



TS-METROPCS-033-110720MA

July 20, 2011

Ms. Linda Roberts
Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, Connecticut 06051

RECEIVED
JUL 20 2011
CONNECTICUT
SITING COUNCIL

Re: MetroPCS (HFC0212A) Tower Sharing Request
160 West Street,Cromwell CT

Dear Ms. Roberts:

On behalf of our client, MetroPCS, enclosed please find a tower sharing request (1 Original and 25 Copies) for the existing tower facility referenced above along with a check in the amount of \$625. The tower sharing request contains site plans, signed and sealed structural information and MPE calculations. I'll follow up with the council staff next week to discuss the request further.

Thank you in advance for your consideration of the enclosed.

Very-truly yours,

Michael J. Elsier
Site Acquisition Specialist
Nanepashemet Project Management, Inc.
On behalf of MetroPCS, Inc.

Encs.

Exhibit A- Site Plan

Exhibit B- Structural Analysis

cc: John M. Flanders, First Selectman, Town of Cromwell
Kellie Dunn, MetroPCS
Kate Rugman, MetroPCS
TowerCO

328 West Shore Drive, Marblehead MA 01945
Phone (781) 424-7726

MetroPCS Site ID: HFC0212A
Facility ID: 160 West Street

**METROPCS' TOWER SHARING REQUEST FOR
AN EXISTING TELECOMMUNICATIONS FACILITY AT
160 WEST STREET, CROMWELL, CONNECTICUT**

Pursuant to the Connecticut General Statutes (C.G.S.) § 16-50aa, Metro PCS, Inc., by and through its agent MetroPCS Massachusetts, LLC (“MetroPCS”) hereby requests an order from the Connecticut Siting Council (the “Council”) to approve the proposed shared use of an existing communications tower, located at and owned by TowerCO, 160 West Street in the Town of Cromwell (the “160 West Street Facility”), and leased to MetroPCS. MetroPCS and TowerCO have agreed to the shared use of the West Street Facility as detailed below.

The West Street Facility

The 160 West Street Facility is located just off of exit 19 of CT-372/ West St toward Cromwell. The site is situated on the left side of West Street on an approximate 3.53 acre parcel of land owned by the One Sixty West Street, LLC. The 160 West Street Facility consists of an approximately a Seventy Seven (77) foot high steel stealth monopine telecommunications tower (the “Tower”) and wireless equipment currently being used by Verizon and Sprint/Nextel . The certificate of environmental and public need for the tower structure was issued on November 29, 2007. Associated equipment is located immediately adjacent to the Tower. The current adjacent land uses are general rural and residential. A chain link fence surrounds the Tower and equipment areas. The site coordinates are Latitude 41.605992N and Longitude 72.6704W.

MetroPCS' Wireless Facility

As shown on the enclosed plans (Exhibit A) prepared by Chappell Engineering Associates, including a site plan, compound plan, tower elevation and antenna/equipment detail of the 160 West Street Facility, MetroPCS proposes shared use of the Facility by placing antennas on the Tower and equipment cabinets within the existing fenced compound to provide personal communications services (“PCS”). MetroPCS will install up to six (6) Kathrein Model 800-10504 panel antennas, or their functional equivalents, at the 75 foot level of the Tower. A GPS antenna and associated equipment including a battery cabinet, a ppc cabinet, a cdma modcell cabinet and space for a future battery cabinet and future cdma modcell cabinet will be located on a 10 ft. x 16 foot concrete pad within the existing fenced compound.

Connecticut General Statutes § 16-50aa provides that, upon written request for shared use approval, an order approving such use shall be issued, “if the council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns.” (C.G.S. § 16-50aa(c)(1)). Further, upon approval of such shared use, it is exclusive and no local zoning or land use approvals are required C.G.S. § 16-50x. Shared use of the 160 West Street Facility satisfies the approval criteria set forth in C.G.S. § 16-50aa as follow:

MetroPCS Site ID: HFC0212A

Facility ID: 160 West Street

- A. Technical Feasibility MetroPCS has confirmed that the Tower is structurally capable of supporting the addition of MetroPCS' antennas as set forth in a letter from Vertical Solutions Corporation (Exhibit B). The proposed shared use of this Tower is therefore technically feasible.
- B. Legal Feasibility Pursuant to C.G.S. § 16-50aa, the Council has been authorized to issue an order approving shared use of the existing 160 West Street Facility. (C.G.S. § 16-50aa(c)(1)). Under the authority vested in the Council by C.G.S. § 16-50aa, an order by the Council approving the shared use of a tower would permit the Applicant to obtain a building permit for the proposed installation.
- C. Environmental Feasibility The proposed shared use would have a minimal environmental effect, for the following reasons:
- a. The proposed installation would have a de minimis visual impact, and would not cause any significant change or alteration in the physical or environmental characteristics of the existing facility;
 - b. The proposed installation by MetroPCS would not increase the height of the tower or extend the boundaries of the 160 West Street Facility;
 - c. The proposed installation would not increase the noise levels at the existing facility boundaries by six (6) decibels or more;
 - d. Operation of MetroPCS antennas at this site would not exceed the total radio frequency electromagnetic radiation power density level adopted by the FCC and Connecticut Department of Health. The "worst case" exposure calculated for the operation of this facility for all carriers would be approximately 76.64% of MPE as prepared by Frantz Pierre, RF Engineer, MetroPCS and detailed in the Power Density Calculation section shown on the next page;
 - e. The proposed shared use of the 160 West Street Facility would not require any water or sanitary facilities, or generate air emissions or discharges to water bodies. Further, the installation will not generate any traffic other than for periodic maintenance visits.
- D. Economic Feasibility The Applicant and the Tower owner have agreed to share use of the 160 West Street Facility on terms agreeable to both parties. The proposed tower sharing is therefore economically feasible.
- E. Public Safety As stated above and evidenced in the power density calculation shown on the next page, the operation of MetroPCS' facility will not increase the cumulative radio frequency electromagnetic radiation power density at the Tower site's boundary to or above the standard adopted by the Connecticut Department of Environmental Protection as set forth in Section 22a-162 of the Connecticut General Statutes and MPE limits

MetroPCS Site ID: HFC0212A

Facility ID: 160 West Street

established by the Federal Communications Commission. Further, the addition of MetroPCS' telecommunications service in the Cromwell area through shared use of the 160 West Street Facility is expected to enhance the safety and welfare of local residents and travelers through the area resulting in an improvement to public safety in this area of Cromwell.

Power Density Calculation

The tower currently has Two (2) existing carriers: Verizon and Sprint/Nextel. The power density for existing conditions is fully documented in the last filing with the Connecticut. The corresponding power density of existing conditions is 62.7% of the MPE. Calculations for MetroPCS' proposed facility are as follows:

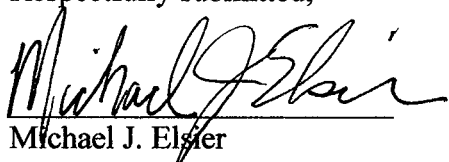
Carrier	Centerline Height	Frequency (MHz)	Number of Channels	Power Per Channel (Watts)	Power Density	Standard Limits	Percent of Limits
MetroPCS	75'	2140	3	727	0.1394	1.0000	13.94%

When combining the cumulative "worse case" power density levels for the existing facility with MetroPCS' proposed facility, it would result in a total power density of 76.64% which is well within applicable standards.

Conclusion

As delineated above, the proposed shared use of the 160 West Street Facility satisfies the criteria set forth in C.G.S. § 16-50aa, and advances the General Assembly's and the Siting Council's goal of preventing the proliferation of towers in the State of Connecticut. MetroPCS therefore requests the Siting Council issue an order approving the proposed shared use of the West Street Facility.

Respectfully submitted,

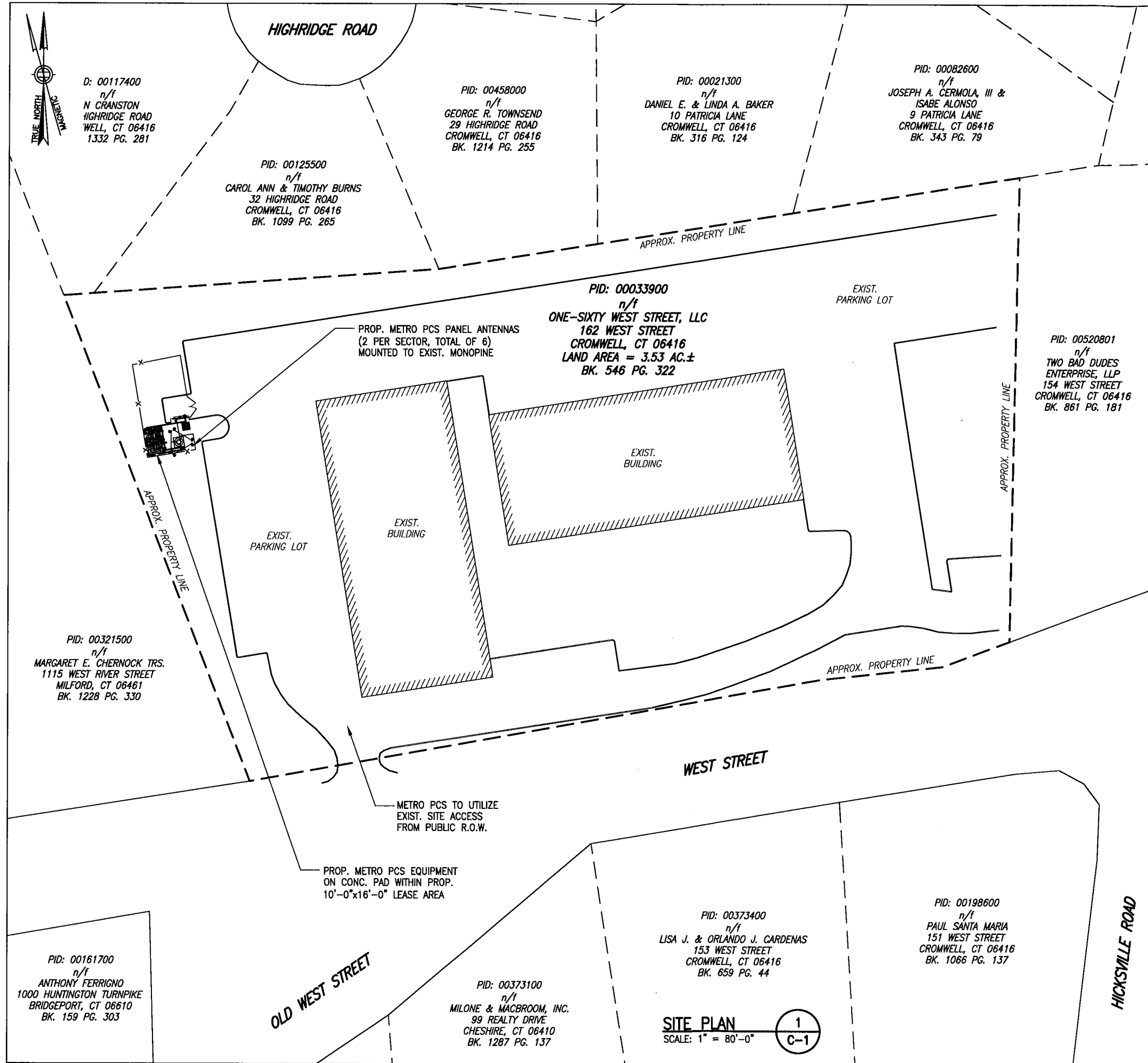
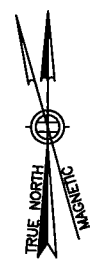


Michael J. Elsier
Nanepashemet Project Management, Inc.
Site Acquisition Specialist
On behalf of Metro PCS, Inc.

cc: John M. Flanders, First Selectman, Town of Cromwell
Kellie Dunn, MetroPCS
Kate Rugman, MetroPCS
TowerCo

Exhibit A

Site Plans



D: 00117400
n/f
N CRANSTON
HIGHRIERGE ROAD
WELL, CT 06416
1332 PG. 281

PID: 00458000
n/f
GEORGE R. TOWNSEND
29 HIGHRIERGE ROAD
CROMWELL, CT 06416
BK. 1214 PG. 255

PID: 00021300
n/f
DANIEL E. & LINDA A. BAKER
10 PATRICIA LANE
CROMWELL, CT 06416
BK. 316 PG. 124

PID: 00082600
n/f
JOSEPH A. CERMOLA, III &
ISABE ALONSO
9 PATRICIA LANE
CROMWELL, CT 06416
BK. 343 PG. 79

PID: 00125500
n/f
CAROL ANN & TIMOTHY BURNS
32 HIGHRIERGE ROAD
CROMWELL, CT 06416
BK. 1099 PG. 265

PID: 00033900
n/f
ONE-SIXTY WEST STREET, LLC
162 WEST STREET
CROMWELL, CT 06416
LAND AREA = 3.53 AC.±
BK. 546 PG. 322

PID: 00520801
n/f
TWO BAD DUDES
ENTERPRISE, LLP
154 WEST STREET
CROMWELL, CT 06416
BK. 861 PG. 181

PID: 00321500
n/f
MARGARET E. CHERNOCK TRS.
1115 WEST RIVER STREET
MILFORD, CT 06461
BK. 1228 PG. 330

PID: 00161700
n/f
ANTHONY FERRIGNO
1000 HUNTINGTON TURNPIKE
BRIDGEPORT, CT 06610
BK. 159 PG. 303

PID: 00373100
n/f
MILONE & MACBROOM, INC.
99 REALTY DRIVE
CHESHIRE, CT 06410
BK. 1287 PG. 137

PID: 00373400
n/f
LISA J. & ORLANDO J. GARDENAS
153 WEST STREET
CROMWELL, CT 06416
BK. 659 PG. 44

PID: 00198600
n/f
PAUL SANTA MARIA
151 WEST STREET
CROMWELL, CT 06416
BK. 1066 PG. 137

SITE PLAN
SCALE: 1" = 80'-0"
1
C-1

metroPCS
Unlimit Yourself.

285 BILLERICA ROAD
THIRD FLOOR
CHELMSFORD, MA 01824
TEL (978) 244-7200
FAX (978) 244-7240



CHAPPELL
ENGINEERING
ASSOCIATES, LLC

Civil - Structural - Land Surveying

R.K. EXECUTIVE CENTRE
201 BOSTON POST ROAD WEST, SUITE 301
MARLBOROUGH, MA 01752
TEL (508) 481-7400
FAX (508) 481-7406

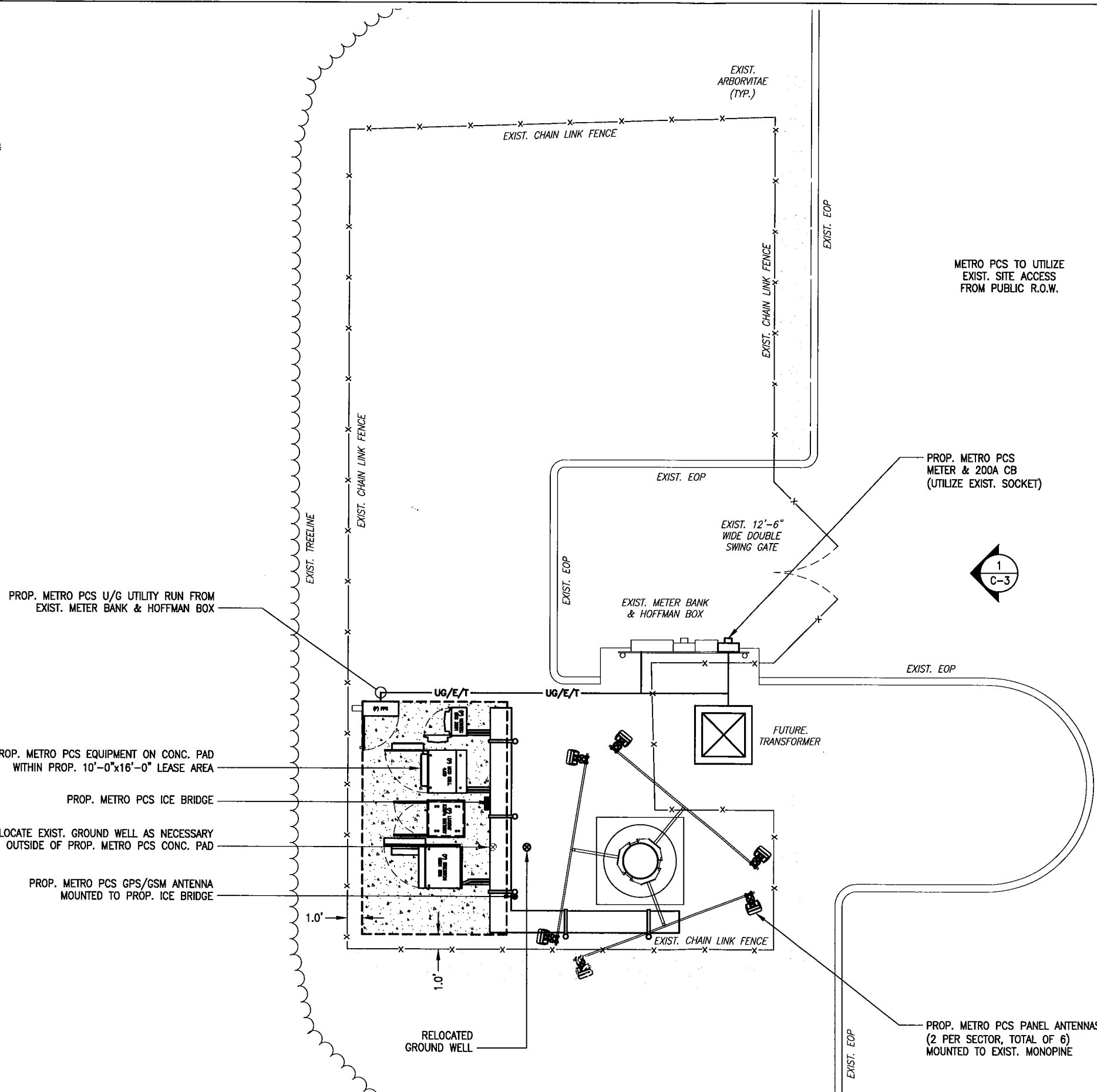
0	07/20/11	CONN. SITING COUNCIL PLAN	NWC	JMT	JMT
NO.	DATE	REVISIONS	BY	CHK	APP'D
NOT TO SCALE		DESIGNED BY: JMT	DRAWN BY: CMC		

SITE OWNER	DATE
CONSTRUCTION MANAGER	DATE
RF ENGINEER	DATE
SITE ACQUISITION	DATE

THE ABOVE PARTIES HEREBY APPROVE AND ACCEPT THESE DOCUMENTS AND AUTHORIZE THE CONTRACTOR TO PROCEED WITH THE CONSTRUCTION DESCRIBED HERIN. ALL CONSTRUCTION DOCUMENTS ARE SUBJECT TO REVIEW BY THE LOCAL BUILDING DEPARTMENT AND ANY CHANGES OR MODIFICATIONS THEY MAY IMPOSE.

SITE ID	HFC0212A
SITE NAME	TOWERCO WEST STREET CROMWELL
SITE ADDRESS	160 WEST STREET CROMWELL, CT 06416
METRO PCS LEASE AREA	EQUIPMENT: 10'-0"x16'-0"=160.0 S.F.
TOTAL:	= 160.0 S.F.

PROJECT NO.	DRAWING NAME	DATE	SHEET NO.	REV
736.383	C-1	07/20/11	1 OF 4	0



PROP. METRO PCS U/G UTILITY RUN FROM EXIST. METER BANK & HOFFMAN BOX

PROP. METRO PCS EQUIPMENT ON CONC. PAD WITHIN PROP. 10'-0"x16'-0" LEASE AREA

PROP. METRO PCS ICE BRIDGE

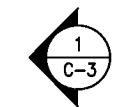
RELOCATE EXIST. GROUND WELL AS NECESSARY OUTSIDE OF PROP. METRO PCS CONC. PAD

PROP. METRO PCS GPS/GSM ANTENNA MOUNTED TO PROP. ICE BRIDGE

RELOCATED GROUND WELL

PROP. METRO PCS METER & 200A CB (UTILIZE EXIST. SOCKET)

PROP. METRO PCS PANEL ANTENNAS (2 PER SECTOR, TOTAL OF 6) MOUNTED TO EXIST. MONOPINE



COMPOUND PLAN
SCALE: 1" = 10'-0"
1
C-2

metroPCS
Unlimit Yourself.

285 BILLERICA ROAD
THIRD FLOOR
CHELMSFORD, MA 01824
TEL (978) 244-7200
FAX (978) 244-7240



CHAPPELL
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0	07/20/11	CONN. SITING COUNCIL PLAN	NWC	JMT	JMT
NO.	DATE	REVISIONS	BY	CHK	APP'D
NOT TO SCALE			DESIGNED BY: JMT		DRAWN BY: CMC

APPROVALS

SITE OWNER _____ DATE _____

CONSTRUCTION MANAGER _____ DATE _____

RF ENGINEER _____ DATE _____

SITE ACQUISITION _____ DATE _____

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SITE ID
HFC0212A

SITE NAME
TOWERCO WEST STREET
CROMWELL

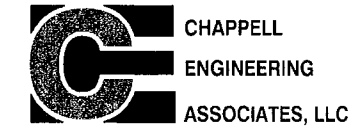
SITE ADDRESS
160 WEST STREET
CROMWELL, CT
06416

METRO PCS LEASE AREA
EQUIPMENT: 10'-0"x16'-0"=160.0 S.F.

TOTAL: = 160.0 S.F.

PROJECT NO.	DRAWING NAME	DATE	SHEET NO.	REV
736.383	C-2	07/20/11	2 OF 4	0

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NO.	DATE	REVISIONS	BY	CHK	APP'D
0	07/20/11	CONN. SITING COUNCIL PLAN	NWC	JMT	JMT

NOT TO SCALE DESIGNED BY: JMT DRAWN BY: CMC

APPROVALS

SITE OWNER	DATE
CONSTRUCTION MANAGER	DATE
RF ENGINEER	DATE
SITE ACQUISITION	DATE

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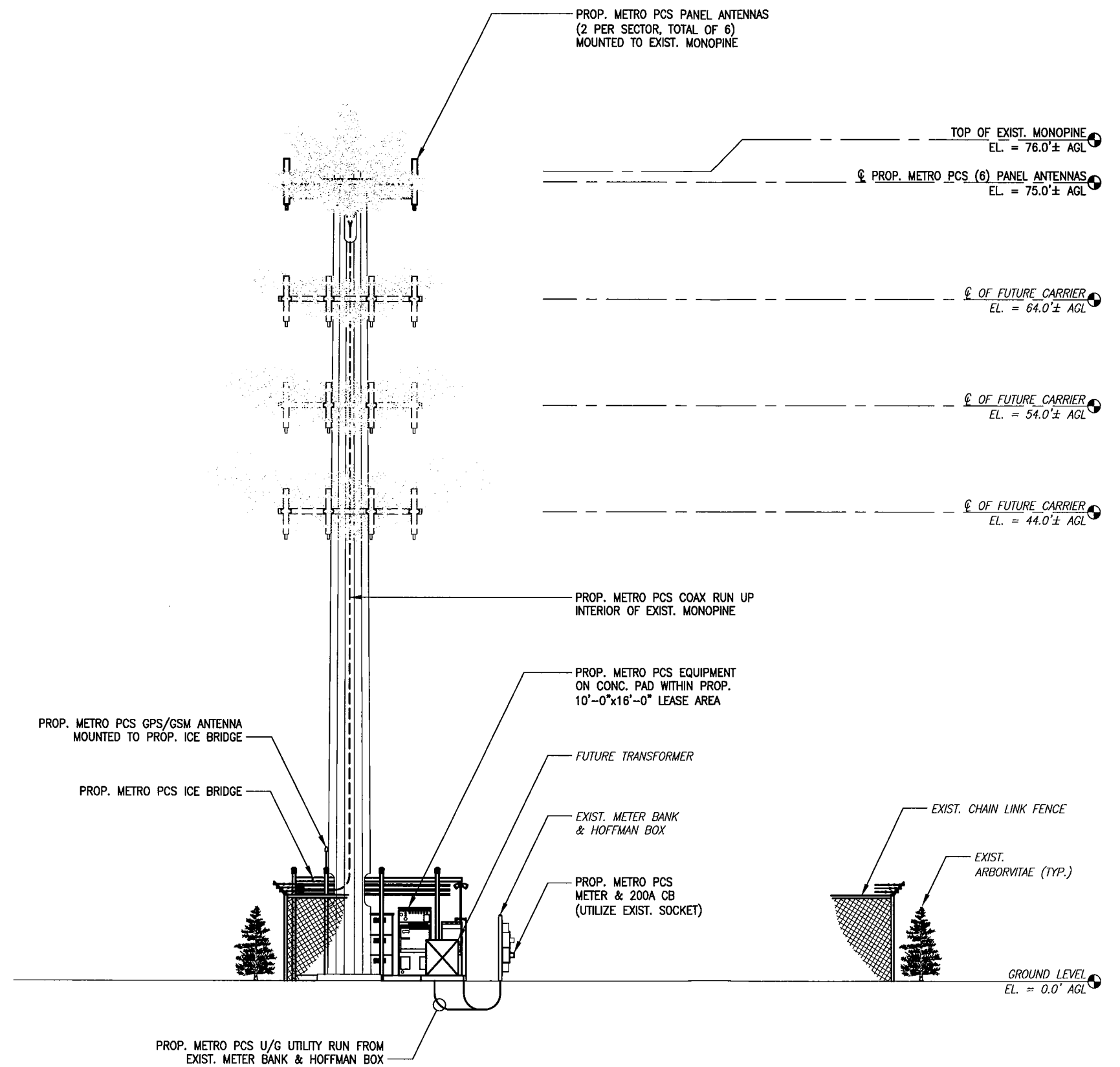
SITE ID
HFC0212A

SITE NAME
TOWERCO WEST STREET CROMWELL

SITE ADDRESS
160 WEST STREET
CROMWELL, CT
06416

METRO PCS LEASE AREA
EQUIPMENT: 10'-0"x16'-0"=160.0 S.F.
TOTAL: = 160.0 S.F.

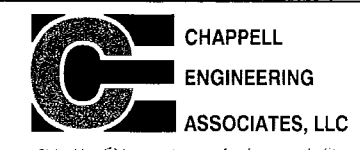
PROJECT NO.	DRAWING NAME	DATE	SHEET NO.	REV
736.383	C-3	07/20/11	3 OF 4	0



EAST TOWER ELEVATION
SCALE: 1" = 15'-0"



285 BILLERICA ROAD
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0	07/20/11	CONN. SITING COUNCIL PLAN	NWC	JMT	JMT
NO.	DATE	REVISIONS	BY	CHK	APP'D
NOT TO SCALE		DESIGNED BY: JMT	DRAWN BY: CMC		

APPROVALS

SITE OWNER	DATE
CONSTRUCTION MANAGER	DATE
RF ENGINEER	DATE
SITE ACQUISITION	DATE

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SITE ID
HFC0212A

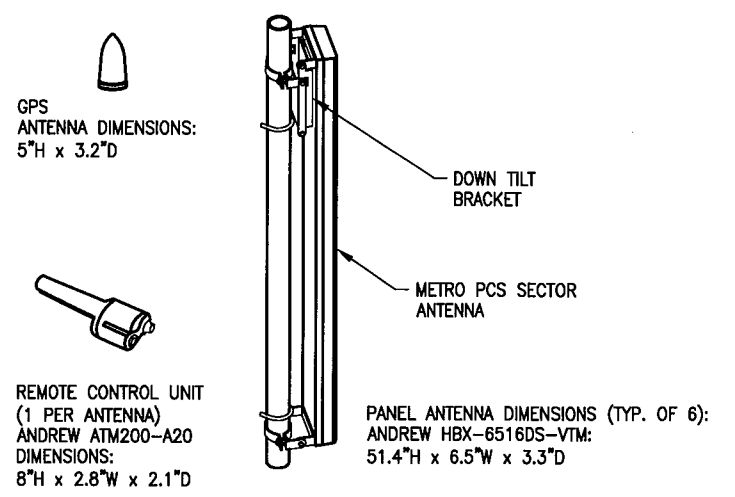
SITE NAME
TOWERCO WEST STREET
CROMWELL

SITE ADDRESS
160 WEST STREET
CROMWELL, CT
06416

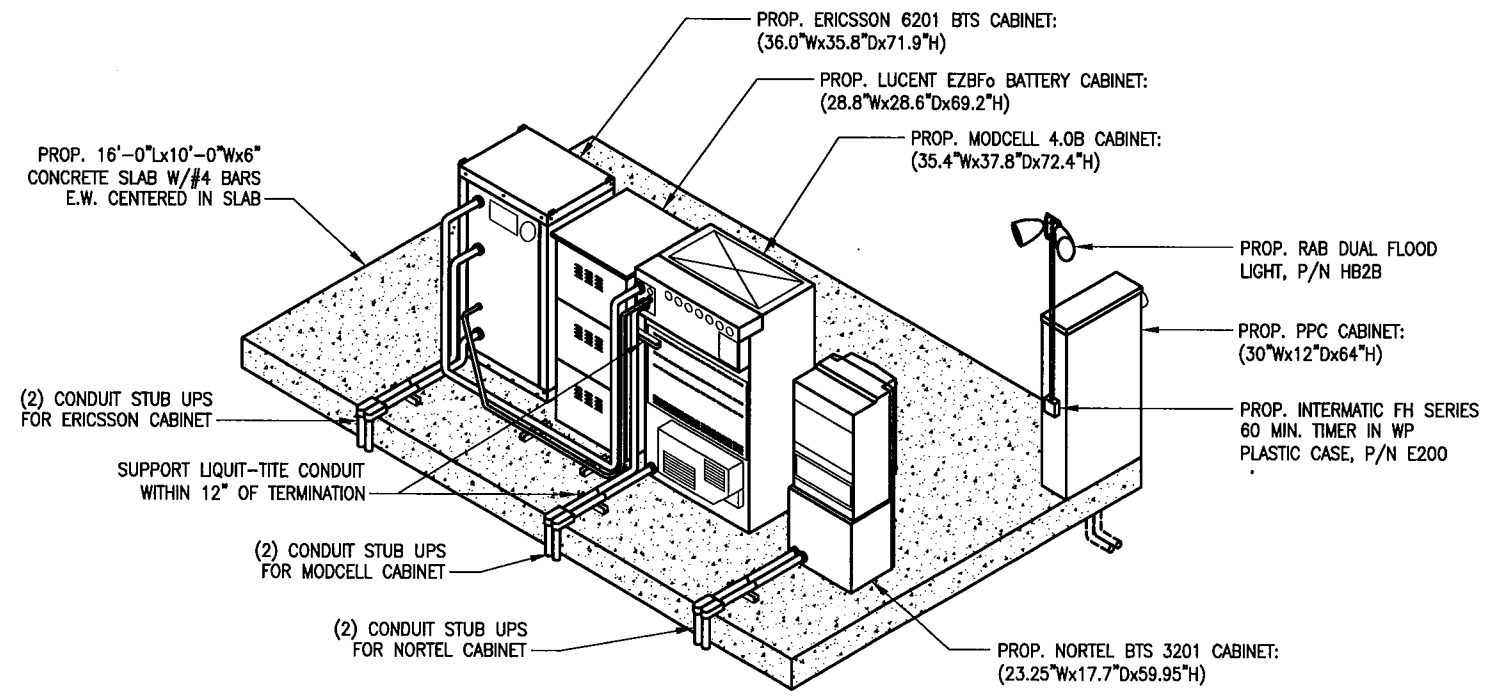
METRO PCS LEASE AREA
EQUIPMENT: 10'-0"x16'-0"=160.0 S.F.

TOTAL: = 160.0 S.F.

PROJECT NO.	DRAWING NAME	DATE	SHEET NO.	REV
736.383	C-4	07/20/11	4 OF 4	0



GPS & PANEL ANTENNA DETAIL 1
SCALE: NOT TO SCALE C-4



EQUIPMENT DETAIL 2
SCALE: NOT TO SCALE C-4

Exhibit B

Structural Analysis

June 08, 2011

Mr. Stephen Rambeau
TowerCo, LLC
5000 Valleystone Drive
Cary, NC 27519
(919) 632-7866

Vertical Solutions, Inc.
PO Box 579
Holly Springs, NC 27540
(888) 321-6167
operations@verticalsolutions-inc.com

Subject: **Rigorous Structural Analysis**

Carrier Designation **Metro PCS, Co-Location**
Site Number: HFC0212A
Site Name: Cromell Monopine

TowerCo Designation **Site Number: CT0004**
Site Name: Middletown North

Engineering Firm Designation **Vertical Solutions Project: 110718.01 Rev0**

Site Data **160 West Street, Cromwell, Middlesex County, CT 06416**
Latitude: N41° 36' 21.60"±; Longitude: W072° 40'13.40"±
Elevation: 133 ft±, Topography Category: 1;
Exposure Category: "C"; Structure Class II; Site Class "D"
77-ft Self Supporting Pole Structure (Monopine)

Dear Mr. Rambeau,

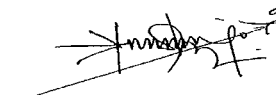
To your request, we present our structural analysis.

Our work indicates that with the proposed appurtenance configuration, the tower and foundation **will** satisfy the structural strength requirements of ANSI/TIA-222-G-2005, *Structural Standard for Antenna Supporting Structures and Antennas* (industry standard) and the *2003 International Building Code* (local building code) for:

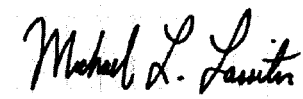
- 85-mph fastest mile basic wind speed
- 74-mph fastest mile basic wind speed with 1/2-in radial ice

We trust you find our work satisfactory. Please do not hesitate to call should you have any questions.

Sincerely,



Kingsley C. Igboanugo, E.I.
Structural Engineer-In-Training



Michael L. Lassiter, S.E., P.E., C.W.I.
Structural Engineer, Civil Engineer, Certified Weld Inspector
& President
CT PE License 25064

Table 1: Existing, Proposed and Reserved Appurtenance Configuration

Elevation (AGL, ft)	Carrier	Mount	Equipment	Coax	Location
75	Metro PCS	(3) T-Arms	(6) Andrew HBX-6516DS-VTM (6) Andrew ATM200-A20	(12) 7/8 (6) 3/8	Inside
64	Verizon	(3) T-Arms	(6) Antel LPA-185063/8CF (6) Decibel DB846F65ZAXY (3) Antel BXA-70063/6CF	(24) 1 5/8	Inside

Table 2: Tower Structure Results, Percent Capacity Utilized

Elevation (ft)	Shaft	Result	Connections	Result
76 to 23	62	O.K.	-	-
23 to 0	64	O.K.	63	O.K.

1 -Utilization of 105% or less considered acceptable

Table 3: Foundation Results, Percent Capacity Utilized

Component	Design Foundation	Analysis Requirements	Percent Utilized	Result
Moment	1944 k-ft	1306 k-ft	67	O. K.
Axial	19 k	11 k	58	O. K.
Shear	37 k	23 k	62	O. K.

1-Design reactions have been multiplied by a factor of 1.35 per 15.5.1 of TIA-222-G.

Attachments:

- Project History
- Proposed Coax Layout, QP-P
- RISA Tower Program input and output
- Base plate and anchor rod calculations



Project History, 110718, CT0004, Middletown_CT

TowerCo Document	Structure	Issued Date	Document ID	Issued By	Issued To	Description
165073	CT0004	12/31/2007	20071231_GEO_CT00004.Pdf	Dr. Clarence Welti, P.E, P.C.	URS	Geotechnical Investigation
781268	CT0004	2/17/2010	20100217_TDDC_CT00004.Pdf	DaVinci Engineering	TowerCo	Tower Design Drawings with Calculations
782279	CT0004	2/23/2010	20100223_FDD_CT00004.Pdf	Vertical Solutions	TowerCo	Foundation Design Drawings
803325	CT0004	7/19/2010	20100719_TED_CT00004.Pdf	TransAmerican	Cell Trees, Inc.	Tower Erection Drawing
--	CT0004	6/8/2011	20110608_CTA_CT00004.Pdf	Metro PCS	TowerCo	Co-location Tenant Application

Table Note:

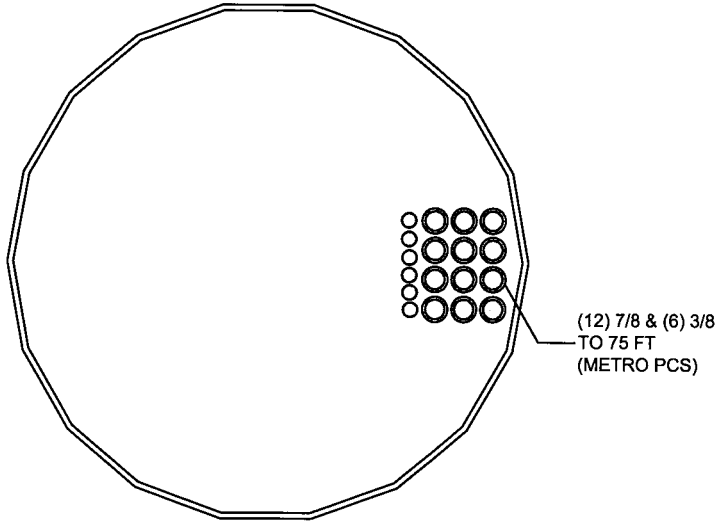
Files name format YYYYMMDD-XXX-ZZZZZZ.pdf

Where:

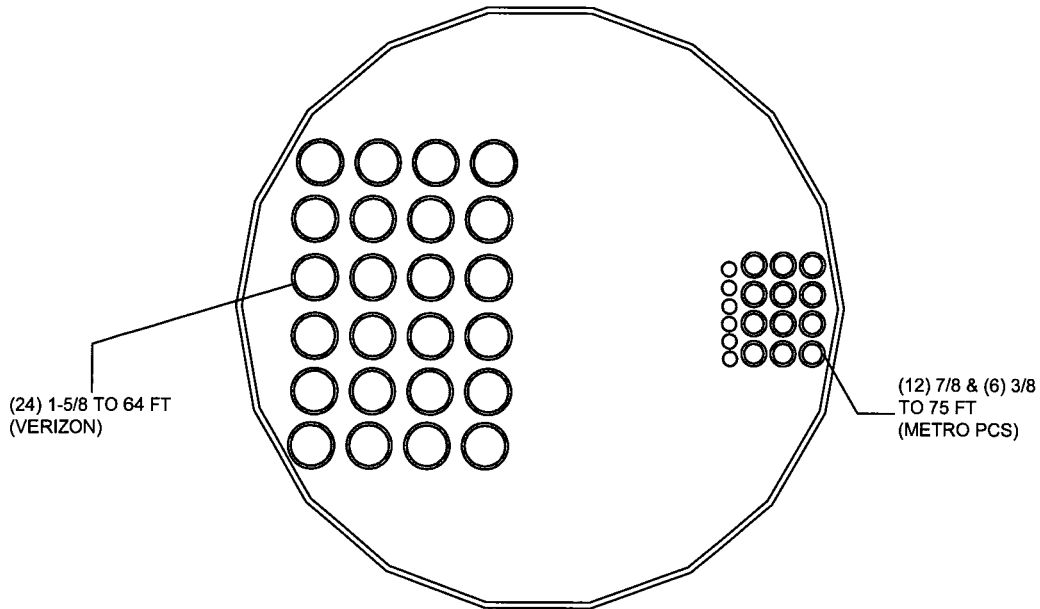
- YYYY=year
- MM=month
- DD=day published/issued
- XXX=file descriptor
- GEO=geotechnical report
- HLS=hydrological study
- FDD=foundation design drawings
- TDC=tower design calculations
- TDD=tower design drawings
- SAR=structural analysis report
- TID=tower improvement drawings
- ZZZZZ=TowerCo Site ID

Additional Comment:

**COAX CONFIGURATION
PLAN AT 75.0-FT**



**COAX CONFIGURATION
PLAN AT 64.0-FT**



**COAX CONFIGURATION
PLAN AT 64.0-FT**

SCALE: 1-1/2" = 1'-0"

DRAWN BY:	KCI	CHECKED BY:	MLL
SHEET NUMBER:		REVISION:	0
QP-P		VSI #: 110718.01	

REV	DATE
0	06/08/2011

PREPARED FOR:

5000 Valley Stone Drive
Cary, NC 27519
Office: (919) 489-5559
Fax: (919) 489-5530
www.towerco.com

TowerCo

PROJECT NAME:
MIDDLETOWN NORTH

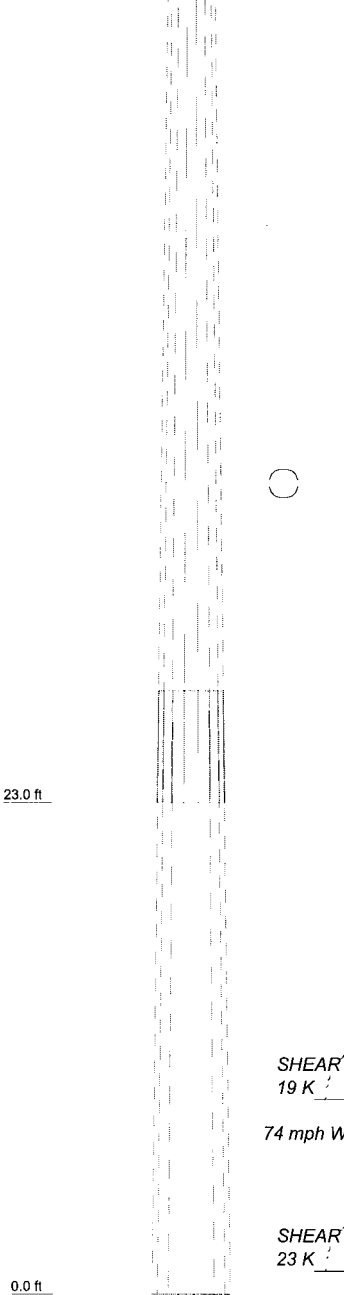
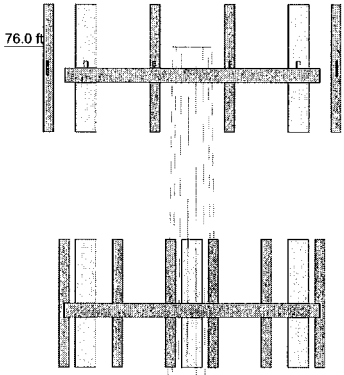
TOWERCO JOB #:
CT0004

PREPARED BY:

2002 Production Drive
Apex, NC 27539
Office: (888) 321-6167
Fax: (919) 321-1788
www.verticalsolutions-inc.com

vertical solutions

Section	1	2
Length (ft)	53.00	28.25
Number of Sides	18	18
Thickness (in)	0.2500	0.3125
Socket Length (ft)	5.25	35.9502
Top Dia (in)	22.0000	44.5000
Bot Dia (in)	38.0390	
Grade	4.3	3.8
Weight (K)		8.1



DESIGNED APPURTENANCE LOADING

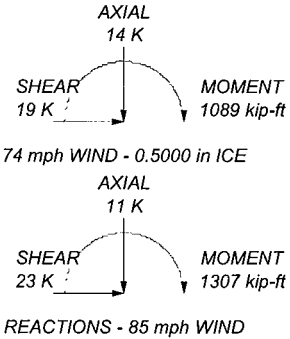
TYPE	ELEVATION	TYPE	ELEVATION
4-ft Branches	75.45	(2) DB846F65ZAXY w/Mount Pipe (Verizon)	64
(2) Andrew HBX-6516DS-VTM with Mount Pipe (Metro PCS)	75	Antel BXA-70063/6CF w Mount Pipe (Verizon)	64
(2) Andrew HBX-6516DS-VTM with Mount Pipe (Metro PCS)	75	Antel BXA-70063/6CF w Mount Pipe (Verizon)	64
(2) Andrew ATM200-A20 (Metro PCS)	75	Antel BXA-70063/6CF w Mount Pipe (Verizon)	64
(2) Andrew ATM200-A20 (Metro PCS)	75	Antel BXA-70063/6CF w Mount Pipe (Verizon)	64
(2) Andrew ATM200-A20 (Metro PCS)	75	2' Standoff T-Arm (10' face width) (Verizon)	64
2' Standoff T-Arm (10' face width) (Metro PCS)	75	2' Standoff T-Arm (10' face width) (Verizon)	64
2' Standoff T-Arm (10' face width) (Metro PCS)	75	2' Standoff T-Arm (10' face width) (Verizon)	64
(2) Andrew HBX-6516DS-VTM with Mount Pipe (Metro PCS)	75	(2) Antel LPA-185063/8CF w/ mp (Verizon)	64
Antenna Branches	74	(2) Antel LPA-185063/8CF w/ mp (Verizon)	64
6-ft Branches	67.06	(2) Antel LPA-185063/8CF w/ mp (Verizon)	64
(2) DB846F65ZAXY w/Mount Pipe (Verizon)	64	8-ft Branches	55.44
(2) DB846F65ZAXY w/Mount Pipe (Verizon)	64	10-ft Branches	42.31

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 60 mph wind.
5. TOWER RATING: 63.6%



	TowerCo LLC 5000 Vallestone Dr. Cary, NC 27519 Phone: (919) 469-5559 FAX: (919) 469-5530	Job: CT0004 Project: 110718.01 Client: TowerCo Code: TIA/EIA-222-F Path: L:\2011\0718_Middletown North_CTYTask1\Models\CT0004-ERP.er
	Drawn by: Kingsley Date: 06/09/11 Scale: NTS Dwg No. E-1	App'd: App'd: App'd:

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Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in Middlesex County, Connecticut.

Basic wind speed of 85 mph.

Nominal ice thickness of 0.5000 in.

Ice density of 56 pcf.

A wind speed of 74 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Treat Feedline Bundles As Cylinder
Consider Moments - Horizontals	Assume Legs Pinned	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Diagonals	√ Assume Rigid Index Plate	√ Calculate Redundant Bracing Forces
Use Moment Magnification	√ Use Clear Spans For Wind Area	Ignore Redundant Members in FEA
√ Use Code Stress Ratios	√ Use Clear Spans For KL/r	SR Leg Bolts Resist Compression
√ Use Code Safety Factors - Guys	√ Retension Guys To Initial Tension	√ All Leg Panels Have Same Allowable
Escalate Ice	√ Bypass Mast Stability Checks	Offset Girt At Foundation
Always Use Max Kz	√ Use Azimuth Dish Coefficients	Consider Feedline Torque
Use Special Wind Profile	√ Project Wind Area of Appurt.	Include Angle Block Shear Check
√ Include Bolts In Member Capacity	√ Autocalc Torque Arm Areas	Poles
√ Leg Bolts Are At Top Of Section	SR Members Have Cut Ends	√ Include Shear-Torsion Interaction
√ Secondary Horizontal Braces Leg	Sort Capacity Reports By Component	Always Use Sub-Critical Flow
Use Diamond Inner Bracing (4 Sided)	√ Triangulate Diamond Inner Bracing	Use Top Mounted Sockets
Add IBC .6D+W Combination		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	76.00-23.00	53.00	5.25	18	22.0000	38.0390	0.2500	1.0000	A572-65 (65 ksi)
L2	23.00-0.00	28.25		18	35.9502	44.5000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

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Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	It/Q in ²	w in	w/t
L1	22.3394	17.2586	1031.4832	7.7212	11.1760	92.2945	2064.3237	8.6310	3.4320	13.728
	38.6258	29.9856	5409.7922	13.4151	19.3238	279.9547	10826.7027	14.9956	6.2549	25.019
L2	38.1182	35.3482	5671.8473	12.6514	18.2627	310.5697	11351.1578	17.6774	5.7772	18.487
	45.1865	43.8285	10811.6677	15.6866	22.6060	478.2654	21637.5616	21.9184	7.2820	23.302

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
L1 76.00-23.00				1	1	1		
L2 23.00-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A	Weight
						ft ² /ft	plf
LDF5-50A (7/8 FOAM) (Metro PCS)	A	No	Inside Pole	75.00 - 0.00	12	No Ice 1/2" Ice	0.00 0.33
LDF2-50A (3/8 FOAM) (Metro PCS)	A	No	Inside Pole	75.00 - 0.00	6	No Ice 1/2" Ice	0.00 0.08

LDF7-50A (1-5/8 FOAM) (Verizon)	A	No	Inside Pole	64.00 - 0.00	24	No Ice 1/2" Ice	0.00 0.82

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R	A _F	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	76.00-23.00	A	0.000	0.000	0.000	0.000	1.04
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
L2	23.00-0.00	A	0.000	0.000	0.000	0.000	0.55
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R	A _F	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	76.00-23.00	A	0.500	0.000	0.000	0.000	0.000	1.04
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
L2	23.00-0.00	A	0.500	0.000	0.000	0.000	0.000	0.55
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00

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Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz	Vert						
			ft	ft	°	ft	ft ²	ft ²	K	
(2) Andrew HBX-6516DS-VTM with Mount Pipe (Metro PCS)	A	From Leg	4.00	0.00	0.0000	75.00	No Ice 1/2" Ice	3.55 3.93	3.62 4.24	0.06 0.10
(2) Andrew HBX-6516DS-VTM with Mount Pipe (Metro PCS)	B	From Leg	4.00	0.00	0.0000	75.00	No Ice 1/2" Ice	3.55 3.93	3.62 4.24	0.06 0.10
(2) Andrew HBX-6516DS-VTM with Mount Pipe (Metro PCS)	C	From Leg	4.00	0.00	0.0000	75.00	No Ice 1/2" Ice	3.55 3.93	3.62 4.24	0.06 0.10
(2) Andrew ATM200-A20 (Metro PCS)	A	From Leg	4.00	0.00	0.0000	75.00	No Ice 1/2" Ice	0.22 0.29	0.20 0.27	0.01 0.01
(2) Andrew ATM200-A20 (Metro PCS)	B	From Leg	4.00	0.00	0.0000	75.00	No Ice 1/2" Ice	0.22 0.29	0.20 0.27	0.01 0.01
(2) Andrew ATM200-A20 (Metro PCS)	C	From Leg	4.00	0.00	0.0000	75.00	No Ice 1/2" Ice	0.22 0.29	0.20 0.27	0.01 0.01
2' Standoff T-Arm (10' face width) (Metro PCS)	A	None			0.0000	75.00	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
2' Standoff T-Arm (10' face width) (Metro PCS)	B	None			0.0000	75.00	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
2' Standoff T-Arm (10' face width) (Metro PCS)	C	None			0.0000	75.00	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17

(2) Antel LPA-185063/8CF w/ mp (Verizon)	A	From Leg	3.00	0.00	0.0000	64.00	No Ice 1/2" Ice	3.32 3.73	4.06 4.67	0.04 0.07
(2) Antel LPA-185063/8CF w/ mp (Verizon)	B	From Leg	3.00	0.00	0.0000	64.00	No Ice 1/2" Ice	3.32 3.73	4.06 4.67	0.04 0.07
(2) Antel LPA-185063/8CF w/ mp (Verizon)	C	From Leg	3.00	0.00	0.0000	64.00	No Ice 1/2" Ice	3.32 3.73	4.06 4.67	0.04 0.07
(2) DB846F65ZAXY w/Mount Pipe (Verizon)	A	From Leg	3.00	0.00	0.0000	64.00	No Ice 1/2" Ice	7.27 7.88	7.82 9.01	0.05 0.11
(2) DB846F65ZAXY w/Mount Pipe (Verizon)	B	From Leg	3.00	0.00	0.0000	64.00	No Ice 1/2" Ice	7.27 7.88	7.82 9.01	0.05 0.11
(2) DB846F65ZAXY w/Mount Pipe (Verizon)	C	From Leg	3.00	0.00	0.0000	64.00	No Ice 1/2" Ice	7.27 7.88	7.82 9.01	0.05 0.11
Antel BXA-70063/6CF w Mount Pipe	A	From Leg	3.00	0.00	0.0000	64.00	No Ice 1/2" Ice	7.75 8.29	6.10 7.04	0.04 0.10

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement	C _A A ₁ Front	C _A A ₁ Side	Weight	
			ft ft ft	°	ft	ft ²	ft ²	K	
(Verizon)			0.00						
Antel BXA-70063/6CF w Mount Pipe (Verizon)	B	From Leg	3.00	0.0000	64.00	No Ice 1/2" Ice	7.75 8.29	6.10 7.04	0.04 0.10
Antel BXA-70063/6CF w Mount Pipe (Verizon)	C	From Leg	3.00	0.0000	64.00	No Ice 1/2" Ice	7.75 8.29	6.10 7.04	0.04 0.10
2' Standoff T-Arm (10' face width) (Verizon)	A	None		0.0000	64.00	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
2' Standoff T-Arm (10' face width) (Verizon)	B	None		0.0000	64.00	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
2' Standoff T-Arm (10' face width) (Verizon)	C	None		0.0000	64.00	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
Antenna Branches	C	None		0.0000	74.00	No Ice 1/2" Ice	22.43 24.91	0.00 0.00	0.00 0.00
4-ft Branches	C	None		0.0000	75.45	No Ice 1/2" Ice	36.86 40.54	0.00 0.00	0.00 0.00
6-ft Branches	C	None		0.0000	67.06	No Ice 1/2" Ice	83.63 92.00	0.00 0.00	0.00 0.00
8-ft Branches	C	None		0.0000	55.44	No Ice 1/2" Ice	150.70 165.77	0.00 0.00	0.00 0.00
10-ft Branches	C	None		0.0000	42.31	No Ice 1/2" Ice	54.43 59.88	0.00 0.00	0.00 0.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 90 deg - No Ice
4	Dead+Wind 180 deg - No Ice
5	Dead+Ice+Temp
6	Dead+Wind 0 deg+Ice+Temp
7	Dead+Wind 90 deg+Ice+Temp
8	Dead+Wind 180 deg+Ice+Temp
9	Dead+Wind 0 deg - Service
10	Dead+Wind 90 deg - Service
11	Dead+Wind 180 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	76 - 23	9.623	9	1.0012	0.0000
L2	28.25 - 0	1.435	9	0.4517	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
75.45	4-ft Branches	9	9.508	0.9957	0.0000	60174
75.00	(2) Andrew HBX-6516DS-VTM with Mount Pipe	9	9.414	0.9911	0.0000	60174
74.00	Antenna Branches	9	9.205	0.9810	0.0000	60174
67.06	6-ft Branches	9	7.763	0.9105	0.0000	13461
64.00	(2) Antel LPA-185063/8CF w/ mp	9	7.140	0.8790	0.0000	10029
55.44	8-ft Branches	9	5.463	0.7882	0.0000	5853
42.31	10-ft Branches	9	3.205	0.6373	0.0000	3571

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	76 - 23	19.307	3	2.0088	0.0000
L2	28.25 - 0	2.880	3	0.9063	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
75.45	4-ft Branches	3	19.076	1.9977	0.0000	30038
75.00	(2) Andrew HBX-6516DS-VTM with Mount Pipe	3	18.887	1.9886	0.0000	30038
74.00	Antenna Branches	3	18.467	1.9683	0.0000	30038
67.06	6-ft Branches	3	15.575	1.8268	0.0000	6719
64.00	(2) Antel LPA-185063/8CF w/ mp	3	14.324	1.7635	0.0000	5006
55.44	8-ft Branches	3	10.960	1.5814	0.0000	2921
42.31	10-ft Branches	3	6.430	1.2788	0.0000	1782

Compression Checks

Pole Design Data

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Section No.	Elevation ft	Size	L ft	L _n ft	KL/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio $\frac{P}{P_a}$
L1	76 - 23 (1)	TP38.039x22x0.25	53.00	0.00	0.0	39.000	28.7249	-6.15	1120.27	0.005
L2	23 - 0 (2)	TP44.5x35.9502x0.3125	28.25	0.00	0.0	39.000	43.8285	-11.48	1709.31	0.007

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M _x kip-ft	Actual f _{bx} ksi	Allow. F _{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M _y kip-ft	Actual f _{by} ksi	Allow. F _{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	76 - 23 (1)	TP38.039x22x0.25	685.88	32.046	39.000	0.822	0.00	0.000	39.000	0.000
L2	23 - 0 (2)	TP44.5x35.9502x0.3125	1306.52	32.781	39.000	0.841	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f _v ksi	Allow. F _v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f _{vt} ksi	Allow. F _{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	76 - 23 (1)	TP38.039x22x0.25	21.07	0.734	26.000	0.056	0.00	0.000	26.000	0.000
L2	23 - 0 (2)	TP44.5x35.9502x0.3125	22.90	0.523	26.000	0.040	0.00	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	76 - 23 (1)	0.005	0.822	0.000	0.056	0.000	0.828	1.333	H1-3+VT ✓
L2	23 - 0 (2)	0.007	0.841	0.000	0.040	0.000	0.848	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P _{allow} K	% Capacity	Pass Fail	
L1	76 - 23	Pole	TP38.039x22x0.25	1	-6.15	1493.32	62.1	Pass	
L2	23 - 0	Pole	TP44.5x35.9502x0.3125	2	-11.48	2278.51	63.6	Pass	
							Summary		
							Pole (L2)	63.6	Pass
							RATING =	63.6	Pass

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FLANGE PLATE DESIGN, DEFORMATION METHOD (DIFFERENT AREAS)

Input - M := 1306·kip·ft = moment at top of flange plate
 P := 11·kip = axial load (use zero if base plate is grouted)
 F_y := 60·ksi = yield stress of flange plate
 b_{eff} := 11.75·in = effective width of flange plate in flexure
 t := 2.0·in = thickness of flange plate
 ASI := 133·% = allowable stress increase

CONSTANTS:

psi ≡ $\frac{\text{lb}}{\text{in}^2}$
 ksi ≡ 1000·psi
 kip ≡ 1000·lb

$$Q := \begin{pmatrix} 2 \\ 4 \\ 4 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \quad d := \begin{pmatrix} 2 \cdot 12 + 1 + \frac{3}{4} \\ 1 \cdot 12 + 8 + \frac{13}{16} \\ 7 + \frac{15}{16} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot \text{in} \quad A_{\text{stiff}} := \begin{pmatrix} 3.976 \\ 3.976 \\ 3.976 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \text{in}^2 \quad A_{\text{stress}} := \begin{pmatrix} 3.25 \\ 3.25 \\ 3.25 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \text{in}^2 \quad F_t := \begin{pmatrix} 0.6 \cdot 75 \\ 0.6 \cdot 75 \\ 0.6 \cdot 75 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \text{ksi}$$

$$\sum(Q) = 10 \quad \text{sumQAd} := \sum(Q \cdot d^2 \cdot A_{\text{stiff}})$$

sumQAd = 13164 in⁴

$$R_w := \frac{M \cdot (\overrightarrow{d \cdot A_{\text{stiff}}})}{\text{sumQAd}} + \frac{P \cdot A_{\text{stiff}}}{\sum(A_{\text{stiff}} \cdot Q)}$$

$$f_t := \left(\frac{R}{A_{\text{stress}}} \right) \quad r := \left(\frac{f_t}{\text{ASI} \cdot F_t} \right)$$

$$R = \begin{pmatrix} 123.0 \\ 99.6 \\ 38.7 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \text{kip} \quad f_t = \begin{pmatrix} 37.8 \\ 30.7 \\ 11.9 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \text{ksi} \quad r = \begin{pmatrix} 63 \\ 51 \\ 20 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \%$$

Q = quantity of fasteners

d = distance from center

A = area of fastener

F_t = allowable tension stress

$$m := \begin{pmatrix} 2 + \frac{3}{8} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot \text{in}$$

$$M_{PL} := \left[\left(\frac{Q}{2} \right) \cdot R \cdot m \right]$$

$$M_{PL} = \begin{pmatrix} 24.3 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \text{ kip}\cdot\text{ft}$$

$$\sum M_{PL} = 292.1 \text{ kip}\cdot\text{in}$$

$$f_b := \frac{\sum M_{PL}}{\left(\frac{b_{\text{eff}} \cdot t^2}{6} \right)}$$

$$f_b = 37.3 \text{ ksi}$$

$$F'_b := \text{ASI} \cdot 0.75 \cdot F_y$$

$$r_b := \frac{f_b}{F'_b}$$

$$r_b = 62\%$$
