STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

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MEMORANDUM

To: Telecommunications Carriers and their Representatives

From: Cymon Holzschuh, Siting Analyst C H

Re: Exempt Modification Filings

Date: November 10, 2015

Pursuant to Regulations of Connecticut State Agencies § 16-50j-72, and the April 2013 Guide for Modification of Existing Telecommunications Facilities, the Connecticut Siting Council (Council) seeks to facilitate the efficient processing of exempt modification filings by requesting that certain information is included in these filings. Ensuring that the Council is provided all necessary information can prevent delays.

Each exempt modification filing should include:

- Street address, with any previous addresses on file in parentheses
- Longitude/Latitude coordinates of the facility
- Number of proposed/reused antennas at each frequency band
- Antenna height above ground level
- Height of structure
- Structure type
- Whether the Council or Town approved the structure, and when, in which decision
- Conditions of structure approval by Council or Town
- Notification to the municipality's chief elected official
- Notification to the underlying property owner
- Notification to the structure owner
- All changes to tower-mounted equipment
- All changes to ground equipment within the lease area, as required per the Council's February 28, 2014 memo (see attachment B)
- Construction drawings consistent with other documentation (see attachment B)
- Structural analysis consistent with other documentation
- RF Analysis (Power Density) consistent with other documentation (see attachment C)

A cover letter template and power density calculation template (see attachment A) are attached, and are recommended for use to ensure all necessary information is provided.

It is also requested that calculations and raw data for the structural analysis be included in the electronic filing only. These can amount to hundreds of sheets of paper for each filing, and sending them electronically will help to preserve resources.

ATTACHMENT A

<Filer name>
<Filer address>
<Filer phone number>
<Filer e-mail address>

<Date>

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Notice of Exempt Modification
<Facility address> <Previous address(es) on file should be included in parentheses>
<Facility N coordinates>
<Facility W coordinates>

Dear Ms. Bachman:

<Carrier> currently maintains <#existing> antennas at the <#existing antenna CL height>-foot level of the existing <#tower height>-foot <structure type> at <facility address>. The tower is owned by <tower owner>. The property is owned by <property owner – list even if this is also the tower owner or municipality>. <Carrier> now intends to <(install)/(replace <#> of its existing antennas with)> <number of new antennas> new <MHz band> antennas. These antennas would be installed at the <#new antenna CL height>-foot level of the tower. <Carrier> also intends to <(install)/(replace)/(remove)> <all additional equipment. Any changes of any type noted in the structural analysis and construction drawings should also be noted here.>

This facility was approved by the <Council/Town> in <application/docket #> on <approval date>. This approval included the condition(s) that <conditions which could feasibly be violated by this modification, including total facility height or mounting restrictions>. This modification complies with the aforementioned condition(s).

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to <elected official>, <title> for the <Town/City> of <municipality>, as well as the property owner and the tower owner.

ATTACHMENT A

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

1. The proposed modifications will not result in an increase in the height of the existing structure.

2. The proposed modifications will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The existing structure and its foundation can support the proposed loading <Include "with certain modifications" if the tower will be reinforced to support them>.

For the foregoing reasons, <carrier> respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

<signature>

<Filer name>
<Filer address>
<Filer phone number>
<Filer e-mail address>

Attachments

cc: <elected official> - as elected official
<tower owner> - as tower owner
<property owner> - as property owner

ATTACHMENT A

Power Density

Existing Loading on Tower

Carrier	# of Channels	ERP/Ch (W)	Antenna Centerline Height (ft)	Power Density (mW/cm^2)	Freq. Band (MHz**)	Limit S (mW /cm^2)	%MPE
Other Carriers*							X%
Carrier LTE	1	500	97	0.0217	740	0.4933	0.44%
Carrier GSM	2	296	97	0.0257	880	0.5867	0.44%
Carrier GSM	2	427	97	0.0371	1900	1.0000	0.37%
Carrier UMTS	1	500	97	0.0217	880	0.5867	0.37%
Carrier UMTS	1	500	97	0.0217	1900	1.0000	0.22%
Site Total							1.84%

*Per CSC Records (available upon request, includes calculation formulas)

** If a range of frequencies are used, such as 880-894, enter the lowest value, i.e. 880

Proposed Loading on Tower

Carrier	# of Channels	ERP/Ch (W)	Antenna Centerline Height (ft)	Power Density (mW/cm^2)	Freq. Band (MHz**)	Limit S (mW /cm^2)	%MPE
Other Carriers*							X%
Carrier LTE	1	500	97	0.0217	740	0.4933	0.44%
Carrier LTE	1	500	97	0.0217	740	0.4933	0.44%
Carrier LTE	1	500	97	0.0217	740	0.4933	0.44%
Carrier GSM	2	296	97	0.0257	880	0.5867	0.44%
Carrier GSM	2	427	97	0.0371	1900	1.0000	0.37%
Carrier UMTS	1	500	97	0.0217	880	0.5867	0.37%
Carrier UMTS	1	500	97	0.0217	1900	1.0000	0.22%
Site Total							2.72%

*Per CSC Records (available upon request, includes calculation formulas)

** If a range of frequencies are used, such as 880-894, enter the lowest value, i.e. 880

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ATTACHMENT B

VIA ELECTRONIC MAIL

February 28, 2014

TO: Kenneth C. Baldwin, Esq., Verizon Wireless
Christopher B. Fisher, Esq., AT&T
Julie D. Kohler, Esq., T-Mobile
Thomas J. Regan, Esq., Sprint
John R. Morissette, Northeast Utilities
Bruce L. McDermott, Esq., United Illuminating
Alex Giannaras, HPC Wireless
Steve Levine, Centek Engineering, Inc.
Adam Braillard, Smartlink, LLC
Melanie Howlett, HPC Wireless
Rick Woods, SBA
Kri Pelletier, SBA
James Burgess, TRM, Inc.
Jacqueline Clifford, TRM, Inc.
Matt Burke, TRM, Inc.

FROM: Melanie A. Bachman, Acting Executive Director MAB

RE: Exempt Modification/Tower Share Filings

Pursuant to Section 16-50aa of the Connecticut General Statutes, the Connecticut Siting Council (Council) shall issue an order approving shared use of a telecommunications facility if the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns.

Pursuant to Section 16-50j-72(b)(2)(B) of the Regulations of Connecticut State Agencies, changes on an existing telecommunications tower site that do not extend the boundaries of the site by any dimension shall not constitute a modification. "Site" is defined under Section 16-50j-2a(22) as "a contiguous parcel of property with specified boundaries, including, but not limited to, **the leased area**, right-of-way, access and easements on which a facility and associated equipment are located, shall be located, or are proposed to be located" (Emphasis added).

A Town Planner recently informed the Council that a request for installation of a backup generator at an existing telecommunications tower site was proposed outside of the boundaries depicted on the site plan approved by the town and expressed concern that the town, in the process of approving PCS towers prior to the Council assuming jurisdiction, was not aware that there were leased areas.

The Council hereby requests that a depiction or description of the leased area for the subject site be included with the site plan for requests for tower shares and exempt modifications. This information is critical to a determination that the requested shared use or requested modification does not extend the boundaries of the site by any dimension.

Thank you in advance for your cooperation.

ATTACHMENT C

In a memorandum to Siting Council members titled "RF Power Density Calculations and Measurements" (**see attachment D**) dated February 21, 2014, Siting Council staff member David Martin provided background information about the Federal Communications Commission's (FCC) recommendations regarding theoretical calculation methods and compiled examples of sites for which we have both the carriers' theoretical calculations and actual field measurements.

Council staff maintains a power density table including every facility over which the Council has jurisdiction. In 2001, the Council adopted one of the "worst case" equations included in the FCC's OET Bulletin 65 as its standard method for the calculation of power density levels (http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf). For the most part, carriers proceeded to use this equation when supplying power density information in their filings. However, the first paragraph of the Introduction to OET 65 states the bulletin *". . . is not intended to establish mandatory procedures, and other methods and procedures may be acceptable if based on sound engineering practice."*

Where "worst case" predictions may be overly conservative, the bulletin states that it is permissible to use a relative field factor if information about an antenna's radiation pattern is known. According to the bulletin, such a factor may result in a more realistic prediction.

In cases where this equation would result in a calculated power density level in excess of one-hundred percent of the maximum permissible exposure (MPE) described in OET 65, both AT&T and Verizon have used such relative field factors. Verizon's Far Field Approximations result in a power density prediction that is between 15 to 30 percent of the prediction that would result from the Council's standard "worst case" equation. In the power density calculations for many of its LTE upgrade filings, AT&T included a nominal -10 dB Off-Beam Pattern Adjustment to account for the lower relative gain below antennas that are typically pointed towards the horizon. This factor results in a number that is 10 percent of what the standard "worst case" calculation would produce, and is very straightforward to implement.

OET Bulletin 65 also includes recommended procedures for measuring actual RF fields in cases where prediction methods cannot be used or the predicted levels are at or near the MPE thresholds. *RF Power Density Calculations and Measurements* provided multiple examples of cases where, when RF measurements were taken, the highest recorded values were less than ten percent of the "worst case" calculation's prediction.

Because available data indicated that the Far Field Approximation and the -10 dB Off-Beam Pattern Adjustment were still conservative, predicting higher RF values than measurements reflected, these calculations have been used in every case where an applicant has requested them. At time of writing, well over one hundred facilities in the Siting Council's power density table would exceed the MPE threshold if the "worst case" calculation were used, and this number grows as carriers seek to meet capacity demands in high-traffic areas. Predictably, applicants who seek to install or upgrade antennas at these facilities have consistently requested the aforementioned calculations' use in their applications, such that a sizable portion of facilities in the Siting Council's power density table now reflect values predicted by these methods, rather than the "worst case" calculation adopted in 2001.

ATTACHMENT C

A facility's total predicted power density is, simply, the sum of predicted power densities for all antennas at that facility. Applicants typically use values provided by the Siting Council for other carriers' antennas. In cases where other carriers hadn't installed or replaced antennas for some time, these values were often predicted using the "worst case" calculation.

The purpose of the Siting Council's power density table is to provide a conservative but accurate prediction of power density - this prediction should provide a consistent estimate across different carriers. Therefore, the Council will include the -10 dB Off-Beam Pattern Adjustment in the power density calculations for all applications by default. This relative field factor is consistent with OET 65.

The Council's power density table is available upon request. Applicants are encouraged to cite and utilize this power density table for their RF Analyses.

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ATTACHMENT D
MEMORANDUM

To: Siting Council Members

From: David Martin, Siting Analyst

Re: RF Power Density Calculations and Measurements

Date: February 21, 2014

At the E/T meeting held on February 6, 2014, Council members spent considerable time discussing power density levels of telecommunications facilities: the various methods of calculation and differences between theoretical calculations typically provided by the carriers and field measurements of actual power density levels recorded around active sites.

In order to provide Council members with additional clarification on this subject, I provided some background information about the Federal Communications Commission's (FCC) recommendations regarding theoretical calculation methods and compiled examples of sites for which we have both the carriers' theoretical calculations and actual field measurements.

Calculation Methods

The methods that can be used to predict power density levels are enumerated in a publication issued by the FCC's Office of Engineering & Technology — OET Bulletin 65. (This document is posted on the Council's website. Here's the URL: http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf) For those seeking one unequivocal method for predicting the likely strength of RF fields, however, this is not the document to turn to. The first paragraph of the document's Introduction states that this bulletin *". . . is not intended to establish mandatory procedures, and other methods and procedures may be acceptable if based on sound engineering practice."* (emphasis in original)

There are a number of different equations included in this bulletin, which describes them as generally accurate in the far-field of an antenna but over-predictive in the near field when they can be used for making a "worst case" prediction.

In 2001, the Council adopted one of the "worst case" equations included in OET 65 as its standard method for the calculation of power density levels. For the most part, carriers use this equation when supplying power density information in their filings. In those cases where applicants use a different method of calculation, staff adapts the information supplied to the Council's standard method to the extent possible.

Where "worst case" predictions may be overly conservative, the bulletin states that it is permissible to use a relative field factor if information about an antenna's radiation pattern is known. According to the bulletin, such a factor may result in a more realistic prediction.

In some recent filings, both AT&T and Verizon have used such relative field factors. Verizon's Far Field Approximation, which is calculated with reference to an antenna's main beam centerline, was discussed at the February 6 meeting. Typically, Verizon's Far Field Approximations result in a power density prediction that is between 15 to 30 percent of the prediction that would result from the Council's standard "worst case" equation. In the power density calculations for many of its LTE upgrade filings, AT&T included a nominal 10 dB Off-Beam Pattern Adjustment to account for the lower relative gain below antennas that are typically pointed towards the horizon. This factor resulted in a number that was 10 percent of what the standard "worst case" calculation would produce.

OET Bulletin 65 also discusses methods and provides sample equations for calculating power densities in situations involving multiple transmitters and other complex environments.

Field Measurements (Radio Frequency Exposure Reports)

OET Bulletin 65 also includes recommended procedures for measuring actual RF fields in cases where prediction methods cannot be used or the predicted levels are at or near the thresholds of Maximum Permissible Exposure (MPE).

In those instances where RF levels of a particular facility have been measured by a carrier or its consultants, the resulting Radio Frequency Exposure Report, in which measurement results are listed, always includes descriptions of the measurement protocols followed. Typically, the reports describe the equipment used, the range of frequencies measured, the sampling methodology used (e.g. the number of measurement points, the distance from each measurement point to the antennas on the tower, the time of day each measurement was made), and the measurement uncertainty of the equipment used.

Radio Frequency Exposure Reports are usually submitted when carriers know that a facility may be close to or above the maximum permissible exposure limits when "worst case" prediction equations are used or in the cases where a tower may host numerous antennas for which the RF operating parameters are not known.

Example 1: 10 North Ridge Drive, Windham

This is a 90-foot monopole tower owned by AT&T. The tower was originally approved for a height of 107 feet under Docket 275, but AT&T decided to initially erect the tower to 90 feet due to issues related to the proximity of the Windham Airport. Currently AT&T has antennas at a centerline height of 88 feet, and Verizon has antennas ten feet below at a centerline height of 78 feet. In 2013, both AT&T and Verizon filed notices of exempt modification for 4G/LTE upgrades. Using the Council's standard "worst case" calculation, the combined power density of the AT&T and Verizon antennas equals **109.3%** of the Maximum Permissible Exposure. When the combined power density is calculated using each carrier's respective far-field adjustment, the result equals **18.5%** of the MPE. (See Table 1)

Because the "worst case" calculation predicted that this site would be above the FCC's permissible limit, Council staff ordered Verizon to take field measurements of RF levels once its antennas had been installed. Acting in accordance with the Council's order, Verizon had RF measurements taken on July 18, 2013 after its antennas were installed and operating. The highest RF measurement recorded was **6.2%** of the FCC's limit. (See Table 2)

Example 2: Mohawk Mountain, Cornwall

This is a rooftop self-supporting lattice tower that reaches an overall height of 79 feet above ground level. Within a distance of approximately 230 feet, there is also a 180-foot self-supporting lattice tower owned by the Department of Public Safety that is host to a number of different antennas belonging to various government agencies. T-Mobile has antennas installed on this nearby tower as well.

In May 2012, Verizon filed an exempt modification for an LTE upgrade on the shorter tower. At the time of its filing, CSC records indicated that AT&T, Verizon, and Sprint/Nextel had antennas on this tower. Because of the number of antennas at a low height on the 79-foot tower and the proximity of the DPS tower, Verizon commissioned field measurements to take into account the radio emissions from both towers. The highest measurement obtained in this study for all the existing antennas on both of the towers was **10.8%** of the FCC's limit. (See Table 4) The sum of the "worst case" calculations for the antennas that were on the lower tower at the time of the RF study was **117.8%** of the FCC limit. For the taller tower, the sum of the "worst case" calculations was **19.7%**. The sum for the two towers would have been **137.5%** of the FCC limit. (See Table 3)

Example 3: Garden Hill Circle, Waterbury

This location is on one of the prominent hilltops in Waterbury and is, as is often the case with strategically located hilltops, host to several telecommunications facilities — six towers and one water tank with antennas on it. Because of the proximity of these towers to one another, it would be unrealistic to estimate the maximum power density of one tower without taking into consideration RF levels contributed by its neighbors. However, not all of these facilities have come under CSC jurisdiction, so staff cannot generate a "worst case" calculation that accounts for all of the antennas on all of the towers. The sum of the power densities of the three towers for which CSC does have information equals **78.3%** of the FCC limit. (See Table 5)

CL&P recognized this problem when it submitted Petition 1006, a request to swap antennas from one tower to a stronger, neighboring tower. Rather than try to gather calculations from all of the antennas on all of the towers, CL&P commissioned an RF study to measure existing power density levels around the area likely to be influenced by the towers. All of the readings taken for this study were below the measurement range of the equipment used and represent Maximum Permissible Limit values below **2.5%** of the FCC limit. (See Table 6)

Table 1: 10 North Ridge Road, Windham - Power Density Calculations

Carrier	# Ch	Watts/Ch	Ant Ht	Power Density (mW/cm2)	MHz	S	%MPE	Site Total
With CSC worst-case calculation:								
AT&T UMTS	2	565	88	0.0525	880	0.5867	8.94%	
AT&T UMTS	2	875	88	0.0813	1900	1.0000	8.13%	
AT&T GSM	1	283	88	0.0131	880	0.5867	2.24%	
AT&T GSM	4	525	88	0.0975	1900	1.0000	9.75%	
AT&T LTE	1	1615	88	0.0750	734	0.4893	15.32%	
Verizon cellular	9	277	79	0.1436	869	0.5793	24.79%	
Verizon PCS	11	282	79	0.1787	1970	1.0000	17.87%	
Verizon AWS	1	1750	79	0.1008	2145	1.0000	10.08%	
Verizon LTE	1	1050	79	0.0605	746	0.4973	12.16%	**109.29%**
With Verizon far field approximation and AT&T -10 dB off-beam adjustment:								
AT&T UMTS	2	565	88	0.0525	880	0.5867	0.89%	
AT&T UMTS	2	875	88	0.0813	1900	1.0000	0.81%	
AT&T GSM	1	283	88	0.0131	880	0.5867	0.22%	
AT&T GSM	4	525	88	0.0975	1900	1.0000	0.98%	
AT&T LTE	1	1615	88	0.0750	734	0.4893	1.53%	
Verizon cellular	9	277	79		869	0.5793	4.00%	
Verizon PCS	11	282	79		1970	1.0000	5.10%	
Verizon AWS	1	1750	79		2145	1.0000	3.10%	
Verizon LTE	1	1050	79		746	0.4973	1.90%	**18.54%**

Table 2: RF Measurements Taken at 10 North Ridge Drive, Windham

Measurement Location	Location Description	Latitude	Longitude	Distance from Tower (ft)	Ave % Uncontrolled / General Population
1	West corner of compound	41.7399	-72.1730	38	5.44
2	SW side of compound	41.7398	-72.1730	29	6.17
3	South corner of compound	41.7398	-72.1730	39	5.95
4	SE side of compound	41.7398	-72.1729	27	5.84
5	East corner of compound	41.7398	-72.1728	38	5.72
6	NE side of compound	41.7399	-72.1728	26	4.54
7	North corner of compound	41.7400	-72.1729	36	2.71
8	NW side of compound	41.7399	-72.1730	28	1.92
9	Tower Access/Northridge Dr.	41.7395	-72.1727	162	1.01
10	29 North Ridge Drive (Sears Parking Lot)	41.7389	-72.1735	384	1.38
11	North Ridge Drive	41.7385	-72.1753	823	1.14
12	474 Boston Post Rd (Walmart Parking Lot)	41.7398	-72.1742	358	1.02
13	474 Boston Post Rd (Walmart Parking Lot)	41.7413	-72.1753	825	1.02
14	5 North Ridge Drive (Wendy's Parking Lot)	41.7407	-72.1772	1211	1.20
15	361 Boston Post Rd	41.7417	-72.1768	1271	1.42
16	55 Crystal Rd	41.7373	-72.1751	1104	2.52
17	38 Crystal Rd	41.7380	-72.1763	1148	1.68
18	18 Crystal Rd	41.7389	-72.1782	1480	1.70
19	6 Industrial Park Rd	41.7423	-72.1772	1471	1.69
20	6 Industrial Park Rd	41.7427	-72.1759	1319	2.08
21	415 Boston Post Rd	41.7432	-72.1739	1238	3.68
22	418 Boston Post Rd (Home Depot Parking Lot)	41.7418	-72.1713	835	2.65
23	418 Boston Post Rd (Home Depot Parking Lot)	41.7412	-72.1707	783	3.41
24	Tiny Ave/Gamache Ln	41.7436	-72.1708	1487	3.84
25	26 Baker Rd	41.7429	-72.1691	1507	2.97
26	Gate at the end od Baker Rd	41.7424	-72.1686	1480	2.92

(Measurement Locations & Results from Radio Frequency Exposure Report: Windham North, Verizon Wireless; prepared by C Squared Systems, July 23, 2013)

Table 3: Mohawk Mountain, Cornwall - Power Density Calculations

79-Foot Tower	# Ch	Watts/Ch	Ant Ht	Power Density (mW/cm2)	MHz	S	%MPE	Site Total
AT&T UMTS	1	500	65	0.0426	880	0.5867	7.25%	
AT&T GSM	2	427	65	0.0727	1900	1.0000	7.27%	
AT&T GSM	4	296	65	0.1008	880	0.5867	17.18%	
Verizon PCS	6	305	48	0.2856	1900	1.0000	28.56%	
Verizon cellular	6	61	48	0.0064	850	0.5667	1.13%	
Verizon	1	0.61	48	0.0001	5.4GH	1.0000	0.01%	
Sprint/Nextel iDEN	12	100	60	0.1199	851	0.5673	21.13%	
Sprint CDMA	6	588	60	0.3524	1900	1.0000	35.24%	117.76%
180-foot DPS Tower								
Antenna no.1 (CSP)	1	300	180	0.0005	42.04	0.2000	0.25%	
Antenna no.2 (CSP)	5	200	180	0.0016	867.5	0.5783	0.28%	
Antenna no.3 (CSP)	5	200	180	0.0016	867.5	0.5783	0.28%	
Antenna no.4 (CSP)	5	200	180	0.0016	867.5	0.5783	0.28%	
Antenna no.6 (DOE)	1	251	180	0.0004	2530	1.0000	0.04%	
Antenna no.7 (CSP)	1	5591	177	0.0000	6700	1.0000	0.00%	
Antenna no.8 (CSP)	1	9939	170	0.0003	6700	1.0000	0.03%	
Antenna no.9 (LCD/DHS)	2	278.5	160	0.0011	463	0.3087	0.35%	
Antenna no.10 (OEM)	1	60	164	0.0001	153.74	0.2000	0.06%	
Antenna no.12 (OEM)	1	178	151	0.0004	45.52	0.2000	0.20%	
Antenna no.13 (DHS)	1	335	143	0.0008	153.815	0.2000	0.39%	
Antenna no.14 (CSP)	1	1255	144	0.0030	154.665	0.2000	1.50%	
Antenna no.15 (CSP)	1	5591	137	0.0004	6700	1.0000	0.04%	
Antenna no.16 (FBI)	1	995	128	0.0029	170	0.2000	1.45%	
Antenna no.17 (DEP)	1	270	122	0.0009	44.68	0.2000	0.47%	
Antenna no.18 (CSP)	1	1275	121	0.0000	1920	1.0000	0.00%	
Antenna no.19 (USS)	1	398	116	0.0014	165.6875	0.2000	0.69%	
Antenna no.20 (NEC)	1	1018	112	0.0000	2144.4	1.0000	0.00%	
Antenna no.21 (NEC)	1	1015	112	0.0000	2141.2	1.0000	0.00%	
Antenna no.22 (DEP)	1	1015	109	0.0012	44.72	0.2000	0.58%	
Antenna no.23 (DEP)	1	270	96	0.0015	44.76	0.2000	0.74%	
Antenna no.24 (DEP)	1	270	85	0.0019	44.92	0.2000	0.93%	
Antenna no.25 (LCD/SHP)	1	794	86	0.0047	151.355	0.2000	2.37%	
Antenna no.26 (LCD)	1	178	64	0.0014	33.7	0.2000	0.72%	
Antenna no.27 (WTR)	1	125	71	0.0014	169.425	0.2000	0.70%	
Antenna no.28 (DOE)	1	5591	66	0.0008	6700	1.0000	0.08%	
Antenna no.30 (DMV)	1	995	60	0.0111	150	0.2000	5.55%	
Antenna no.33 (DHS)	1	100	85	0.0007	152.34	0.2000	0.37%	
Antenna no.34 (CSP)	1	5591	140	0.0004	6700	1.0000	0.04%	
Antenna no.35 (FBI)	1	10	128	0.0000	406	0.2707	0.01%	
Antenna no.36 (DOE)	2	3986	6	0.0055	2530	1.0000	0.55%	
Antenna no.37 (T-Mobile)	3	893.3	140	0.0077	1937.5	1.0000	0.77%	19.71%

Table 4: RF Measurements Taken at Mohawk Mountain, Cornwall

Meas. Location	Latitude	Longitude	Ground Elevation (ft)	Distance from Tower (ft)	Measured % MPE (General Population/ Uncontrolled)	Calculated % MPE (LTE - 750MHz)	Composite % MPE
1	41.82136	-73.29740	1668	270	4.49	3.00	7.48
2	41.82132	-73.29737	1668	260	4.87	3.22	8.09
3	41.82129	-73.29734	1665	251	5.07	3.44	8.51
4	41.82124	-73.29718	1670	208	3.84	4.96	8.80
5	41.82131	-73.29722	1672	218	5.71	4.55	10.26
6	41.82119	-73.29731	1663	247	4.03	3.53	7.56
7	41.82129	-73.29753	1660	303	3.42	2.38	5.79
8	41.82134	-73.29730	1679	243	10.84	3.68	14.52
9	41.82143	-73.29737	1670	265	8.76	3.12	11.88
10	41.82132	-73.29726	1670	232	4.73	4.03	8.75
11	41.82168	-73.29738	1671	303	4.09	2.40	6.50
12	41.82192	-73.29778	1658	439	3.66	1.15	4.81
13	41.82179	-73.29691	1678	230	4.91	4.15	9.06
14	41.82150	-73.29695	1679	165	3.27	7.87	11.14
15	41.82121	-73.29702	1674	166	3.55	7.43	10.99
16	41.82101	-73.29675	1666	136	3.37	3.69	7.06
17	41.82114	-73.29654	1676	60	2.50	3.06	5.56
18	41.82121	-73.29648	1677	29	3.54	0.61	4.15
19	41.82126	-73.29631	1675	30	2.87	0.55	3.42
20	41.82129	-73.29665	1679	65	1.98	2.99	4.97
21	41.82139	-73.29668	1680	83	2.48	2.81	5.29
22	41.82140	-73.29654	1678	54	3.80	3.21	7.00
23	41.82138	-73.29639	1674	37	5.24	0.55	5.78
24	41.82169	-73.29653	1673	153	3.82	7.57	11.39
25	41.82176	-73.29666	1674	189	5.02	6.01	11.02
26	41.82192	-73.29702	1672	285	7.88	2.71	10.59
27	41.82179	-73.29722	1674	288	1.03	2.66	3.69
28	41.82201	-73.29561	1651	343	6.31	1.85	8.13
29	41.82245	-73.29679	1621	440	3.38	1.11	4.50
30	41.82255	-73.29793	1604	621	3.96	0.57	4.53

(Measurement Locations & Results from Radio Frequency Exposure Report: Mohawk Mountain CT, Verizon Wireless; prepared by C Squared Systems, April 30, 2012)

Table 5: Garden Hill Circle, Waterbury - Power Density Calculations

SBA Tower	# Ch	Watts/Ch	Ant Ht	Power Density (mW/cm2)	MHz	S	%MPE	Site Total
Sky Tel 1	1	469.6	282	0.0021	940.225	0.6268	0.34%	
Sky Tel 2	1	547	282	0.0025	931.9375	0.6213	0.40%	
Sky Tel 3	1	547	282	0.0025	931.4375	0.6210	0.40%	
Bell South	1	250	282	0.0011	937.2625	0.6248	0.18%	
Arch 1	1	925	282	0.0042	929.8375	0.6199	0.67%	
Arch 2	1	384	282	0.0017	454.45	0.3030	0.57%	
Mobile com 1	1	1000	282	0.0045	931.9875	0.6213	0.73%	
Mobile Com 2	1	989	282	0.0045	931.8875	0.6213	0.72%	
Fedex	1	220	282	0.0010	858.8625	0.5726	0.17%	
#7	1	22.4	252	0.0001	152.21	0.2000	0.06%	
CL&P	1	300	98	0.0112	900	0.6000	1.87%	
CL&P	1	300	98	0.0112	900	0.6000	1.87%	
T-Mobile GSM/UMTS	2	12	182	0.0003	1950	1.0000	0.03%	
T-Mobile UMTS	2	12	182	0.0003	2100	1.0000	0.03%	
T-Mobile LTE	2	24	182	0.0005	2100	1.0000	0.05%	
MediaFLO			262		716		0.52%	
CL&P (150 MHz)	1	120	122	0.0029	173.3	0.2000	1.45%	
CL&P (150 MHz)	1	100	132	0.0021	153.0875	0.2000	1.03%	
CL&P (150 MHz)	1	31.7	132	0.0007	150	0.2000	0.33%	
CL&P (50 MHz)	1	250	122	0.0060	48.8	0.2000	3.02%	
CL&P (5 GHz)	1	0.51	130	0.0000	5800	1.0000	0.00%	
CL&P (5 GHz)	1	0.51	135	0.0000	5800	1.0000	0.00%	**14.45%**
American Tower Tower								
AT&T UMTS	2	565	152	0.0176	880	0.5867	3.00%	
AT&T UMTS	2	875	152	0.0272	1900	1.0000	2.72%	
AT&T GSM	1	647	152	0.0101	880	0.5867	1.72%	
AT&T GSM	4	934	152	0.0581	1900	1.0000	5.81%	
AT&T LTE	1	1615	152	0.0251	734	0.4893	5.14%	
Verizon cellular	9	282	129	0.0548	869	0.5793	9.47%	
Verizon PCS	7	298	129	0.0451	1970	1.0000	4.51%	
Verizon LTE	1	826	129	0.0178	698	0.4653	3.84%	
Verizon AWS	1	1750	129	0.0378	2145	1.0000	3.78%	
Arch Paging	1	1990	161	0.0276	931.19	0.6208	4.45%	**44.42%**
Message Center Mngmt Tower								
MetroPCS CDMA	3	727	160	0.0306	2135	1.0000	3.06%	
MetroPCS LTE	1	1200	160	0.0169	2130	1.0000	1.69%	
Clearwire	2	153	137	0.0059	2496	1.0000	0.59%	
Clearwire	1	211	137	0.0040	11 GHz	1.0000	0.40%	
Clearwire	1	211	137	0.0040	11 GHz	1.0000	0.40%	
Sprint CDMA/LTE	1	390	130	0.0083	850	0.5667	1.46%	
Sprint CDMA/LTE	8	693	130	0.1180	1962.5	1.0000	11.80%	**19.40%**

Table 6: RF Measurements Taken at Garden Hill Circle, Waterbury

Measurement Point	Latitude	Longitude	Dist. From MCM Tower	Measured Controlled/ Occupational % MPE	Measured Uncontrolled/ General % MPE
1	41°34'13.86"N	73°01'02.73"W	289'	< 0.50	<2.50
2	41°34'12.70"N	73°01'01.47"W	173'	< 0.50	<2.50
3	41°34'12.65"N	73°00'59.83"W	50'	< 0.50	<2.50
4	41°34'12.54"N	73°00'58.92"W	34'	< 0.50	<2.50
5	41°34'12.81"N	73°00'59.46"W	19'	< 0.50	<2.50
6	41°34'13.55"N	73°00'59.88"W	91'	< 0.50	<2.50
7	41°34'14.55"N	73°00'59.20"W	178'	< 0.50	<2.50
8	41°34'11.36"N	73°01'00.24"W	167'	< 0.50	<2.50
9	41°34'09.30"N	73°01'00.16"W	357'	< 0.50	<2.50
10	41°34'07.66"N	73°00'56.81"W	547'	< 0.50	<2.50
11	41°34'01.40"N	73°01'01.10"W	1157'	< 0.50	<2.50
12	41°34'08.85"N	73°01'12.93"W	1109'	< 0.50	<2.50
13	41°34'17.41"N	73°01'06.97"W	755'	< 0.50	<2.50
14	41°34'22.69"N	73°01'08.24"W	1223'	< 0.50	<2.50
15	41°34'22.47"N	73°01'01.99"W	1013'	< 0.50	<2.50
16	41°34'18.04"N	73°00'57.46"W	556'	< 0.50	<2.50
17	41°34'18.49"N	73°00'51.43"W	838'	< 0.50	<2.50
18	41°34'10.68"N	73°00'36.24"W	1758'	< 0.50	<2.50

(Survey Results from Radio Frequency Exposure Report: Garden Circle Relo, Northeast Utilities; prepared by C Squared Systems, May 4, 2011)