing wireless communication facility with panel antennas installed on the monopole. The RF summary for the facility is shown in the following Table.

Carrier:	Verizon Wireless
Type of Service:	i) EVDO ii) CDMA
Antenna Quantity:	9 (3 per sector)
Antenna Type:	i) Allgon 7130.18 ii) Antel LPD-7907-4
Maximum Power:	500 W *(Maximum ERP per technology, per sector)*
Antenna Height:	58' ± *(Radiation center AGL)*

Table 2. Verizon Wireless RF summary

There are also four other existing wireless communication facilities with panel antennas located at various locations within the substation. The RF summaries for the facilities are shown in the following Tables.

Carrier:	AT&T
Type of Service:	1900 MHz GSM/UMTS, 850 MHz GSM
Antenna Quantity:	6 (2 per sector)
Antenna Type:	Kathrein 742 264
Maximum Power:	500 W *(Maximum ERP per technology, per sector)*
Antenna Height:	14' ±, 34'-10" ± *(Radiation center AGL)*

Table 3. AT&T RF summary

Carrier:	Sprint PCS
Type of Service:	1900 MHz CDMA *(broadband PCS)*
Antenna Quantity:	3 (1 per sector)
Antenna Type:	EMS RR65-18XX-PL2
Maximum Power:	500 W *(Maximum ERP per sector)*
Antenna Height:	20'-5" ± *(Radiation center AGL)*

Table 4. Sprint PCS RF summary

Carrier:	Metro PCS
Type of Service:	1900 MHz CDMA *(broadband PCS)*
Antenna Quantity:	6 (2 per sector)
Antenna Type:	Andrew 932LG65VTE-B
Maximum Power:	500 W *(Maximum ERP per sector)*
Antenna Height:	20'-5" ± *(Radiation center AGL)*

Table 5. Metro PCS RF summary

Carrier:	Nextel Communications
Type of Service:	850 MHz ESMR
Antenna Quantity:	12 (4 per sector)
Antenna Type:	Decibel DB844H65E-XY, Antel LDB-7908/4
Maximum Power:	500 W *(Maximum ERP per sector)*
Antenna Height:	25'-10" ± *(Radiation center AGL)*

Table 6. Nextel Communications RF summary

PROTOCOL:

This study, and the calculations performed therein, is based on OET Bulletin 65[1] which adopts ANSI C95.1-1992 and NCRP standards. In particular, equation 10 from section 2 of the guideline is used as a model (in conjunction with known antenna radiation patterns) for calculating the power density at different points of interest. This information will be used to judge the RF exposure level incident upon the general population, and any employee present in the area. It should be noted that ground reflection of RF waves has been taken into account.

ENVIRONMENTAL EVALUATION:

According to Table 2 in Appendix A of Bulletin 65, an MDS facility is subject to routine environmental evaluation if the height above ground level to the lowest point on a non-building mounted antenna is less than 10 m, **and** the total power of all channels in a given sector is in excess of 1000 W ERP. The height above ground level to the lowest point of the antenna in question is 54'± (16.5 m); therefore, this facility is exempt from routine environmental evaluation.

FCC'S MAXIMUM PERMISSIBLE EXPOSURE (MPE) LIMIT:

In order to evaluate the RF exposure level, the power densities at different locations of interest have been examined. Equation 10 from Bulletin 65 is reproduced here as equation 1:

$$S = \frac{33.4 F^2 ERP}{R^2} \qquad \textbf{(1)}$$

Where:
S = *Power density [μW/cm²]*
ERP = *Effective radiated power [W]*
R = *Distance [m]*
F = *Relative field factor (relative numeric gain)*

Scenario 1: *Standing near the compound*

The RF exposure level for a six-foot tall person standing near the facilities is analyzed. For the worst-case scenario, we assume that all facilities will radiate the maximum number of channels for all the technologies at the same time, with each channel at its maximum power level.

[1] Cleveland, Robert F, et al. Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET Bulletin 65, Edition 97-01, August 1997.

In addition, the azimuths of the antennas of all carriers are assumed to be in the direction of the studied location. Please refer to scenario 1 in appendix A for the complete geometry and analysis. The highest exposure location on ground level is found to be approximately 7' from Clearwire's sector 1 antenna. The calculations of the maximum cumulative RF power densities are shown in Table 7.

Service	Max. ERP	F^2	R (m)	S (μW/cm²) (from eq. 1)	MPE %
clearwire (panel)	969 W	-30 dB (0.0010)	13.6	0.1750	0.0175
clearwire ISEP	100 W	-57 dB (0.0000)	14.6	0.0000	0.0000
Verizon EVDO	500 W	-30 dB (0.0010)	16.0	0.0652	0.0065
Verizon CDMA	500 W	-25 dB (0.0032)	16.0	0.2088	0.0360
Sprint PCS	500 W	-22 dB (0.0063)	8.8	1.3586	0.1359
Metro PCS	500 W	-25 dB (0.0032)	8.8	0.6901	0.0690
AT&T 1900 MHz	1000 W	-15 dB (0.0316)	54.1	0.3606	0.0361
AT&T 850 MHz	500 W	-3 dB (0.5012)	54.1	2.8598	0.4931
Nextel	500 W	-1 dB (0.7943)	53.7	4.5999	0.7931
Total					1.5872

Table 7. Worst-case predicted power density values for scenario 1.

The Maximum Permissible Exposure (MPE) limit for 1900 MHz and 2500 MHz facilities[2] for general population/uncontrolled exposure is 1000 μW/cm², and 580 μW/cm² for 850 MHz facilities. The maximum cumulative power density for the proposed Clearwire antennas and the existing antennas is calculated to be 1.58% of the MPE limit.

Scenario 2: *Nearby Rooftops*

There are some buildings within the substation compound and residential houses further in the distance. The RF exposure level on these building rooftops is evaluated. The highest exposure location is on the rooftop of the nearest building southeast of the subject site. Please refer to scenario 2 in appendix A for the analysis. We assume again, all antennas within a sector are transmitting with maximum power level and the antennas azimuths are in the direction of the studied location. The calculations for the maximum possible power density are summarized Table 8.

Service	Max. ERP	F^2	R (m)	S (μW/cm²) (from eq. 1)	MPE %
clearwire (panel)	969 W	-1 dB (0.7943)	75.7	4.4860	0.4486
clearwire ISEP	100 W	-23 dB (0.0050)	75.7	0.0029	0.0003
Verizon EVDO	500 W	-1 dB (0.7943)	75.8	2.3087	0.2309
Verizon CDMA	500 W	-2 dB (0.6310)	75.8	1.8340	0.3162
Sprint PCS	500 W	-1 dB (0.7943)	70.4	2.6764	0.2676
Metro PCS	500 W	0 dB (1.0000)	70.4	3.3695	0.3370
AT&T 1900 MHz	1000 W	-1 dB (0.7943)	56.1	8.4296	0.9149
AT&T 850 MHz	500 W	0 dB (1.0000)	56.1	5.3063	0.9084
Nextel	500 W	0 dB (1.0000)	56.3	5.2687	0.9084
Total					4.2669

Table 8. Worst-case predicted power density values for scenario 2.

[2] Ibid., page 67.

The maximum cumulative power density on a building rooftop from the proposed Clearwire antennas and the existing antennas is calculated to be 4.27% of the MPE limit. There is a relatively low level of RF energy directed either above or below the horizontal plane of the antennas, and there are no locations in the surrounding areas near the compound that will have RF exposure levels close to the MPE limit.

Conclusion:

Under "worst-case" conditions, the calculations shown above predict that the maximum possible RF exposure is 4.27% of the MPE limit. There will be less RF exposure on the ground level or nearby buildings as a person moves away from the site. Therefore, the proposed Clearwire facility in co-location with the existing facilities will comply with the general population/uncontrolled limit.

FCC COMPLIANCE:

Only trained persons will be permitted to access the compound. They will be made fully aware of the potential for RF exposure and can choose to exercise control over their exposure that is within the occupational/controlled limits.

The general population/uncontrolled exposure near the antennas, including persons on the street level, in nearby open areas, and inside or on existing nearby buildings will have RF exposure much lower than the "worst-case" scenario, which is only a small percentage of the MPE limit.

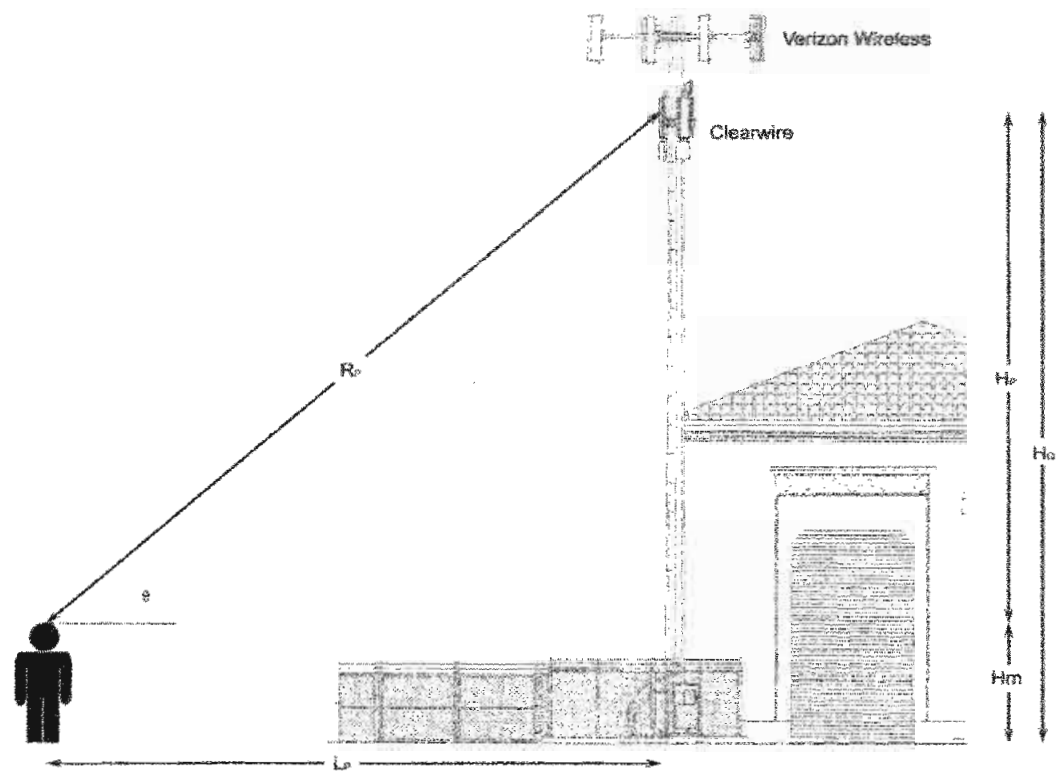
REGISTERED PROFESSIONAL ENGINEER
SEI YUEN SYLVAN WONG
16850
EXP. 12/31/10
ELECTRICAL
STATE OF CALIFORNIA

December 21, 2009

Sei Yuen Sylvan Wong, PE
California PE Reg. No. E 16850

APPENDIX A

Scenario 1: Surrounding Area of the Facility



person's height (H_M) = 6 ft

Building elvation = 503 ft

Sector 1

Horizontal distance from rooftop, L_P is 7 ft at Θ= 80 ° Elevation above sea level: 503 feet

Service Provider	Height H_S, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	44.00	969.0	Θ = 80 °	-30 dB (0.0010)	13.6	0.1750	0.0175
clearwire ISEP	53.50	47.50	100.0	Θ = 82 °	-57 dB (0.0000)	14.6	0.0000	0.0000
Verizon EVDO	58.00	52.00	500.0	Θ = 83 °	-30 dB (0.0010)	16.0	0.0652	0.0065
Verizon CDMA	58.00	52.00	500.0	Θ = 83 °	-25 dB (0.0032)	16.0	0.2068	0.0360
L_P from main building is 25 ft								
Sprint PCS	20.40	14.40	500.0	Θ = 30 °	-22 dB (0.0063)	8.8	1.3586	0.1359
Metro PCS	20.40	14.40	500.0	Θ = 30 °	-25 dB (0.0032)	8.8	0.6901	0.0690
L_P from Nextel shelter is 175 ft								
AT&T 1900 MHz	34.80	28.80	1000.0	Θ = 9 °	-15 dB (0.0316)	54.1	0.3606	0.0361
AT&T 850 MHz	34.80	28.80	500.0	Θ = 9 °	-3 dB (0.5012)	54.1	2.8598	0.4931
Nextel	25.80	19.80	500.0	Θ = 6 °	-1 dB (0.7943)	53.7	4.5999	0.7931
						Total		1.5872

Horizontal distance from rooftop, L_P is 22 ft at Θ= 60 ° Elevation above sea level: 503 feet

Service Provider	Height H_S, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	44.00	969.0	Θ = 60 °	-30 dB (0.0010)	15.5	0.1347	0.0135
clearwire ISEP	53.50	47.50	100.0	Θ = 65 °	-46 dB (0.0000)	16.0	0.0000	0.0000
Verizon EVDO	58.00	52.00	500.0	Θ = 67 °	-30 dB (0.0010)	17.2	0.0564	0.0056
Verizon CDMA	58.00	52.00	500.0	Θ = 67 °	-25 dB (0.0032)	17.2	0.1806	0.0311
L_P from main building is 39 ft								
Sprint PCS	20.40	14.40	500.0	Θ = 20 °	-16 dB (0.0251)	12.7	2.5989	0.2599
Metro PCS	20.40	14.40	500.0	Θ = 20 °	-18 dB (0.0158)	12.7	1.6359	0.1636
L_P from main building is 196 ft								
AT&T 1900 MHz	34.80	28.80	1000.0	Θ = 8 °	-15 dB (0.0316)	60.4	0.2893	0.0289
AT&T 850 MHz	34.80	28.80	500.0	Θ = 8 °	-3 dB (0.5012)	60.4	2.2943	0.3956
Nextel	25.80	19.80	500.0	Θ = 6 °	-1 dB (0.7943)	60.1	3.6724	0.6332
						Total		1.5314

Horizontal distance from rooftop, L_P is 38 ft at Θ= 45 ° Elevation above sea level: 503 feet

Service Provider	Height H_G, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	44.00	969.0	Θ= 45 °	-30 dB (0.0010)	19.0	0.0897	0.0090
clearwire ISEP	53.50	47.50	100.0	Θ= 51 °	-42 dB (0.0001)	18.5	0.0010	0.0001
Verizon EVDO	58.00	52.00	500.0	Θ= 54 °	-25 dB (0.0032)	19.6	0.1391	0.0139
Verizon CDMA	58.00	52.00	500.0	Θ= 54 °	-30 dB (0.0010)	19.6	0.0435	0.0075
L_P from main building is 53 ft								
Sprint PCS	20.40	14.40	500.0	Θ= 15 °	-16 dB (0.0251)	16.7	1.5030	0.1503
Metro PCS	20.40	14.40	500.0	Θ= 15 °	-14 dB (0.0398)	16.7	2.3832	0.2383
L_P from main building is 212 ft								
AT&T 1900 MHz	34.80	28.80	1000.0	Θ= 8 °	-15 dB (0.0316)	65.2	0.2483	0.0248
AT&T 850 MHz	34.80	28.80	500.0	Θ= 8 °	-3 dB (0.5012)	65.2	1.9689	0.3395
Nextel	25.80	19.80	500.0	Θ= 5 °	0 dB (1.0000)	64.9	3.9649	0.6836
						Total		1.4670

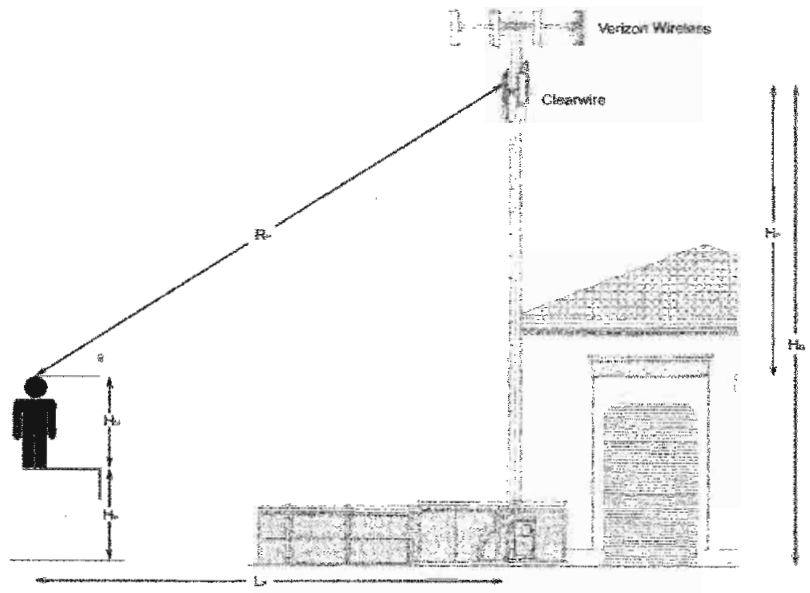
Horizontal distance from rooftop, L_P is 74 ft at Θ= 30 ° Elevation above sea level: 498 feet

Service Provider	Height H_G, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	49.00	969.0	Θ= 30 °	-14 dB (0.0398)	29.9	1.4408	0.1441
clearwire ISEP	53.50	52.50	100.0	Θ= 35 °	-42 dB (0.0001)	27.8	0.0004	0.0000
Verizon EVDO	58.00	57.00	500.0	Θ= 37 °	-25 dB (0.0032)	28.6	0.0653	0.0065
Verizon CDMA	58.00	57.00	500.0	Θ= 37 °	-20 dB (0.0100)	28.6	0.2042	0.0352
L_P from main building is 95 ft								
Sprint PCS	20.40	19.40	500.0	Θ= 12 °	-14 dB (0.0398)	29.6	0.7586	0.1308
Metro PCS	20.40	19.40	500.0	Θ= 12 °	-15 dB (0.0316)	29.6	0.6023	0.0602
L_P from main building is 256 ft								
AT&T 1900 MHz	34.80	33.80	1000.0	Θ= 8 °	-15 dB (0.0316)	78.7	0.1704	0.0170
AT&T 850 MHz	34.80	33.80	500.0	Θ= 8 °	-3 dB (0.5012)	78.7	1.3514	0.2330
Nextel	25.80	24.80	500.0	Θ= 6 °	-1 dB (0.7943)	78.4	2.1581	0.3721
						Total		0.9989

Horizontal distance from rooftop, L_P is 157 ft at Θ= 15 ° Elevation above sea level: 499 feet

Service Provider	Height H_G, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	48.00	969.0	Θ= 15 °	-13 dB (0.0501)	56.5	0.5079	0.0508
clearwire ISEP	53.50	51.50	100.0	Θ= 18 °	-38 dB (0.0002)	50.3	0.0003	0.0000
Verizon EVDO	58.00	56.00	500.0	Θ= 20 °	-20 dB (0.0100)	50.7	0.0650	0.0065
Verizon CDMA	58.00	56.00	500.0	Θ= 20 °	-20 dB (0.0100)	50.7	0.0650	0.0112
L_P from main building is 193 ft								
Sprint PCS	20.40	18.40	500.0	Θ= 5 °	-4 dB (0.3981)	59.1	1.9034	0.3282
Metro PCS	20.40	18.40	500.0	Θ= 5 °	0 dB (1.0000)	59.1	4.7813	0.4781
L_P from main building is 325 ft								
AT&T 1900 MHz	34.80	32.80	1000.0	Θ= 6 °	-5 dB (0.3162)	99.6	1.0646	0.1065
AT&T 850 MHz	34.80	32.80	500.0	Θ= 6 °	-1 dB (0.7943)	99.6	1.3372	0.2306
Nextel	25.80	23.80	500.0	Θ= 4 °	0 dB (1.0000)	99.4	1.6902	0.2914
						Total		1.5033

Scenario 2: Nearby Buildings/Rooftop



person's height (H_B) = 6 ft

Building elvation = 503 ft

Location 1: Nearest building within Sector 1

H_B= 24.0 ft, L_P is 1000 ft Elevation above sea level: 825 feet

Service Provider	Height H_G, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	-302.00	969.0	Θ = -17 °	-12 dB (0.0631)	318.5	0.0201	0.0020
clearwire ISEP	53.50	-298.50	100.0	Θ = -17 °	-37 dB (0.0002)	318.2	0.0000	0.0000
Verizon EVDO	58.00	-294.00	500.0	Θ = -16 °	-13 dB (0.0501)	317.8	0.0083	0.0008
Verizon CDMA	58.00	-294.00	500.0	Θ = -16 °	-10 dB (0.1000)	317.8	0.0165	0.0028
L_P from main building is 1000 ft								
Sprint PCS	20.40	-331.60	500.0	Θ = -18 °	-16 dB (0.0251)	321.2	0.0041	0.0004
Metro PCS	20.40	-331.60	500.0	Θ = -18 °	-15 dB (0.0316)	321.2	0.0051	0.0005
L_P from Nextel shelter is 1000 ft								
AT&T 1900 MHz	34.80	-317.20	1000.0	Θ = -18 °	-25 dB (0.0032)	319.8	0.0010	0.0001
AT&T 850 MHz	34.80	-317.20	500.0	Θ = -18 °	-20 dB (0.0100)	319.8	0.0016	0.0003
Nextel	25.80	-326.20	500.0	Θ = -18 °	-15 dB (0.0316)	320.7	0.0051	0.0009
						Total		0.0078

Location 2: Nearest building surface within Sector 2

H_B= 33.0 ft, L_P is 248 ft Elevation above sea level: 505 feet

Service Provider	Height H_G, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	9.00	969.0	Θ = 2 °	-1 dB (0.7943)	75.7	4.4860	0.4486
clearwire ISEP	53.50	12.50	100.0	Θ = 3 °	-23 dB (0.0050)	75.7	0.0029	0.0003
Verizon EVDO	58.00	17.00	500.0	Θ = 4 °	-1 dB (0.7943)	75.8	2.3087	0.2309
Verizon CDMA	58.00	17.00	500.0	Θ = 4 °	-2 dB (0.6310)	75.8	1.8340	0.3162
L_P from main building is 230 ft								
Sprint PCS	20.40	-20.60	500.0	Θ = -5 °	-1 dB (0.7943)	70.4	2.6764	0.2676
Metro PCS	20.40	-20.60	500.0	Θ = -5 °	0 dB (1.0000)	70.4	3.3695	0.3370
L_P from Nextel shelter is 184 ft								
AT&T 1900 MHz	34.80	-6.20	1000.0	Θ = -2 °	-1 dB (0.7943)	56.1	8.4296	0.8430
AT&T 850 MHz	34.80	-6.20	500.0	Θ = -2 °	0 dB (1.0000)	56.1	5.3063	0.9149
Nextel	25.80	-15.20	500.0	Θ = -5 °	0 dB (1.0000)	56.3	5.2687	0.9084
						Total		4.2669

Location 3: Nearest building surface within Sector 3

H_B= 24.0 ft, L_P is 1000 ft Elevation above sea level: 276 feet

Service Provider	Height H_G, ft	Height H_P, ft	Max. ERP	Angle Θ	F^2	R_P(m)	S (μW/cm2)	MPE%
clearwire panel	50.00	247.00	969.0	Θ = 14 °	-20 dB (0.0100)	314.0	0.0033	0.0003
clearwire ISEP	53.50	250.50	100.0	Θ = 14 °	-34 dB (0.0004)	314.3	0.0000	0.0000
Verizon EVDO	58.00	255.00	500.0	Θ = 14 °	-12 dB (0.0631)	314.6	0.0106	0.0011
Verizon CDMA	58.00	255.00	500.0	Θ = 14 °	-10 dB (0.1000)	314.6	0.0169	0.0029
L_P from main building is 1000 ft								
Sprint PCS	20.40	217.40	500.0	Θ = 12 °	-14 dB (0.0398)	312.0	0.0068	0.0007
Metro PCS	20.40	217.40	500.0	Θ = 12 °	-15 dB (0.0316)	312.0	0.0054	0.0005
L_P from AT&T shelter is 1000 ft								
AT&T 1900 MHz	14.00	211.00	1000.0	Θ = 12 °	-13 dB (0.0501)	311.6	0.0172	0.0017
AT&T 850 MHz	14.00	211.00	500.0	Θ = 12 °	-5 dB (0.3162)	311.6	0.0544	0.0094
L_P from Nextel shelter is 1000								
Nextel	25.80	222.80	500.0	Θ = 13 °	-10 dB (0.1000)	312.4	0.0171	0.0029
						Total		0.0195

KATHREIN
SCALA DIVISION

840 10054

87° XX-pol Panel Antenna
2496–2690 MHz

Kathrein Scala's XX-polarized adjustable electrical downtilt antennas offer the carrier the ability to tailor sites for optimum performance. Using variable downtilt, only a few models need be procured to accommodate the needs of widely varying conditions. Remotely controlled downtilt is available as a retrofitable option.

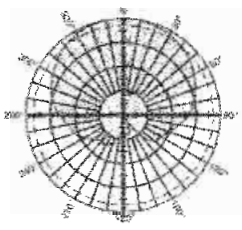
- 0–10° electrical downtilt range.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Optional remote downtilt control.

Specifications:

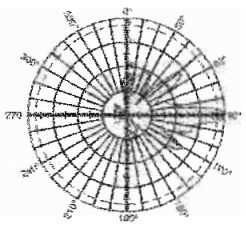
Frequency range	2496–2690 MHz
Gain	2 x 16 dBi
Impedance	50 ohms
VSWR	< 1.5:1
Intermodulation (2x20w)	IM3:< -150 dBc
Polarization	+45° and -45°
Front-to-back ratio	>23 dB typical
Maximum input power	300 watts (at 50°C)
+45° and -45° polarization horizontal beamwidth	87 degrees at midband (half power)
+45° and -45° polarization vertical beamwidth	7 degrees at midband (half power)
Electrical downtilt continously adjustable	0–10 degrees
Connector	4 x 7-16 DIN female
Sidelobe suppression for first sidelobe above horizon	0° 4° 8° 10° 15 15 15 15 dB (typical)
Null fill	> -1 dBi to 12° below horizon (typical) (17 dB below 16 dBi main beam)
Isolation	>30 dB
Weight	30 lb (13.6 kg)
Dimensions	42 x 12.7 x 2.8 inches (1067 x 323 x 71 mm)
Equivalent flat plate area	4.8 ft² (0.45 m²)
Wind survival rating*	120 mph (200 kph)
Shipping dimensions	48 x 13.3 x 5.1 inches (1220 x 337 x 130 mm)
Shipping weight	34 lb (15.4 kg)
Mounting	Fixed and tilt-mount options are available for 2 to 5.7 inch (50 to 145 mm) OD masts.

See reverse for order information.

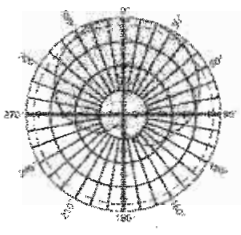
*Mechanical design is based on environmental conditions as stipulated in EIA-222-F (June 1996) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.



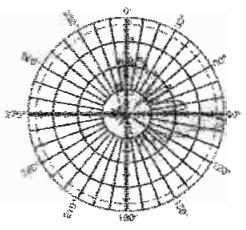
Horizontal pattern
±45°- polarization
0° electrical downtilt



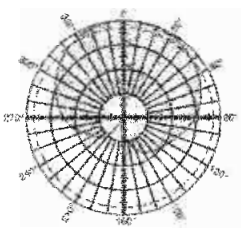
Vertical pattern
±45°- polarization
0° electrical downtilt



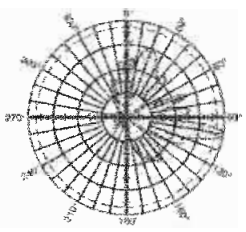
Horizontal pattern
±45°- polarization
5° electrical downtilt



Vertical pattern
±45°- polarization
5° electrical downtilt



Horizontal pattern
±45°- polarization
10° electrical downtilt

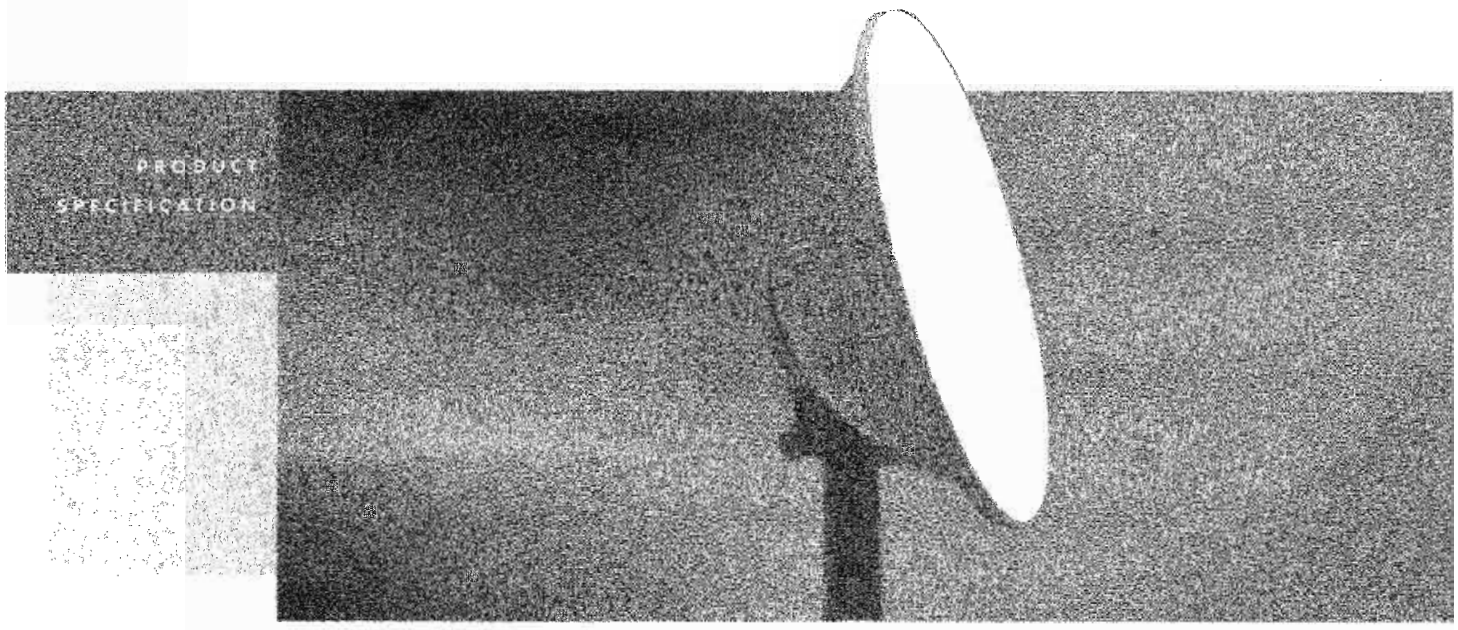


Vertical pattern
±45°- polarization
10° electrical downtilt

11098-A

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

ANDREW®



ValuLine® III Next Generation Antennas
VHLP2

SPECIFICATIONS

	VHLP2-7W	VHLP2-10W	VHLP2-11	VHLP2-13	VHLP2-15	VHLP2-18	VHLP2-23	VHLP2-26	VHLP2-28	VHLP2-32	VHLP2-38
Frequency Band, GHz	7.125–8.5	10.55–10.68	10.7–11.7	12.70–13.25	14.25–15.35	17.7–19.7	21.2–23.6	24.25–26.5	27.5–29.5	31.8–33.4	37.0–40.0
Bottom Band Gain, dBi	29.5	33.7	34.0	35.6	36.5	38.3	39.8	40.8	41.8	43.4	44.6
Mid Band Gain, dBi	30.7	33.8	34.4	35.8	36.8	38.7	40.4	41.2	42.2	43.7	45.2
Top Band Gain, dBi	31.9	34.3	35.0	36.0	37.2	39.1	41.0	41.8	42.7	44.0	45.8
Beamwidth, degrees	4.7	3.7	3.3	2.7	2.5	2.1	1.7	1.5	1.3	1.0	0.9
Front/Back, dB	57	56	60	62	65	67	66	68	68	61	66
XPD, dB	32	30	30	30	30	30	30	30	30	30	30
Return Loss, dB	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7
Regulatory Compliance											
ETSI Class	R1 C3	R1 C2	R1 C3	R1 C3	R2 C3	R2 C3	R3 C3	R4 C3	R4 C3	R5 C3B	R5 C3B
FCC Part 101	N/A	CAT A*	CAT B	N/A	N/A	CAT A	CAT A	CAT A	N/A	N/A	CAT A
Brazil Anatel	N/A	C2	C2	C2	C2	C2	C2	C2	C2	C2	C2
Canada SRSP	N/A	310.5	N/A	312.7B	314.5A	Note 1	Note 2	N/A	N/A	N/A	338.6A
Andrew RPE Number	7075A	7085B, 7086B*	7083A	7004	7008	7012A	7016A	7020A	7024A	7028	7032A

Note 1: Meets Canada SRSP 317.8A, 318.5, 318.8
Note 2: Meets Canada SRSP 312.2A, 321.8B

** Use for FCC band (10.5–10.7 GHz)*

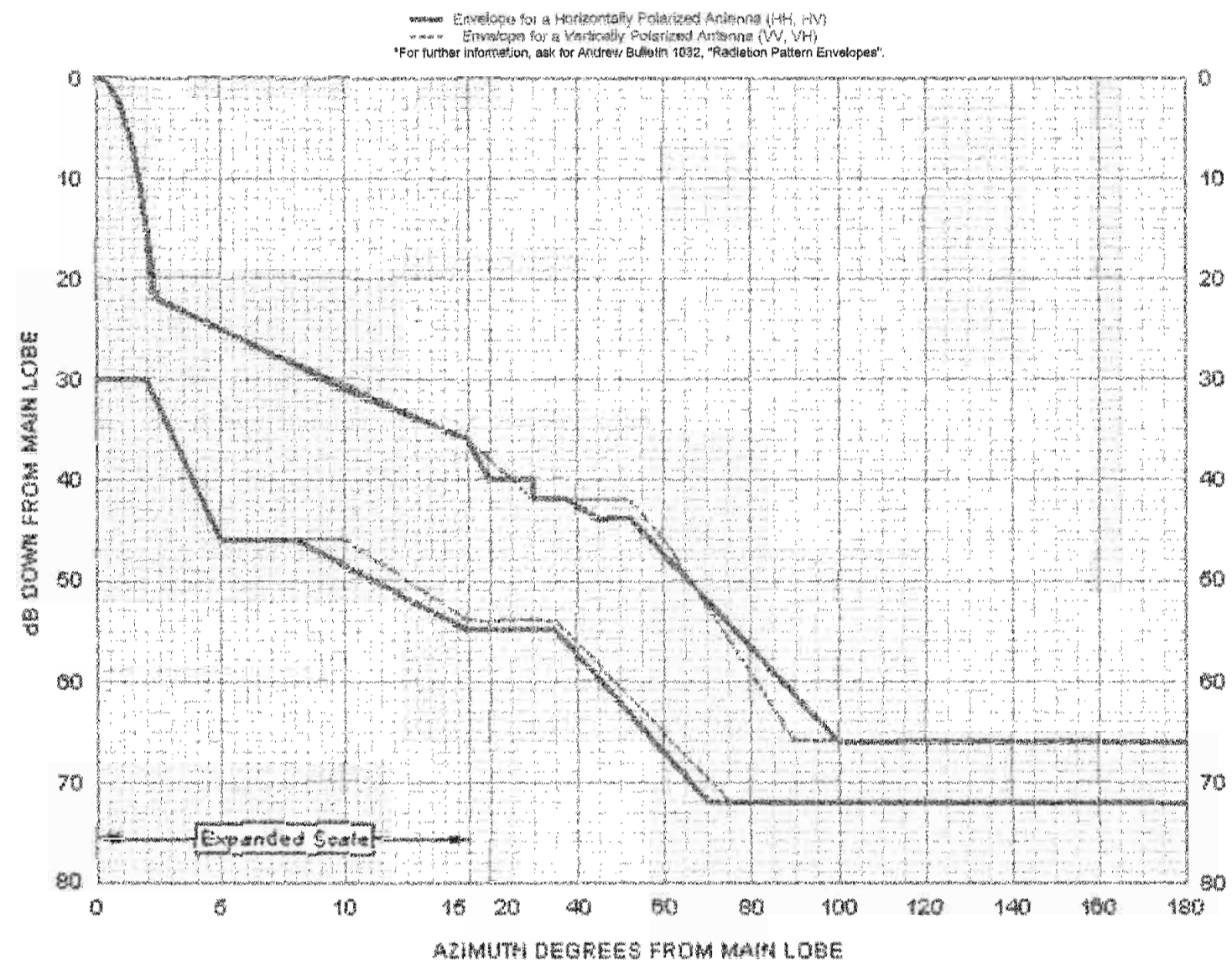
One Company. A World of Solutions.

VHLP2-23 - Radiation Pattern Envelope

ANDREW.

ANDREW.
RPE: 7016

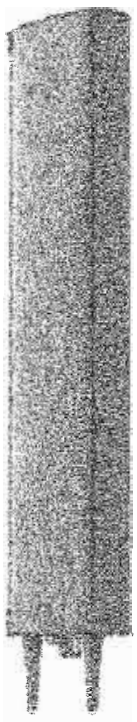
Engineering Approved:
25 October 2004



KATHREIN
SCALA DIVISION

AP14/17-880/1940/065D/ADT/XXP 742-264

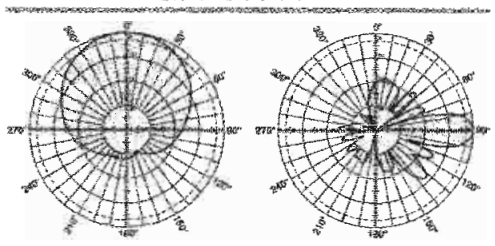
65° Multiband Directional Antenna



Kathrein's dual band antennas are ready for 3G applications, covering all existing wireless bands as well as all spectrum under consideration for future systems, AMPS, PCS and 3G/UMTS. These cross-polarized antennas offer diversity operation in the same space as a conventional 800 MHz antenna, and are mountable on our compact sector brackets.

- Wide band operation.
- Exceptional intermodulation characteristics.
- Remote control ready.
- Various gain, beamwidth and downtilt ranges.
- AISG compatible.
- High strength pultruded fiberglass radome.

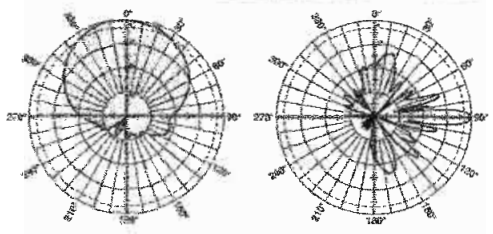
824–960 MHz



Horizontal pattern
±45°- polarization

Vertical pattern
±45°- polarization
0°–14° electrical downtilt

1710–2170 MHz



Horizontal pattern
±45°- polarization

Vertical pattern
±45°- polarization
0°–8° electrical downtilt

General specifications:

Frequency range	824–960 MHz 1710–2170 MHz
Impedance	50 ohms
VSWR	<1.5:1
Intermodulation (2x20w)	IM3: -150 dBc
Polarization	+45° and -45°
Connector	4 x 7/16 DIN female
Isolation intrasystem intersystem	>30 dB >50 dB (824–960 // 1710–2170 MHz)
Weight	36.4 lb (16.5 kg)
Dimensions	51.8 x 10.3 x 5.5 inches (1316 x 262 x 139 mm)
Equivalent flat plate area	4.13 ft² (0.384 m²)
Wind survival rating*	120 mph (200 kph)
Shipping dimensions	64 x 12 x 8 inches (1626 x 305 x 203 mm)
Shipping weight	45 lb (20.4 kg)
Mounting	Fixed mount options are available for 2 to 4.6 inch (50 to 115 mm) OD masts.

See reverse for order information.

Specifications:	824–894 MHz	870–960 MHz	1710–1880 MHz	1850–1990 MHz	1920–2170 MHz
Gain	12 dBd/14 dBi	12 dBd/14 dBi	14.5 dBd/16.5 dBi	14.8 dBd/16.8 dBi	15 dBd/17 dBi
Front-to-back ratio	>26 dB (co-polar)	>26 dB (co-polar)	>25 dB (co-polar)	>25 dB (co-polar)	>25 dB (co-polar)
Maximum input power	250 watts (at 50°C)	250 watts (at 50°C)	200 watts (at 50°C)	200 watts (at 50°C)	200 watts (at 50°C)
+45° and -45° polarization horizontal beamwidth	68° (half-power)	65° (half-power)	65° (half-power)	65° (half-power)	63° (half-power)
+45° and -45° polarization vertical beamwidth	16° (half-power)	14.5° (half-power)	7.8° (half-power)	7.3° (half-power)	6.8° (half-power)
Electrical downtilt continuously adjustable	0°–14°	0°–14°	0°–8°	0°–8°	0°–8°
Sidelobe suppression for first sidelobe above horizon	0° 7° 14° T 14 14 13 dB	0° 7° 14° T 14 14 13 dB	0° 4° 8° T 14 14 14 dB	0° 4° 8° T 16 16 15 dB	0° 4° 8° T 15 16 15 dB
Cross polar ratio Main direction 0° Sector ±60°	20 dB (typical) >10 dB	20 dB (typical) >10 dB	16 dB (typical) >10 dB	18 dB (typical) >10 dB	20 dB (typical) >10 dB

*Mechanical design is based on environmental conditions as stipulated in EIA-222-F (June 1996) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

TÜV

10633-F
936.209/I

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

Product Specifications

ANDREW®
A CommScope Company

932LG65VTE-B

Directed Dipole™ Antenna, 1710–2170 MHz, 65° horizontal beamwidth, RET compatible variable electrical tilt

- Unique Directed Dipole™ design provides exceptional azimuth pattern roll-off and strong front-to-back ratio
- Enhanced control of out-of-sector power improves co-channel interference, reduces softer hand-offs, improves capacity
- Field adjustable electrical tilt
- Fully compatible with Andrew Teletilt® remote control system

CHARACTERISTICS

General Specifications

Antenna Type	Directed Dipole™
Brand	Directed Dipole™ | DualPol® | Teletilt®
Operating Frequency Band	1710 – 2170 MHz

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2170**
Beamwidth, Horizontal, degrees	65	65	68
Gain, dBd	15.0	15.4	14.9
Gain, dBi	17.1	17.5	17.0
Beamwidth, Vertical, degrees	7.3	6.8	6.3
Beam Tilt, degrees	0–8	0–8	0–8
Upper Sidelobe Suppression (USLS), typical, dB	17	18	18
Front-to-Back Ratio at 180°, dB	35	35	35
Isolation, dB	30	30	30
VSWR | Return Loss, db	1.5:1 | 14.0	1.5:1 | 14.0	1.5:1 | 14.0
Intermodulation Products, 3rd Order, 2 x 20 W, dBc	-150	-150	-150
Input Power, maximum, watts	250	250	250
Polarization	±45°	±45°	±45°
Impedance, ohms	50	50	50
Lightning Protection	dc Ground	dc Ground	dc Ground

©2009 CommScope, Inc. All rights reserved.
All trademarks identified by ® or ™ are registered trademarks or trademarks, respectively, of CommScope. All specifications are subject to change.
See www.commscope.com/andrew for the most current information.

Product Specifications

932LG65VTE-B

Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity	2
Wind Loading, maximum	244.7 N @ 100 mph 55.0 lbf @ 100 mph
Wind Speed, maximum	241.4 km/h | 150.0 mph

Dimensions

Depth	172.0 mm | 6.8 in
Length	1312.0 mm | 51.7 in
Width	209.0 mm | 8.2 in
Net Weight	9.1 kg | 20.1 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	932LG65R2E-B
Model with Factory Installed AISG 2.0 Actuator	932LG65A1E-B
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2002/95/EC	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)

INCLUDED PRODUCTS

DB5098
Downtilt Mounting Kit for 4.5 in (114.3 mm) OD round members

DB390
Pipe Mounting Kit for 4.5 in (114.3 mm) OD round members

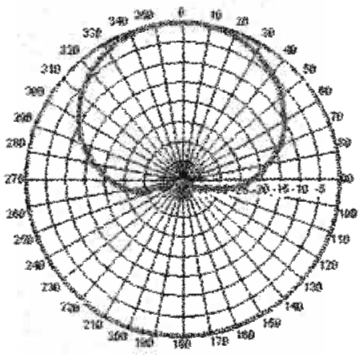
©2009 CommScope, Inc. All rights reserved.
All trademarks identified by ® or ™ are registered trademarks or trademarks, respectively, of CommScope. All specifications are subject to change.
See www.commscope.com/andrew for the most current information.

Product Specifications

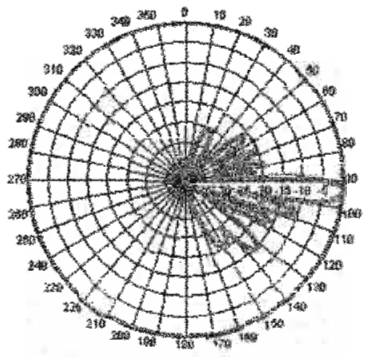
932tG65VTE-B

ANDREW®
A CommScope Company

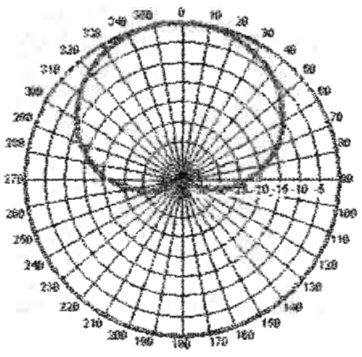
Horizontal Pattern	Vertical Pattern



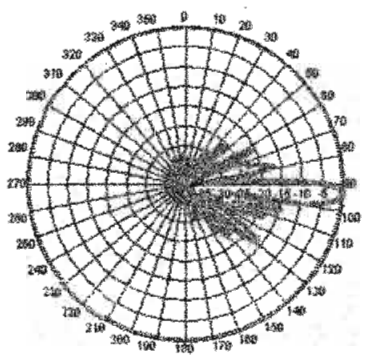
Freq: 1785 MHz, Tilt: 4



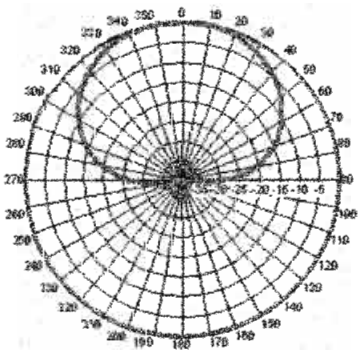
Freq: 1785 MHz, Tilt: 4



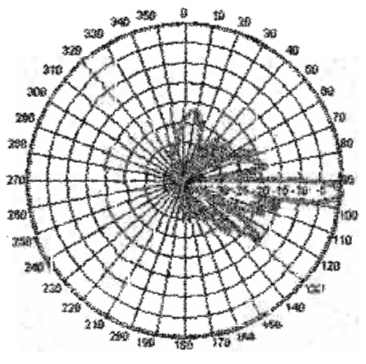
Freq: 1920 MHz, Tilt: 4



Freq: 1920 MHz, Tilt: 4



Freq: 2110 MHz, Tilt: 4



Freq: 2110 MHz, Tilt: 4

©2009 CommScope, Inc. All rights reserved.
All trademarks identified by ® or ™ are registered trademarks or trademarks, respectively, of CommScope. All specifications are subject to change.
See www.commscope.com/andrew for the most current information.

DB844H65E-XY

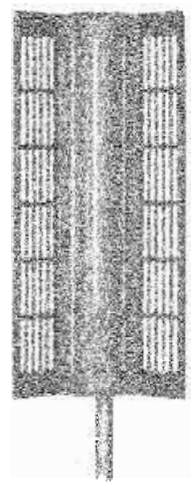
Directed Dipole Antenna

Decibel®
Base Station Antennas

- Excellent azimuth roll-off: 15-20% reduction in cell to cell overlap
- Superior front to back ratio
- Low profile, low wind load for easy zoning
- Outstanding field record, with thousands of units deployed, world wide

ELECTRICAL

Frequency (MHz) :	806 - 896	870 - 960
Polarization :	Vertical	Vertical
Gain (dBd/dBi) :	13.1/15.2	13.3/15.4
Azimuth BW (Deg.):	65	65
Elevation BW (Deg.):	15	15
Beam Tilt (Deg.):	0	0
USLS* (dB) :	15	15
Front-To-Back Ratio* (dB) :	40	40
VSWR :	<1.5:1	<1.5:1
Max. Input Power (Watts) :	500	500
Impedance (Ohms) :	50	50
Lightning Protection :	DC Ground	DC Ground



MECHANICAL

Weight :	9.0 kg (20 lb)
Dimensions (LxWxD) :	1,219 x 521 x 229 mm (48 x 20.5 x 9 in)
Max. Wind Area :	0.40 m² (4.3 ft²)
Max. Wind Load (@ 100 mph) :	1,071.9 N (241 lbf)
Max. Wind Speed :	201 km/h (125 mph)
Hardware Material :	Galvanized Steel
Connector Type :	7-16 DIN - Female (1, Back)
Color :	Light Gray
Standard Mounting Hardware :	DB380
Standard Downtilt Mounting Hardware :	DB5083

Andrew Corporation
2601 Telecom Parkway
Richardson, Texas U.S.A 75082-3521
Tel: 214.631.0310

Fax: 214.631.4706
Toll Free Tel: 1.800.676.5342
Fax: 1.800.229.4706
www.andrew.com

* - Indicates Typical

6/21/2006

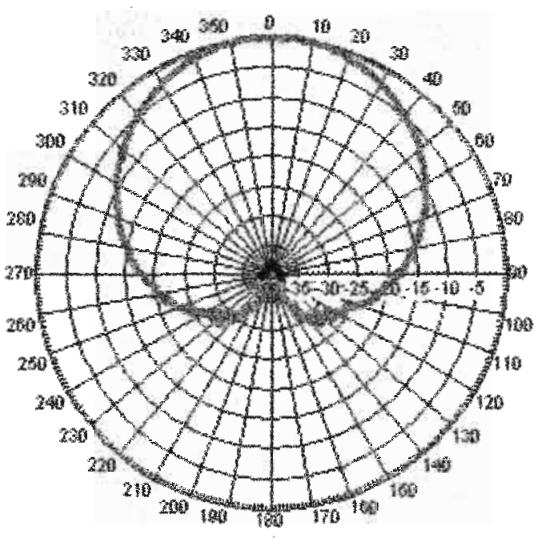
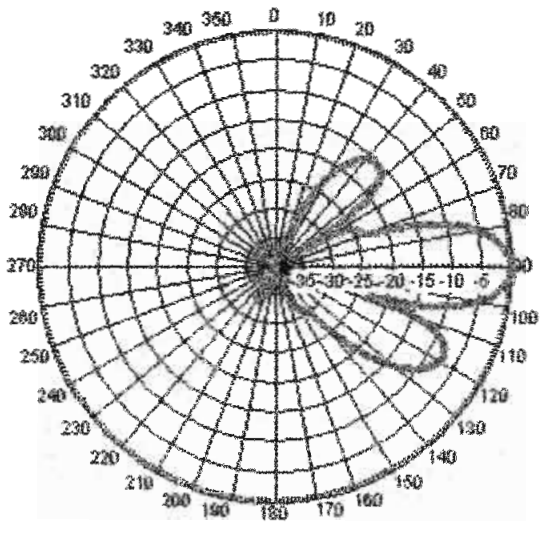
dbtech@andrew.com

Information correct at date of issue but may be subject to change without notice.

DB844H65E-XY

Directed Dipole Antenna

Decibel®
Base Station Antennas

AZIMUTH PATTERN	ELEVATION PATTERN
	
Freq: 835 MHz, Tilt: 0	Freq: 835 MHz, Tilt: 0

Andrew Corporation
2601 Telecom Parkway
Richardson, Texas U.S.A 75082-3521
Tel: 214.631.0310

Fax: 214.631.4706
Toll Free Tel: 1.800.676.5342
Fax: 1.800.229.4706
www.andrew.com

* - Indicates Typical

6/21/2006

dbtech@andrew.com

Information correct at date of issue but may be subject to change without notice.

EMS Wireless

RR65-18-XXDPL2

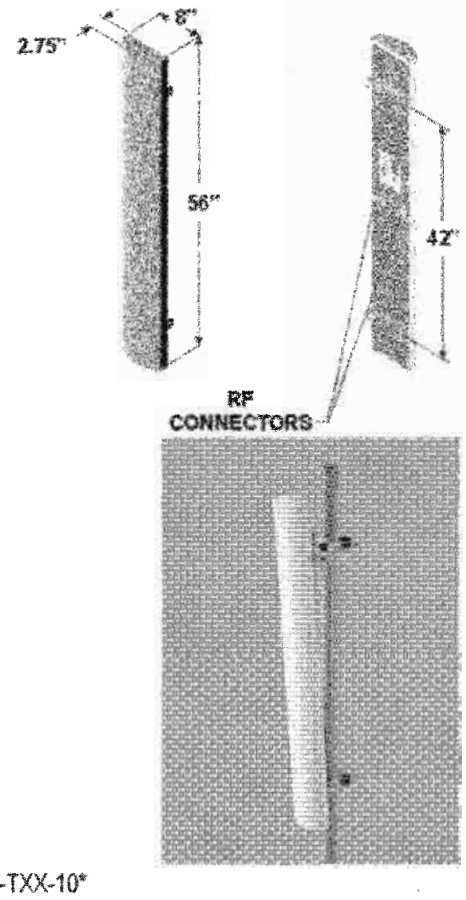
DualPol® Polarization

1850 MHz - 1990 MHz

OptiRange™ Suppressor™

Electrical Specifications

Azimuth Beamwidth (-3 dB)	65°
Elevation Beamwidth(-3 dB)	6°
Elevation Sidelobes (Upper)	≥ 18 dB
Gain	17.5 dBi (15.4 dBd)
Polarization	Dual Linear Slant (± 45°)
Port-to-Port Isolation	≥ 30 dB
Front-to-Back Ratio	≥ 30 dB
Electrical Downtilt Options	0°, 2°, 4°, 6°
VSWR	1.35:1 Max
Connectors	2; 7-16 DIN (female)
Power Handling	250 Watts CW
Passive Intermodulation	≤ -150 dBc [2 x 20 W (+ 43 dBm)]
Lightning Protection	Chassis Ground



Mechanical Specifications

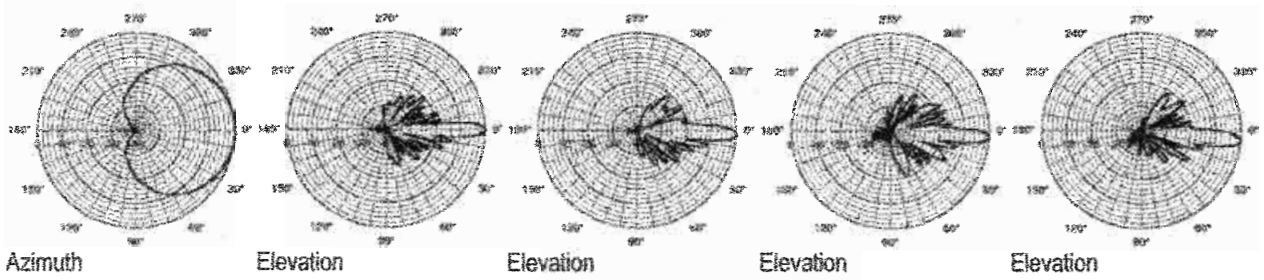
Dimensions (L x W x D)	56 in x 8 in x 2.75 in (142 cm x 20.3 cm x 7.0 cm)
Rated Wind Velocity	150 mph (241 km/hr)
Equivalent Flat Plate Area	3.1ft² (.29 m²)
Front Wind Load @ 100 mph (161 kph)	90 lbs (400 N)
Side Wind Load @ 100 mph (161 kph)	31 lbs (139 N)
Weight	18 lbs (8.2 kg)

Mounting Options

MTG-P00-10, MTG-S02-10, MTG-DXX-20*, MTG-CXX-10*, MTG-C02-10, MTG-TXX-10*

*Note: *Model number shown represents a series of products. See Mounting Options section for specific model number.*

Patterns



Azimuth | Elevation 0° Downtilt | Elevation 2° Downtilt | Elevation 4° Downtilt | Elevation 6° Downtilt

Revised 04/05/02

+1 770.582.0555 ext. 5310 • Fax +1 770.729.0036
www.emswireless.com

Vertically Polarized, Log Periodic 80° / 13 dBd

LPD-7907/4 ___

When ordering, replace "___" with connector type.

Mechanical specifications

Length	1200 mm	47.2 in
Width	130 mm	5.1 in
Depth	375 mm	14.8 in
[4] Weight	12 kg	26.5 lbs
Wind Area	0.40 m^2	4.3 ft^2
Wind load at 50 m/s	830 N	142 lbs

Antenna consisting of brass and covered by a fiberglass radome.

Mounting & Downtilting:
Mounting brackets attach to a pipe diameter of Ø50-160 mm (2.0-6.3 in).

Mounting bracket kit #36110003
Downtilt bracket kit #36114002

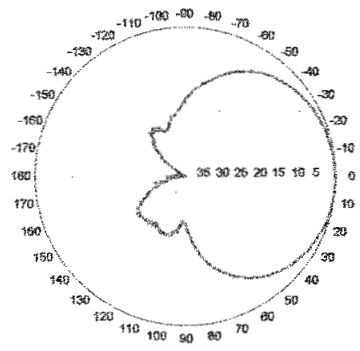
Electrical specifications

Frequency Range	806-960 MHz
Impedance	50Ω
[3] Connector	NE, E-DIN
[1] VSWR	≤1.25:1
Polarization	Vertical
[1] Gain	13 dBd
[2] Power Rating	500 W
[1] Half Power Angle	
H-Plane	80°
E-Plane	14°
[1] Electrical Downtilt	1.25°
[1] Null Fill	5%
Lightning Protection	Direct Ground

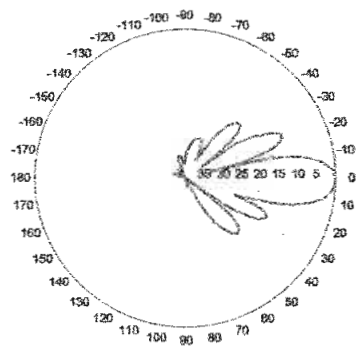
[1] Typical Values
[2] Power Rating limited by connector only
[3] NE indicates an elongated N Connector.
E-DIN indicates an elongated DIN Connector.
[4] The antenna weight listed above does not include the bracket weight.

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.

Radiation-pattern[1)]



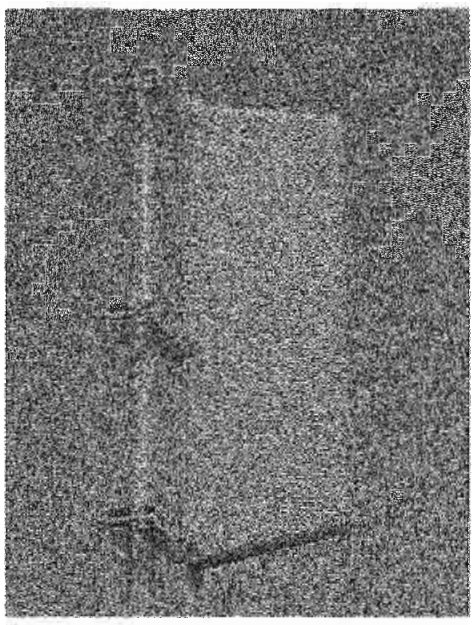
Horizontal



Vertical

Radiation patterns for all antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back Ratio.



Amphenol Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:

- True log-periodic design allows for superior front-to-side characteristics to minimize sector overlap.
- Durable brass feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad bandwidth and superior performance.
- Air as insulation for virtually no internal signal loss.

Every Amphenol Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connector only.

806-960 MHz

Amphenol Antel, Inc.
The Antenna Technology Company

1300 Capital Drive Rockford, IL 61109 Toll-Free (888) 417-9562 Tel. (815) 399-0001
Fax. (815) 399-0156 Email: antel@antelinc.com www.antelinc.com

Revision Date: 6/3/04

7130.18.33.00 A-800-95-16i-0-D

Electrical Specifications

Gain	14dBd (16dBi)
Polarization	linear, vertical
VSWR, 50Ω	<1.5:1 (806MHz to 824MHz)
VSWR, 50Ω	<1.4:1 (824MHz to 896MHz)
Horizontal 3dB beamwidth	95°
Vertical 3dB beamwidth	8°
Electrical downtilt angle	0°
40 degree cone Front-to-back ratio	> 28dB
Suppression of first upper side lobe	> 20dB
Maximum CW input power	500W
Two tone intermodulation 3rd order	< -103dBm for 2x20W (146dBc at 2x43dBm)

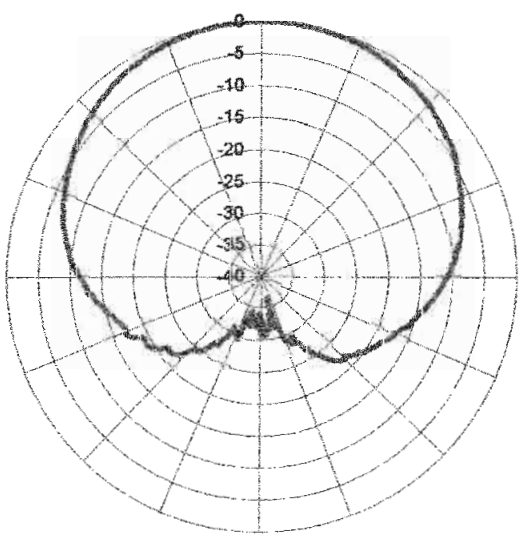
Mechanical Specifications

Connector	7/16 DIN side mounted
Height	102.4" (2600mm)
Width	11.4" (290mm)
Depth	11.4" (290mm)
Weight	35.2lbs (16kg)
Survival wind speed	156mph (70m/s)
Maximum wind area	8.1sq.ft (0.75sq.m)
Frontal wind load @100mph (C=1)	213lbf (947N)

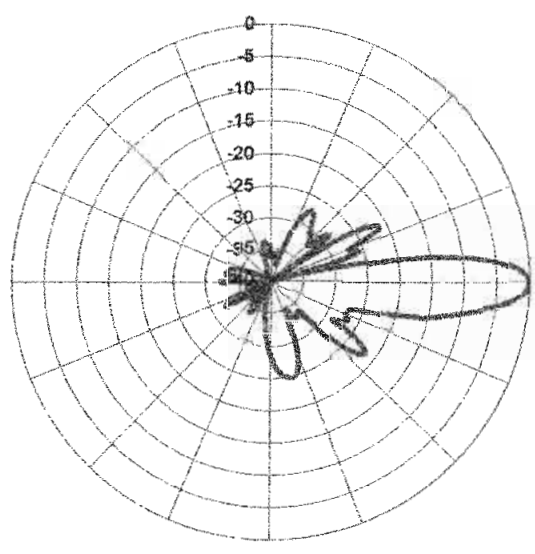
*All metallic components DC grounded for Lightning Protection

Mounting Hardware Options for Installation

1) 2165.10 pole mount (1" minimum to 5" maximum diameter)
2) 7254.10 combined pole mount and downtilt bracket (-0.5° to +12°)



Horizontal Pattern



Vertical Pattern

Future on Demand.

www.us.allgon.com