COHEN and WOLF P.C.
ATTORNEYS AT LAW

JULIE D. KOHLER

PLEASE REPLY TO: Bridgeport
WRITER'S DIRECT DIAL: (203) 337-4157
E-Mail Address: jkohler@cohenandwolf.com

March 11, 2014

Attorney Melanie Bachman
Acting Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Notice of Exempt Modification
Kathy-Lee and Wayne Kemp/ T-Mobile co-location
Site ID CT11144C
1050 Buckley Highway, Union CT

Dear Attorney Bachman:

This office represents T-Mobile Northeast LLC ("T-Mobile") and has been retained to file exempt modification filings with the Connecticut Siting Council on its behalf.

In this case Kathy-Lee and Wayne Kemp/New England Site Management, LLC own the existing telecommunications tower and related facility at 1050 Buckley Highway, Union Connecticut (Latitude: 41.99938533/ Longitude: -72.1522986). T-Mobile intends to replace six antennas and related equipment at this existing telecommunications facility in Union ("Union Facility"). Please accept this letter as notification, pursuant to R.C.S.A. § 16-50j-73, of construction which constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to the Union First Selectman Albert L. "Andy" Goodhall, Jr, and the property owners, Kathy-Lee and Wayne Kemp.

The existing Union Facility consists of a 168 foot tall tower.[1] T-Mobile plans to replace six antennas, add three antennas and replace three TMAs (tower mounted amplifiers) at a centerline of 140 feet. (See the plans revised to February 6, 2014 attached hereto as Exhibit A). T-Mobile will also replace an equipment cabinet, install fiber and coax cable and reuse existing coax cable. With minor modifications (see Section 5.1 of the structural analysis) the existing Union Facility is structurally capable of supporting T-Mobile's proposed modifications, as indicated in the structural analysis dated March 5, 2014 and attached hereto as Exhibit B.

[1] While the online docket for the Connecticut Siting Council does not provide a docket or petition number for the approval of this structure, it does reference this structure in connection with notices of intent, the most recent captioned EM-CING-145-120424.

The planned modifications to the Union Facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modification will not increase the height of the tower. T-Mobile's replacement antennas will be installed at a centerline of 140 feet, merely replacing existing antennas located at the same 140 elevation. The enclosed tower drawing confirms that the proposed modification will not increase the height of the tower.

2. The proposed modifications will not require an extension of the site boundaries or lease area. T-Mobile's equipment will be located entirely within the existing compound and leased area (See Sheet 1 of the plans which depicts the lease area.)

3. The proposed modification to the Union Facility will not increase the noise levels at the existing facility by six decibels or more.

4. The operation of the replacement antennas will not increase the total radio frequency (RF) power density, measured at the base of the tower, to a level at or above the applicable standard. According to a Radio Frequency Emissions Analysis Report prepared by EBI dated February 28, 2014, T-Mobile's operations would add 0.581% of the FCC Standard. Therefore, the calculated "worst case" power density for the planned combined operation at the site including all of the proposed antennas would be 50.8% of the FCC Standard as calculated for a mixed frequency site as evidenced by the engineering exhibit attached hereto as Exhibit C.

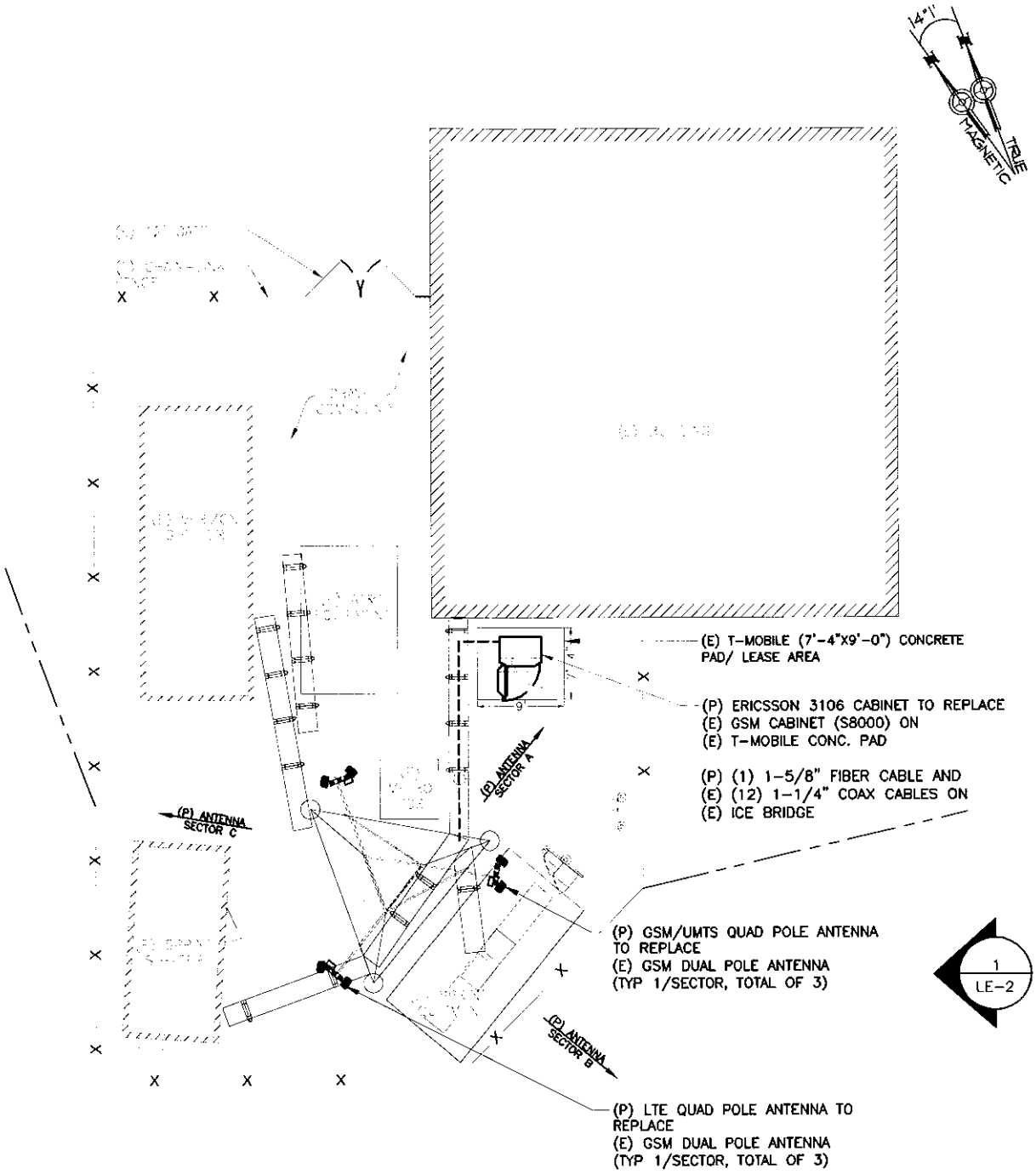
For the foregoing reasons, T-Mobile respectfully submits that the proposed replacement antennas and equipment at the Union Facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2). Upon acknowledgement by the Council of this proposed exempt modification, T-Mobile shall commence construction approximately sixty days from the date of the Council's notice of acknowledgement.

Sincerely,

Julie D. Kohler, Esq.

cc: Union First Selectman Albert L. "Andy" Goodhall, Jr.
Kathy-Lee and Wayne Kemp/New England Site Management LLC
Northeast Site Solutions, Sheldon J. Freincle

EXHIBIT A



ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY LESSEE/LICENSEE'S STRUCTURAL & RF ENGINEERS. LOCATIONS OF POWER & TELEPHONE FACILITIES ARE SUBJECT TO APPROVAL BY UTILITY COMPANIES.

SITE PLAN

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

1
LE-1

CONFIGURATION
2C

SUBMITTALS	
LE REV A	02.04.14
LE REV 0	02.06.14

ATLANTIS GROUP
1340 Centre Street
Suite 203
Newton, MA 02459
Office: 617-965-0789
Fax: 617-213-5056

LEASE EXHIBIT

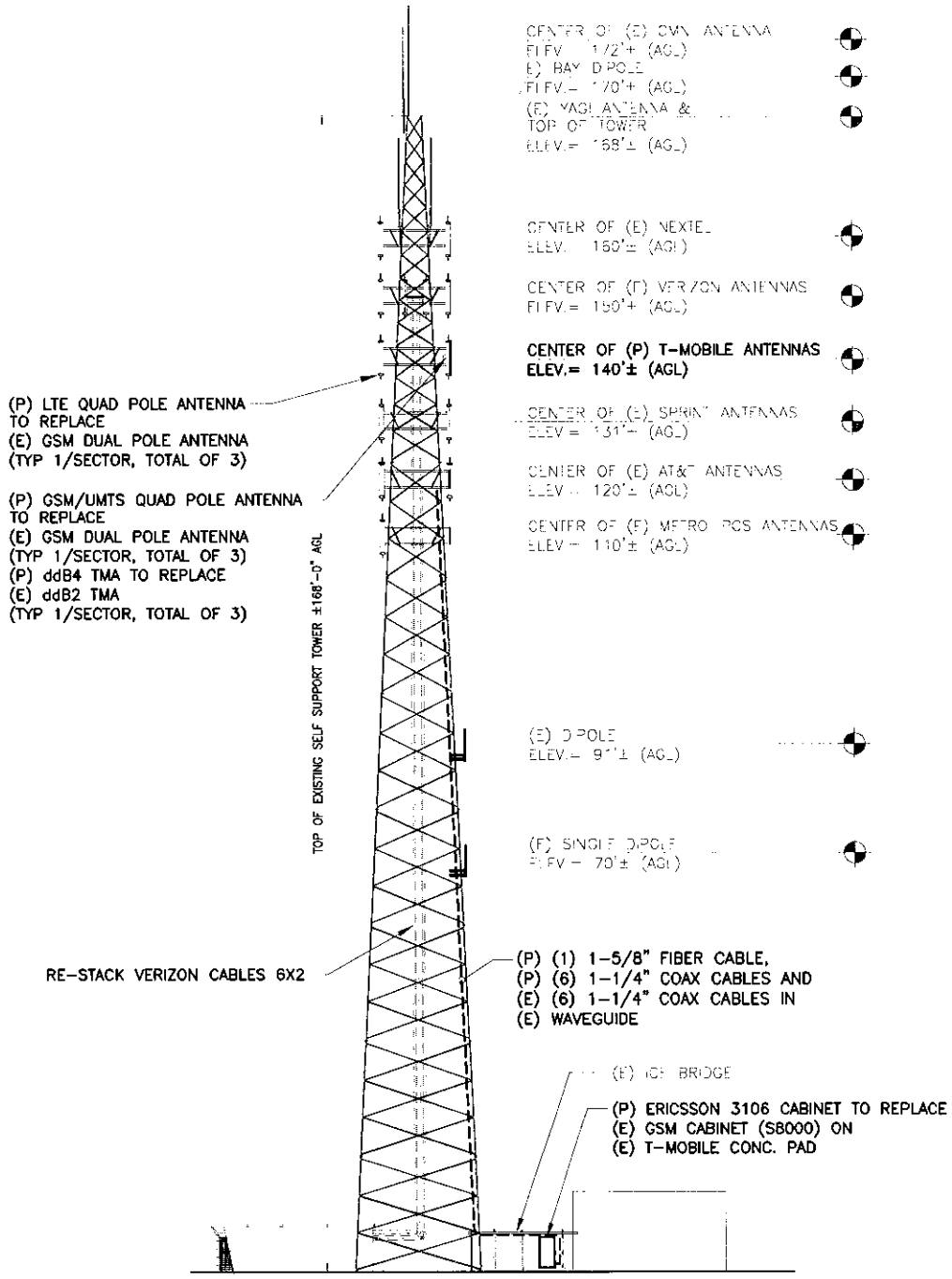
SITE NUMBER:
CT11144C

SITE NAME:
UNION/ I-84 X73-74/CEMET1

SITE ADDRESS:
1050 BUCKLEY HIGHWAY
UNION, CT, 06076

NORTHEAST SITE SOLUTIONS
54 MAIN STREET, UNIT 3
STURBRIDGE, MA 01566
(508) 434-5237
FOR
T-MOBILE NORTHEAST, LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 692-7100
FAX: (860) 692-7159

DRAWN BY: FG | CHECKED BY: SM



ELEVATION

SCALE: 1" = 20'-0"

1 / LE-2

CONFIGURATION

2C

SUBMITTALS	
LE REV A	02.04.14
LE REV 0	02.06.14

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DRAWN BY: FG | CHECKED BY: SM

EXHIBIT B

STRUCTURAL ANALYSIS REPORT
SELF SUPPORTING TOWER

Prepared For:

T-Mobile

35 Griffin Road South
Bloomfield, CT 06002

Tower Rating

Tower: **Pass (99.8 %)**
(after modifications in section 5.1)

Foundation: **Pass**

Atlantis Group, Inc.
3-05-2014

STATE OF CONNECTICUT
DMITRIY V. ALBUL
No. 26725
LICENSED
PROFESSIONAL ENGINEER

03/05/2014

CT Professional Engineer
License No:

Site ID: CT11144C
Site Name: Union/ I-84 X73-74/Cemet1
1050 Buckley Highway,
Union, CT 06076

Prepared
By:

Atlantis Group, Inc.
1340 Centre Street, Suite 203
Newton, Massachusetts 02459
Phone: 617-965-0789, Fax: 617-965-0103

CONTENTS

1.0 SUBJECT AND REFERENCES

The purpose of this analysis is to evaluate the structural capacity of the existing 168 feet high self-supporting tower, located at 1050 Buckley Highway, Union, CT 06076, for the alteration and addition of wireless telecommunication appurtenances proposed by T-Mobile.

The structural analysis of the site is based on the following documents provided to us:

1. Structural Analysis Reports prepared by Natcomm Consulting Engineers, Inc. for Pocket Wireless site HFCT1249, dated 06/08/2009 and for Verizon, dated 12/14/2009.
2. Existing and proposed antenna information provided by T-Mobile.

Note that this information does not account for bracing gusset thickness for proper connectivity assessment.

1.1 STRUCTURE

The self-supporting tower is a 168 feet high, triangular based tower manufactured by Rohn. Round pipe legs are X-braced the full height of the tower with single angle bracing. Some sections of tower legs have been reinforced with welded-on half pipe and secondary horizontal bracing. Please refer to the tower elevation drawing in Appendix A, for details about the tower geometry, member sizes, etc.

2.0 EXISTING AND PROPOSED CONFIGURATION

Antennas and Appurtenances:

The analysis is based on the following existing and proposed appurtenances:

Existing Configuration of T-MOBILE Appurtenances:

Sector	RAD Center (ft.)	Antenna & TMA		Mount	Feed Lines
Alpha	140	GSM Antenna TMA	(2) RR90-17-02DP (1) dd B2	(1) Standoff	(6) 1-1/4"
Beta	140	GSM Antenna TMA	(2) RR90-17-02DP (1) dd B2	(1) Standoff	
Gamma	140	GSM Antenna TMA	(2) RR90-17-02DP (1) dd B2	(1) Standoff	

Proposed Configuration of T-MOBILE Appurtenances:

Sector	RAD Center (ft.)	Antenna & TMA		Mount	Feed Lines
Alpha	140	GSM/UMTS Antenna LTE Antenna TMA	(1) AIR21 B2A/B4P (1) AIR21 B4A/B2P (1) dd B4	(1) Standoff	(7) 1-1/4" + (1) Hybrid Line (1-5/8")
Beta	140	GSM/UMTS Antenna LTE Antenna TMA	(1) AIR21 B2A/B4P (1) AIR21 B4A/B2P (1) dd B4	(1) Standoff	
Gamma	140	GSM/UMTS Antenna LTE Antenna TMA	(1) AIR21 B2A/B4P (1) AIR21 B4A/B2P (1) dd B4	(1) Standoff	

Existing and Remaining Appurtenances by Others:

RAD Center (ft.) Carrier	Antenna & TMA	Mount	Feed Lines
173	(1) DB224	-	(1) 1-1/4"
172	(1) 6' Omni	-	(1) ½"
170	(1) 2 Bay Dipole	-	(1) ½"
168	(1) 6' Yagi	(1) Pipe Mount	(1) ½"
160 (Nextel)	(4) DB809KE-XC	(4) Standoff	(4) 1-1/4"
150 (Verizon)	(6) LPA-185080/8CF (3) BXA-185063/12CF (3) P65-16-XL-2	(3) Boom Gates	(12) 1-5/8" **stacked 6x2**
131 (Sprint)	(6) DB980H90A-M	(3) Sector Mounts	(6) 1-5/8"
120 (AT&T)	(3) 96"x11"x7" Panel antennas (3) Powerwave 7770 (3) 7020 RET unit (3) RRUS-11	(3) Sector Mounts	(6) 1-1/4"
110 (Metro PCS)	(3) APXV18-206517S	(3) Pipe Mounts	(6) 1-5/8"
91	Small Dipole	-	(1) ½"
70	Single Pole Dipole	-	(1) ½"

3.0 CODES AND LOADING

The tower was analyzed per ANSI/TIA-222-F as referenced by the 2005 Connecticut Building Code with 2011 Supplement, which is the adopted building code. The following wind loading was used in compliance with the standard for Tolland County, CT.

- Basic wind speed 85 mph (W) without ice [fastest-mile speed equivalent to 100 mph 3-second gust].
- Basic wind speed 73.61 mph (W_i) with 1/2" radial and escalating ice.

The following load combinations were used with wind blowing at 0°, 30°, 60° and 90°, measured from a line normal to the face of the self-supporting tower.

- D + W
- D + I + W_i + 1.0Ti

D: Dead Load of structure and appurtenances, except guy wires
W: Wind Load, without ice
W_i: Wind Load with ice
I: Ice Gravity Load

4.0 STANDARD CONDITIONS FOR ENGINEERING SERVICES ON EXISTING STRUCTURES

The analysis is based on the information provided to Atlantis Group and is assumed to be current and correct. Unless otherwise noted, the structure and the foundation system are assumed to be in good condition, free of defects and can achieve theoretical strength.

It is assumed that the structure has been maintained and shall be maintained during its service. The superstructure and the foundation system are assumed to be designed with proper engineering practice and fabricated, constructed and erected in accordance with the design documents. Atlantis Group will accept no liability which may arise due to any existing deficiency in design, material, fabrication, erection, construction, etc. or lack of maintenance.

Contractor should inspect the condition of the existing structure, mounts and connections and notify Atlantis Group for any discrepancies and deficiencies before proceeding with the construction.

The evaluation results presented in this report are only applicable for the previously mentioned existing and proposed additions and alterations. Any deviation of the proposed equipment and placement, etc., will require Atlantis Group to generate an additional structural evaluation.

5.0 ANALYSIS and ASSUMPTIONS

The tower was analyzed by utilizing tnx-Tower, non-linear 3-Dimensional finite element software, a product of Tower Numerics, Inc. Software output for this analysis is provided in Appendix-A of this report.

5.1 REQUIRED MODIFICATION

The analysis described here on is based on the assumption that the existing Verizon coax cables that are currently arranged 12x1 (single row) are to be restacked 6x2 (two rows).

6.0 RESULTS and CONCLUSION

Based on an analysis per ANSI/TIA-222-F, the existing tower is found to have **inadequate** structural capacity for the proposed changes by T-Mobile. For the aforementioned load combinations and as a maximum, the tower legs between 20 feet and 40 feet AGL will be stressed to **99.8%** of capacity. Maximum usage of bracing is **88.5%**. The tower foundation system is found to have adequate **structural** strength.

Foundation Reactions:

Design	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
Uplift	2.0	2.42	**PASS**
Design	**Design Reaction (ksf)**	**Proposed Reaction (ksf)**	**Result**
Bearing	8	6.74	**PASS**

Note 1: FS denotes Factor of Safety

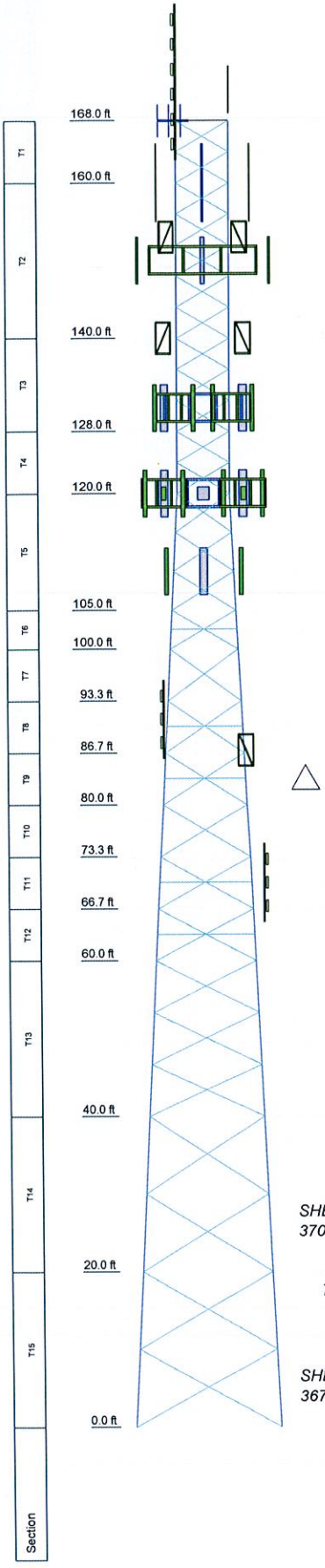
Therefore, the proposed additions and alterations by T-Mobile cannot be implemented with the conditions outlined in this report without structural modifications to the tower and foundation.

Should you have any questions or need any clarifications about this report, please contact us at (617) 965-0789.

Sincerely,
Atlantis Group, Inc.

03/05/2014

APPENDIX A
CALCULATIONS



MAX. CORNER RI
DOWN: 24116
SHEAR: 21674

UPLIFT: -20061
SHEAR: 20337

AXIAL
53442 lb

SHEAR
37075 lb

MOMENT
3646 kip-ft

TORQUE 4 kip-ft
74 mph WIND - 0.5000 in ICE

AXIAL
32485 lb

SHEAR
36746 lb

MOMENT
3622 kip-ft

TORQUE 3 kip-ft
REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB224 (E-Gamma)	173	3' Side arm mount (E-TMO-Gamma)	140
2"ODx6' Omni (E-Beta)	172	10' Frame (E-Sprint-Alpha)	131
2 Bay Dipole (E-Alpha)	170	10' Frame (E-Sprint-Beta)	131
6' Yagi w. MtgPipe (E)	168	10' Frame (E-Sprint-Gamma)	131
DB809KE-XC (E-Nextel)	160	(2) DB980H90A-M w/Mount Pipe (E-Sprint-Alpha)	131
DB809KE-XC (E-Nextel)	160	(2) DB980H90A-M w/Mount Pipe (E-Sprint-Beta)	131
DB809KE-XC (E-Nextel)	160	(2) DB980H90A-M w/Mount Pipe (E-Sprint-Gamma)	131
DB809KE-XC (E-Nextel)	160	96"x11"x7" antenna w. MtgPipe (E-ATT-Gamma)	120
3' Side arm mount (E-Nextel)	153	96"x11"x7" antenna w. MtgPipe (E-ATT-Beta)	120
3' Side arm mount (E-Nextel)	153	Powerwave 7770.00 w. MtgPipe (E-ATT-Alpha)	120
3' Side arm mount (E-Nextel)	153	Powerwave 7770.00 w. MtgPipe (E-ATT-Beta)	120
3' Side arm mount (E-Nextel)	153	Powerwave 7770.00 w. MtgPipe (E-ATT-Gamma)	120
Rohn 6'x15' Boom Gate (3) (E-VZW)	150	7020 RET Unit (E-ATT-Alpha)	120
(2) LPA-185080-8CF w. MtgPipe (E-VZW-Alpha)	150	7020 RET Unit (E-ATT-Beta)	120
(2) LPA-185080-8CF w. MtgPipe (E-VZW-Beta)	150	7020 RET Unit (E-ATT-Gamma)	120
(2) LPA-185080-8CF w. MtgPipe (E-VZW-Gamma)	150	RRUS-11 (E-ATT-Alpha)	120
BXA-185063/12CF w. Mtg Pipe (E-VZW-Alpha)	150	RRUS-11 (E-ATT-Beta)	120
BXA-185063/12CF w. Mtg Pipe (E-VZW-Beta)	150	RRUS-11 (E-ATT-Gamma)	120
BXA-185063/12CF w. Mtg Pipe (E-VZW-Gamma)	150	96"x11"x7" antenna w. MtgPipe (E-ATT-Alpha)	120
P65-16-XL-2 w. MtgPipe (E-VZW-Alpha)	150	12' T-Frame (E-ATT-Alpha)	120
P65-16-XL-2 w. MtgPipe (E-VZW-Beta)	150	12' T-Frame (E-ATT-Beta)	120
P65-16-XL-2 w. MtgPipe (E-VZW-Gamma)	150	12' T-Frame (E-ATT-Gamma)	120
(2) AIR21 B2A/B4P w. MtgPipe (P-TMO-Alpha)	140	APXV18-206517S w. Mtg Pipe (E-Metro-Gamma)	110
(2) AIR21 B2A/B4P w. MtgPipe (P-TMO-Beta)	140	APXV18-206517S w. Mtg Pipe (E-Metro-Alpha)	110
(2) AIR21 B2A/B4P w. MtgPipe (P-TMO-Gamma)	140	APXV18-206517S w. Mtg Pipe (E-Metro-Beta)	110
AWS-PCS TMA (behind antenna) (P-TMO-Alpha)	140	Small Single Pole Dipole	91
AWS-PCS TMA (behind antenna) (P-TMO-Beta)	140	GPS	87
AWS-PCS TMA (behind antenna) (P-TMO-Gamma)	140	GPS	87
3' Side arm mount (E-TMO-Alpha)	140	4' Standoff	87
3' Side arm mount (E-TMO-Beta)	140	GPS	82
		Single Pole Dipole	70

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A572-50	50 ksi	65 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

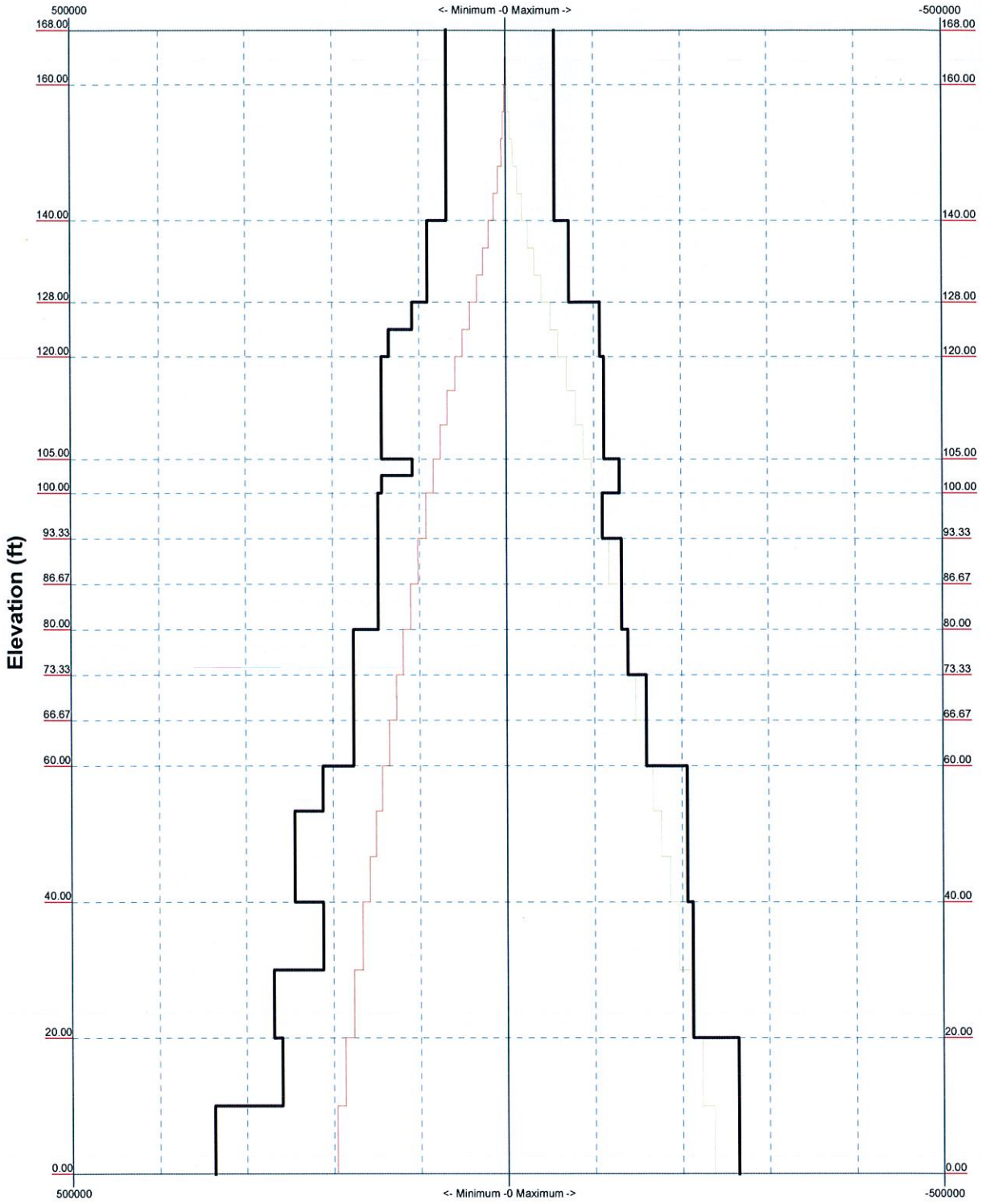
1. Tower is located in Tolland County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TMO antennas are indicated as (P)roposed and (E)xisting. All others are existing.
9. TOWER RATING: 99.8%

ATLANTIS GROUP
Atlantis Group Inc.
1340 Centre Street, Suite 212
Newton, MA 02459
Phone: (617) 965-0789
FAX: (617) 213-3123

Job: **168' ROHN SS TOWER ANALYSIS**			
Project: **CT11144C**			
Client: T-Mobile	Drawn by: Archan Shah	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/14	Scale: NTS	
Path: Y:\Atlantis Group\T-Mobile\CT11144C 148SS\Feb2014 Analysis\tnx\168'SS.eri		Dwg No. E-1	

TIA/EIA-222-F - 85 mph/74 mph 0.5000 in Ice

Leg Capacity ——— **Leg Compression (lb)**



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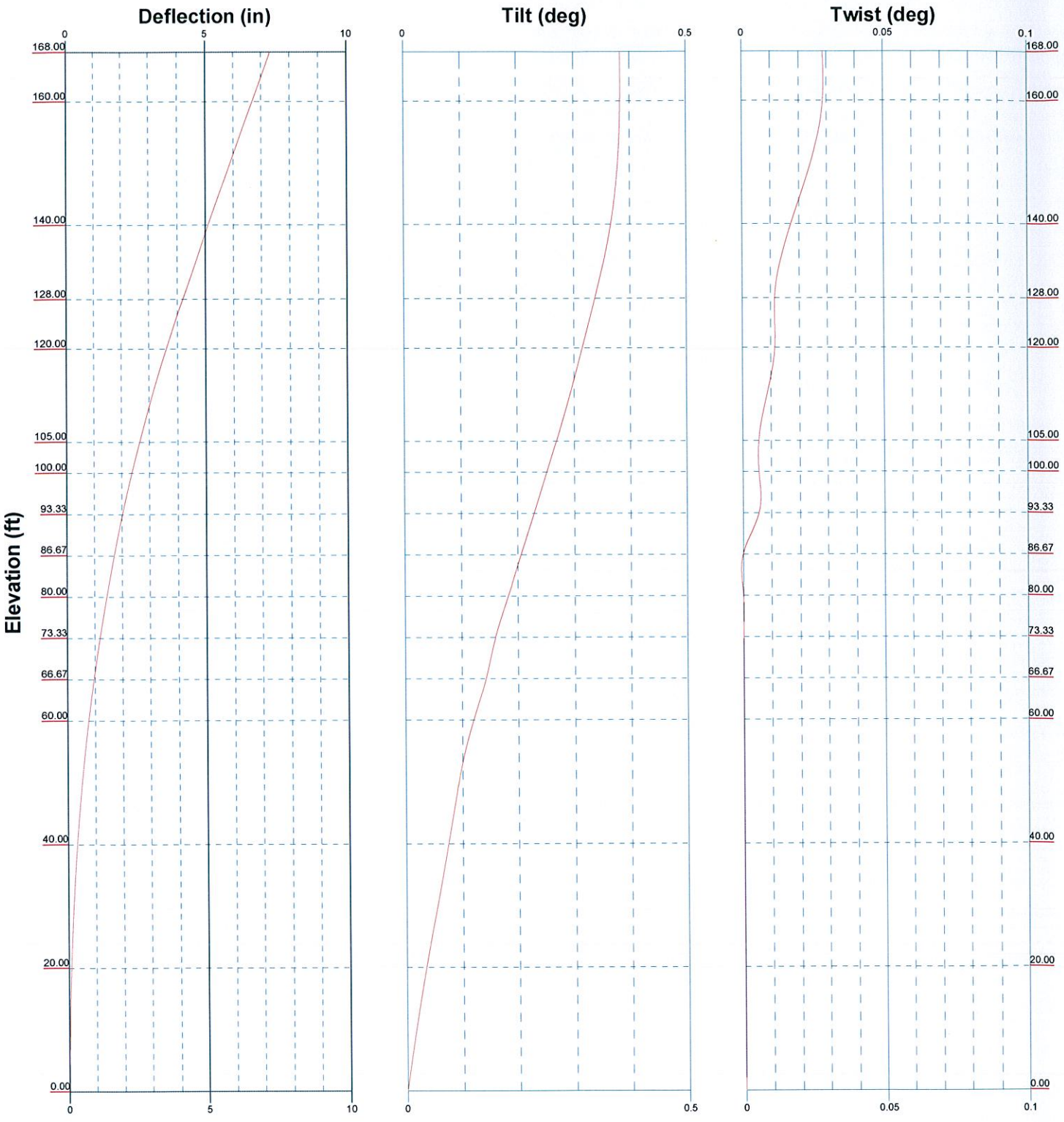
Project: CT11144C			
Client: T-Mobile	Drawn by: Archan Shah	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/14	Scale: NTS	
Path: Y:\Atlantis Group\T-Mobile\CT11144C 148SS\Feb2014 Analysis\tnx\168 SS.eg		Dwg No. E-3	

TIA/EIA-222-F - Service - 50 mph

Maximum Values



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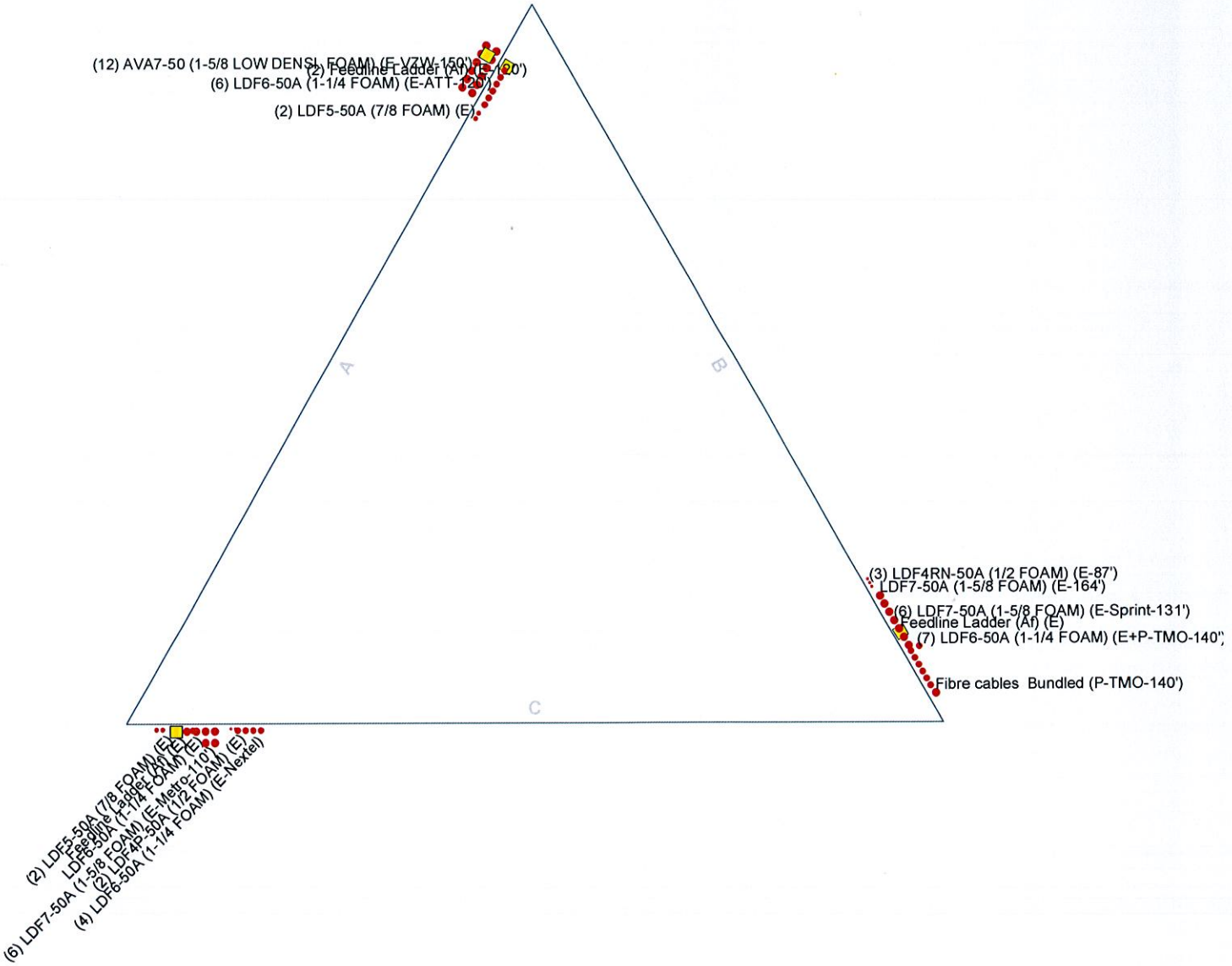
Project: CT11144C			
Client: T-Mobile	Drawn by: Archan Shah	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/14	Scale: NTS	
Path: Y:\Atlantis Group\T-Mobile\CT11144C 148SS\Feb2014 Analysis\tnx\168 SS.eri		Dwg No. E-5	

Feed Line Plan

Round Flat App In Face App Out Face



ATLANTIS GROUP

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FAX: (617) 213-3123

Job: ***168' ROHN SS TOWER ANALYSIS***			
Project: ***CT11144C***			
Client: T-Mobile	Drawn by: Archan Shah	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/14	Scale: NTS	
Path: Y:\Atlantis Group\T-Mobile\CT11144C 148SS\Feb2014 Analysis\tnx\168'SS.e		Dwg No. E-7	

ATLANTIS GROUP *Atlantis Group, Inc.* *1340 Centre Street, Suite 212* *Newton, MA 02459* *Phone: (617) 965-0789* *FAX: (617) 213-3123*	**Job** 168' ROHN SS TOWER ANALYSIS	**Page** 1 of 9
	Project CT11144C	**Date** 16:20:47 03/04/14
	Client T-Mobile	**Designed by** Archan Shah

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*
	ft	*in*		°	°
T1	168 - 160	7.345	27	0.3838	0.0273
T2	160 - 140	6.705	27	0.3833	0.0268
T3	140 - 128	5.110	27	0.3668	0.0194
T4	128 - 120	4.198	27	0.3388	0.0139
T5	120 - 105	3.629	27	0.3180	0.0104
T6	105 - 100	2.670	27	0.2711	0.0055
T7	100 - 93.3333	2.384	27	0.2538	0.0044
T8	93.3333 - 86.6667	2.034	27	0.2305	0.0034
T9	86.6667 - 80	1.719	27	0.2067	0.0026
T10	80 - 73.3333	1.435	27	0.1824	0.0021
T11	73.3333 - 66.6667	1.186	27	0.1618	0.0017
T12	66.6667 - 60	0.965	27	0.1410	0.0014
T13	60 - 40	0.773	27	0.1201	0.0012

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T14	40 - 20	0.338	27	0.0745	0.0007
T15	20 - 0	0.092	27	0.0329	0.0003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
173.00	DB224	27	7.345	0.3838	0.0273	227896
172.00	2"ODx6' Omni	27	7.345	0.3838	0.0273	227896
170.00	2 Bay Dipole	27	7.345	0.3838	0.0273	227896
168.00	6' Yagi w. MtgPipe	27	7.345	0.3838	0.0273	227896
160.00	DB809KE-XC	27	6.705	0.3833	0.0268	189699
153.00	3' Side arm mount	27	6.144	0.3811	0.0249	219483
150.00	Rohn 6'x15' Boom Gate (3)	27	5.903	0.3792	0.0238	107076
140.00	(2) AIR21 B2A/B4P w. MtgPipe	27	5.110	0.3668	0.0194	39461
131.00	10' Frame	27	4.420	0.3465	0.0153	24855
120.00	12' T-Frame	27	3.629	0.3180	0.0104	19038
110.00	APXV18-206517S w. Mtg Pipe	27	2.974	0.2878	0.0069	18102
91.00	Small Single Pole Dipole	27	1.920	0.2223	0.0031	15961
87.00	4' Standoff	27	1.734	0.2080	0.0026	17866
82.00	GPS	27	1.516	0.1894	0.0022	14845
70.00	Single Pole Dipole	27	1.072	0.1515	0.0016	19260

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	168 - 160	21.194	15	1.1064	0.0790
T2	160 - 140	19.346	15	1.1047	0.0774
T3	140 - 128	14.741	15	1.0562	0.0560
T4	128 - 120	12.113	15	0.9769	0.0401
T5	120 - 105	10.475	15	0.9166	0.0300
T6	105 - 100	7.713	15	0.7814	0.0160
T7	100 - 93.3333	6.889	15	0.7317	0.0126
T8	93.3333 - 86.6667	5.879	15	0.6648	0.0097
T9	86.6667 - 80	4.970	15	0.5965	0.0075
T10	80 - 73.3333	4.151	15	0.5265	0.0064
T11	73.3333 - 66.6667	3.434	15	0.4672	0.0059
T12	66.6667 - 60	2.795	15	0.4073	0.0052
T13	60 - 40	2.241	15	0.3470	0.0044
T14	40 - 20	0.982	15	0.2155	0.0028
T15	20 - 0	0.266	15	0.0952	0.0014

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
173.00	DB224	15	21.194	1.1064	0.0790	80666
172.00	2"ODx6' Omni	15	21.194	1.1064	0.0790	80666
170.00	2 Bay Dipole	15	21.194	1.1064	0.0790	80666
168.00	6' Yagi w. MtgPipe	15	21.194	1.1064	0.0790	80666

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168' ROHN SS TOWER ANALYSIS	3 of 9
Project CT11144C	**Date** 16:20:47 03/04/14
Client T-Mobile	**Designed by** Archan Shah

Elevation ft	*Appurtenance*	*Gov. Load Comb.*	*Deflection* in	*Tilt* °	*Twist* °	*Radius of Curvature* ft
160.00	DB809KE-XC	15	19.346	1.1047	0.0774	68402
153.00	3' Side arm mount	15	17.723	1.0978	0.0721	68279
150.00	Rohn 6'x15' Boom Gate (3)	15	17.028	1.0921	0.0689	35025
140.00	(2) AIR21 B2A/B4P w. MtgPipe	15	14.741	1.0562	0.0560	13393
131.00	10' Frame	15	12.754	0.9988	0.0442	8771
120.00	12' T-Frame	15	10.475	0.9166	0.0300	6622
110.00	APXV18-206517S w. Mtg Pipe	15	8.587	0.8293	0.0200	6312
91.00	Small Single Pole Dipole	15	5.551	0.6413	0.0089	5549
87.00	4' Standoff	15	5.014	0.6000	0.0075	6143
82.00	GPS	15	4.386	0.5467	0.0067	5163
70.00	Single Pole Dipole	15	3.104	0.4377	0.0056	6673

Bolt Design Data

Section No.	*Elevation* ft	*Component Type*	*Bolt Grade*	*Maximum Load per Bolt* lb	*Allowable Load* lb	*Ratio Load / Allowable*	*Allowable Ratio*	*Criteria*
T1	168	Leg	A325N	112.78	13499.00	0.008 ✔	1.333	Bolt Tension
		Diagonal	A325N	515.14	3874.22	0.133 ✔	1.333	Member Block Shear
		Top Girt	A325N	126.52	3874.22	0.033 ✔	1.333	Member Block Shear
T2	160	Leg	A325N	2312.56	13499.00	0.171 ✔	1.333	Bolt Tension
		Diagonal	A325N	3207.03	3874.22	0.828 ✔	1.333	Member Block Shear
T3	140	Diagonal	A325N	4807.72	4553.91	1.056 ✔	1.333	Member Block Shear
T4	128	Leg	A325N	8316.08	13499.00	0.616 ✔	1.333	Bolt Tension
		Diagonal	A325N	5369.88	4553.91	1.179 ✔	1.333	Member Block Shear
T5	120	Diagonal	A325N	4780.33	4553.91	1.050 ✔	1.333	Member Block Shear
T6	105	Leg	A325N	13961.00	13499.00	1.034 ✔	1.333	Bolt Tension
		Diagonal	A325N	4723.32	4553.91	1.037 ✔	1.333	Member Block Shear
		Secondary Horizontal	A325N	1690.99	6117.19	0.276 ✔	1.333	Member Bearing
T7	100	Diagonal	A325N	5003.52	5097.66	0.982 ✔	1.333	Member Bearing
T8	93.3333	Diagonal	A325N	5040.96	5097.66	0.989 ✔	1.333	Member Bearing
		Secondary Horizontal	A325N	2045.46	4553.91	0.449 ✔	1.333	Member Block Shear
T9	86.6667	Leg	A325N	18401.40	19438.50	0.947 ✔	1.333	Bolt Tension
		Diagonal	A325N	4987.48	5097.66	0.978 ✔	1.333	Member Bearing
		Secondary Horizontal	A325N	2223.69	4553.91	0.488 ✔	1.333	Member Block Shear
T10	80	Diagonal	A325N	5196.51	6442.72	0.807 ✔	1.333	Bolt Shear
T11	73.3333	Diagonal	A325N	5216.69	6442.72	0.810 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	2574.57	5097.66	0.505 ✔	1.333	Member Bearing
T12	66.6667	Diagonal	A325N	5384.70	6442.72	0.836 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	2739.57	4621.88	0.593 ✔	1.333	Member Block Shear

Section No.	Elevation ft	Component Type	Bolt Grade	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T13	60	Leg	A325N	26293.30	26458.10	0.994 ✔	1.333	Bolt Tension
		Diagonal	A325N	5746.98	6442.72	0.892 ✔	1.333	Bolt Shear
T14	40	Leg	A325N	29443.50	26458.10	1.113 ✔	1.333	Bolt Tension
		Diagonal	A325N	6937.74	6442.72	1.077 ✔	1.333	Bolt Shear
T15	20	Leg	A354-BC	32658.50	32397.70	1.008 ✔	1.333	Bolt Tension
		Diagonal	A325N	7564.40	9140.63	0.828 ✔	1.333	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	168 - 160	8.00	4.00	50.7 K=1.00	24.247	1.7040	-1285.60	41317.80	0.031 ✔
T2	160 - 140	20.00	4.00	50.7 K=1.00	24.247	1.7040	-18861.70	41317.80	0.457 ✔
T3	140 - 128	12.00	4.00	51.9 K=1.00	24.045	2.2535	-40549.30	54185.50	0.748 ✔
T4	128 - 120	8.00	4.00	51.9 K=1.00	24.049	3.3650	-58765.70	80923.30	0.726 ✔
T5	120 - 105	15.03	5.01	54.4 K=1.00	23.652	3.5680	-88340.20	84390.70	1.047 ✔
T6	105 - 100	5.01	2.58	28.0 K=1.00	27.395	3.5680	-97504.60	97747.20	0.998 ✔
T7	100 - 93.3333	6.68	6.68	61.3 K=1.00	22.489	3.6784	-107019.00	82724.00	1.294 ✔
T8	93.3333 - 86.6667	6.68	3.45	31.7 K=1.00	26.936	3.6784	-117944.00	99083.00	1.190 ✔
T9	86.6667 - 80	6.68	3.45	31.7 K=1.00	26.945	3.6784	-128220.00	99115.20	1.294 ✔
T10	80 - 73.3333	6.68	6.68	54.3 K=1.00	23.672	4.4074	-138789.00	104331.00	1.330 ✔
T11	73.3333 - 66.6667	6.68	3.43	27.9 K=1.00	27.407	4.4074	-148453.00	120794.00	1.229 ✔
T12	66.6667 - 60	6.68	3.43	27.9 K=1.00	27.412	4.4074	-157967.00	120816.00	1.307 ✔
T13	60 - 40	20.03	6.68	43.6 K=1.00	25.320	6.1120	-186839.00	154757.00	1.207 ✔
T14	40 - 20	20.03	10.02	54.0 K=1.00	23.712	6.7133	-211446.00	159188.00	1.328 ✔
T15	20 - 0	20.03	10.02	54.8 K=1.00	23.591	8.4049	-236397.00	198279.00	1.192 ✔

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168' ROHN SS TOWER ANALYSIS	5 of 9
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Client	**Designed by**
T-Mobile	Archan Shah

Diagonal Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	168 - 160	7.79	3.76	131.3 K=1.00	8.663	0.6211	-548.82	5380.43	0.102 ✓
T2	160 - 140	7.79	3.76	131.3 K=1.00	8.663	0.6211	-3198.35	5380.43	0.594 ✓
T3	140 - 128	7.79	3.76	114.4 K=1.00	11.064	0.7150	-4866.93	7911.04	0.615 ✓
T4	128 - 120	7.79	3.70	112.8 K=1.00	11.294	0.7150	-5494.67	8074.84	0.680 ✓
T5	120 - 105	9.40	4.67	142.1 K=1.00	7.396	0.7150	-4877.34	5288.06	0.922 ✓
T6	105 - 100	9.83	4.88	148.7 K=1.00	6.753	0.7150	-4741.41	4828.70	0.982 ✓
T7	100 - 93.3333	11.25	5.63	136.4 K=1.00	8.029	0.9020	-5208.42	7242.03	0.719 ✓
T8	93.3333 - 86.6667	11.80	5.90	143.1 K=1.00	7.297	0.9020	-5113.62	6582.07	0.777 ✓
T9	86.6667 - 80	12.36	6.18	149.9 K=1.00	6.648	0.9020	-5136.00	5996.33	0.857 ✓
T10	80 - 73.3333	12.93	6.45	157.5 K=1.00	6.019	1.1900	-5196.51	7162.25	0.726 ✓
T11	73.3333 - 66.6667	13.52	6.74	164.7 K=1.00	5.508	1.1900	-5216.69	6554.91	0.796 ✓
T12	66.6667 - 60	14.11	7.03	171.9 K=1.00	5.054	1.1900	-5384.70	6014.70	0.895 ✓
T13	60 - 40	15.92	7.89	160.0 K=1.00	5.835	1.4400	-5505.21	8402.20	0.655 ✓
T14	40 - 20	19.14	9.54	165.0 K=1.00	5.484	1.6900	-6397.26	9268.54	0.690 ✓
T15	20 - 0	20.01	9.98	172.6 K=1.00	5.011	1.6900	-7447.60	8469.26	0.879 ✓

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T6	105 - 100	8.46	8.15	164.0 K=1.00	5.552	1.0900	-1690.99	6052.00	0.279 ✓
T8	93.3333 - 86.6667	9.72	9.38	142.9 K=0.50	7.311	0.7150	-2045.46	5227.38	0.391 ✓
T9	86.6667 - 80	10.39	10.06	153.2 K=0.50	6.361	0.7150	-2223.69	4548.23	0.489 ✓
T11	73.3333 - 66.6667	11.75	11.37	114.5 K=0.50	10.945	1.0900	-2574.57	11930.30	0.216 ✓
T12	66.6667 - 60	12.42	12.05	183.5 K=0.50	4.436	0.7150	-2739.57	3171.86	0.864 ✓

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Top Girt Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	168 - 160	6.69	6.45	225.4 K=1.00	2.940	0.6211	-156.58	1825.97	0.086 ✓

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	168 - 160	8.00	4.00	50.7	30.000	1.7040	676.69	51121.50	0.013 ✓
T2	160 - 140	20.00	4.00	50.7	30.000	1.7040	13875.30	51121.50	0.271 ✓
T3	140 - 128	12.00	4.00	51.9	30.000	2.2535	33173.30	67606.20	0.491 ✓
T4	128 - 120	8.00	4.00	51.9	30.000	3.3650	49896.50	100950.00	0.494 ✓
T5	120 - 105	15.03	5.01	54.4	30.000	3.5680	75689.40	107040.00	0.707 ✓
T6	105 - 100	5.01	2.58	28.0	30.000	3.5680	83840.90	107040.00	0.783 ✓
T7	100 - 93.3333	6.68	6.68	61.3	30.000	3.6784	92413.40	110352.00	0.837 ✓
T8	93.3333 - 86.6667	6.68	3.45	31.7	30.000	3.6784	101803.00	110352.00	0.923 ✓
T9	86.6667 - 80	6.68	3.45	31.7	30.000	3.6784	110498.00	110352.00	1.001 ✓
T10	80 - 73.3333	6.68	6.68	54.3	30.000	4.4074	119382.00	132223.00	0.903 ✓
T11	73.3333 - 66.6667	6.68	3.43	27.9	30.000	4.4074	127271.00	132223.00	0.963 ✓
T12	66.6667 - 60	6.68	3.43	27.9	30.000	4.4074	135089.00	132223.00	1.022 ✓
T13	60 - 40	20.03	6.68	43.6	30.000	6.1120	157760.00	183359.00	0.860 ✓
T14	40 - 20	20.03	10.02	54.0	30.000	6.7133	176661.00	201398.00	0.877 ✓
T15	20 - 0	20.03	10.02	54.8	30.000	8.4049	195951.00	252148.00	0.777 ✓

Diagonal Design Data (Tension)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	168 - 160	7.79	3.76	84.0	29.000	0.3604	515.14	10450.20	0.049 ✓
T2	160 - 140	7.79	3.76	84.0	29.000	0.3604	3207.03	10450.20	0.307 ✓
T3	140 - 128	7.79	3.76	73.1	29.000	0.4308	4807.72	12492.70	0.385 ✓
T4	128 - 120	7.79	3.70	72.0	29.000	0.4308	5369.88	12492.70	0.430

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Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T5	120 - 105	8.97	4.46	86.7	29.000	0.4308	4780.33	12492.70	0.383 ✓
T6	105 - 100	9.83	4.88	95.0	29.000	0.4308	4723.32	12492.70	0.378 ✓
T7	100 - 93.3333	11.25	5.63	86.8	29.000	0.5710	5003.52	16559.90	0.302 ✓
T8	93.3333 - 86.6667	11.80	5.90	91.0	29.000	0.5710	5040.96	16559.90	0.304 ✓
T9	86.6667 - 80	12.36	6.18	95.4	29.000	0.5710	4987.48	16559.90	0.301 ✓
T10	80 - 73.3333	12.93	6.45	100.6	29.000	0.7519	5040.35	21804.40	0.231 ✓
T11	73.3333 - 66.6667	13.52	6.74	105.1	29.000	0.7519	5105.37	21804.40	0.234 ✓
T12	66.6667 - 60	14.11	7.03	109.7	29.000	0.7519	5157.88	21804.40	0.237 ✓
T13	60 - 40	15.92	7.89	101.8	32.500	0.9394	5746.98	30529.70	0.188 ✓
T14	40 - 20	19.14	9.54	105.1	32.500	1.1269	6937.74	36623.40	0.189 ✓
T15	20 - 0	20.89	10.42	114.7	32.500	1.1034	7564.40	35861.70	0.211 ✓

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T6	105 - 100	8.46	8.15	104.1	29.000	0.6945	1690.99	20139.10	0.084 ✓
T8	93.3333 - 86.6667	9.72	9.38	182.5	29.000	0.4308	2045.46	12492.70	0.164 ✓
T9	86.6667 - 80	10.39	10.06	195.7	29.000	0.4308	2223.69	12492.70	0.178 ✓
T11	73.3333 - 66.6667	11.75	11.37	145.3	29.000	0.7120	2574.57	20648.90	0.125 ✓
T12	66.6667 - 60	12.42	12.05	234.3	29.000	0.4132	2739.57	11982.90	0.229 ✓

Top Girt Design Data (Tension)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	168 - 160	6.69	6.45	144.2	29.000	0.3604	126.52	10450.20	0.012 ✓

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Section Capacity Table

Section No.	Elevation ft	Component Type	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	168 - 160	Leg	1	-1285.60	55076.63	2.3	Pass
T2	160 - 140	Leg	19	-18861.70	55076.63	34.2	Pass
T3	140 - 128	Leg	52	-40549.30	72229.27	56.1	Pass
T4	128 - 120	Leg	73	-58765.70	107870.75	54.5	Pass
T5	120 - 105	Leg	88	-88340.20	112492.80	78.5	Pass
T6	105 - 100	Leg	109	-97504.60	130297.02	74.8	Pass
						77.6 (b)	
T7	100 - 93.3333	Leg	123	-107019.00	110271.09	97.1	Pass
T8	93.3333 - 86.6667	Leg	132	-117944.00	132077.63	89.3	Pass
T9	86.6667 - 80	Leg	144	-128220.00	132120.56	97.0	Pass
T10	80 - 73.3333	Leg	156	-138789.00	139073.22	99.8	Pass
T11	73.3333 - 66.6667	Leg	165	-148453.00	161018.40	92.2	Pass
T12	66.6667 - 60	Leg	177	-157967.00	161047.72	98.1	Pass
T13	60 - 40	Leg	189	-186839.00	206291.07	90.6	Pass
T14	40 - 20	Leg	210	-211446.00	212197.60	99.6	Pass
T15	20 - 0	Leg	225	-236397.00	264305.90	89.4	Pass
T1	168 - 160	Diagonal	11	-548.82	7172.11	7.7	Pass
						10.0 (b)	
T2	160 - 140	Diagonal	26	-3198.35	7172.11	44.6	Pass
						62.1 (b)	
T3	140 - 128	Diagonal	60	-4866.93	10545.42	46.2	Pass
						79.2 (b)	
T4	128 - 120	Diagonal	77	-5494.67	10763.76	51.0	Pass
						88.5 (b)	
T5	120 - 105	Diagonal	92	-4877.34	7048.98	69.2	Pass
						78.7 (b)	
T6	105 - 100	Diagonal	113	-4741.41	6436.66	73.7	Pass
						77.8 (b)	
T7	100 - 93.3333	Diagonal	125	-5208.42	9653.63	54.0	Pass
						73.6 (b)	
T8	93.3333 - 86.6667	Diagonal	134	-5113.62	8773.90	58.3	Pass
						74.2 (b)	
T9	86.6667 - 80	Diagonal	146	-5136.00	7993.11	64.3	Pass
						73.4 (b)	
T10	80 - 73.3333	Diagonal	158	-5196.51	9547.28	54.4	Pass
						60.5 (b)	
T11	73.3333 - 66.6667	Diagonal	167	-5216.69	8737.69	59.7	Pass
						60.7 (b)	
T12	66.6667 - 60	Diagonal	178	-5384.70	8017.60	67.2	Pass
T13	60 - 40	Diagonal	191	-5505.21	11200.13	49.2	Pass
						66.9 (b)	
T14	40 - 20	Diagonal	212	-6397.26	12354.96	51.8	Pass
						80.8 (b)	
T15	20 - 0	Diagonal	234	-7447.60	11289.52	66.0	Pass
T6	105 - 100	Secondary Horizontal	120	-1690.99	8067.32	21.0	Pass
T8	93.3333 - 86.6667	Secondary Horizontal	140	-2045.46	6968.10	29.4	Pass
						33.7 (b)	
T9	86.6667 - 80	Secondary Horizontal	152	-2223.69	6062.79	36.7	Pass
T11	73.3333 - 66.6667	Secondary Horizontal	173	-2574.57	15903.09	16.2	Pass
						37.9 (b)	
T12	66.6667 - 60	Secondary Horizontal	185	-2739.57	4228.09	64.8	Pass
T1	168 - 160	Top Girt	6	-156.58	2434.02	6.4	Pass
						Summary	
					Leg (T10)	99.8	Pass
					Diagonal (T4)	88.5	Pass
					Secondary Horizontal	64.8	Pass

ATLANTIS GROUP *Atlantis Group, Inc.* *1340 Centre Street, Suite 212* *Newton, MA 02459* *Phone: (617) 965-0789* *FAX: (617) 213-3123*	**Job** 168' ROHN SS TOWER ANALYSIS	**Page** 9 of 9
	Project CT11144C	**Date** 16:20:47 03/04/14
	Client T-Mobile	**Designed by** Archan Shah

Section No.	*Elevation ft*	*Component Type*	*Critical Element*	*P lb*	*SF*P_{allow} lb*	*% Capacity*	*Pass Fail*
					(T12)		
					Top Girt (T1)	6.4	Pass
					Bolt Checks	88.5	Pass
					RATING =	**99.8**	**Pass**

Pad and Pier Foundation With Rock Anchors:

Customer: T-Mobile
Site: CT11144C
Site Name- Union

Input Data :

Max Load at Tower Leg:

Uplift := 201kip

Compression := 241kip

Max_{shear} := 22kip

Pier and Pad Properties:

Pier Height =	P_H := 10ft
Pier Projection Above Grade =	P_p := 1.33ft
Pier Diameter =	P_d := 3ft
Pad Thickness =	PD_t := 2ft
Pad Width =	PD_w := 6.25ft
Reinforced Bar Diameter =	d_{bar} := .75in
No.of bars =	N_{bar} := 12
Eccentricity of Anchor Bolts from CL of pier =	OS_{bolts} := 6in

Rock Anchors Properties:

No. Of Rock Anchors =	N_{RB} := 2	
Rock Anchor Yield Strength =	Anchor := 300kip	150 ksi All Threaded Bar
Rock Anchor Bolt Diameter =	$Diam_{RB}$:= 1.25in	

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Subgrade Properties :

Concrete Unit Weight = $\gamma_c := 150pcf$

Water Unit Weight = $\gamma_w := 62.4pcf$

Soil Unit Weight = $\gamma_s := 125pcf$

Rock Unit Weight = $\gamma_{rock} := 150pcf$

Uplift Angle = $\psi := 34deg$

Soil Bearing Capacity = $q_u := 8ksf$

Distance to Water Table = $D_{wt} := 20ft$

Concrete Compressive Strength = $f_c := 3ksi$

CALCULATIONS :

Active Pressure = $K_a := \left(\frac{1 - \sin(\psi)}{1 + \sin(\psi)}\right) = 0.283$

$$P_a := \frac{1}{2}\left[\left(P_H + PD_t\right)\cdot\left(P_H + PD_t\right)\right]\cdot P_d\cdot\gamma_s\cdot K_a = 7.6\cdot kip$$

Passive Pressure = $K_p := \frac{1 + \sin(\psi)}{1 - \sin(\psi)} = 3.537$

$$Pa_p := \frac{1}{2}\left[\left(P_H + PD_t\right)\cdot\left(P_H + PD_t\right)\right]\cdot P_d\cdot\gamma_s\cdot K_p = 95.5\cdot kip$$

Area of Reinforcement Bar = $A_{bar} := \frac{\pi}{4}\cdot {d_{bar}}^2 = 0.4\cdot in^2$

Area of Pier = $A_{pier} := \frac{\pi}{4}{P_d}^2 = 7.1\cdot ft^2$

Area of Pad = $A_{pad} := {PD_w}^2 = 39.1\cdot ft^2$

Sectional Modulus of Pad = $S_{pad} := \frac{PD_w\cdot {PD_w}^2}{6} = 40.7\cdot ft^3$

Volume Of Concrete = $V_{conc} := P_H \cdot (A_{pier}) + A_{pad} \cdot PD_t = 148.8 \cdot ft^3$

$H_s := P_H - P_p = 8.67 \cdot ft$

$B_1 := PD_w^{\,2} = 39.1 \cdot ft^2$

$B_2 := \left(2 \cdot \tan(\psi) \cdot H_s + PD_w\right)^2 = 322.1 \cdot ft^2$

Volume of Soil = $V_{soil} := \left[\frac{H_s}{3} \cdot \left[B_1 + B_2 + \left(B_1 \cdot B_2\right)^{\frac{1}{2}}\right]\right] - \left(H_s \cdot A_{pier}\right) = 1306.5 \cdot ft^3$

Mass of Soil = $M_{soil} := V_{soil} \cdot \gamma_s = 163.3 \cdot kip$

Mass of Concrete = $M_{conc} := V_{conc} \cdot \gamma_c = 22.3 \cdot kip$

Total Mass = $M_{total} := M_{soil} + M_{conc} + Anchor = 485.6 \cdot kip$

CHECK UPLIFT :

Factor of Safety = $F_s := 2$

$ActualFS := \frac{M_{total}}{Uplift} = 2.42$

$Uplift_{check} := \frac{F_s}{ActualFS} = 82.8 \cdot \%$

CHECK BEARING :

$Bearing := \frac{Compression + M_{conc}}{A_{pad}} = 6.74 \cdot ksf$

$Bearing_{check} := \frac{Bearing}{q_u} = 84.3 \cdot \%$

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Phone: 617-965-0789

EXHIBIT C

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RADIO FREQUENCY EMISSIONS ANALYSIS REPORT
EVALUATION OF HUMAN EXPOSURE POTENTIAL TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CT11144C

Union / I-84 / X73-X74 / Cemet1
1050 Buckley Highway
Union, CT 06076

February 28, 2014

EBI Project Number: 62141024

21 B Street Burlington, MA 01803 Tel: (781) 273.2500 Fax: (781) 273.3311

EBI Consulting
environmental | engineering | due diligence

February 28, 2014

T-Mobile USA
Attn: Jason Overbey, RF Manager
35 Griffin Road South
Bloomfield, CT 06002

Re: Emissions Values for Site: **CT11144C - Union / I-84 / X73-X74 / Cemet1**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at 1050 Buckley Highway, Union, CT, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of μW/cm2 calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter (μW/cm2). The general population exposure limit for the cellular band is 567 μW/cm2, and the general population exposure limit for the PCS band is 1000 μW/cm2. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at 1050 Buckley Highway, Union, CT, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, the actual antenna pattern gain value in the direction of the sample area was used. For this report the sample point is a 6 foot person standing at the base of the tower

For all calculations, all equipment was calculated using the following assumptions:

1) 2 GSM channels (1935.000 MHz—to 1945.000 MHz) were considered for each sector of the proposed installation.
2) 2 UMTS channels (2110.000 MHz to 2120.000 MHz / 2140.000 MHz to 2145.000 MHz) were considered for each sector of the proposed installation
3) 2 LTE channels (2110.000 MHz to 2120.000 MHz / 2140.000 MHz to 2145.000 MHz) were considered for each sector of the proposed installation
4) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
5) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The actual gain in this direction was used per the manufactures supplied specifications.
6) The antenna used in this modeling is the Ericsson AIR21 for LTE, UMTS and GSM. This is based on feedback from the carrier with regards to anticipated antenna selection. This antenna has a 15.6 dBd gain value at its main lobe. Actual antenna gain values were used for all calculations as per the manufacturers specifications

7) The antenna mounting height centerline of the proposed antennas is **140 feet** above ground level (AGL)
8) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

All calculation were done with respect to uncontrolled / general public threshold limits

Site ID	CT11144C - Union / I-84 / X73-X74 / Cemet1
Site Addresss	1050 Buckley Highway, Union, CT 06070
Site Type	Self Support Tower

Sector 1

Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	140	134	None	0	0	48.326044	0.967559	0.09676%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-			0	-3.95	140	134	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	140	134	1-5/8"	0	0	24.163022	0.48378	0.04838%
2B	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	140	134	1-5/8"	0	0	24.163022	0.48378	0.04838%
														Sector total Power Density Value:		0.194%	

Sector 2

Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	140	134	None	0	0	48.326044	0.967559	0.09676%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-			0	-3.95	140	134	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	140	134	1-5/8"	0	0	24.163022	0.48378	0.04838%
28	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	140	134	1-5/8"	0	0	24.163022	0.48378	0.04838%
														Sector total Power Density Value:		0.194%	

Sector 3

Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	140	134	None	0	0	48.326044	0.967559	0.09676%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-			0	-3.95	140	134	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	140	134	1-5/8"	0	0	24.163022	0.48378	0.04838%
28	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	140	134	1-5/8"	0	0	24.163022	0.48378	0.04838%
														Sector total Power Density Value:		0.194%	

Site Composite MPE %

Carrier	MPE %
T-Mobile	0.581%
AT&T	23.870%
Sprint	5.850%
Verizon Wireless	9.730%
MetroPCS	5.630%
Nextel	2.230%
PageNet	2.910%
Total Site MPE %	**50.801%**

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Summary

All calculations performed for this analysis yielded results that were well within the allowable limits for general public exposure to RF Emissions.

The anticipated Maximum Composite contributions from the T-Mobile facility are **0.581% (0.194% from each sector)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

The anticipated composite MPE value for this site assuming all carriers present is **50.810%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.

Scott Heffernan
RF Engineering Director

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