STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

September 7, 2012

John Lawrence
New Cingular Wireless PCS, LLC
95 Ryan Drive, Suite #1
Raynham, MA 02767

RE: **EM-CING-155-120822** – New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 491 South Quaker Lane, West Hartford, Connecticut.

Dear Mr. Lawrence:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated July 3, 2012. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding

the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

LRoberts

Linda Roberts
Executive Director

LR/CDM/cm

c: The Honorable Scott Slifka, Mayor, Town of West Hartford
Barry M. Feldman, Town Manager, Town of West Hartford
Ronald F. Van Winkle, Town Planner, Town of West Hartford

EM-CING-155-120822

New Cingular Wireless
CS, LLC
00 Enterprise Drive
ocky Hill, Connecticut 06067

ohn Lawrence
Real Estate Consultant
95 Ryan Drive, Suite #1
Raynham, MA 02767
Phone: (781) 715-5532
lawrence@clinellc.com

July 3, 2012

Ron Van Winkle, Town Manager
Town of West Hartford
50 South Main Street
West Hartford, CT 06107

Re: Notice of Exempt Modification – Existing Telecommunications Facility at 491 South Quaker Lane, West Hartford, CT 06110

Dear Mr. Van Winkle,

New Cingular Wireless PCS, LLC ("AT&T") intends to replace telecommunications antennas and associated equipment at an existing telecommunications tower, owned and operated by T-Mobile.

A Notice of Exempt Modification has been filed with the Connecticut Siting Council as required by Regulations of Connecticut State Agencies ("R.C.S.A.") Section 16-50j-73. Please accept this letter as notification to the Town of West Hartford under Section 16-50j-73 of construction which constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2).

The attached letter fully sets forth the AT&T proposal. However, if you have any questions or require any further information on the plans for the site or the Siting Council's procedures, please contact John Lawrence at (781) 715-5532 or Linda Roberts, Executive Director of the Connecticut Siting Council, at (860) 827-2935.

Sincerely,

John Lawrence
Real Estate Consultant

Enclosure
CC: Honorable Robert Stein, Chairmen of the Connecticut Siting Council

New Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, Connecticut 06067

John Lawrence
Real Estate Consultant
95 Ryan Drive, Suite #1
Raynham, MA 02767
Phone: (781) 715-5532
jlawrence@clinellc.com

July 3, 2012

Honorable Robert Stein, Chairman,
and Members of the Connecticut Siting Council
Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051

Re: Notice of Exempt Modification – Existing Telecommunications Facility at 491 South Quaker Lane, West Hartford, CT 06110

Dear Chairman Stein and Members of the Council:

New Cingular Wireless PCS, LLC ("AT&T") intends to modify the existing telecommunications antennas and associated equipment at an existing multicarrier telecommunications tower at 493 South Quaker Lane, West Hartford CT 06110. AT&T operates under licenses issued by the Federal Communications Commission ("FCC") to provide cellular and PCS mobile telephone service in Hartford County, which includes the area to be served by AT&T's proposed installation.

In order to accommodate technological changes, implement Long Term Evolution ("LTE") capabilities, and enhance system performance in the State of Connecticut, New Cingular Wireless PCS, LLC ("AT&T") plans to modify the equipment configurations at many of its existing cell sites. LTE is a new high-performance air interface for cellular mobile communications. It is designed to increase the capacity and speed of mobile telephone networks.

Please accept this letter as notification to the Council, pursuant to R.C.S.A. Section 16-50j-73, of construction which constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2). In compliance with R.C.S.A. Section 16-50j-73, a copy of this letter is being sent to Ron Van Winkle, Town Manager of West Hartford.

Attached is a summary of the planned modifications, including power density calculations reflecting the change in AT&T's operations at the site. Also included is documentation of the structural sufficiency of the tower to accommodate the revised antenna configuration.

Existing Facility

The West Hartford facility is located at 491 South Quaker Lane, West Hartford CT 06110

The facility is owned by T-Mobile

The existing facility consists of a 120 foot monopole tower with an existing chain link fence around the tower compound fenced in compound. AT&T currently operates wireless communications equipment at the facility and has six (6) antennas mounted at the tower centerline height of 110'.

Statutory Considerations

The changes to the West Hartford tower facility do not constitute a modification as defined in Connecticut General Statutes ("C.G.S.") Section 16-50i(d) because the general physical characteristics of the facility will not be significantly changed or altered. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in R.C.S.A. Section 16-50j-72(b)(2) because they will not result in any substantial adverse environmental effect.

1. The height of the overall structure will be unaffected.

2. The proposed changes will not affect the property boundaries. All new construction will take place inside the existing fenced compound.

3. The proposed additions will not increase the noise level at the existing facility by six decibels or more.

4. LTE will utilize additional radio frequencies newly licensed by the FCC for cellular mobile communications. However, the changes will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site.

For the foregoing reasons, New Cingular Wireless respectfully submits that the proposed changes at the referenced site constitute exempt modifications under R.C.S.A Section §16-50j-72(b)(2).

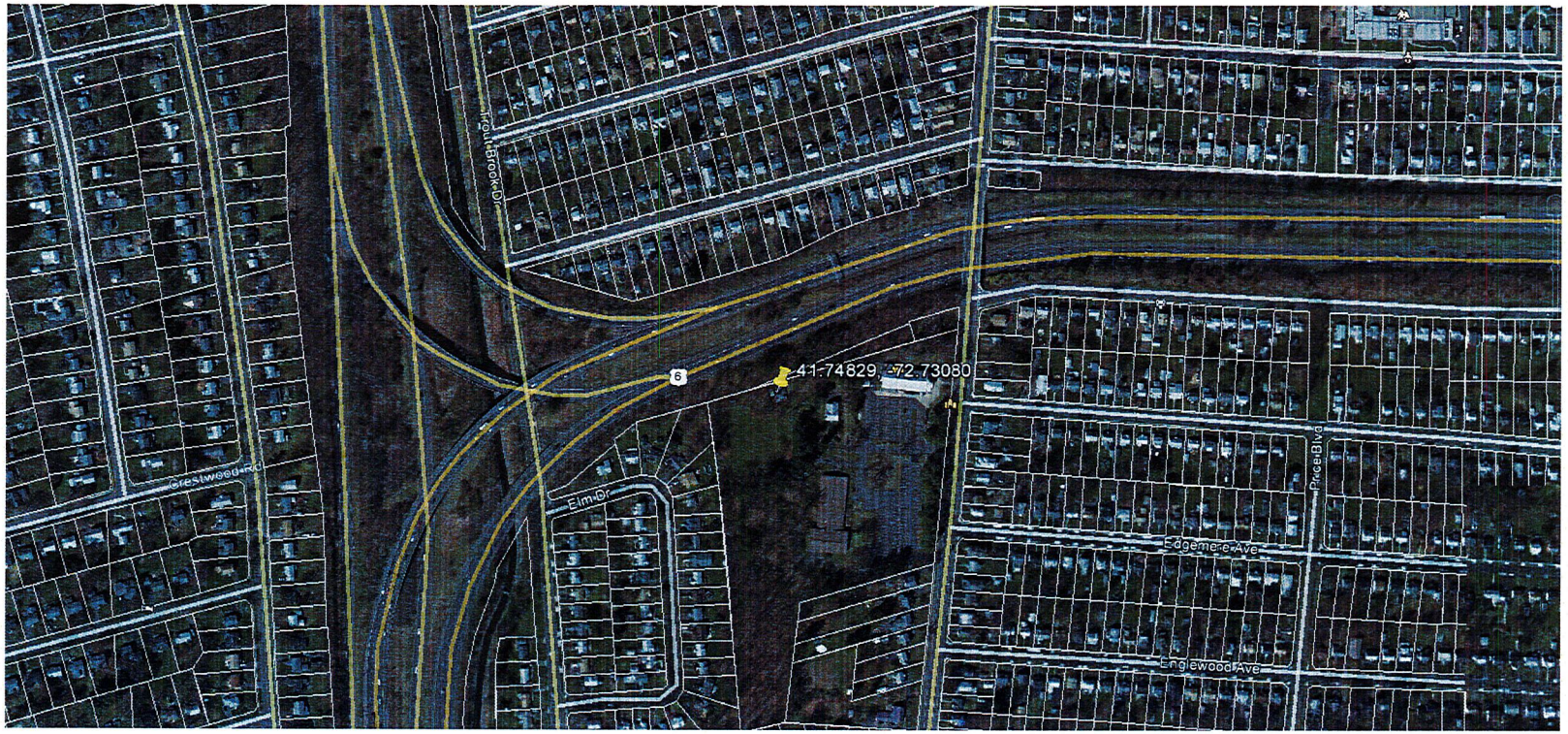
Respectfully yours,

John Lawrence
Real Estate Consultant

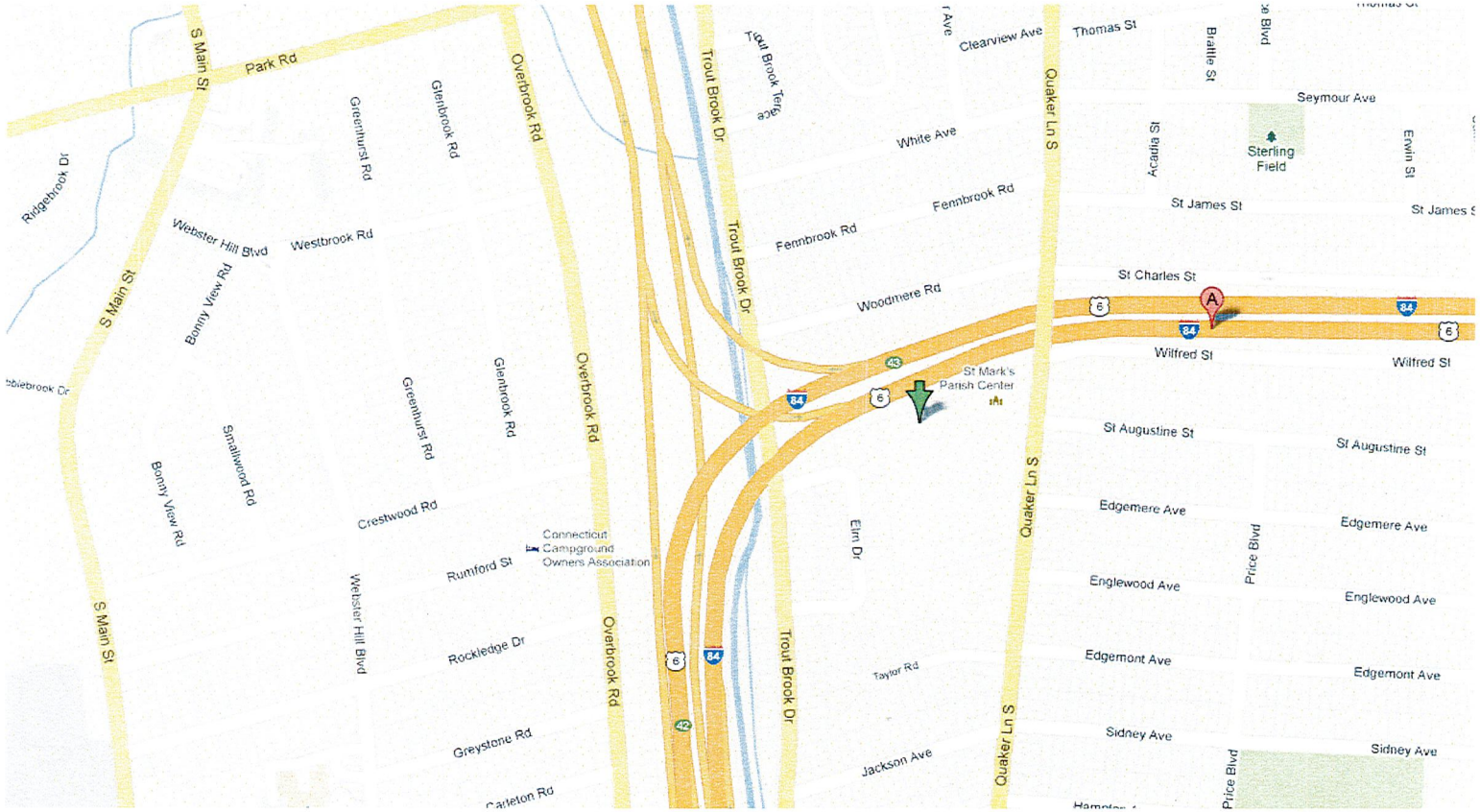
Enclosures:
Ron Van Winkle, Town Manager of West Hartford

CT5258 – 491 Quaker Lane, West Hartford

Aerial Location Map



Street Location Map



PROJECT INFORMATION

SCOPE OF WORK:	UNMANNED TELECOMMUNICATIONS FACILITY MODIFICATIONS
SITE ADDRESS:	491 SOUTH QUAKER LANE WEST HARTFORD, CT 06110
LATITUDE:	41.74829 N 41° 44' 53.8" N
LONGITUDE:	72.73080 W 72° 43' 50.8" W
JURISDICTION:	NATIONAL, STATE & LOCAL CODES OR ORDINANCES
CURRENT USE:	TELECOMMUNICATIONS FACILITY
PROPOSED USE:	TELECOMMUNICATIONS FACILITY

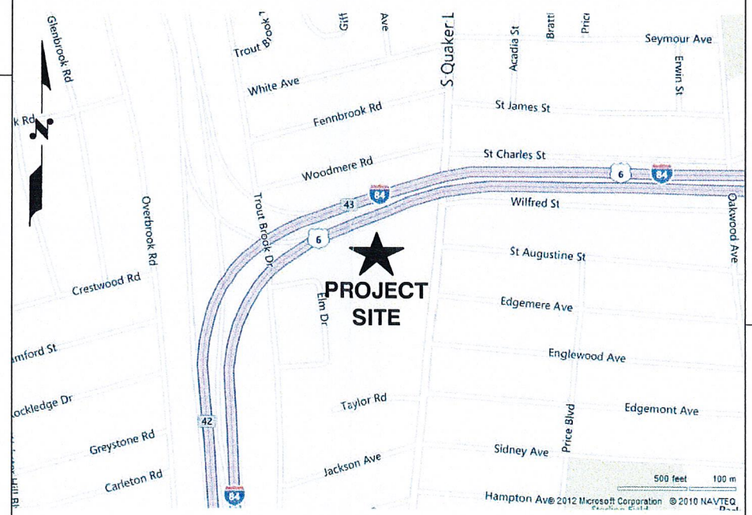
SITE NUMBER: CT5258
SITE NAME: WEST HARTFORD

DRAWING INDEX

		REV
T-1	TITLE SHEET	1
GN-1	GENERAL NOTES	1
A-1	COMPOUND & EQUIPMENT PLAN	1
A-2	ANTENNA LAYOUT & ELEVATION	1
A-3	DETAILS	1
G-1	PLUMBING DIAGRAM & GROUNDING DETAILS	1

VICINITY MAP

DIRECTIONS TO SITE:
HEAD NORTHEAST ON ENTERPRISE DRIVE TOWARD CAPITAL BLVD. 0.3 MI TURN LEFT ONTO CAPITAL BLVD. 0.3 MI TURN LEFT ONTO WEST STREET. 0.2 MI TURN LEFT TO MERGE ONTO I-91 N TOWARD HARTFORD. 8.7 MI TAKE EXIT 32A ON THE LEFT TO MERGE ONTO I-84 W TOWARD WATERBURY. 4.0 MI TAKE EXIT 44 TOWARD PROSPECT OAKWOOD AVENUES. 0.2 MI TURN LEFT ONTO KANE ST. 0.3 MI TAKE THE 1ST LEFT ONTO OAKWOOD AVE. 358 FT TAKE THE 1ST RIGHT ONTO WILFRED ST. 0.4 MI TURN LEFT ONTO QUAKER LN S.



GENERAL NOTES

1. THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF AT&T. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.

2. THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.

3. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE AT&T REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

72 HOURS
BEFORE YOU DIG
CALL TOLL FREE 800-922-4455

UNDERGROUND SERVICE ALERT

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5258
SITE NAME: WEST HARTFORD

491 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
1	04/17/12	ISSUED FOR CONSTRUCTION	SF	DC	DPH
0	03/09/12	ISSUED FOR REVIEW	SF	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: HC | DRAWN BY: SF

DANIEL P. HAMM — LICENSED PROFESSIONAL ENGINEER

AT&T

TITLE SHEET
(LTE)

JOB NUMBER	DRAWING NUMBER	REV
5258.00	T-1	1

GROUNDING NOTES

1. THE SUBCONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ), THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORDIA AND TIA GROUNDING STANDARDS. THE SUBCONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE CONTRACTOR FOR RESOLUTION.

2. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION, AND AC POWER GES'S) SHALL BE BONDED TOGETHER, AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS IN ACCORDANCE WITH THE NEC.

3. THE SUBCONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR NEW GROUND ELECTRODE SYSTEMS. THE SUBCONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS.

4. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO BTS EQUIPMENT.

5. EACH BTS CABINET FRAME SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRES, 6 AWG STRANDED COPPER OR LARGER FOR INDOOR BTS 2 AWG STRANDED COPPER FOR OUTDOOR BTS.

6. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE.

7. APPROVED ANTIOXIDANT COATINGS (I.E., CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.

8. ICE BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO THE BRIDGE AND THE TOWER GROUND BAR.

9. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.

10. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.

11. METAL CONDUIT SHALL BE MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH 6 AWS COPPER WIRE UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.

12. ALL NEW STRUCTURES WITH A FOUNDATION AND/OR FOOTING HAVING 20 FT. OR MORE OF 1/2 IN. OR GREATER ELECTRICALLY CONDUCTIVE REINFORCING STEEL MUST HAVE IT BONDED TO THE GROUND RING USING AN EXOTHERMIC WELD CONNECTION USING #2 AWG SOLID BARE TINNED COPPER GROUND WIRE, PER NEC 250.50

GENERAL NOTES

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:
CONTRACTOR – NEXLINK
SUBCONTRACTOR – GENERAL CONTRACTOR (CONSTRUCTION)
OWNER – AT&T MOBILITY

2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING SUBCONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF CONTRACTOR.

3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. SUBCONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.

4. DRAWINGS PROVIDED HERE ARE NOT TO BE SCALED AND ARE INTENDED TO SHOW OUTLINE ONLY.

5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.

6. "KITTING LIST" SUPPLIED WITH THE BID PACKAGE IDENTIFIES ITEMS THAT WILL BE SUPPLIED BY CONTRACTOR. ITEMS NOT INCLUDED IN THE BILL OF MATERIALS AND KITTING LIST SHALL BE SUPPLIED BY THE SUBCONTRACTOR.

7. THE SUBCONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.

8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE SUBCONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE CONTRACTOR.

9. SUBCONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. SUBCONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. SUBCONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH THE CONTRACTOR.

10. THE SUBCONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT SUBCONTRACTOR'S EXPENSE TO THE SATISFACTION OF OWNER.

11. SUBCONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.

12. SUBCONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.

13. ALL CONCRETE REPAIR WORK SHALL BE DONE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) 301.

14. ANY NEW CONCRETE NEEDED FOR THE CONSTRUCTION SHALL BE AIR-ENTRAINED AND SHALL HAVE 4000 PSI STRENGTH AT 28 DAYS. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.

15. ALL STRUCTURAL STEEL WORK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH AISC SPECIFICATIONS. ALL STRUCTURAL STEEL SHALL BE ASTM A36 (Fy = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (Fy = 36 ksi). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.

16. CONSTRUCTION SHALL COMPLY WITH UMTS SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF AT&T MOBILITY SITES."

17. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.

18. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION. ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.

19. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN TO ALERT OF ANY DANGEROUS EXPOSURE LEVELS.

20. APPLICABLE BUILDING CODES:
SUBCONTRACTOR'S WORK SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES AS ADOPTED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) FOR THE LOCATION. THE EDITION OF THE AHJ ADOPTED CODES AND STANDARDS IN EFFECT ON THE DATE OF CONTRACT AWARD SHALL GOVERN THE DESIGN.
BUILDING CODE: 2003 IBC WITH 2005 CT SUPPLEMENT & 2009 CT AMENDMENTS
ELECTRICAL CODE: REFER TO ELECTRICAL DRAWINGS
LIGHTENING CODE: REFER TO ELECTRICAL DRAWINGS

SUBCONTRACTOR'S WORK SHALL COMPLY WITH THE LATEST EDITION OF THE FOLLOWING STANDARDS:

AMERICAN CONCRETE INSTITUTE (ACI) 318; BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE;

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

MANUAL OF STEEL CONSTRUCTION, ASD, NINTH EDITION;

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) 222-F, STRUCTURAL STANDARDS FOR STEEL

ANTENNA TOWER AND ANTENNA SUPPORTING STRUCTURES; REFER TO ELECTRICAL DRAWINGS FOR SPECIFIC ELECTRICAL STANDARDS.

FOR ANY CONFLICTS BETWEEN SECTIONS OF LISTED CODES AND STANDARDS REGARDING MATERIAL, METHODS OF CONSTRUCTION, OR OTHER REQUIREMENTS, THE MOST RESTRICTIVE REQUIREMENT SHALL GOVERN. WHERE THERE IS CONFLICT BETWEEN A GENERAL REQUIREMENT AND A SPECIFIC REQUIREMENT, THE SPECIFIC REQUIREMENT SHALL GOVERN.

ABBREVIATIONS

AGL	ABOVE GRADE LEVEL	G.C.	GENERAL CONTRACTOR	RF	RADIO FREQUENCY
AWG	AMERICAN WIRE GAUGE	MGB	MASTER GROUND BUS		
BCW	BARE COPPER WIRE	MIN	MINIMUM	TBD	TO BE DETERMINED
BTS	BASE TRANSCEIVER STATION	PROPOSED	NEW	TBR	TO BE REMOVED
EXISTING	EXISTING	N.T.S.	NOT TO SCALE	TBRR	TO BE REMOVED AND REPLACED
EG	EQUIPMENT GROUND	REF	REFERENCE	TYP	TYPICAL
EGR	EQUIPMENT GROUND RING	REQ	REQUIRED		

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5258
SITE NAME: WEST HARTFORD

491 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
1	04/17/12	ISSUED FOR CONSTRUCTION	SF	DC	DPH
0	03/09/12	ISSUED FOR REVIEW	SF	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: HC | DRAWN BY: SF

CONNECTICUT PROFESSIONAL ENGINEER — DANIEL P. HAMM — 16 24 12 — LICENSED

AT&T

GENERAL NOTES
(LTE)

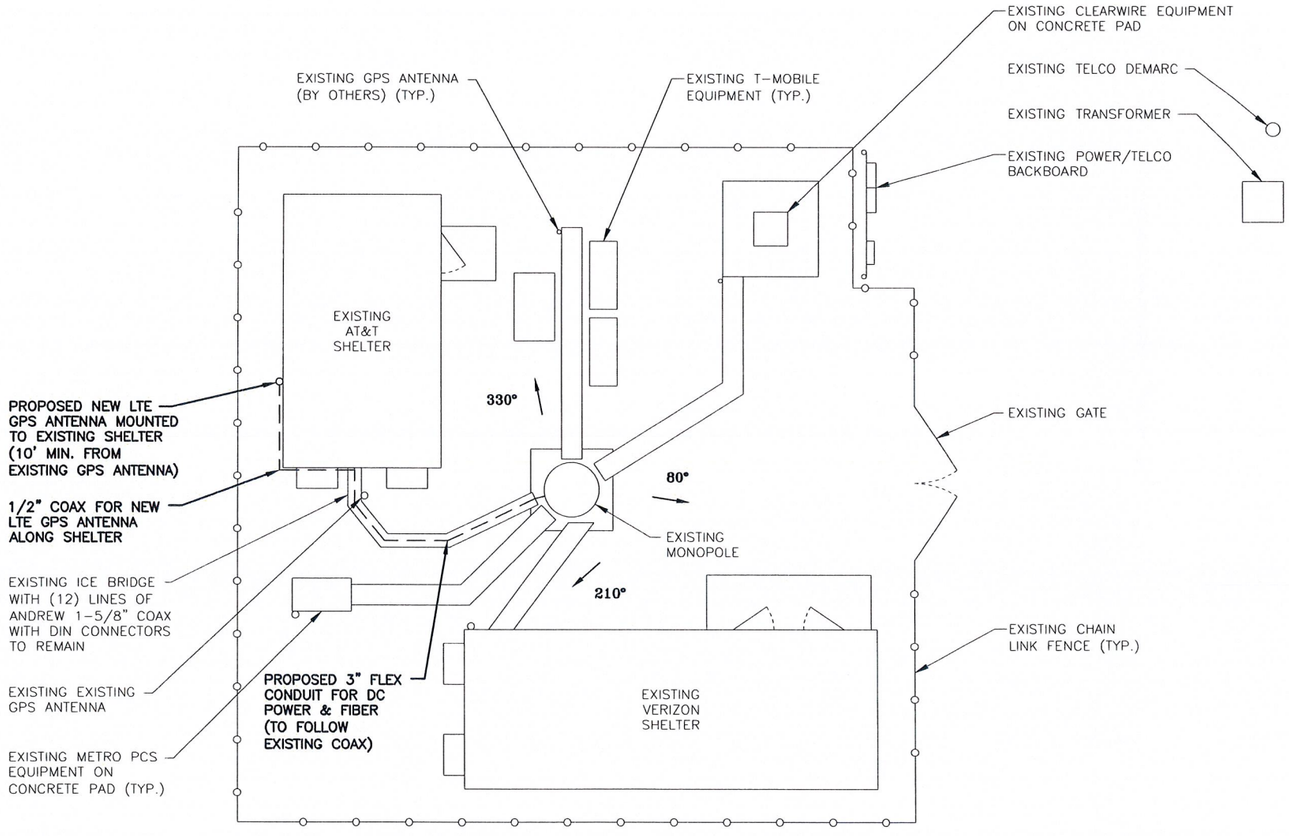
JOB NUMBER	DRAWING NUMBER	REV
5258.00	GN-1	1

NOTE:

REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.



COMPOUND PLAN

SCALE: 3/16"=1'-0"

0 2'-8" 5'-4" 10'-8" 16'-0"

COMPOUND PLAN

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

0 1'-0" 2'-0" 4'-0" 6'-0"

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20-NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5258
SITE NAME: WEST HARTFORD

491 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
1	04/17/12	ISSUED FOR CONSTRUCTION	SF	DC	DPH
0	03/09/12	ISSUED FOR REVIEW	SF	DC	DPH

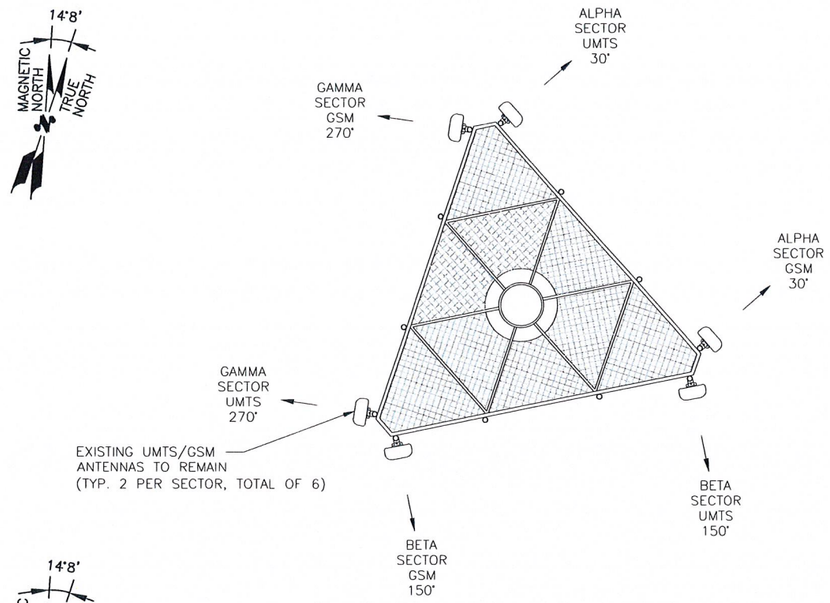
SCALE: AS SHOWN | DESIGNED BY: HC | DRAWN BY: SF

STATE OF CONNECTICUT DANIEL P. HAMM No. 24176 LICENSED PROFESSIONAL ENGINEER

AT&T

COMPOUND & EQUIPMENT PLAN (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5258.00	A-1	1



EXISTING UMTS/GSM ANTENNA PLAN

SCALE: N.T.S.

NOTE:

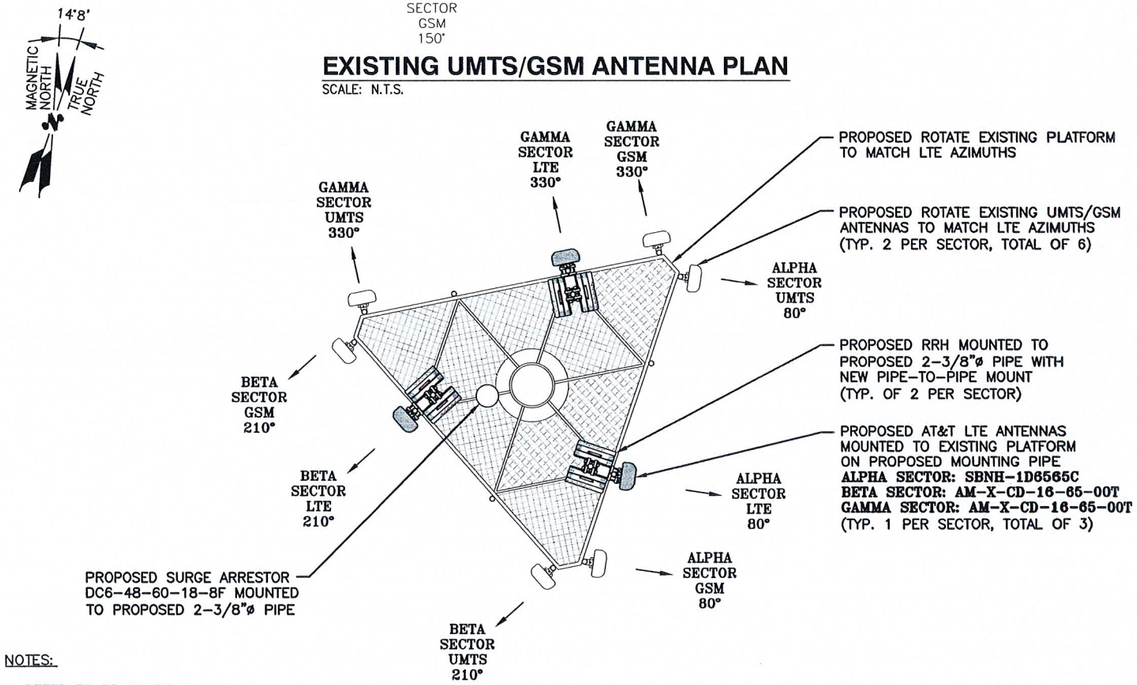
REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.

NOTE:

PROPOSED ANTENNAS, RRH'S & SURGE ARRESTOR TO BE PAINTED TO MATCH EXISTING CONDITIONS.

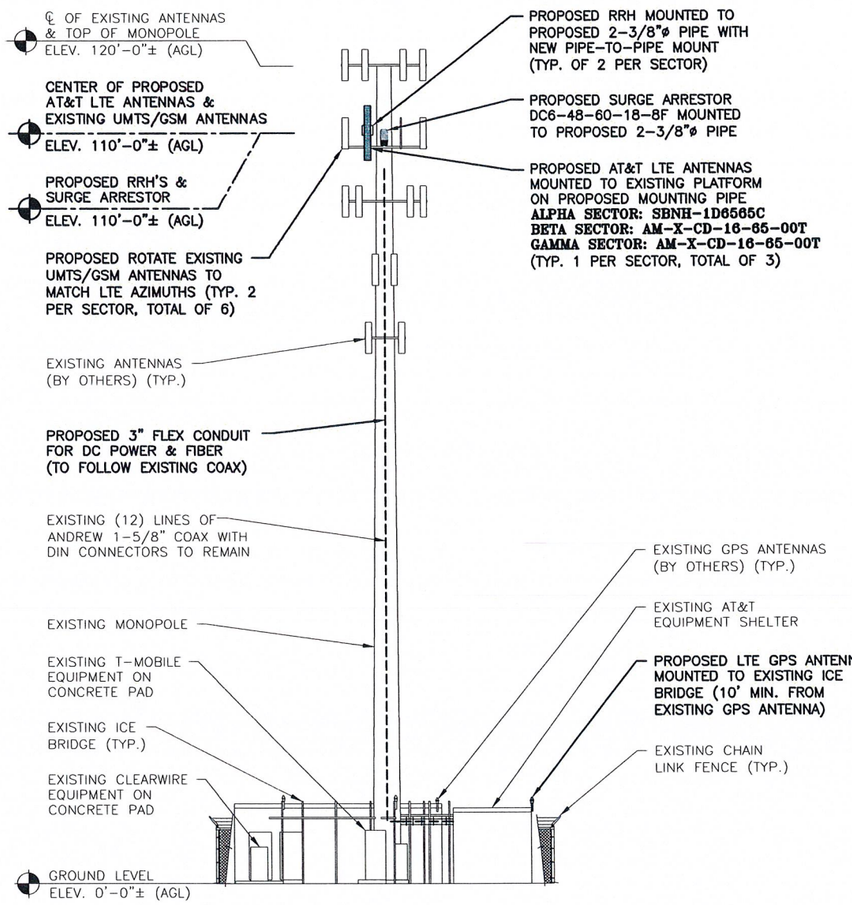


NOTES:

1. REFER TO RF CONFIG & SECTOR SCHEMATICS FOR QUANTITY REQUIRED PER SECTOR

PROPOSED LTE ANTENNA PLAN

SCALE: N.T.S.



NORTH ELEVATION

SCALE: 3/32"=1'-0"

0 5'-4" 10'-8" 21'-4" 32'-0"

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5258
SITE NAME: WEST HARTFORD

491 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
1	04/17/12	ISSUED FOR CONSTRUCTION	SF	DC	DPH
0	03/09/12	ISSUED FOR REVIEW	SF	DC	DPH

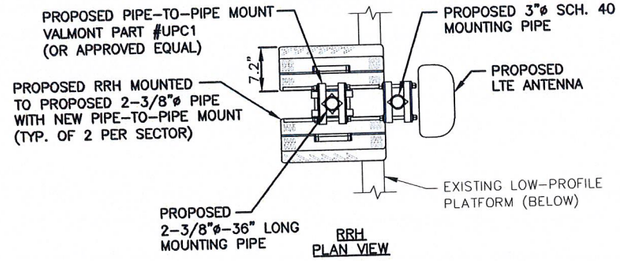
SCALE: AS SHOWN | DESIGNED BY: HC | DRAWN BY: SF

STATE OF CONNECTICUT · DANIEL P. HAMM · No. 21776 · LICENSED PROFESSIONAL ENGINEER

AT&T

ANTENNA LAYOUT & ELEVATION (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5258.00	A-2	1



RRH
PLAN VIEW

NOTE:

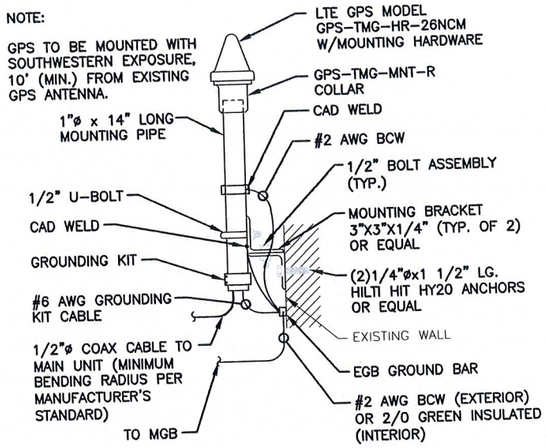
REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.

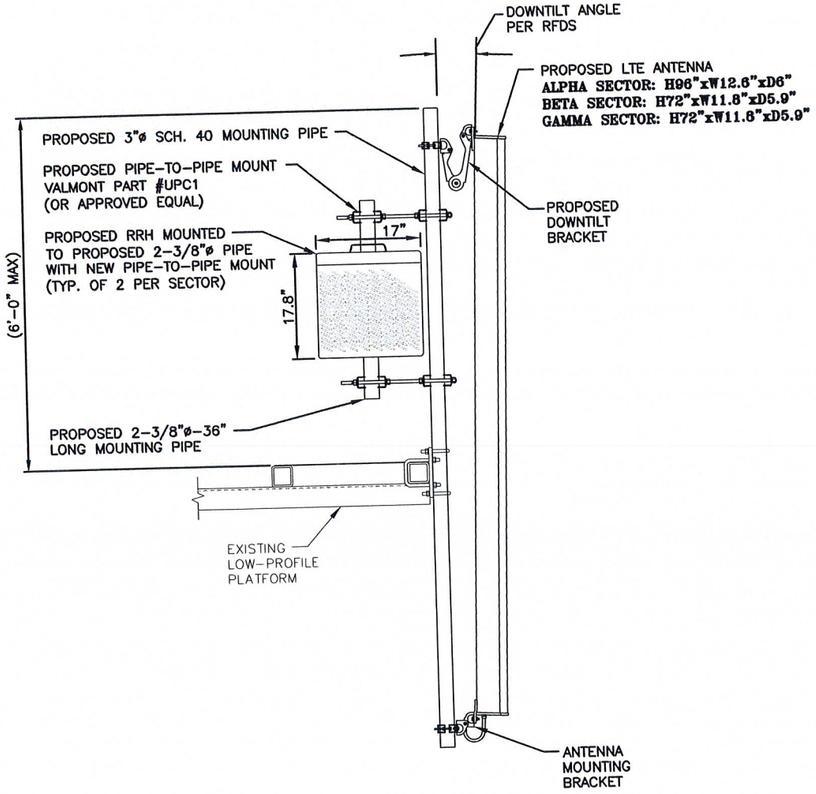
NOTE:

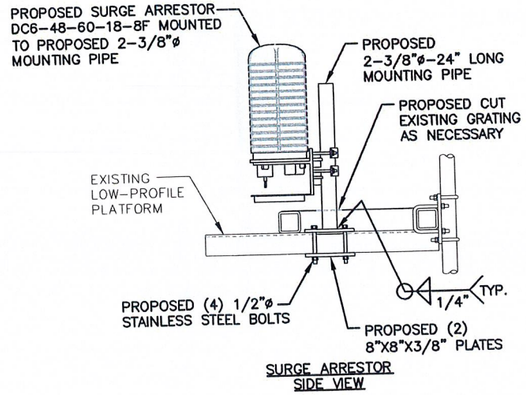
GPS TO BE MOUNTED WITH SOUTHWESTERN EXPOSURE, 10' (MIN.) FROM EXISTING GPS ANTENNA.



GPS MOUNTING DETAIL

SCALE: N.T.S.

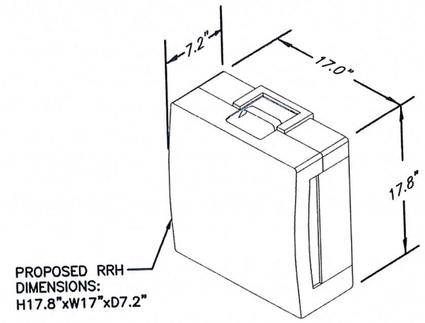




SURGE ARRESTOR
SIDE VIEW

PROPOSED RRH & SURGE ARRESTOR MOUNTING DETAIL

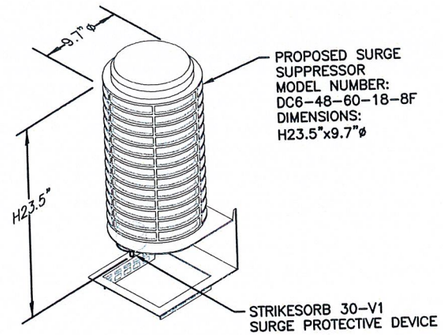
SCALE: N.T.S.



NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

RRH DETAIL

SCALE: N.T.S.



NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

DC SURGE SUPPRESSOR DETAIL

SCALE: N.T.S.

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5258
SITE NAME: WEST HARTFORD

491 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

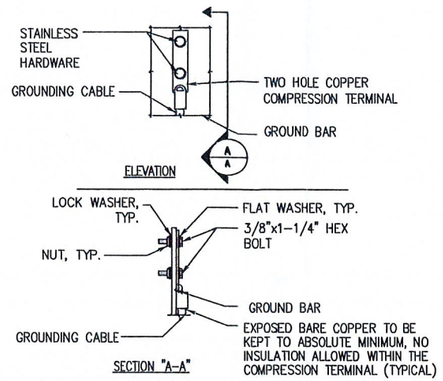
NO.	DATE	REVISIONS	BY	CHK	APP'D
1	04/17/12	ISSUED FOR CONSTRUCTION	SF	DC	DPH
0	03/09/12	ISSUED FOR REVIEW	SF	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: HC | DRAWN BY: SF

AT&T

DETAILS
(LTE)

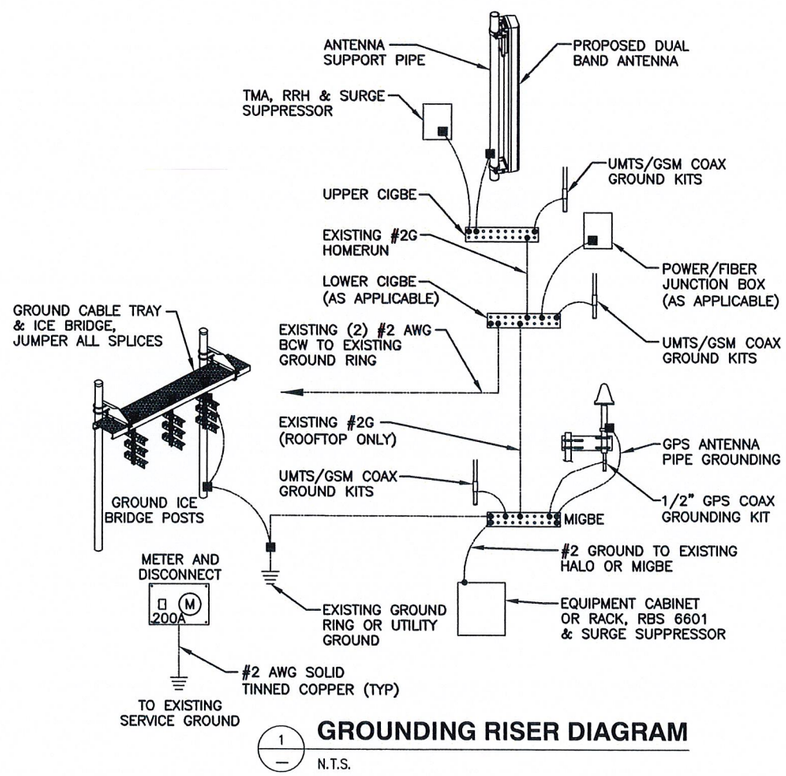
JOB NUMBER	DRAWING NUMBER	REV
5258.00	A-3	1



NOTE:
1. "DOUBLING UP" OR "STACKING " OF CONNECTION IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS.
3. CADWELD DOWNLEADS FROM UPPER EGB, LOWER EGB, AND MGB.

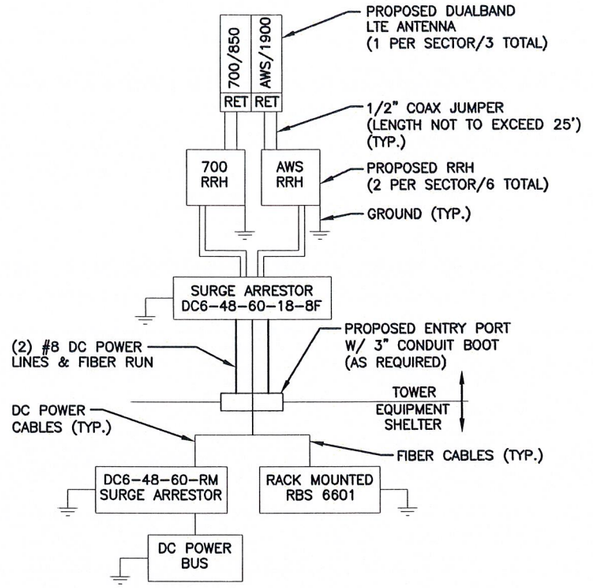
TYPICAL GROUND BAR CONNECTION DETAIL

2 — N.T.S.



GROUNDING RISER DIAGRAM

1 — N.T.S.



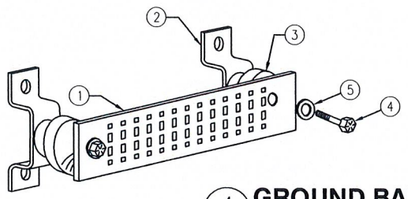
NOTES:

1. CONTRACTOR TO CONFIRM ALL PARTS.
2. INSTALL ALL EQUIPMENT TO MANUFACTURER'S RECOMMENDATIONS.

PLUMBING DIAGRAM

3 — N.T.S.

WIRELESS SOLUTIONS INC.			
NO.	REQ.	PART NO.	DESCRIPTION
1	1	HLGB-0420-IS	SOLID GND. BAR (20"x4"x1/4")
2	2	———	WALL MTG. BRKT.
3	2	———	INSULATORS
4	4	———	5/8"-11x1" H.H.C.S.
5	4	———	5/8 LOCKWASHER



GROUND BAR - DETAIL

4 — N.T.S.

EACH GROUND CONDUCTOR TERMINATING ON ANY GROUND BAR SHALL HAVE AN IDENTIFICATION TAG ATTACHED AT EACH END THAT WILL IDENTIFY ITS ORIGIN AND DESTINATION.

SECTION "P" – SURGE PRODUCERS

CABLE ENTRY PORTS (HATCH PLATES) (#2)
GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
TELCO GROUND BAR
COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
+24V POWER SUPPLY RETURN BAR (#2)
-48V POWER SUPPLY RETURN BAR (#2)
RECTIFIER FRAMES.

SECTION "A" – SURGE ABSORBERS

INTERIOR GROUND RING (#2)
EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING) (#2)
METALLIC COLD WATER PIPE (IF AVAILABLE) (#2)
BUILDING STEEL (IF AVAILABLE) (#2)

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5258
SITE NAME: WEST HARTFORD

491 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
1	04/17/12	ISSUED FOR CONSTRUCTION	SF	DC	DPH
0	03/09/12	ISSUED FOR REVIEW	SF	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: HC | DRAWN BY: SF

STATE OF CONNECTICUT · DANIEL P. HAMM · No. 21176 · LICENSED PROFESSIONAL ENGINEER

AT&T

PLUMBING DIAGRAM & GROUNDING DETAILS (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5258.00	G-1	1

Date: **July 16, 2012**

MeganJo MacLeod
T-Mobile Towers
12920 SE 38th Street
Bellevue, WA 98006
(425) 383-5335

Tower Engineering Professionals
3703 Junction Blvd
Raleigh, NC 27603
(919) 661-6351
bboudreau@tepgroup.net

Subject: **Structural Analysis Report - Revision 2**

Carrier Designation:	***AT&T Reconfiguration***	
	AT&T Site Number:	5258
	AT&T Site Name:	West Hartford - St. Marks
T-Mobile Designation:	**T-Mobile Site Number:**	CT11178D
	T-Mobile Site Name:	St. Mark's Church
Engineering Firm Designation:	**TEP Project Number:**	123480
Site Data:	**467 South Quaker Lane (Church of St. Mark)** **West Hartford, Hartford County, CT 06110** **Latitude N *41° 44' 55.8"*, Longitude W *72° 43' 52.8"*** **120 Foot - Monopole Tower**	

Dear Ms. MacLeod,

Tower Engineering Professionals is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower.

The purpose of the analysis is to determine structural acceptability of the structure stress level. Based on our analysis we have determined the stress level for the structure and foundation, under the following load case, to be:

LC1: Existing + Proposed + Future Equipment **Sufficient Capacity**
Note: See Table 1 for the existing, proposed, and future loading.

Structure Capacity	Controlling Component
96.0%	Rock Anchor Tension

The analysis has been performed in accordance with the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures, ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, and the 2005 Connecticut State Building Code.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Table 1 and the attached drawings for the determined available structural capacity to be effective.

We at *Tower Engineering Professionals* appreciate the opportunity of providing our continuing professional services to you and *T-Mobile Towers*. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:

Andrew T. Haldane, P.E.

STATE OF CONNECTICUT ANDREW T. HALDANE No. 26583 LICENSED PROFESSIONAL ENGINEER 07/16/2012

Revision #	Date Issued	Description
0	June 6, 2012	Original structural analysis report
1	July 2, 2012	Updated AT&T Loading
2	July 16, 2012	Updated foundation analysis per geotechnical investigation

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA
Table 1 - Existing, Proposed, and Future Antenna and Cable Information
Table 2 - Design Antenna and Cable Information

3) ANALYSIS PROCEDURE
Table 3 - Documents Provided
3.1) Analysis Method
3.2) Assumptions

4) ANALYSIS RESULTS
Table 4 - Section Capacity (Summary)
Table 5 - Component Stresses vs. Capacity
Table 6 - Dish Twist/Sway Results for 50 mph Service Wind Speed
4.1) Recommendations

5) APPENDIX A
tnxTower Output

6) APPENDIX B
Coax Configuration

7) APPENDIX C
Additional Calculations

1) INTRODUCTION

This tower is a 120-ft monopole tower designed by Pirod Inc. in May of 2000. The tower was originally designed for a fastest mile wind speed of 80 mph without ice, 69 mph with 0.5 inch ice, and 50 mph under service loads per TIA/EIA-222-F-1996 for the appurtenances listed in Table 2. TEP did not visit the site. All information provided to TEP was to be assumed accurate and complete.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and ASCE 7-05 Minimum Design Loads for Buildings and Other Structures using a fastest mile wind speed of 80 mph with no ice, 28 mph with 1.0 inch ice thickness increasing with height, and 50 mph under service loads.

Table 1 - Existing, Proposed, and Future Antenna and Cable Information

Existing/ Proposed /Future	Elevation (Ft)	Qty	Antenna Model	Mount Type	Qty Coax	Coax Size	Coax[1] Location	Owner/ Tenant
Future	*120*	*9*	*Ericsson AIR 21*	*13' LP Platform*	*25 2*	*1 5/8 1 5/8 Hybrid*	*Inside*	*T-Mobile*
		3	*Ericsson AIR 33*					
		3	*Twin ETW190VS12UB*					
		1	*HCS Fiber/DC Boxes [large]*					
		1	*2' MW Dish*					
Proposed	*110*	*1*	*Andrew SBNH-1D6565C*	*LP Platform*	*12 2 1 1*	*1 5/8 3/8 DC 7/16 Fiber 3" flex conduit*	*Inside*	*AT&T*
		6	*Powerwave 7770*					
		2	*KMW AM-X-CD-16-65-00T-RET*					
		6	*Ericsson RRUS-11*					
		6	*Powerwave LGP 21404 TMA*					
		6	*Powerwave 21903 Diplexer*					
		1	*Raycap DC6-48-60-18-8F*					
Existing	100	2	Andrew LNX-6514DS-T4M	LP Platform	12 1	1 5/8 1/2	Inside	Verizon
		1	Antel BXA-70063/6CF					
		6	Antel LPA-80080/4CF					
		3	Rymsa MG D3-/800T2					
		6	RFS FD9R6004 2C-3L					
		1	GPS					
Existing	90	3	Kathrein 742 213	Flush	6	1 5/8	Outside	Pocket
Existing	80	3	Argus LLPX310R	(3) Pipe mounts on collar	3 3 3 1	1/2 1/4 5/8 5/16	Outside	Clearwire
		3	Dragonwave A-ANT18G-2-C MW					
		3	Horizon ODU's					
		3	Samsung Wimax DapHead					

Notes:
1) See Appendix B – "Coax Configuration" for feed line configuration

Table 2 - Design Antenna and Cable Information

Mounting Level (Ft)	Center Line Elevation (Ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Qty Coax	Coax Size	Coax Location
120	120	12	Unknown	1'x4' Panels	12	1 5/8	Inside
110	110	12	Unknown	1'x4' Panels	12	1 5/8	Inside
100	100	12	Unknown	1'x4' Panels	12	1 5/8	Inside

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Tower and Foundation Drawings	Pirod Inc. dated May 1, 2000 Eng. File No: A-116876	-	T-Mobile
Modification Installation Report	Natcomm, Inc. dated November 9, 2007 Project No: 06115.00	-	T-Mobile
Geotechnical Investigation	Tower Engineering Professionals dated July 6, 2012	123480	TEP
Correspondence	Correspondence from T-Mobile with regards to the existing, proposed, and future loading, SAW dated April 20, 2012	-	T-Mobile

3.1) Analysis Method

tnxTower (version 6.0.4.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) The tower and foundation were built in accordance with the manufacturer's specifications.
2) The tower and foundation have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Table 1 and Appendix B - "Coax Configuration."
4) All unused antennas, mounts, coax, hardware, and appurtenances shall be removed.
5) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by the Standard.
6) Tower Engineering Professionals, Inc. shall assume that all tower components are in sufficient condition to carry their full design capacity.
7) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance. See Table 6.
8) Tower Engineering Professionals, Inc (TEP) did not analyze antenna supporting mounts as part of this structural analysis report. TEP assumes that all antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts.
9) This report is not a construction document.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
L1	119.08 - 101.08	Pole	TP26x22.27x0.25	1	-6556.890	1042527.260	19.2	Pass
L2	101.08 - 66.4967	Pole	TP34.063x24.896x0.313	2	-14325.500	1700521.359	52.8	Pass
L3	66.4967 - 32.83	Pole	TP41.75x32.5x0.375	3	-21562.699	2501454.376	61.1	Pass
L4	32.83 - 0	Pole	TP49.063x39.848x0.375	4	-31498.900	3027842.724	71.1	Pass
							Summary	
						Pole (L4)	71.1	Pass
						RATING =	**71.1**	**Pass**

Table 5 - Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
-	Anchor Rods	-	69.1	Pass
-	Pad and Pier Foundation w/ Rock Anchors (Rock Anchor Tension)	-	96.0	Pass

Structure Rating (max from all components) =	**96.0%**

Table 6 - Dish Twist/Sway Results for 50 mph Service Wind Speed

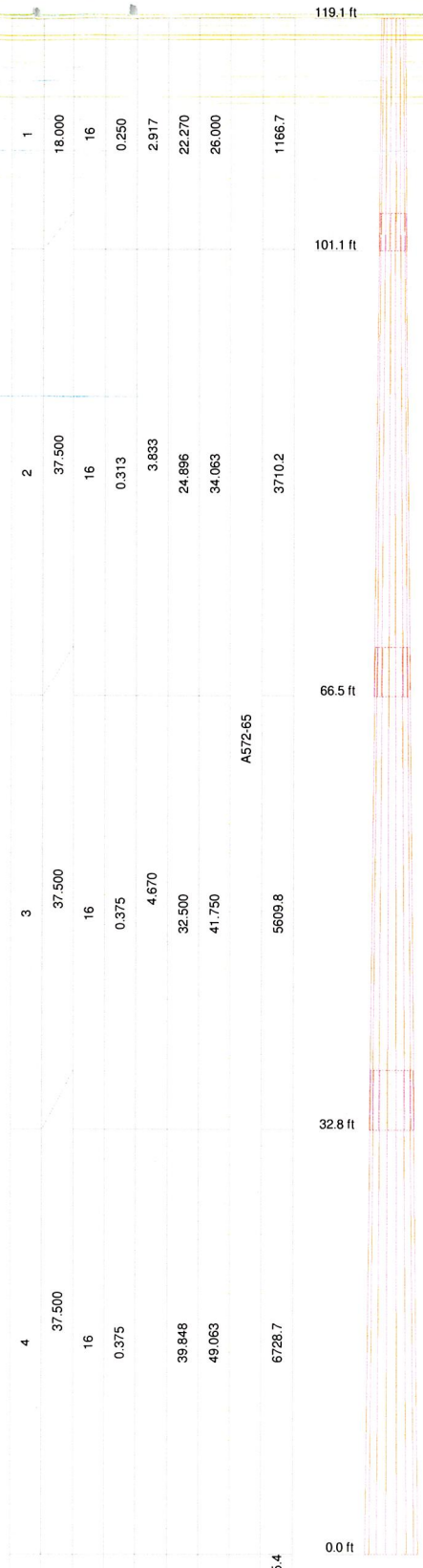
Elevation (ft)	Dish Model	Beam Deflection		
		Deflection (in)	Tilt (deg)	Twist (deg)
120	***2' MW Dish***	***19.332***	***1.354***	***0.002***
80	Dragonwave A-ANT-18G-2-C	9.108	1.059	0.001

4.1) Recommendations

1) If the load differs from that described in Table 1 of this report, Appendix B - "Coax Configuration" or the provisions of this analysis are found to be invalid, another structural analysis should be performed.

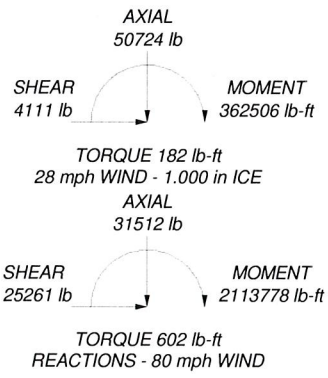
APPENDIX A

TNXTOWER OUTPUT



Section	1	2	3	4
Length (ft)	18.000	37.500	37.500	37.500
Number of Sides	16	16	16	16
Thickness (in)	0.250	0.313	0.375	0.375
Socket Length (ft)	2.917	3.833	4.670	
Top Dia (in)	22.270	24.896	32.500	39.848
Bot Dia (in)	26.000	34.063	41.750	49.063
Grade			A572-65	
Weight (lb)	1166.7	3710.2	5609.8	6728.7

Total Weight (lb): 17215.4



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(3) AIR 21 w/ Mount Pipe	120	LNX-6514DS-T4M w/ Mount Pipe	100
(3) AIR 21 w/ Mount Pipe	120	BXA-70063-6CF-2 w/ Mount Pipe	100
(3) AIR 21 w/ Mount Pipe	120	(2) LPA-80080/4CF w/ Mount Pipe	100
AIR 33 w/ mount pipe	120	(2) LPA-80080/4CF w/ Mount Pipe	100
AIR 33 w/ mount pipe	120	(2) LPA-80080/4CF w/ Mount Pipe	100
AIR 33 w/ mount pipe	120	MG D3-800T2 w/ Pipe Mount	100
ETW190VS12UB	120	MG D3-800T2 w/ Pipe Mount	100
ETW190VS12UB	120	MG D3-800T2 w/ Pipe Mount	100
ETW190VS12UB	120	(2) FD9R6004	100
HCS Fiber/DC box (Large)	120	(2) FD9R6004	100
4.5" x 3' Dish Mount	120	(2) FD9R6004	100
Platform Mount [LP 403-1]	120	GPS_A	100
2-ft HP Dish	120	Platform Mount [LP 403-1]	100
(2) 7770.00 w/ Mount Pipe	110	742 213 w/ Mount Pipe	90
(2) 7770.00 w/ Mount Pipe	110	742 213 w/ Mount Pipe	90
Platform Mount [LP 403-1]	110	742 213 w/ Mount Pipe	90
SBNH-1D6565C w/ Mount Pipe	110	Side Arm Mount [SO 101-3]	80
AM-X-CD-16-65-00T-RET w/ Mount Pipe	110	WIMAX DAP HEAD	80
		LLPX310R w/ Mount Pipe	80
AM-X-CD-16-65-00T-RET w/ Mount Pipe	110	LLPX310R w/ Mount Pipe	80
		LLPX310R w/ Mount Pipe	80
(2) RRUS-11	110	3.5" Dia x 6' Pipe	80
(2) RRUS-11	110	3.5" Dia x 6' Pipe	80
(2) RRUS-11	110	3.5" Dia x 6' Pipe	80
(2) LGP21404	110	Horizon Duo	80
(2) LGP21404	110	Horizon Duo	80
(2) LGP21404	110	Horizon Duo	80
(2) LGP21903	110	WIMAX DAP HEAD	80
(2) LGP21903	110	WIMAX DAP HEAD	80
(2) LGP21903	110	A-ANT-18G-2-C	80
DC6-48-60-18-8F	110	A-ANT-18G-2-C	80
(2) 7770.00 w/ Mount Pipe	110	A-ANT-18G-2-C	80
LNX-6514DS-T4M w/ Mount Pipe	100		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 28 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 71.1%

Tower Engineering Professionals
3703 Junction Blvd.
Raleigh, NC 27603
Phone: (919) 661-6351
FAX: (919) 661-6350

Job:	CT11178D - St. Mark's Church
Project:	TEP# 123480 - Rev 2
Client: T-Mobile	Drawn by: BRB / App'd:
Code: TIA/EIA-222-F	Date: 07/16/12 / Scale: NTS
Path: Q:\3480_CT11178\Structural\Rev 2\tnx\CT11178D.eri	Dwg No. E-1

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 Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 28 mph is used in combination with ice.
Deflections calculated using a wind speed of 50 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	119.080-101.080	18.000	2.917	16	22.270	26.000	0.250	1.000	A572-65 (65 ksi)
L2	101.080-66.497	37.500	3.833	16	24.896	34.063	0.313	1.250	A572-65 (65 ksi)
L3	66.497-32.830	37.500	4.670	16	32.500	41.750	0.375	1.500	A572-65 (65 ksi)
L4	32.830-0.000	37.500		16	39.848	49.063	0.375	1.500	A572-65 (65 ksi)

Tapered Pole Properties

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	22.706	17.561	1075.714	7.839	11.358	94.712	2167.717	8.683	3.934	15.737
	26.509	20.536	1720.191	9.167	13.260	129.728	3466.428	10.154	4.676	18.706
L2	26.110	24.506	1870.962	8.752	12.697	147.358	3770.253	12.117	4.332	13.864
	34.730	33.645	4841.461	12.015	17.372	278.695	9756.227	16.635	6.157	19.701
L3	34.101	38.430	5010.529	11.437	16.575	302.290	10096.923	19.002	5.721	15.257
	42.568	49.495	10704.104	14.730	21.293	502.717	21570.282	24.473	7.562	20.165
L4	41.799	47.220	9294.814	14.052	20.323	457.365	18730.363	23.348	7.184	19.156
	50.024	58.242	17441.697	17.333	25.022	697.058	35147.483	28.798	9.017	24.046

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 119.080-101.080				1	1	1		
L2 101.080-66.497				1	1	1		
L3 66.497-32.830				1	1	1		
L4 32.830-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
PiRod Ladder	C	No	CaAa (Out Of Face)	119.080 - 0.000	1	No Ice	0.054	2.000
						1/2" Ice	0.154	2.635
						1" Ice	0.254	3.881
						2" Ice	0.454	8.206
						4" Ice	0.854	24.187
Safety Line 3/8	C	No	CaAa (Out Of Face)	119.080 - 0.000	1	No Ice	0.037	0.220
						1/2" Ice	0.137	0.750
						1" Ice	0.238	1.280
						2" Ice	0.437	2.340
						4" Ice	0.838	4.460
****								
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	119.080 - 0.000	27	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820
						4" Ice	0.000	0.820
*****								
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	110.000 - 0.000	12	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820
						4" Ice	0.000	0.820
*****								

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	100.000 - 0.000	12	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820
						4" Ice	0.000	0.820
LDF4RN-50A (1/2 FOAM)	C	No	Inside Pole	100.000 - 0.000	1	No Ice	0.000	0.150
						1/2" Ice	0.000	0.150
						1" Ice	0.000	0.150
						2" Ice	0.000	0.150
						4" Ice	0.000	0.150
*****								
LDF7-50A (1-5/8 FOAM)	C	No	CaAa (Out Of Face)	90.000 - 0.000	1	No Ice	0.198	0.820
						1/2" Ice	0.298	2.335
						1" Ice	0.398	4.461
						2" Ice	0.598	10.545
						4" Ice	0.998	30.044
LDF7-50A (1-5/8 FOAM) - Ice Weight Only	C	No	CaAa (Out Of Face)	90.000 - 0.000	5	No Ice	0.000	0.820
						1/2" Ice	0.000	2.335
						1" Ice	0.000	4.461
						2" Ice	0.000	10.545
						4" Ice	0.000	30.044
*****								
2" Flexible Conduit	C	No	CaAa (Out Of Face)	80.000 - 0.000	1	No Ice	0.200	0.340
						1/2" Ice	0.300	1.867
						1" Ice	0.400	4.005
						2" Ice	0.600	10.114
						4" Ice	1.000	29.662
2" Flexible Conduit (Ice Weight Only)	C	No	CaAa (Out Of Face)	80.000 - 0.000	1	No Ice	0.000	0.340
						1/2" Ice	0.000	1.867
						1" Ice	0.000	4.005
						2" Ice	0.000	10.114
						4" Ice	0.000	29.662
LDF4.5-50 (5/8 FOAM) - Ice Weight Only	C	No	CaAa (Out Of Face)	80.000 - 0.000	3	No Ice	0.000	0.150
						1/2" Ice	0.000	0.987
						1" Ice	0.000	1.824
						2" Ice	0.000	3.498
						4" Ice	0.000	6.845
LDF4-50A (1/2 FOAM) - Ice Weight Only	C	No	CaAa (Out Of Face)	80.000 - 0.000	3	No Ice	0.000	0.150
						1/2" Ice	0.000	0.840
						1" Ice	0.000	1.530
						2" Ice	0.000	2.911
						4" Ice	0.000	5.672
1/4 Coax - Ice Weight Only	C	No	CaAa (Out Of Face)	80.000 - 0.000	3	No Ice	0.000	0.100
						1/2" Ice	0.000	0.558
						1" Ice	0.000	1.016
						2" Ice	0.000	1.932
						4" Ice	0.000	3.765
5/16" Coax - Ice Weight Only	C	No	CaAa (Out Of Face)	80.000 - 0.000	1	No Ice	0.000	0.088
						1/2" Ice	0.000	0.584
						1" Ice	0.000	1.080
						2" Ice	0.000	2.072
						4" Ice	0.000	4.057
*****								
3" P&C Flex Conduit	C	No	Inside Pole	110.000 - 0.000	1	No Ice	0.000	1.040
						1/2" Ice	0.000	1.040
						1" Ice	0.000	1.040
						2" Ice	0.000	1.040
						4" Ice	0.000	1.040
3/8" coax	C	No	Inside Pole	110.000 - 0.000	2	No Ice	0.000	0.075
						1/2" Ice	0.000	0.075
						1" Ice	0.000	0.075

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						2" Ice	0.000	0.075
						4" Ice	0.000	0.075
7/16 coax	C	No	Inside Pole	110.000 - 0.000	1	No Ice	0.000	0.113
						1/2" Ice	0.000	0.113
						1" Ice	0.000	0.113
						2" Ice	0.000	0.113
						4" Ice	0.000	0.113

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	119.080-101.080	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.647	537.871
L2	101.080-66.497	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	10.519	1704.703
L3	66.497-32.830	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	16.480	1763.474
L4	32.830-0.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	16.070	1719.649

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	119.080-101.080	A	1.155	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	9.965	605.865
L2	101.080-66.497	A	1.117	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	35.050	2807.844
L3	66.497-32.830	A	1.050	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	46.575	3544.008
L4	32.830-0.000	A	1.000	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	43.641	3307.089

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	119.080-101.080	-0.114	0.066	-0.525	0.303
L2	101.080-66.497	-0.367	0.212	-0.911	0.526

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L3	66.497-32.830	-0.550	0.318	-1.197	0.691
L4	32.830-0.000	-0.563	0.325	-1.233	0.712

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
(3) AIR 21 w/ Mount Pipe	A	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.533 6.978 7.432 8.365 10.336	5.334 6.017 6.727 8.201 11.465	107.425 159.255 220.165 363.653 762.855
(3) AIR 21 w/ Mount Pipe	B	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.533 6.978 7.432 8.365 10.336	5.334 6.017 6.727 8.201 11.465	107.425 159.255 220.165 363.653 762.855
(3) AIR 21 w/ Mount Pipe	C	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.533 6.978 7.432 8.365 10.336	5.334 6.017 6.727 8.201 11.465	107.425 159.255 220.165 363.653 762.855
AIR 33 w/ mount pipe	A	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.386 6.821 7.264 8.177 10.107	5.181 5.862 6.561 8.013 11.232	121.425 172.242 232.036 372.978 765.835
AIR 33 w/ mount pipe	B	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.386 6.821 7.264 8.177 10.107	5.181 5.862 6.561 8.013 11.232	121.425 172.242 232.036 372.978 765.835
AIR 33 w/ mount pipe	C	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.386 6.821 7.264 8.177 10.107	5.181 5.862 6.561 8.013 11.232	121.425 172.242 232.036 372.978 765.835
ETW190VS12UB	A	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.664 0.778 0.901 1.172 1.817	0.367 0.461 0.564 0.796 1.364	14.600 19.541 26.012 44.320 107.848
ETW190VS12UB	B	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.664 0.778 0.901 1.172 1.817	0.367 0.461 0.564 0.796 1.364	14.600 19.541 26.012 44.320 107.848
ETW190VS12UB	C	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.664 0.778 0.901 1.172	0.367 0.461 0.564 0.796	14.600 19.541 26.012 44.320

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
							4" Ice	1.817	1.364	107.848
HCS Fiber/DC box (Large)	A	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.224 3.467 3.717 4.245 5.404	1.162 1.337 1.521 1.915 2.807	19.000 38.056 60.061 113.697 264.913
4.5" x 3' Dish Mount	C	From Centroid-Leg	4.000 0.000 0.000		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.925 1.131 1.372 1.889 3.056	0.925 1.131 1.372 1.889 3.056	32.370 42.303 54.679 87.373 188.802
Platform Mount [LP 403-1]	C	None			0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	18.850 24.300 29.750 40.650 62.450	18.850 24.300 29.750 40.650 62.450	1500.000 1796.560 2093.120 2686.240 3872.480
*****										
(2) 7770.00 w/ Mount Pipe	A	From Centroid-Leg	4.000 0.000 0.000		0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.218 6.769 7.296 8.385 10.691	4.353 5.198 5.919 7.411 10.763	56.900 102.995 159.009 293.014 679.745
(2) 7770.00 w/ Mount Pipe	B	From Centroid-Leg	4.000 0.000 0.000		0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.218 6.769 7.296 8.385 10.691	4.353 5.198 5.919 7.411 10.763	56.900 102.995 159.009 293.014 679.745
(2) 7770.00 w/ Mount Pipe	C	From Centroid-Leg	4.000 0.000 0.000		0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.218 6.769 7.296 8.385 10.691	4.353 5.198 5.919 7.411 10.763	56.900 102.995 159.009 293.014 679.745
Platform Mount [LP 403-1]	C	None			0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	18.850 24.300 29.750 40.650 62.450	18.850 24.300 29.750 40.650 62.450	1500.000 1796.560 2093.120 2686.240 3872.480
*****										
LNX-6514DS-T4M w/ Mount Pipe	A	From Centroid-Leg	4.000 0.000 0.000		0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.682 9.312 9.931 11.198 13.852	7.418 8.452 9.345 11.181 15.216	79.330 149.395 229.857 420.014 938.257
LNX-6514DS-T4M w/ Mount Pipe	B	From Centroid-Leg	4.000 0.000 0.000		0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.682 9.312 9.931 11.198 13.852	7.418 8.452 9.345 11.181 15.216	79.330 149.395 229.857 420.014 938.257
BXA-70063-6CF-2 w/ Mount Pipe	C	From Centroid-Leg	4.000 0.000 0.000		0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.801 6.953 7.819 9.601 13.366	42.246 100.217 169.877 335.132 803.420
(2) LPA-80080/4CF w/ Mount Pipe	A	From Centroid-Leg	4.000 0.000 0.000		0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice	3.110 3.585 4.022 5.013	7.482 8.378 9.152 10.752	33.900 80.485 136.660 269.993

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Offsets: Horz ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
								4" Ice	7.153	14.168	651.414
(2) LPA-80080/4CF w/ Mount Pipe	B	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	3.110	7.482	33.900
			0.000					1/2" Ice	3.585	8.378	80.485
			0.000					1" Ice	4.022	9.152	136.660
								2" Ice	5.013	10.752	269.993
								4" Ice	7.153	14.168	651.414
(2) LPA-80080/4CF w/ Mount Pipe	C	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	3.110	7.482	33.900
			0.000					1/2" Ice	3.585	8.378	80.485
			0.000					1" Ice	4.022	9.152	136.660
								2" Ice	5.013	10.752	269.993
								4" Ice	7.153	14.168	651.414
MG D3-800T2 w/ Pipe Mount	A	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	3.477	3.325	35.850
			0.000					1/2" Ice	3.853	3.956	66.613
			0.000					1" Ice	4.237	4.599	105.974
								2" Ice	5.126	5.934	204.179
								4" Ice	7.041	8.903	505.827
MG D3-800T2 w/ Pipe Mount	B	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	3.477	3.325	35.850
			0.000					1/2" Ice	3.853	3.956	66.613
			0.000					1" Ice	4.237	4.599	105.974
								2" Ice	5.126	5.934	204.179
								4" Ice	7.041	8.903	505.827
MG D3-800T2 w/ Pipe Mount	C	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	3.477	3.325	35.850
			0.000					1/2" Ice	3.853	3.956	66.613
			0.000					1" Ice	4.237	4.599	105.974
								2" Ice	5.126	5.934	204.179
								4" Ice	7.041	8.903	505.827
(2) FD9R6004	A	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	0.367	0.085	3.100
			0.000					1/2" Ice	0.451	0.136	5.399
			0.000					1" Ice	0.543	0.196	8.787
								2" Ice	0.755	0.343	19.608
								4" Ice	1.281	0.740	62.872
(2) FD9R6004	B	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	0.367	0.085	3.100
			0.000					1/2" Ice	0.451	0.136	5.399
			0.000					1" Ice	0.543	0.196	8.787
								2" Ice	0.755	0.343	19.608
								4" Ice	1.281	0.740	62.872
(2) FD9R6004	C	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	0.367	0.085	3.100
			0.000					1/2" Ice	0.451	0.136	5.399
			0.000					1" Ice	0.543	0.196	8.787
								2" Ice	0.755	0.343	19.608
								4" Ice	1.281	0.740	62.872
GPS_A	C	From Centroid-Leg	4.000	0.000	0.000	0.000	100.000	No Ice	0.297	0.297	0.870
			0.000					1/2" Ice	0.374	0.374	4.658
			0.000					1" Ice	0.459	0.459	9.758
								2" Ice	0.655	0.655	24.672
								4" Ice	1.151	1.151	78.797
Platform Mount [LP 403-1]	C	None				0.000	100.000	No Ice	18.850	18.850	1500.000
								1/2" Ice	24.300	24.300	1796.560
								1" Ice	29.750	29.750	2093.120
								2" Ice	40.650	40.650	2686.240
								4" Ice	62.450	62.450	3872.480
*****											
742 213 w/ Mount Pipe	A	From Leg	0.500	0.000	0.000	0.000	90.000	No Ice	5.373	4.620	48.919
			0.000					1/2" Ice	5.950	6.000	90.561
			0.000					1" Ice	6.501	6.982	144.110
								2" Ice	7.611	8.852	277.119
								4" Ice	9.933	12.794	682.430

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Offsets: Horz ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
742 213 w/ Mount Pipe	B	From Leg	0.500	0.000	0.000	0.000	90.000	No Ice	5.373	4.620	48.919
			0.000					1/2" Ice	5.950	6.000	90.561
			0.000					1" Ice	6.501	6.982	144.110
								2" Ice	7.611	8.852	277.119
								4" Ice	9.933	12.794	682.430
742 213 w/ Mount Pipe	C	From Leg	0.500	0.000	0.000	0.000	90.000	No Ice	5.373	4.620	48.919
			0.000					1/2" Ice	5.950	6.000	90.561
			0.000					1" Ice	6.501	6.982	144.110
								2" Ice	7.611	8.852	277.119
								4" Ice	9.933	12.794	682.430
*****											
LLPX310R w/ Mount Pipe	A	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	4.982	2.874	43.868
			0.000					1/2" Ice	5.376	3.398	79.254
			0.000					1" Ice	5.780	3.937	122.333
								2" Ice	6.618	5.125	226.490
								4" Ice	8.437	7.894	531.181
LLPX310R w/ Mount Pipe	B	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	4.982	2.874	43.868
			0.000					1/2" Ice	5.376	3.398	79.254
			0.000					1" Ice	5.780	3.937	122.333
								2" Ice	6.618	5.125	226.490
								4" Ice	8.437	7.894	531.181
LLPX310R w/ Mount Pipe	C	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	4.982	2.874	43.868
			0.000					1/2" Ice	5.376	3.398	79.254
			0.000					1" Ice	5.780	3.937	122.333
								2" Ice	6.618	5.125	226.490
								4" Ice	8.437	7.894	531.181
3.5" Dia x 6' Pipe	A	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	1.928	1.928	45.480
			0.000					1/2" Ice	2.293	2.293	60.656
			0.000					1" Ice	2.667	2.667	80.007
								2" Ice	3.442	3.442	131.841
								4" Ice	5.111	5.111	292.320
3.5" Dia x 6' Pipe	B	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	1.928	1.928	45.480
			0.000					1/2" Ice	2.293	2.293	60.656
			0.000					1" Ice	2.667	2.667	80.007
								2" Ice	3.442	3.442	131.841
								4" Ice	5.111	5.111	292.320
3.5" Dia x 6' Pipe	C	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	1.928	1.928	45.480
			0.000					1/2" Ice	2.293	2.293	60.656
			0.000					1" Ice	2.667	2.667	80.007
								2" Ice	3.442	3.442	131.841
								4" Ice	5.111	5.111	292.320
Horizon Duo	A	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	0.547	0.343	7.000
			0.000					1/2" Ice	0.648	0.426	11.778
			0.000					1" Ice	0.759	0.518	18.028
								2" Ice	1.005	0.728	35.719
								4" Ice	1.601	1.252	97.313
Horizon Duo	B	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	0.547	0.343	7.000
			0.000					1/2" Ice	0.648	0.426	11.778
			0.000					1" Ice	0.759	0.518	18.028
								2" Ice	1.005	0.728	35.719
								4" Ice	1.601	1.252	97.313
Horizon Duo	C	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	0.547	0.343	7.000
			0.000					1/2" Ice	0.648	0.426	11.778
			0.000					1" Ice	0.759	0.518	18.028
								2" Ice	1.005	0.728	35.719
								4" Ice	1.601	1.252	97.313
WIMAX DAP HEAD	A	From Leg	2.000	0.000	0.000	0.000	80.000	No Ice	1.804	0.778	33.000

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
			0.000					1/2" Ice	1.988	0.918	44.576
			0.000					1" Ice	2.180	1.067	58.459
								2" Ice	2.589	1.391	93.926
								4" Ice	3.512	2.143	201.104
WIMAX DAP HEAD	B	From Leg	2.000			0.000	80.000	No Ice	1.804	0.778	33.000
			0.000					1/2" Ice	1.988	0.918	44.576
			0.000					1" Ice	2.180	1.067	58.459
								2" Ice	2.589	1.391	93.926
								4" Ice	3.512	2.143	201.104
WIMAX DAP HEAD	C	From Leg	2.000			0.000	80.000	No Ice	1.804	0.778	33.000
			0.000					1/2" Ice	1.988	0.918	44.576
			0.000					1" Ice	2.180	1.067	58.459
								2" Ice	2.589	1.391	93.926
								4" Ice	3.512	2.143	201.104
Side Arm Mount [SO 101-3]	C	None				0.000	80.000	No Ice	7.500	7.500	252.000
								1/2" Ice	8.900	8.900	333.000
								1" Ice	10.300	10.300	414.000
								2" Ice	13.100	13.100	576.000
								4" Ice	18.700	18.700	900.000
*****											
SBNH-1D6565C w/ Mount Pipe	A	From Centroid-Le g	4.000			0.000	110.000	No Ice	11.695	9.854	99.254
			0.000					1/2" Ice	12.421	11.383	185.387
			0.000					1" Ice	13.157	12.936	286.695
								2" Ice	14.630	15.305	522.509
								4" Ice	17.917	20.189	1168.582
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Centroid-Le g	4.000			0.000	110.000	No Ice	8.498	6.304	74.050
			0.000					1/2" Ice	9.149	7.479	136.213
			0.000					1" Ice	9.767	8.368	210.279
								2" Ice	11.031	10.179	384.862
								4" Ice	13.679	14.024	874.167
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Centroid-Le g	4.000			0.000	110.000	No Ice	8.498	6.304	74.050
			0.000					1/2" Ice	9.149	7.479	136.213
			0.000					1" Ice	9.767	8.368	210.279
								2" Ice	11.031	10.179	384.862
								4" Ice	13.679	14.024	874.167
(2) RRUS-11	A	From Centroid-Le g	4.000			0.000	110.000	No Ice	3.249	1.373	47.620
			0.000					1/2" Ice	3.491	1.551	68.420
			0.000					1" Ice	3.741	1.738	92.255
								2" Ice	4.268	2.138	149.809
								4" Ice	5.426	3.042	309.895
(2) RRUS-11	B	From Centroid-Le g	4.000			0.000	110.000	No Ice	3.249	1.373	47.620
			0.000					1/2" Ice	3.491	1.551	68.420
			0.000					1" Ice	3.741	1.738	92.255
								2" Ice	4.268	2.138	149.809
								4" Ice	5.426	3.042	309.895
(2) RRUS-11	C	From Centroid-Le g	4.000			0.000	110.000	No Ice	3.249	1.373	47.620
			0.000					1/2" Ice	3.491	1.551	68.420
			0.000					1" Ice	3.741	1.738	92.255
								2" Ice	4.268	2.138	149.809
								4" Ice	5.426	3.042	309.895
(2) LGP21404	A	From Centroid-Le g	4.000			0.000	110.000	No Ice	1.288	0.364	14.100
			0.000					1/2" Ice	1.445	0.479	21.263
			0.000					1" Ice	1.611	0.602	30.319
								2" Ice	1.969	0.874	54.887
								4" Ice	2.788	1.522	135.288
(2) LGP21404	B	From Centroid-Le	4.000			0.000	110.000	No Ice	1.288	0.364	14.100
			0.000					1/2" Ice	1.445	0.479	21.263

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
		g	0.000					1" Ice	1.611	0.602	30.319
								2" Ice	1.969	0.874	54.887
								4" Ice	2.788	1.522	135.288
(2) LGP21404	C	From Centroid-Le g	4.000			0.000	110.000	No Ice	1.288	0.364	14.100
			0.000					1/2" Ice	1.445	0.479	21.263
			0.000					1" Ice	1.611	0.602	30.319
								2" Ice	1.969	0.874	54.887
								4" Ice	2.788	1.522	135.288
(2) LGP21903	A	From Centroid-Le g	4.000			0.000	110.000	No Ice	0.270	0.184	11.020
			0.000					1/2" Ice	0.343	0.248	13.435
			0.000					1" Ice	0.425	0.322	16.932
								2" Ice	0.616	0.494	27.952
								4" Ice	1.101	0.943	71.536
(2) LGP21903	B	From Centroid-Le g	4.000			0.000	110.000	No Ice	0.270	0.184	11.020
			0.000					1/2" Ice	0.343	0.248	13.435
			0.000					1" Ice	0.425	0.322	16.932
								2" Ice	0.616	0.494	27.952
								4" Ice	1.101	0.943	71.536
(2) LGP21903	C	From Centroid-Le g	4.000			0.000	110.000	No Ice	0.270	0.184	11.020
			0.000					1/2" Ice	0.343	0.248	13.435
			0.000					1" Ice	0.425	0.322	16.932
								2" Ice	0.616	0.494	27.952
								4" Ice	1.101	0.943	71.536
DC6-48-60-18-8F	A	From Centroid-Le g	4.000			0.000	110.000	No Ice	1.266	1.266	20.000
			0.000					1/2" Ice	1.456	1.456	35.116
			0.000					1" Ice	1.658	1.658	52.569
								2" Ice	2.093	2.093	95.095
								4" Ice	3.098	3.098	214.905

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight lb
2-ft HP Dish	C	Paraboloid w/Shroud (HP)	From Centroid -Face	4.000			0.000		120.000	2.000	No Ice	3.142	200.000
				0.000							1/2" Ice	3.409	217.500
				0.000							1" Ice	3.676	234.999
											2" Ice	4.211	269.998
											4" Ice	5.280	339.996
A-ANT-18G-2-C	A	Paraboloid w/Shroud (HP)	From Leg	2.000			0.000		80.000	2.175	No Ice	3.720	27.150
				0.000							1/2" Ice	4.010	47.730
				0.000							1" Ice	4.300	68.320
											2" Ice	4.880	109.490
											4" Ice	6.040	191.830
A-ANT-18G-2-C	B	Paraboloid w/Shroud (HP)	From Leg	2.000			0.000		80.000	2.175	No Ice	3.720	27.150
				0.000							1/2" Ice	4.010	47.730
				0.000							1" Ice	4.300	68.320
											2" Ice	4.880	109.490
											4" Ice	6.040	191.830

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter		Aperture Area	Weight
				ft	°	°	ft	ft		ft^2	lb
A-ANT-18G-2-C	C	Paraboloid w/Shroud (HP)	From Leg	2.000 0.000 0.000	0.000		80.000	2.175	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.720 4.010 4.300 4.880 6.040	27.150 47.730 68.320 109.490 191.830

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
15	Dead+Wind 0 deg+Ice
16	Dead+Wind 30 deg+Ice
17	Dead+Wind 60 deg+Ice
18	Dead+Wind 90 deg+Ice
19	Dead+Wind 120 deg+Ice
20	Dead+Wind 150 deg+Ice
21	Dead+Wind 180 deg+Ice
22	Dead+Wind 210 deg+Ice
23	Dead+Wind 240 deg+Ice
24	Dead+Wind 270 deg+Ice
25	Dead+Wind 300 deg+Ice
26	Dead+Wind 330 deg+Ice
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		°	°
L1	119.08 - 101.08	19.332	33	1.354	0.002
L2	103.997 - 66.4967	15.115	33	1.301	0.002
L3	70.33 - 32.83	7.044	33	0.930	0.001
L4	37.5 - 0	2.045	33	0.498	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
120.000	2-ft HP Dish	33	19.332	1.354	0.002	23692
110.000	(2) 7770.00 w/ Mount Pipe	33	16.771	1.329	0.002	13046
100.000	LNX-6514DS-T4M w/ Mount Pipe	33	14.040	1.274	0.001	7209
90.000	742 213 w/ Mount Pipe	33	11.474	1.179	0.001	5977
80.000	A-ANT-18G-2-C	33	9.108	1.059	0.001	5105

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	119.08 - 101.08	49.360	8	3.453	0.004
L2	103.997 - 66.4967	38.603	8	3.321	0.004
L3	70.33 - 32.83	17.999	8	2.377	0.001
L4	37.5 - 0	5.227	8	1.273	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
120.000	2-ft HP Dish	8	49.360	3.453	0.005	9420
110.000	(2) 7770.00 w/ Mount Pipe	8	42.828	3.391	0.004	5187
100.000	LNX-6514DS-T4M w/ Mount Pipe	8	35.862	3.253	0.004	2860
90.000	742 213 w/ Mount Pipe	2	29.312	3.013	0.003	2361
80.000	A-ANT-18G-2-C	8	23.271	2.705	0.002	2010

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_u lb	Ratio $\frac{P}{P_a}$
L1	119.08 - 101.08 (1)	TP26x22.27x0.25	18.000	0.000	0.0	39.000	20.054	-6556.890	782091.000	0.008
L2	101.08 - 66.4967 (2)	TP34.063x24.896x0.313	37.500	0.000	0.0	39.000	32.710	-14325.500	1275710.000	0.011
L3	66.4967 - 32.83 (3)	TP41.75x32.5x0.375	37.500	0.000	0.0	39.000	48.117	-21562.699	1876560.000	0.011
L4	32.83 - 0 (4)	TP49.063x39.848x0.375	37.500	0.000	0.0	39.000	58.242	-31498.900	2271450.000	0.014

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	119.08 - 101.08 (1)	TP26x22.27x0.25	99446.667	9.649	39.000	0.247	0.000	0.000	39.000	0.000
L2	101.08 - 66.4967 (2)	TP34.063x24.896x0.313	592198.333	26.983	39.000	0.692	0.000	0.000	39.000	0.000
L3	66.4967 - 32.83 (3)	TP41.75x32.5x0.375	1239175.000	31.306	39.000	0.803	0.000	0.000	39.000	0.000
L4	32.83 - 0 (4)	TP49.063x39.848x0.375	2113775.000	36.389	39.000	0.933	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V lb	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T lb-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	119.08 - 101.08 (1)	TP26x22.27x0.25	9325.520	0.465	26.000	0.036	145.657	0.007	26.000	0.000
L2	101.08 - 66.4967 (2)	TP34.063x24.896x0.313	17981.301	0.550	26.000	0.043	67.543	0.001	26.000	0.000
L3	66.4967 - 32.83 (3)	TP41.75x32.5x0.375	21405.400	0.445	26.000	0.035	223.584	0.003	26.000	0.000
L4	32.83 - 0 (4)	TP49.063x39.848x0.375	25261.801	0.434	26.000	0.034	426.058	0.004	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	119.08 - 101.08 (1)	0.008	0.247	0.000	0.036	0.000	0.256 ✓	1.333	H1-3+VT ✓
L2	101.08 - 66.4967 (2)	0.011	0.692	0.000	0.043	0.000	0.704 ✓	1.333	H1-3+VT ✓

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
L3	66.4967 - 32.83 (3)	0.011	0.803	0.000	0.035	0.000	0.814 ✓	1.333	H1-3+VT ✓
L4	32.83 - 0 (4)	0.014	0.933	0.000	0.034	0.000	0.947 ✓	1.333	H1-3+VT ✓

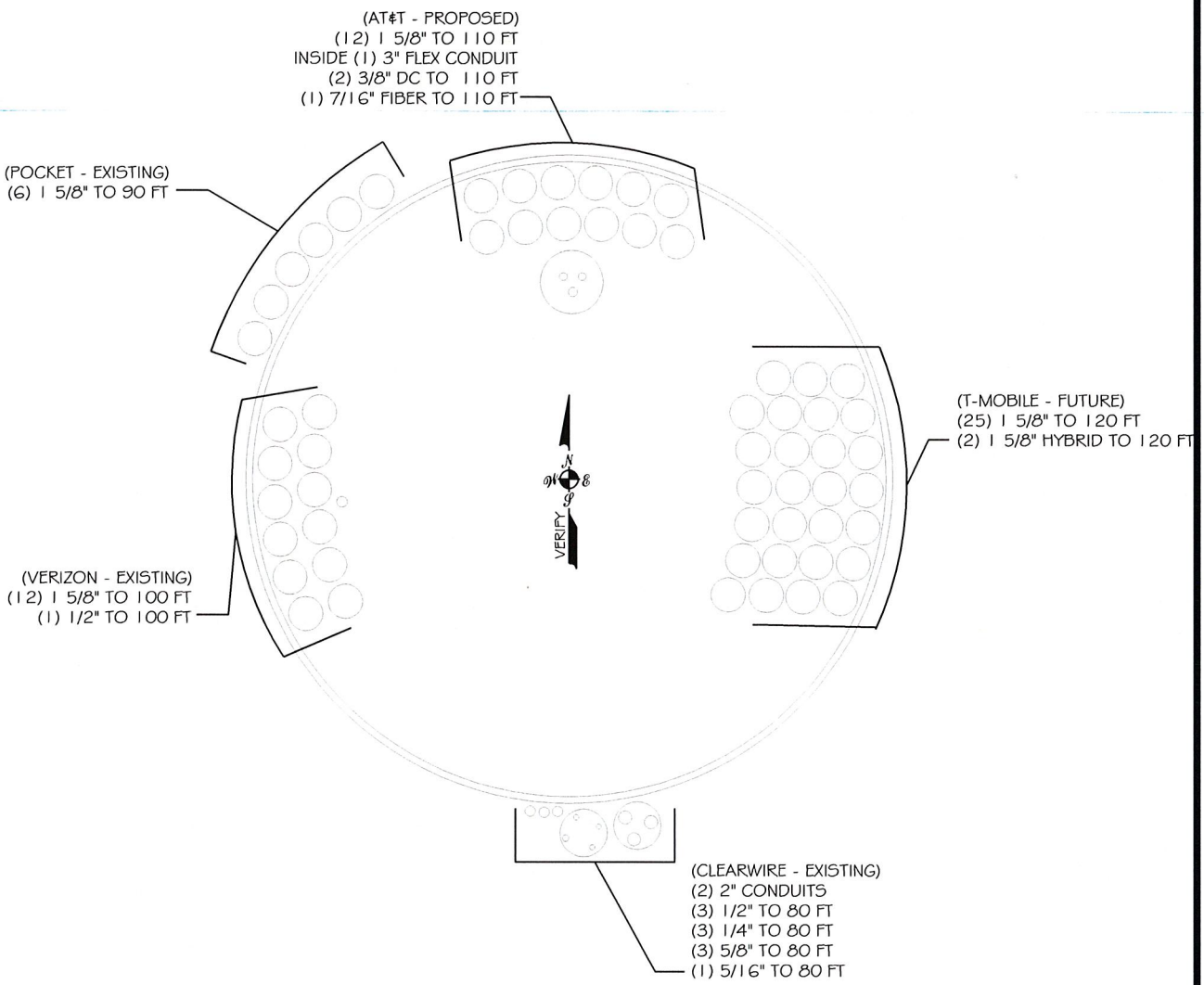
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
L1	119.08 - 101.08	Pole	TP26x22.27x0.25	1	-6556.890	1042527.260	19.2	Pass
L2	101.08 - 66.4967	Pole	TP34.063x24.896x0.313	2	-14325.500	1700521.359	52.8	Pass
L3	66.4967 - 32.83	Pole	TP41.75x32.5x0.375	3	-21562.699	2501454.376	61.1	Pass
L4	32.83 - 0	Pole	TP49.063x39.848x0.375	4	-31498.900	3027842.724	71.1	Pass
							Summary	
							Pole (L4)	71.1	Pass
							RATING =	**71.1**	**Pass**

Program Version 6.0.4.0 - 1/27/2012 File:Q:/3480_CT11178/Structural/Rev 1/tnx/CT11178D.eri

APPENDIX B

COAX CONFIGURATION

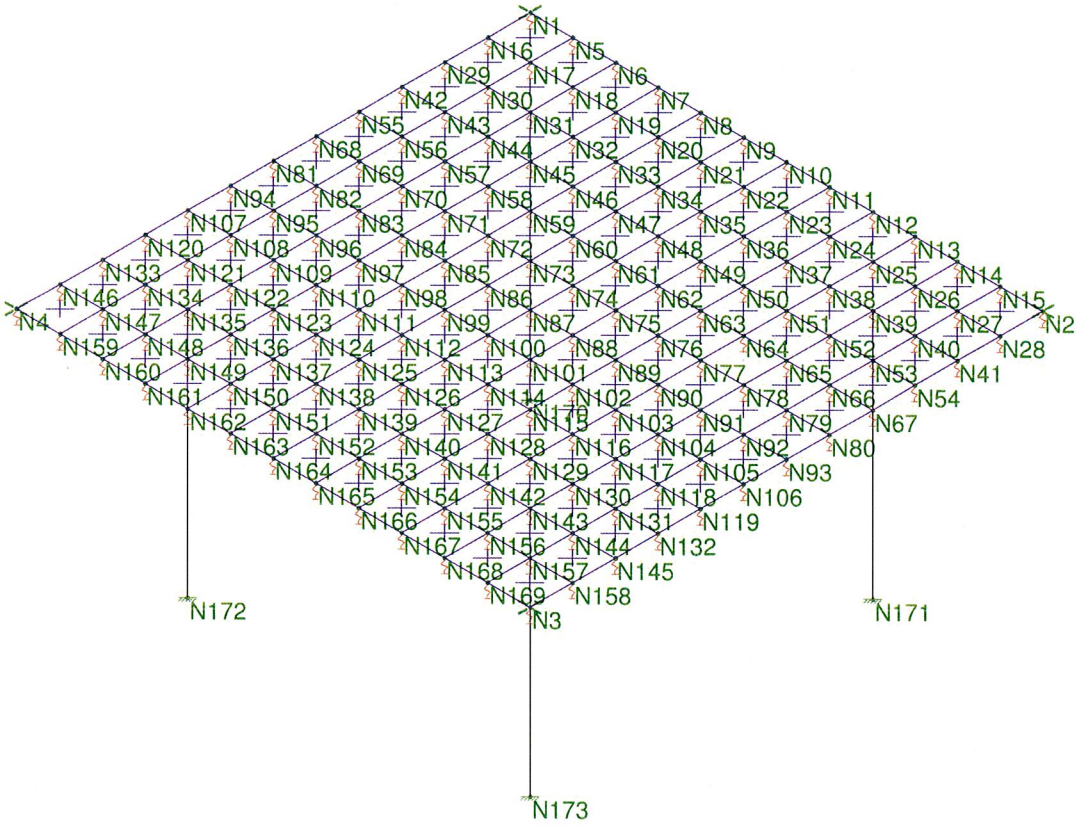


COAX CONFIGURATION - N.T.S.

PREPARED BY:	PREPARED FOR:	PROJECT INFORMATION:	
TOWER ENGINEERING PROFESSIONALS 3703 JUNCTION BOULEVARD RALEIGH, NC 27603-5263 (919) 661-6351 www.tepgroup.net	T-Mobile T-MOBILE TOWERS 12920 SE 38TH STREET BELLEVUE, WA 98006	**SITE # CT11178D** **ST. MARK'S CHURCH** 467 SOUTH QUAKER LN. WEST HARTFORD, CT 06110 (HARTFORD COUNTY)	REVISION: 2 TEP JOB #: 123480 SHEET NUMBER: **S-1**

APPENDIX C

ADDITIONAL CALCULATIONS



Solution: Envelope

T-Mobile	CT11178D - St. Mark's Church	SK - 1
BRB		July 2, 2012 at 11:06 AM
TEP# 123480		Foundation - BRB.r3d

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	Dead	None		-1.035		1				144
2	Moment 0 deg	None				1				
3	Moment 45 deg	None				2				
4	Pretension (Temp)	None						4		

Joint Loads and Enforced Displacements (BLC 1 : Dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft...
1	N87	L	Y	-31.512

Joint Loads and Enforced Displacements (BLC 2 : Moment 0 deg)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft...
1	N87	L	Mx	2290.605

Joint Loads and Enforced Displacements (BLC 3 : Moment 45 deg)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft...
1	N87	L	Mx	1619.702
2	N87	L	Mz	1619.702

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	NC	NC	.469	1	NC	NC	0	1	0	1	0	1
2		min	NC	NC	0	2	NC	NC	0	1	0	1	0	1
3	N2	max	NC	NC	.469	1	NC	NC	0	1	0	1	0	1
4		min	NC	NC	0	2	NC	NC	0	1	0	1	0	1
5	N3	max	NC	NC	2.177	2	NC	NC	0	1	0	1	0	1
6		min	NC	NC	.154	3	NC	NC	0	1	0	1	0	1
7	N4	max	NC	NC	2.983	3	NC	NC	0	1	0	1	0	1
8		min	NC	NC	.469	1	NC	NC	0	1	0	1	0	1
9	N5	max	0	1	.942	1	0	1	0	1	0	1	0	1
10		min	0	1	0	2	0	1	0	1	0	1	0	1
11	N6	max	0	1	.945	1	0	1	0	1	0	1	0	1
12		min	0	1	0	2	0	1	0	1	0	1	0	1
13	N7	max	0	1	.948	1	0	1	0	1	0	1	0	1
14		min	0	1	0	2	0	1	0	1	0	1	0	1
15	N8	max	0	1	.95	1	0	1	0	1	0	1	0	1
16		min	0	1	0	2	0	1	0	1	0	1	0	1
17	N9	max	0	1	.952	1	0	1	0	1	0	1	0	1
18		min	0	1	0	2	0	1	0	1	0	1	0	1
19	N10	max	0	1	.952	1	0	1	0	1	0	1	0	1
20		min	0	1	0	2	0	1	0	1	0	1	0	1
21	N11	max	0	1	.952	1	0	1	0	1	0	1	0	1
22		min	0	1	0	2	0	1	0	1	0	1	0	1
23	N12	max	0	1	.95	1	0	1	0	1	0	1	0	1
24		min	0	1	0	2	0	1	0	1	0	1	0	1
25	N13	max	0	1	.948	1	0	1	0	1	0	1	0	1
26		min	0	1	0	2	0	1	0	1	0	1	0	1
27	N14	max	0	1	.945	1	0	1	0	1	0	1	0	1
28		min	0	1	0	2	0	1	0	1	0	1	0	1
29	N15	max	0	1	.942	1	0	1	0	1	0	1	0	1
30		min	0	1	0	2	0	1	0	1	0	1	0	1
31	N16	max	0	1	.942	1	0	1	0	1	0	1	0	1
32		min	0	1	0	2	0	1	0	1	0	1	0	1
33	N17	max	0	1	1.89	1	0	1	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
34		min	0	1	0	2	0	1	0	1	0	1	0	1
35	N18	max	0	1	1.897	1	0	1	0	1	0	1	0	1
36		min	0	1	0	2	0	1	0	1	0	1	0	1
37	N19	max	0	1	1.904	1	0	1	0	1	0	1	0	1
38		min	0	1	0	2	0	1	0	1	0	1	0	1
39	N20	max	0	1	1.909	1	0	1	0	1	0	1	0	1
40		min	0	1	0	2	0	1	0	1	0	1	0	1
41	N21	max	0	1	1.912	1	0	1	0	1	0	1	0	1
42		min	0	1	0	2	0	1	0	1	0	1	0	1
43	N22	max	0	1	1.914	1	0	1	0	1	0	1	0	1
44		min	0	1	0	2	0	1	0	1	0	1	0	1
45	N23	max	0	1	1.912	1	0	1	0	1	0	1	0	1
46		min	0	1	0	2	0	1	0	1	0	1	0	1
47	N24	max	0	1	1.909	1	0	1	0	1	0	1	0	1
48		min	0	1	0	2	0	1	0	1	0	1	0	1
49	N25	max	0	1	1.904	1	0	1	0	1	0	1	0	1
50		min	0	1	0	2	0	1	0	1	0	1	0	1
51	N26	max	0	1	1.897	1	0	1	0	1	0	1	0	1
52		min	0	1	0	2	0	1	0	1	0	1	0	1
53	N27	max	0	1	1.89	1	0	1	0	1	0	1	0	1
54		min	0	1	0	2	0	1	0	1	0	1	0	1
55	N28	max	0	1	.942	1	0	1	0	1	0	1	0	1
56		min	0	1	0	2	0	1	0	1	0	1	0	1
57	N29	max	0	1	1.313	3	0	1	0	1	0	1	0	1
58		min	0	1	0	2	0	1	0	1	0	1	0	1
59	N30	max	0	1	1.897	1	0	1	0	1	0	1	0	1
60		min	0	1	0	2	0	1	0	1	0	1	0	1
61	N31	max	0	1	1.905	1	0	1	0	1	0	1	0	1
62		min	0	1	0	2	0	1	0	1	0	1	0	1
63	N32	max	0	1	1.912	1	0	1	0	1	0	1	0	1
64		min	0	1	0	2	0	1	0	1	0	1	0	1
65	N33	max	0	1	1.918	1	0	1	0	1	0	1	0	1
66		min	0	1	0	2	0	1	0	1	0	1	0	1
67	N34	max	0	1	1.922	1	0	1	0	1	0	1	0	1
68		min	0	1	0	2	0	1	0	1	0	1	0	1
69	N35	max	0	1	1.923	1	0	1	0	1	0	1	0	1
70		min	0	1	0	2	0	1	0	1	0	1	0	1
71	N36	max	0	1	1.922	1	0	1	0	1	0	1	0	1
72		min	0	1	0	2	0	1	0	1	0	1	0	1
73	N37	max	0	1	1.918	1	0	1	0	1	0	1	0	1
74		min	0	1	0	2	0	1	0	1	0	1	0	1
75	N38	max	0	1	1.912	1	0	1	0	1	0	1	0	1
76		min	0	1	0	2	0	1	0	1	0	1	0	1
77	N39	max	0	1	1.905	1	0	1	0	1	0	1	0	1
78		min	0	1	0	2	0	1	0	1	0	1	0	1
79	N40	max	0	1	1.897	1	0	1	0	1	0	1	0	1
80		min	0	1	0	2	0	1	0	1	0	1	0	1
81	N41	max	0	1	.945	1	0	1	0	1	0	1	0	1
82		min	0	1	0	2	0	1	0	1	0	1	0	1
83	N42	max	0	1	1.812	3	0	1	0	1	0	1	0	1
84		min	0	1	0	2	0	1	0	1	0	1	0	1
85	N43	max	0	1	2.611	3	0	1	0	1	0	1	0	1
86		min	0	1	0	2	0	1	0	1	0	1	0	1
87	N44	max	0	1	1.912	1	0	1	0	1	0	1	0	1
88		min	0	1	0	2	0	1	0	1	0	1	0	1
89	N45	max	0	1	1.92	1	0	1	0	1	0	1	0	1
90		min	0	1	0	2	0	1	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
91	N46	max	0	1	1.927	1	0	1	0	1	0	1	0	1
92		min	0	1	0	2	0	1	0	1	0	1	0	1
93	N47	max	0	1	1.932	1	0	1	0	1	0	1	0	1
94		min	0	1	0	2	0	1	0	1	0	1	0	1
95	N48	max	0	1	1.934	1	0	1	0	1	0	1	0	1
96		min	0	1	0	2	0	1	0	1	0	1	0	1
97	N49	max	0	1	1.932	1	0	1	0	1	0	1	0	1
98		min	0	1	0	2	0	1	0	1	0	1	0	1
99	N50	max	0	1	1.927	1	0	1	0	1	0	1	0	1
100		min	0	1	0	2	0	1	0	1	0	1	0	1
101	N51	max	0	1	1.92	1	0	1	0	1	0	1	0	1
102		min	0	1	0	2	0	1	0	1	0	1	0	1
103	N52	max	0	1	1.912	1	0	1	0	1	0	1	0	1
104		min	0	1	0	2	0	1	0	1	0	1	0	1
105	N53	max	0	1	1.904	1	0	1	0	1	0	1	0	1
106		min	0	1	0	2	0	1	0	1	0	1	0	1
107	N54	max	0	1	.948	1	0	1	0	1	0	1	0	1
108		min	0	1	0	2	0	1	0	1	0	1	0	1
109	N55	max	0	1	2.307	3	0	1	0	1	0	1	0	1
110		min	0	1	0	2	0	1	0	1	0	1	0	1
111	N56	max	0	1	3.619	3	0	1	0	1	0	1	0	1
112		min	0	1	0	2	0	1	0	1	0	1	0	1
113	N57	max	0	1	2.62	3	0	1	0	1	0	1	0	1
114		min	0	1	0	2	0	1	0	1	0	1	0	1
115	N58	max	0	1	1.927	1	0	1	0	1	0	1	0	1
116		min	0	1	0	2	0	1	0	1	0	1	0	1
117	N59	max	0	1	1.936	1	0	1	0	1	0	1	0	1
118		min	0	1	0	2	0	1	0	1	0	1	0	1
119	N60	max	0	1	1.942	1	0	1	0	1	0	1	0	1
120		min	0	1	0	2	0	1	0	1	0	1	0	1
121	N61	max	0	1	1.944	1	0	1	0	1	0	1	0	1
122		min	0	1	0	2	0	1	0	1	0	1	0	1
123	N62	max	0	1	1.942	1	0	1	0	1	0	1	0	1
124		min	0	1	0	2	0	1	0	1	0	1	0	1
125	N63	max	0	1	1.936	1	0	1	0	1	0	1	0	1
126		min	0	1	0	2	0	1	0	1	0	1	0	1
127	N64	max	0	1	1.927	1	0	1	0	1	0	1	0	1
128		min	0	1	0	2	0	1	0	1	0	1	0	1
129	N65	max	0	1	1.918	1	0	1	0	1	0	1	0	1
130		min	0	1	0	2	0	1	0	1	0	1	0	1
131	N66	max	0	1	1.909	1	0	1	0	1	0	1	0	1
132		min	0	1	0	2	0	1	0	1	0	1	0	1
133	N67	max	0	1	.95	1	0	1	0	1	0	1	0	1
134		min	0	1	0	2	0	1	0	1	0	1	0	1
135	N68	max	0	1	2.796	3	0	1	0	1	0	1	0	1
136		min	0	1	0	2	0	1	0	1	0	1	0	1
137	N69	max	0	1	4.618	3	0	1	0	1	0	1	0	1
138		min	0	1	0	2	0	1	0	1	0	1	0	1
139	N70	max	0	1	3.646	3	0	1	0	1	0	1	0	1
140		min	0	1	0	2	0	1	0	1	0	1	0	1
141	N71	max	0	1	2.662	3	0	1	0	1	0	1	0	1
142		min	0	1	0	2	0	1	0	1	0	1	0	1
143	N72	max	0	1	1.942	1	0	1	0	1	0	1	0	1
144		min	0	1	0	2	0	1	0	1	0	1	0	1
145	N73	max	0	1	1.951	1	0	1	0	1	0	1	0	1
146		min	0	1	0	2	0	1	0	1	0	1	0	1
147	N74	max	0	1	1.954	1	0	1	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
148		min	0	1	0	2	0	1	0	1	0	1	0	1
149	N75	max	0	1	1.951	1	0	1	0	1	0	1	0	1
150		min	0	1	0	2	0	1	0	1	0	1	0	1
151	N76	max	0	1	1.942	1	0	1	0	1	0	1	0	1
152		min	0	1	0	2	0	1	0	1	0	1	0	1
153	N77	max	0	1	1.932	1	0	1	0	1	0	1	0	1
154		min	0	1	0	2	0	1	0	1	0	1	0	1
155	N78	max	0	1	1.922	1	0	1	0	1	0	1	0	1
156		min	0	1	0	2	0	1	0	1	0	1	0	1
157	N79	max	0	1	1.913	1	0	1	0	1	0	1	0	1
158		min	0	1	0	2	0	1	0	1	0	1	0	1
159	N80	max	0	1	.952	1	0	1	0	1	0	1	0	1
160		min	0	1	0	2	0	1	0	1	0	1	0	1
161	N81	max	0	1	3.274	3	0	1	0	1	0	1	0	1
162		min	0	1	.32	2	0	1	0	1	0	1	0	1
163	N82	max	0	1	5.598	3	0	1	0	1	0	1	0	1
164		min	0	1	.633	2	0	1	0	1	0	1	0	1
165	N83	max	0	1	4.654	3	0	1	0	1	0	1	0	1
166		min	0	1	.629	2	0	1	0	1	0	1	0	1
167	N84	max	0	1	3.708	3	0	1	0	1	0	1	0	1
168		min	0	1	.627	2	0	1	0	1	0	1	0	1
169	N85	max	0	1	2.745	3	0	1	0	1	0	1	0	1
170		min	0	1	.627	2	0	1	0	1	0	1	0	1
171	N86	max	0	1	1.954	1	0	1	0	1	0	1	0	1
172		min	0	1	.631	2	0	1	0	1	0	1	0	1
173	N87	max	0	1	1.969	1	0	1	0	1	0	1	0	1
174		min	0	1	.567	3	0	1	0	1	0	1	0	1
175	N88	max	0	1	1.954	1	0	1	0	1	0	1	0	1
176		min	0	1	0	3	0	1	0	1	0	1	0	1
177	N89	max	0	1	1.944	1	0	1	0	1	0	1	0	1
178		min	0	1	0	3	0	1	0	1	0	1	0	1
179	N90	max	0	1	1.934	1	0	1	0	1	0	1	0	1
180		min	0	1	0	3	0	1	0	1	0	1	0	1
181	N91	max	0	1	1.923	1	0	1	0	1	0	1	0	1
182		min	0	1	0	3	0	1	0	1	0	1	0	1
183	N92	max	0	1	1.914	1	0	1	0	1	0	1	0	1
184		min	0	1	0	3	0	1	0	1	0	1	0	1
185	N93	max	0	1	.952	1	0	1	0	1	0	1	0	1
186		min	0	1	0	3	0	1	0	1	0	1	0	1
187	N94	max	0	1	3.741	3	0	1	0	1	0	1	0	1
188		min	0	1	.952	1	0	1	0	1	0	1	0	1
189	N95	max	0	1	6.553	3	0	1	0	1	0	1	0	1
190		min	0	1	1.913	1	0	1	0	1	0	1	0	1
191	N96	max	0	1	5.633	3	0	1	0	1	0	1	0	1
192		min	0	1	1.922	1	0	1	0	1	0	1	0	1
193	N97	max	0	1	4.715	3	0	1	0	1	0	1	0	1
194		min	0	1	1.932	1	0	1	0	1	0	1	0	1
195	N98	max	0	1	3.789	3	0	1	0	1	0	1	0	1
196		min	0	1	1.942	1	0	1	0	1	0	1	0	1
197	N99	max	0	1	2.81	3	0	1	0	1	0	1	0	1
198		min	0	1	1.951	1	0	1	0	1	0	1	0	1
199	N100	max	0	1	2.313	2	0	1	0	1	0	1	0	1
200		min	0	1	1.751	3	0	1	0	1	0	1	0	1
201	N101	max	0	1	2.221	2	0	1	0	1	0	1	0	1
202		min	0	1	.553	3	0	1	0	1	0	1	0	1
203	N102	max	0	1	2.147	2	0	1	0	1	0	1	0	1
204		min	0	1	0	3	0	1	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
205	N103	max	0	1	2.094	2	0	1	0	1	0	1	0	1
206		min	0	1	0	3	0	1	0	1	0	1	0	1
207	N104	max	0	1	2.059	2	0	1	0	1	0	1	0	1
208		min	0	1	0	3	0	1	0	1	0	1	0	1
209	N105	max	0	1	2.036	2	0	1	0	1	0	1	0	1
210		min	0	1	0	3	0	1	0	1	0	1	0	1
211	N106	max	0	1	1.01	2	0	1	0	1	0	1	0	1
212		min	0	1	0	3	0	1	0	1	0	1	0	1
213	N107	max	0	1	4.196	3	0	1	0	1	0	1	0	1
214		min	0	1	.95	1	0	1	0	1	0	1	0	1
215	N108	max	0	1	7.48	3	0	1	0	1	0	1	0	1
216		min	0	1	1.909	1	0	1	0	1	0	1	0	1
217	N109	max	0	1	6.576	3	0	1	0	1	0	1	0	1
218		min	0	1	1.918	1	0	1	0	1	0	1	0	1
219	N110	max	0	1	5.673	3	0	1	0	1	0	1	0	1
220		min	0	1	1.927	1	0	1	0	1	0	1	0	1
221	N111	max	0	1	4.752	3	0	1	0	1	0	1	0	1
222		min	0	1	1.936	1	0	1	0	1	0	1	0	1
223	N112	max	0	1	3.788	3	0	1	0	1	0	1	0	1
224		min	0	1	1.942	1	0	1	0	1	0	1	0	1
225	N113	max	0	1	3.704	2	0	1	0	1	0	1	0	1
226		min	0	1	1.944	1	0	1	0	1	0	1	0	1
227	N114	max	0	1	3.672	2	0	1	0	1	0	1	0	1
228		min	0	1	1.647	3	0	1	0	1	0	1	0	1
229	N115	max	0	1	3.594	2	0	1	0	1	0	1	0	1
230		min	0	1	.55	3	0	1	0	1	0	1	0	1
231	N116	max	0	1	3.52	2	0	1	0	1	0	1	0	1
232		min	0	1	0	3	0	1	0	1	0	1	0	1
233	N117	max	0	1	3.461	2	0	1	0	1	0	1	0	1
234		min	0	1	0	3	0	1	0	1	0	1	0	1
235	N118	max	0	1	3.417	2	0	1	0	1	0	1	0	1
236		min	0	1	0	3	0	1	0	1	0	1	0	1
237	N119	max	0	1	1.691	2	0	1	0	1	0	1	0	1
238		min	0	1	0	3	0	1	0	1	0	1	0	1
239	N120	max	0	1	4.642	3	0	1	0	1	0	1	0	1
240		min	0	1	.948	1	0	1	0	1	0	1	0	1
241	N121	max	0	1	8.384	3	0	1	0	1	0	1	0	1
242		min	0	1	1.904	1	0	1	0	1	0	1	0	1
243	N122	max	0	1	7.488	3	0	1	0	1	0	1	0	1
244		min	0	1	1.912	1	0	1	0	1	0	1	0	1
245	N123	max	0	1	6.59	3	0	1	0	1	0	1	0	1
246		min	0	1	1.92	1	0	1	0	1	0	1	0	1
247	N124	max	0	1	5.672	3	0	1	0	1	0	1	0	1
248		min	0	1	1.927	1	0	1	0	1	0	1	0	1
249	N125	max	0	1	5.026	2	0	1	0	1	0	1	0	1
250		min	0	1	1.932	1	0	1	0	1	0	1	0	1
251	N126	max	0	1	5.049	2	0	1	0	1	0	1	0	1
252		min	0	1	1.934	1	0	1	0	1	0	1	0	1
253	N127	max	0	1	5.026	2	0	1	0	1	0	1	0	1
254		min	0	1	1.932	1	0	1	0	1	0	1	0	1
255	N128	max	0	1	4.969	2	0	1	0	1	0	1	0	1
256		min	0	1	1.604	3	0	1	0	1	0	1	0	1
257	N129	max	0	1	4.898	2	0	1	0	1	0	1	0	1
258		min	0	1	.555	3	0	1	0	1	0	1	0	1
259	N130	max	0	1	4.831	2	0	1	0	1	0	1	0	1
260		min	0	1	0	3	0	1	0	1	0	1	0	1
261	N131	max	0	1	4.774	2	0	1	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
262		min	0	1	0	3	0	1	0	1	0	1	0	1
263	N132	max	0	1	2.363	2	0	1	0	1	0	1	0	1
264		min	0	1	0	3	0	1	0	1	0	1	0	1
265	N133	max	0	1	5.084	3	0	1	0	1	0	1	0	1
266		min	0	1	.945	1	0	1	0	1	0	1	0	1
267	N134	max	0	1	9.274	3	0	1	0	1	0	1	0	1
268		min	0	1	1.897	1	0	1	0	1	0	1	0	1
269	N135	max	0	1	8.383	3	0	1	0	1	0	1	0	1
270		min	0	1	1.905	1	0	1	0	1	0	1	0	1
271	N136	max	0	1	7.488	3	0	1	0	1	0	1	0	1
272		min	0	1	1.912	1	0	1	0	1	0	1	0	1
273	N137	max	0	1	6.575	3	0	1	0	1	0	1	0	1
274		min	0	1	1.918	1	0	1	0	1	0	1	0	1
275	N138	max	0	1	6.348	2	0	1	0	1	0	1	0	1
276		min	0	1	1.922	1	0	1	0	1	0	1	0	1
277	N139	max	0	1	6.365	2	0	1	0	1	0	1	0	1
278		min	0	1	1.923	1	0	1	0	1	0	1	0	1
279	N140	max	0	1	6.348	2	0	1	0	1	0	1	0	1
280		min	0	1	1.922	1	0	1	0	1	0	1	0	1
281	N141	max	0	1	6.302	2	0	1	0	1	0	1	0	1
282		min	0	1	1.918	1	0	1	0	1	0	1	0	1
283	N142	max	0	1	6.24	2	0	1	0	1	0	1	0	1
284		min	0	1	1.592	3	0	1	0	1	0	1	0	1
285	N143	max	0	1	6.174	2	0	1	0	1	0	1	0	1
286		min	0	1	.569	3	0	1	0	1	0	1	0	1
287	N144	max	0	1	6.113	2	0	1	0	1	0	1	0	1
288		min	0	1	0	3	0	1	0	1	0	1	0	1
289	N145	max	0	1	3.028	2	0	1	0	1	0	1	0	1
290		min	0	1	0	3	0	1	0	1	0	1	0	1
291	N146	max	0	1	5.524	3	0	1	0	1	0	1	0	1
292		min	0	1	.942	1	0	1	0	1	0	1	0	1
293	N147	max	0	1	10.16	3	0	1	0	1	0	1	0	1
294		min	0	1	1.89	1	0	1	0	1	0	1	0	1
295	N148	max	0	1	9.274	3	0	1	0	1	0	1	0	1
296		min	0	1	1.897	1	0	1	0	1	0	1	0	1
297	N149	max	0	1	8.384	3	0	1	0	1	0	1	0	1
298		min	0	1	1.904	1	0	1	0	1	0	1	0	1
299	N150	max	0	1	7.622	2	0	1	0	1	0	1	0	1
300		min	0	1	1.909	1	0	1	0	1	0	1	0	1
301	N151	max	0	1	7.661	2	0	1	0	1	0	1	0	1
302		min	0	1	1.912	1	0	1	0	1	0	1	0	1
303	N152	max	0	1	7.675	2	0	1	0	1	0	1	0	1
304		min	0	1	1.914	1	0	1	0	1	0	1	0	1
305	N153	max	0	1	7.661	2	0	1	0	1	0	1	0	1
306		min	0	1	1.912	1	0	1	0	1	0	1	0	1
307	N154	max	0	1	7.622	2	0	1	0	1	0	1	0	1
308		min	0	1	1.909	1	0	1	0	1	0	1	0	1
309	N155	max	0	1	7.566	2	0	1	0	1	0	1	0	1
310		min	0	1	1.904	1	0	1	0	1	0	1	0	1
311	N156	max	0	1	7.504	2	0	1	0	1	0	1	0	1
312		min	0	1	1.6	3	0	1	0	1	0	1	0	1
313	N157	max	0	1	7.441	2	0	1	0	1	0	1	0	1
314		min	0	1	.589	3	0	1	0	1	0	1	0	1
315	N158	max	0	1	3.691	2	0	1	0	1	0	1	0	1
316		min	0	1	0	3	0	1	0	1	0	1	0	1
317	N159	max	0	1	5.524	3	0	1	0	1	0	1	0	1
318		min	0	1	.942	1	0	1	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
319	N160	max	0	1	5.084	3	0	1	0	1	0	1	0	1
320		min	0	1	.945	1	0	1	0	1	0	1	0	1
321	N161	max	0	1	4.642	3	0	1	0	1	0	1	0	1
322		min	0	1	.948	1	0	1	0	1	0	1	0	1
323	N162	max	0	1	4.472	2	0	1	0	1	0	1	0	1
324		min	0	1	.95	1	0	1	0	1	0	1	0	1
325	N163	max	0	1	4.49	2	0	1	0	1	0	1	0	1
326		min	0	1	.952	1	0	1	0	1	0	1	0	1
327	N164	max	0	1	4.496	2	0	1	0	1	0	1	0	1
328		min	0	1	.952	1	0	1	0	1	0	1	0	1
329	N165	max	0	1	4.49	2	0	1	0	1	0	1	0	1
330		min	0	1	.952	1	0	1	0	1	0	1	0	1
331	N166	max	0	1	4.472	2	0	1	0	1	0	1	0	1
332		min	0	1	.95	1	0	1	0	1	0	1	0	1
333	N167	max	0	1	4.446	2	0	1	0	1	0	1	0	1
334		min	0	1	.948	1	0	1	0	1	0	1	0	1
335	N168	max	0	1	4.415	2	0	1	0	1	0	1	0	1
336		min	0	1	.945	1	0	1	0	1	0	1	0	1
337	N169	max	0	1	4.384	2	0	1	0	1	0	1	0	1
338		min	0	1	.811	3	0	1	0	1	0	1	0	1
339	N170	max	0	1	.011	1	0	1	0	1	0	1	0	1
340		min	0	1	-38.415	2	0	1	0	1	0	1	0	1
341	N171	max	0	1	.011	1	0	1	0	1	0	1	0	1
342		min	0	1	-57.609	3	0	1	0	1	0	1	0	1
343	N172	max	0	1	.011	1	0	1	0	1	0	1	0	1
344		min	0	1	.011	1	0	1	0	1	0	1	0	1
345	N173	max	0	1	.011	1	0	1	0	1	0	1	0	1
346		min	0	1	.011	1	0	1	0	1	0	1	0	1
347	Totals:	max	0	1	276.083	1	0	1						
348		min	0	1	276.083	3	0	1						

Project Name: St. Marks Church
Project #: 123480
Date: 7/16/2012
Design: BRB
Check: REG
Page 1 of 2

Foundation Loads for 3-D model

- Max Moment at base of pad

$$M + V \cdot h = 2113.778 + 25261 \cdot (7) = 2290.605 \text{ k·ft}$$

- Moment vectors for 45° Wind

$$2290.605 \ (\sin 45°) = 1619.702 \text{ k·ft}$$

- Weight of soil (backfill)

$$\text{Vol} = (16.5^2 - 6^2) \cdot 4 = 945 \text{ ft}^2$$

$$\text{Weight} = 945 \text{ ft}^2 \cdot 0.125 \text{ kcf} = 118.125 \text{ k}$$

- Weight of pier

$$36 \text{ ft}^2 \cdot 4.5 \text{ ft} \cdot 0.15 \text{ kcf} = 24.3 \text{ k}$$

- Total weight of Mat + Pier

$$118.1 + 24.3 = 142.4 \text{ k} \quad \therefore \quad \frac{142.4 \text{ k}}{(16.5 \text{ ft})^2} = 0.523 \text{ ksf}$$

- Weight of Mat will be input as gravity load per material density

Project Name: St. Marks Church
Project #: 123480
Date: 7/16/2012
Design: BRB
Check: RE b
Page 2 of 2

Foundation Capacity

- Anchor Rod 1"Ø, 150 ksi ult, F_y = 128 ksi

- Allowable Tensile Strength

$A_n = 0.850\ in^2$

$T_a = 0.60(F_y)A_n = 0.6\,(0.850)\,(128) = 65.3\,k$

Note: proof load to 60 k

- Check Bond

Allowable bond stress = 50 psi

Hole diameter = 3.5"

Minimum embedment = 15' 15' to 4' = 132"

$R_a = (3.5") \cdot \pi \cdot (132") \cdot \left(\frac{50\,psi}{1000}\right) = 72.6\,k$

- Check Rock Breakout Cone

$Vol = \frac{1}{3}\pi r^2 h$ $r = \tan 30°(h) = 15\tan(30) = 8.66$

$= \frac{1}{3}\pi(8.66)^2 15 = 1178\,ft^3$ Weight of rock = $1178\,ft^3 \times 0.126 = 148.4\,k$

As allowable exceeds proof load conservatively use T_a = proofload = 60k

- Max load to Anchor Rod Per Risa-3D Analysis: 57.609 k

$T/T_a = \frac{57.609}{60} \times 100 = 96.0\%$ ← controls

- Max Corner Load to Foundation Spring: 2.983

spring tributary = $\frac{1.35^2}{4.00} = 0.456\,ft^2$ $q = \frac{2.983\,k}{0.456\,ft^2} = 6.547\,ksf$

capacity: $\frac{q}{q_a} = \frac{6.547}{10.833} = 60.4\%$

C Squared Systems, LLC
65 Dartmouth Drive, Unit A3
Auburn, NH 03032
(603) 644-2800
support@csquaredsystems.com

Calculated Radio Frequency Emissions

CT5258

(West Hartford)

491 South Quaker Ln, West Hartford, CT 06110

(aka: 451/471 South Quaker Ln)

March 27, 2012

Table of Contents

1. Introduction 1
2. FCC Guidelines for Evaluating RF Radiation Exposure Limits 1
3. RF Exposure Prediction Methods 2
4. Calculation Results 3
5. Conclusion 4
6. Statement of Certification 4
Attachment A: References 5
Attachment B: FCC Limits for Maximum Permissible Exposure (MPE) 6
Attachment C: AT&T Antenna Data Sheets and Electrical Patterns 8

List of Tables

Table 1: Carrier Information 3
Table 2: FCC Limits for Maximum Permissible Exposure (MPE) 6

List of Figures

Figure 1: Graph of FCC Limits for Maximum Permissible Exposure (MPE) 7

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the existing AT&T antenna arrays mounted on the monopole tower located at 491 South Quaker Ln in West Hartford, CT. The coordinates of the tower are 41-44-55.62 N, 72-43-52.80 W.

AT&T is proposing the following modifications:

1) Install three 700 MHz LTE antennas (one per sector);
2) Install three 700 MHz LTE Remote Radio Units (RRUs) (one per sector).

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{1.6^2 \times EIRP}{4\pi \times R^2} \right) \text{x Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity and power, and that all channels are transmitting simultaneously. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not take into account actual terrain elevations which could attenuate the signal. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the finished modifications.

4. Calculation Results

Table 1 below outlines the power density information for the site. Because the proposed AT&T antennas are directional in nature, the majority of the RF power is focused out towards the horizon. As a result, there will be less RF power directed below the antennas relative to the horizon, and consequently lower power density levels around the base of the tower. Please refer to Attachment C for the vertical pattern of the proposed AT&T antennas. The calculated results for AT&T in Table 1 include a nominal 10 dB off-beam pattern loss to account for the lower relative gain below the antennas.

Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	Number of Trans.	ERP Per Transmitter (Watts)	Power Density (mw/cm^2)	Limit	%MPE
AT&T UMTS	107	880	1	500	0.0157	0.5867	2.68%
AT&T GSM	107	1900	2	427	0.0268	1.0000	2.68%
AT&T GSM	107	880	4	296	0.0372	0.5867	6.34%
Clearwire	80	2496	2	153	0.0172	1.0000	1.72%
Clearwire	80	11000	1	211	0.0119	1.0000	1.19%
T-Mobile GSM	120	1945	8	236	0.0471	1.0000	4.71%
T-Mobile UMTS	120	2100	2	944	0.0471	1.0000	4.71%
Pocket	90	2130	3	631	0.0840	1.0000	8.40%
Verizon	100	869	9	274	0.0887	0.5793	15.31%
Verizon	100	1970	3	433	0.0467	1.0000	4.67%
Verizon	100	757	1	736	0.0265	0.5047	5.24%
AT&T UMTS	113	880	2	565	0.0318	0.5867	0.54%
AT&T UMTS	113	1900	2	875	0.0493	1.0000	0.49%
AT&T LTE	113	734	1	1375	0.0387	0.4893	0.79%
AT&T GSM	113	880	1	283	0.0080	0.5867	0.14%
AT&T GSM	113	1900	4	525	0.0591	1.0000	0.59%
						Total	**48.51%**

Table 1: Carrier Information[1][2]

[1] The existing CSC filing for AT&T should be removed and replaced with the updated AT&T technologies and values provided in Table 1. The power density information for carriers other than AT&T was taken directly from the CSC database dated 1/10/2012.

[2] In the case where antenna models are not uniform across all 3 sectors for the same frequency band, the antenna model with the highest gain was used for the calculations to present a worse-case scenario.

5. Conclusion

The above analysis verifies that emissions from the existing site will be below the maximum power density levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Even when using conservative methods, the cumulative power density from the proposed transmit antennas at the existing facility is well below the limits for the general public. The highest expected percent of Maximum Permissible Exposure at ground level is **48.51% of the FCC limit**.

As noted previously, obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels are more conservative (higher) than the actual signal levels will be from the finished modifications.

6. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.

Daniel L. Goulet
C Squared Systems, LLC

March 27, 2012
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz. IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave. IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[3]

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

(B) Limits for General Population/Uncontrolled Exposure[4]

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

f = frequency in MHz * Plane-wave equivalent power density

Table 2: FCC Limits for Maximum Permissible Exposure (MPE)

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

[4] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure

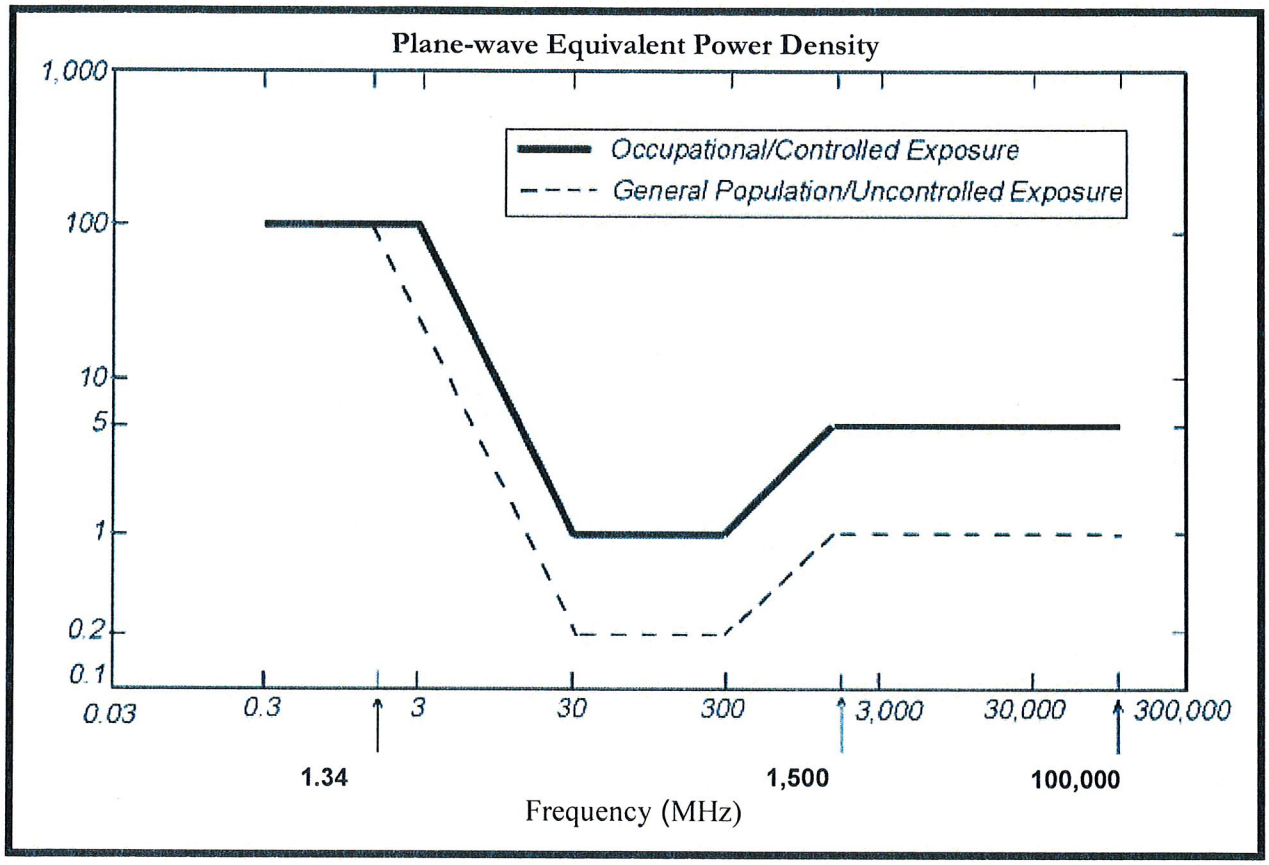
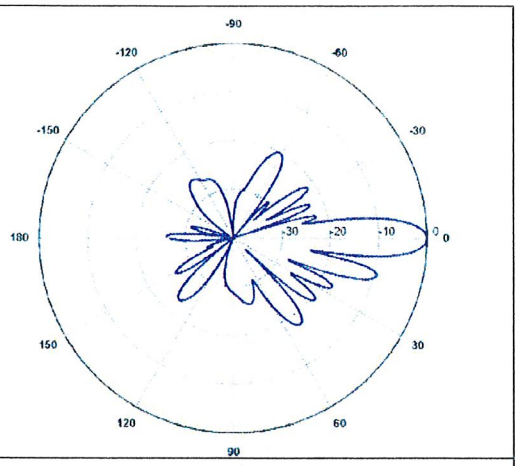


Figure 1: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: AT&T Antenna Data Sheets and Electrical Patterns

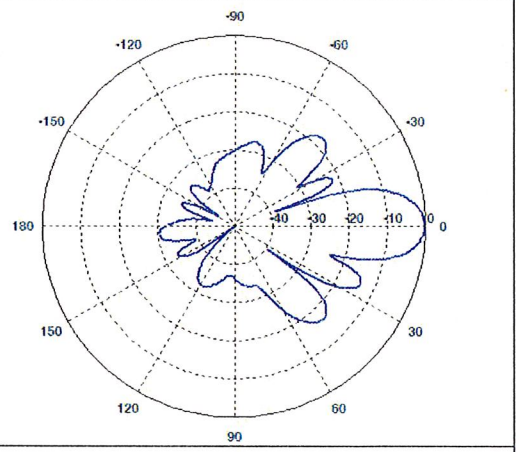
700 MHz

Manufacturer:	Commscope
Model #:	SBNH-1D6565C
Frequency Band:	698-806 MHz
Gain:	13.6 dBd
Vertical Beamwidth:	8.6°
Horizontal Beamwidth:	71°
Polarization:	± 45°
Size L x W x D:	96.4" x 11.9" x 7.1"



850 MHz

Manufacturer:	Powerwave
Model #:	7770.00
Frequency Band:	824-896 MHz
Gain:	11.4 dBd
Vertical Beamwidth:	15°
Horizontal Beamwidth:	85°
Polarization:	Dual Linear ±45°
Size L x W x D:	55.0" x 11.0" x 5.0"



1900 MHz

Manufacturer:	Powerwave
Model #:	7770.00
Frequency Band:	1850-1990 MHz
Gain:	13.4 dBd
Vertical Beamwidth:	7°
Horizontal Beamwidth:	90°
Polarization:	Dual Linear ±45°
Size L x W x D:	55.0" x 11.0" x 5.0"