EXTENET INFORMATION IN RESPONSE TO CTC 12/4 FOLLOW UP QUESTIONS DATED DECEMBER 12, 2014

This report has been prepared by ExteNet to provide additional information in response to questions from the Village's consultant, CTC in furtherance of the December 2nd public hearing held on ExteNet's application for a Distributed Antenna System ("DAS") in the Village of Pelham, New York. The information contained herein was prepared by Chris Fridrich, ExteNet RF Manager and Rick Angelini, ExteNet Director of Construction who testified before the Village Board on November 6th and contributed to ExteNet's November 17th report.

I. T-Mobile Additional Information

ExteNet appreciates CTC's technical comments related to how this project fills a significant gap and while not clear from CTC's memorandum, the focus of this last memorandum appeared to be on additional data related to gaps in "coverage". Enclosed is a supplemental report from T-Mobile with added technical information that responds to the recommendations of CTC for additional information listed in bullets 1, 2, 3 and 5 of their December 4, 2014 comment memo. T-Mobile's information further emphasizes the significance of the gap in coverage they currently experience in Pelham and how the DAS network will remedy same in providing reliable service to the public.

CTC is also referred to ExteNet's filing dated December 8, 2014 in response to public comments. This information was provided given that the Village Code and Section 87-8 relates to gaps in "service" which is a broader analysis than a "coverage" gap alone and not fully dependent on analysis of technical mapping by a carrier. Based on the additional information we provided on Monday, and in T-Mobile's latest submission as requested by the Village, the need for all three DAS nodes to fill significant gaps in both coverage and provide reliable service has been shown technically as related to both the FCC licensed carrier's network standards and also the importance to end users of commercial wireless networks in Pelham who use devices at home, in the car, at the train station and schools, etc.

II. ExteNet – Pole Surveys in the Area of Cliff & Second

For the reasons noted by us and our counsel in our filings of Monday December 8, 2014, we do not agree with the proposition that Chapter 87-8 of the Village Code requires proof that an attachment to a utility pole is required first in relation to a proposal for a new utility pole set. Rather, the Village Code expresses a strong preference for utility pole attachments and new pole sets of the same scale in comparison to any other structure or siting in a residential area of

Pelham. We do nevertheless refer CTC to the aerial photograph in Exhibit C of its December 8, 2014 submission to the Village Board in response to public comments. ExteNet has surveyed poles in this area of the Village on numerous occasions dating back years now to its initial design of the DAS network in Pelham. It is noted that there are no commercial structures, etc. in this part of the Village which was part of the evidence previously provided in the application materials and original T-Mobile reports.

Clearly, had an attachment option been readily available from a T-Mobile network perspective, Con Edison/Verizon pole attachment basis, and other factors related to same, ExteNet would have selected that option if not for any other reason than avoiding the cost of a new pole set. We testified at length on November 6th with CTC's representatives present, who also surveyed the area prior to the hearing, regarding all of these factors and also provided further evidence in our November 17th filing. Simply put, the closest attachment option would materially degrade areas of reliable service in T-Mobile's network given topography to the south, a potential option ExteNet has been willing to consider in the context of settlement of litigation.

Finally, with respect to "alternatives", members of the public have also commented that this node location could be shifted north and increased in height 10'-20' at 111 Cliff Avenue (i.e. a 45' to 55' pole) or even increased 45' in height closer to residences on First Avenue closer to the train station (i.e. an 80' pole). We just don't see any objective basis for those "alternatives" given that such structures per Con Ed requirements would be brand new poles across the street from existing utility lines (not attachments) and introduce poles that are not the norm for residents in Pelham and out of character visually for these areas of the community. As such, there just are not any facts we see that would provide a reasonable basis for the Village Board to conclude that there is a "less intrusive" alternative for the community, as compared with the one new pole set which is no different than any other utility pole located in Village rights-of-way in diameter, height, color, etc.

December 11, 2014

Honorable Mayor
and Members of the Board of Trustees
Village of Pelham
Village Hall
195 Sparks Avenue
Pelham, NY 10803

RE: Response to CTC December 4, 2014 Letter
ExteNet DAS Application

Hon. Mayor and Members of the Board of Trustees:

I am a radio frequency engineer for PierCon Solutions, representing T-Mobile Northeast LLC ("T-Mobile"). The following information is submitted in response to the December 4, 2014 CTC Technology and Energy ("CTC") letter with respect to the above captioned matter.[1]

1. Drive Test Methodology:

The drive data included within the prior submissions was performed by T-Mobile's regional drive team. T-Mobile's regional drive team collected the data at TX 2110-2120MHZ RX 1710-1720MHZ with the use of a scanner using an industry accepted TEMS test program with external antennas. The three nodes where driven together, once with the three nodes on the air and once with the three nodes off the air. The test was conducted as such since the three nodes are considered to be one system.

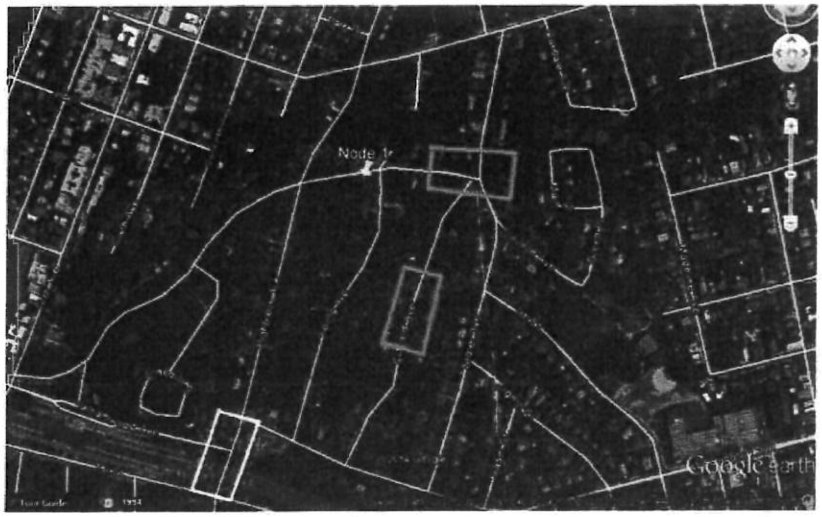
---

[1] The information contained in this letter is submitted under protest as it is not required by the Village Code. Moreover, the requested information is beyond the jurisdiction of the Village as technology issues are federally pre-empted in this context.

2. <u>Node 1 Fills a Significant Gap in Service</u>:

Previously, I submitted actual drive test data establishing the service provided by the DAS, including Node 1. The three DAS nodes within the Village of Pelham work together as a system in order to provide reliable coverage to the local area. Coverage from Node 1 cannot be analyzed in isolation as I have detailed previously. If Node 1 was removed, the DAS system would not work as efficiently with the existing network. Node 1 provides the ability to connect the coverage from the southern nodes to the existing northern macro sites, and is a crucial part of the DAS system within the Village of Pelham. Even with Node 1, reliable coverage is a challenge based on the topography and low height of each DAS node, particularly in comparison to the installation of a new tower to replace the DAS. Without Node 1, a new tower within the Village to replace the entire DAS would be necessary.

It is also essential to understand that that Node 1 provides a dominate signal to the surrounding area, as well as enhances the existing network in the locations shown below. Without this dominance, the reliability of the network would be compromised. The locations circled in Yellow are where 3G In-vehicle coverage is enhanced by Node 1, and the areas circled in Green are where 3G In-building coverage is enhanced by Node 1. These areas are significant in terms of the roads they are on and the number of residences in these areas, particularly in comparison to the minimal intrusion created by the facility comprising Node1.



3. <u>T-Mobile's Design Criteria</u>:

T-Mobile's design criteria is not subject to regulation by the Village. Nevertheless, the design criteria set forth in my prior reports is objectively reasonable, and to the best of my knowledge, unopposed in the administrative record in this proceeding. Moreover, the Village requirement that in-building test data be collected is entirely unreasonable given the in ability for T-Mobile to access a significant number of private residences to collect statistically meaningful data. Moreover, the drive test methodology used herein (i.e. collecting data with a specially equipped drive test vehicle and applying the relevant deign criteria to determine whether there is a gap in reliable in-building service), is the industry standard methodology. This methodology is reasonable and generally accepted as the correct methodology for evaluating in-building coverage gaps. Moreover, the issue of building loss must be analyzed in the context of the design criteria in order to account for the need to design a reliable network. In other words, it is entirely inaccurate to suggest that the difference between an in-vehicle design criteria and an in-building design criteria is merely the building loss.

The following information is provided to demonstrate the general basis of T-Mobile's design criteria in this administrative context where there is no code requirement to do so.

T-Mobile has established design criteria so that its wireless network will provide reliable wireless service to its customers, whether those customers are on the street, in a vehicle, or in a building. Providing reliable service to T-Mobile's customers within vehicles and buildings is critical to provide the quality of wireless service that customers demand and successfully compete with other wireless providers, such as Sprint, AT&T and Verizon Wireless. To meet customer demands, there are three levels of coverage that strives to provide: In-Vehicle coverage, In-Building Residential coverage, and In-Building Commercial coverage. It is important to understand that the levels of coverage do not represent an objective to achieve a higher level of call quality but to maintain a minimum signal strength and hence reliability of service at the mobile handset as the environment changes. As further detailed below, the signal is, by its nature, subject to attenuation depending upon the conditions and characteristics of the area. Moreover, as previously indicted, signal interference issues are critical in the 3G/4G design criteria context and is included in T-Mobile's design criteria. The following is a brief description of each level of coverage.

<u>In-Vehicle Coverage</u>: To successfully provide reliable In-Vehicle coverage, a T-Mobile customer should be able to place or receive a call within a vehicle successfully across 95% of a site's coverage area. In-Vehicle coverage is the minimum level of acceptable coverage within the T-Mobile network in areas with low population and along major highways covering rural areas. One must bear in mind that designing for only the In-Vehicle coverage threshold will typically result in unreliable in-building coverage, and hence customer dissatisfaction. However, since the signal level is stronger closer to the antenna site than further away from the antenna site, there will be some coverage within buildings close to the site.

<u>In-Building Residential Coverage</u>: To successfully provide reliable In-Building Residential coverage, a T-Mobile customer should be able to place or receive a call on the ground floor of a building that is three stories or less in height successfully across 95% of the site's coverage area. In-Building Residential coverage is the mid-level of coverage within T-Mobile network. In-Building Residential coverage is targeted for residential areas and low-rise commercial districts with building heights of three stories or less. This type of coverage will typically provide reliable coverage over the majority of the cell coverage area; however in some areas, and specifically at

the outer geographic boundaries of the cell sites' coverage area, coverage will be restricted only to rooms with windows and will likely lead to customer dissatisfaction if customers try to place or receive a call inside a windowless room, cellar or emergency shelter.

In-Building Commercial Coverage: To successfully provide reliable In-Building Commercial coverage, a T-Mobile customer should be able to place or receive a call on the ground floor of a building that is greater than three stories in height successfully across 95% of a site's coverage area. In-Building Commercial coverage is the top level of coverage within the T-Mobile network at this time. In-Building Commercial coverage is targeted for urban residential centers (high-rise buildings), urban business districts and suburban business centers. Coverage issues may still occur in hard to serve locations such as within elevators and parking structures.

Signal Strength: To provide these levels of coverage, T-Mobile has scientifically determined the strength of the wireless signal ("signal strength") necessary to provide In-Vehicle coverage, In-Building Residential coverage, or In-Building Commercial coverage. Because wireless signals are attenuated (i.e. degraded or partially blocked) by obstructions such as trees, automobile windows, automobile sheet metal, and building materials such as wood, brick and metal, a wireless signal must be of sufficient strength in the ambient environment (i.e. outside with no obstructions) to reliably penetrate into automobiles and buildings.

Assume for example that a homeowner placed a radio on the front lawn of his house and played a song. The sound level would be louder closer to the radio than farther away because audio sound waves weaken as they travel farther away from their source. The song will be clearly audible to a person with average hearing capacity sitting on the front lawn next to the radio. Another person may be able to hear the song within her car parked in the driveway a short distance away from the radio, although she may have difficulty deciphering the words. Still another person within the house may not be able to hear the song at all. For the person within the house to hear the song, the radio must be moved closer to the house. The song cannot simply be made louder within the house by turning up the volume, as there is a practical limit to how much sound (power) the loudspeakers can produce without physically damaging the radio, or introducing distortion into the sound. Similarly, a cell site's transmission power is limited by the physical output power capabilities of the amplifiers and the legal restrictions of the licenses T-Mobile operates under. It is also important to understand that unlike this simple radio analogy, a wireless telecommunication system is a two-way system. The signal is transmitted from the antenna site to the receiver in the wireless phone. The wireless phone transmits a signal back to a receiver at the antenna site. Each signal link must work for reliable two-way communication. Therefore, T-Mobile cannot simply turn up the power on its antenna site to provide a stronger signal level because doing this has no impact on the ability of the mobile phone to transmit a signal back to the receiver at the antenna site. The radio frequency power output of mobile phones is far less than the typical output power at the cell site. Although the cell site has some techniques to redress this power imbalance, the link must remain balanced. Accordingly, the relevant question is as follows: How close must the radio be to the house so that the radio waves are strong enough for the person in the house to clearly hear the song? In like manner, T-Mobile design criteria reflect the need to provide a wireless signal strong enough to provide reliable service within a vehicle or building.

In contrast to a 2G network, signal strength is not the single most important objective when designing and operating 3G/4G networks; signal quality is of greater importance because the same frequencies are used at each adjoining site. Operating efficient 3G/4G networks requires that signal interference among adjoining sites be strictly controlled.

Required Signal Strength Levels: A "receive signal code power" level of greater than or equal to –90 dBm and -12dB Ec/Io, represents T-Mobile's design criteria for reliable 3G/4G in-building residential voice coverage. A receive signal level of greater than and equal to –98dBm and -12dB Ec/Io, which represents T-Mobile's design criteria for reliable 3G/4G in-vehicle voice coverage.[2] The quality of a 3G/4G voice signal is referenced by the relative strength of the strongest "pilot signal" in relation to the entire wideband signal interference it encounters (Pilot + Noise). Wideband signal interference noise is generated by other sites within the network including its own signal, and this relative signal quality threshold is referred to as Ec/Io(defined as the energy per chip over the noise floor density). Wireless signal strength is measured on a logarithmic power scale referenced to 1 milli-watt of power. Signal strength levels less than 1milli-watt being

[2] 3G/4G voice design guidelines in this report are based on an AMR 12.2 Codec. Updated codecs will require more stringent design guidelines in the future. Data design guidelines are at least 3 dB to 10 dB more stringent than voice design guidelines.

negative. The smaller the negative dBm number, the stronger the signal. For example, -90dBm is a stronger signal level than –98dBm.

At present T-Mobile's design criteria for wireless facilities serving an area are based upon providing 95% reliable signal over a site's coverage area to ensure reliable service for customers. This standard reflects a business judgment that 100% reliability is an unrealistic goal at this time due to financial, technical and environmental constraints. A 95% level of reliability is consistent with the level of service provided by T-Mobile's competitors. Providing service at this level allows T-Mobile to satisfy customers' demands and compete on an equal footing with competitors serving this market. It is critical to understand that this standard is NOT a 95% call success rate.

To achieve the 95% reliable design goal, maximum path loss values are derived based upon T-Mobile's technology and the area served. Path loss means the amount the T-Mobile signal is degraded from the point at which the signal leaves the T-Mobile antenna site until it reaches the T-Mobile customer's mobile device or telephone. The equation is as follows: In-Building coverage = Receiver Sensitivity + Body Loss + In Building Loss with Standard Deviation + Fade Margin. Each component of this equation is described below.

Returning to our earlier example of the radio on the lawn, we must first determine the minimum song volume for a typical person to hear the song. This is the equivalent to the Receiver Sensitivity. We must then determine the degree to which the vehicle, the building and other obstructions in the environment obstruct the song, which is the equivalent to the path loss. Finally we need to introduce the concept of probability. As we do not know the exact location or direction of the listener, we need to make some adjustments for known variances to provide us with a 95% success target, this is the Fade Margin.

<u>Building Loss</u>: The concept of building attenuation, commonly referred to as building loss, has long been defined as the difference between the median field strength intensity at street level averaged around the exterior of the building, and the median field strength intensity at a location on the first floor inside the building. This difference is known as the building loss. <u>See</u> Rice LP: "Radio Transmission into buildings on 35 and 150 MHz" Bell Systems Technical Journal 1959.

Many measurements have been performed to derive values of the mean building loss for different types of buildings and environments. One researcher found mean losses of approximately 27dB for downtown Tokyo. See Kozono et al: "Influence of Environmental Buildings on UHF Land Mobile Radio Propagation" IEEE Transactions on communications October 1977. Another researcher has described losses of 15dB for downtown Chicago. See Walker E H: "Penetration of radio signals in to buildings in a Cellular Environment" Bell Systems Technical Journal 1983. Extensive measurements were performed at 900MHz in New York and determined that the median value of loss is 20dB. See Durante J: "Building Penetration loss at 900MHz" IEEE VTG Conference 1973. Researchers in Philadelphia, measured building losses averaging 16dB at 1900 MHz and 19dB at 800MHz for a range of buildings in urban, suburban and rural areas. See Tanis W and Pilato G: "Building penetration characteristics of 880MHz and 1922MHz Radio Waves" IEEE Journal 1993. Measurements in Liverpool, UK, showed losses averaging 13.4dB for measurements made at the ground floor of buildings. See Turkmani A and Toledo A: Radio Transmission at 1800MHz in to and within multistory buildings", IEEE Proceedings-1, vol 138, No 6 December 1991. Further measurements within Liverpool showed losses of between 24dB and 9dB for buildings in the City center and losses on the University campus of between 14 and 18dB. See Toledo A, Turkmani A and Parsons J, IEEE Personal Communications, April 1998. The ETSI Technical Report 03.30 (GSM Planning Aspects) uses building losses of 15dB for urban and 10dB for rural areas. Based on the foregoing, and as further described below, T-Mobile uses an 11dB loss for In-Building Residential and a 16dB loss for In-Building Commercial.

In addition to the "static" loss of 11 and 16dB, T-Mobile uses the reported "Standard Deviation" of building loss of 6.5dB and 7.0dB as reported in the references above. Durante and Rice compiled the largest set of measurement results in order to extract the standard deviation of the building loss. Rice quoted a deviation of 12 to 14dB around the mean loss and Durante reported 5 to 7.5dB deviation for ground floor measurements. Turkmani *et. al.* reported a standard deviation of 7.2dB for the buildings in the Liverpool measurement study. Standard Deviation is used to overcome the statistical distributions of building losses in an area. For example, the average loss for Residential buildings may be 11dB. However, some buildings made of brick or with aluminum siding, for example, may have much greater losses as high as 25dB or more. The standard deviation of the building loss is used in a calculation to ensure that 95% of buildings are covered and not just 50% of buildings if only the mean loss was taken into account.

Vehicle Loss: With respect to vehicle loss, it is important to note that the majority of customers use hand portable devices without exterior antennas on the vehicle. The signal strength loss due to the need to penetrate the vehicle to reach the handset must be taken into account when designing RF coverage for highways using the In-Vehicle coverage criteria. Extensive measurements have been performed at 900 MHz in three vehicle types; minivan, full sized car and small sports car. See Ivica Kostanic, Chris Hall and John McCarthy, TEC CELLULAR, Inc., VTC IEEE Conference 1997. Measurements were made with the mobile phone adjacent to the driver's head, with the mobile phone on the dashboard and with the mobile phone on the passenger seat. It was determined that for a minivan, losses (including body losses) were between 8 and 9dB with a standard deviation of 2 to 3dB. Losses for a full sized car were between 7.25 and 9dB (including body losses). Due to size of the windows in the small sports car, losses were found to be higher at between 9 and 14dB. ETSI Technical Report 03.30 (GSM Planning Aspects) recommends a vehicle loss of 6dB. Based on the foregoing, T-Mobile utilizes a figure of 6dB for vehicle losses.

Fade Margin and Standard Deviation: The standard deviation is a mathematical expression of how a set of data samples varies from the mean value. For example, if an observer was to measure the speeds of cars passing a point and plot the number of cars observed at each speed the graph would probably resembles a "Bell" curve. One speed will be the mean or average speed and represent the top of the Bell. On either side of this mean, fewer and fewer cars will have higher or lower speeds, forming the sloping sides of the Bell. The Standard Deviation is a measure of the width of the Bell. A low Standard Deviation would represent a narrow Bell. A large standard deviation would represent a wide Bell. In a mobile radio environment the observed signal strength varies at any point due to the radio waves taking numerous different paths from the transmit antenna to the receiver antenna and the minute variations in the surroundings (moving objects, vibrations, temperature effects, and local obstructions such as cars and trees). These effects produce "Fast" changing signal strengths at the mobile device. These effects are generally overcome by system features such as "Frequency Hopping", where the radio frequency is changed many times a second. Terrain obstacles, trees, and buildings, produce "Slow" changing effects, where the signal strength at the mobile device can change as the user moves a short distance. All of us will experience these effects if we talk on a wireless handset while walking. The observed signal strength will change as we move along. Slow fading effects result in a margin of error between the propagation tools used to prepare the coverage maps, and the mean signal at the mobile device. These Slow or Shadow fading effects must be compensated for in the design of the system.

Digital planning tools try to match a model of the propagation environment to known measurements in an area. If the model is successful then the accuracy of the model will approach the slow fading levels encountered in the field. A good model will estimate the long-term average mean of the signal over the prediction square or bin (generally 25 meter square). The slow fading and any additional model errors will be seen as a standard deviation of the tool when compared to known measurements. The planning tool that T-Mobile employs uses industry leading digital terrain and environmental databases and uses advanced calculations to produce an accurate estimation of the signal strength on the ground. The tool uses the MYRIAD model developed by Orange Labs.

Slow fading measurements in the field show a typical range of between 4 and 6 dB for non-line of sight environments and between 6 and 9dB where a dominant propagation path exists. See Turkmani A and Toledo A: Estimating Coverage of Radio Transmission in to and within Buildings at 900, 1800 and 2300MHz, IEEE Personal Communications, April 1998. Based on the accuracy of the tool in resolving shadowing errors and the residual slow fading error inherent in radio transmissions, T-Mobile utilizes a slow/shadow fading standard deviation of 8dB. It is important to understand that the published measurements of slow fading relate to measurements at a single point whereas T-Mobile is setting a compensation figure for the variance in predicted signal over a wider 25m bin.

The building losses also include a measure of variance with the Standard Deviation of the building losses being between 6.5dB and 7.0dB. The slow fading Standard Deviation and the in-building loss Standard Deviation are statistically independent and hence can be combined in to a single distribution using the following formula:

$$\sigma = \sqrt{(\sigma^2_{slowfading} + \sigma^2_{building\ loss})}$$

The computer software-planning tool creates a propagation map by predicting the average signal strength for a small area (e.g. a 25m by 25m square), based on a digital terrain database and a computer model that predicts the mean signal for each small area. A margin of error due to the Standard Deviation of the slow fading and building losses exists between the tool's prediction and the expected mean signal level.

The expected signal strength forms a lognormal distribution (a "bell" curve) around the predicted local mean. In other words, due to the variation in the environment across the predicted area, an additional margin is needed such that a certain probability of coverage is attained. This margin is deemed the Fade Margin.

Two methods may be used to calculate the Fade Margin. The first method uses the probability of a detected signal strength exceeding a defined threshold across a single prediction square (edge probability). The second method uses the probability across many squares to provide a wide area probability (cell area probability). Both probabilities are interlinked and depend on the variation in signal strength across the small prediction area, i.e. the standard deviation ("σ").

Determination of the fade margin and associated area cell reliability figures are calculated using the lognormal fading equations and methodology. See W.C. Jakes, Jr., "Microwave Mobile Communications," John Wiley & Sons, New York, 1974 (p. 126). This is the standard recommended methodology as described by the ETSI Technical Report of GSM Planning Aspects. The appropriate fade margin for 95% reliability employs the following equation:

$$Fu = \frac{1}{2}\left[1 - erf(a) + \exp\left(\frac{1-2ab}{b^2}\right)\left(1 - erf\left(\frac{1-ab}{b}\right)\right)\right]$$

Given that

$$a = \frac{x_0 - X}{\sigma\sqrt{2}} \qquad b = \frac{10n\log(e)}{\sigma\sqrt{2}}$$

Where Fu represents the fraction of useful area for which the signal strength x exceeds a given threshold Xo (the wanted fade margin). σ is the combined standard deviation and n represents the distance/power law relationship. "n'' is the rate at which radio waves decrease with the Log of distance. It has been shown to be between 2 and 6, see Turkmani A and Toledo A: Radio transmission at 1800MHz into and within multistory buildings, IEE Proceedings vol 138, No6 Dec 1991. The value of "n" depends on the environment and propagation conditions. T-Mobile uses a value of 3.5.

For example, in a suburban environment, design levels for 2G In-Vehicle would be calculated by the following:

σ = 8dB

Body Loss = 3dB

In vehicle loss = 6dB

Receiver Sensitivity = -102dBm

Path loss n = 3.5

Reliability = 95%

The required 2G signal on the street outside the vehicle would be:

Xo = Receiver Sensitivity + body loss + In-Vehicle loss

= -102dBm + 3dB + 6dB

= -93dBm

Setting Fu= 0.95, n=3.5 Xo=-93dBm and σ=8dB and solving for X in the equation above gives X= -84.4dBm, i.e. a total fade margin of 17.6dB.

The appropriate 2G signal strength planning levels for all area types are shown in the table below.

Area	MS (Rx Sensitivity)	Fade Margin and losses	Planning Level
In-Vehicle	-102 dBm	17.6	-84.0 dBm
In-Building (residential)	-102 dBm	26.0	-76.0 dBm
In-Building (commercial)	-102 dBm	31.4	-70.6 dBm

With regard to the 3G design level standards applying the same fade margin and losses to the 3G technology receiver specification yields the following planning levels:

Area	MS (Rx Sensitivity/Required level)	Fade Margin and losses	Planning Level
In-Vehicle	-116 dBm	17.6	-98.0 dBm
In-Building (residential)	-116 dBm	26.0	-90.0 dBm
In-Building (commercial)	-116 dBm	31.4	-84.6 dBm

Based on the foregoing, T-Mobile's design criteria are factually and statistically justified.

Respectfully submitted,

Senior RF Engineer
Joseph Menio