



**Engineering Statement  
Prepared for Dane County, WI  
Third Party Review  
RE: Proposed US Cellular Tower WI**

**April 17, 2016**

**Prepared by:  
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**BACKGROUND**

This report has been prepared by Ralph E. Evans of Evans Associates, Communications Consultants in Glendale, Wisconsin, regarding a proposed US Cellular self-supporting lattice structure and a fenced compound, with an equipment shelter, on a total of 2500 square feet of property in the Town of Cambridge, in Dane County, Wisconsin. United States Cellular Operating Company LLC (USCOC) is proposing to construct a 196' Self-Support tower off Lagoon Drive in the Town of Christiana, Dane County, Wisconsin. The propose tower is being constructed will improve coverage in the area and add capacity to the existing network.

USCOC's site of choice was to collocate on the existing water tower off S.T.H. 134. Part of the collocation process for USCOC is to run a structural analysis to confirm the structure will be adequate to support the proposed loading. The structural analysis came back from the engineer showing the railing on the water tank would be at 330% of capacity with the new equipment. This type of an upgrade would make it cost prohibitive to modify the water tank.

This consultant agrees with this determination.

The search was then expanded to other properties in the area. USCC worked on trying to stay in the immediate area to meet their needs and to also keep the tower out of the direct view of any residents. The instant property was identified to host a new lattice tower.

This proposal is submitted from the standpoint of siting a cellular tower for minimal aggregate visual impact, as well as compliance with Dane County Zoning Ordinance, specifically §10.255(2)(h)<sup>1</sup> (as modified by the present regulatory environment). Pursuant to our employment, this exhibit has been prepared.

The siting information provided to Evans Associates by US Cellular has been used in evaluating this tower. The analysis and the conclusions contained herein have been prepared by, or under the direction of, Ralph E. Evans, or have been submitted by the applicant. Information provided to Evans Associates by other parties is believed to be correct, and has been verified where feasible.

The new mobile tower siting law in Section 66.0404 of the Wisconsin statutes places limits on the review authority of local governments. This consultant believes, however, that the local review authority extends to verification that reasonable co-location alternatives have been investigated and documented by the applicant.

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<sup>1</sup> Requirements intended to minimize proliferation of towers in the County.



It is the opinion of the consultant that reasonable investigation and documentation has not occurred in the instant case. The notarized application shows the lack of alternative co-location factors is, in our opinion, adequate to support the conclusion of site uniqueness.

The following analysis consists of three sections:

1. Abstract (Section I)
2. Site Analysis (Section II)
3. Recommendations (Section III)

## **I. ABSTRACT**

US Cellular is continuing its process of building out their network in Dane County. Accordingly, the specified site is a “macrocell,” which means it is required to improve the coverage of the primary service in all, or most, directions in a larger sized area. Generally, macrocells have minimal overlap with adjacent cells utilized by the same provider; the need for the new site is therefore normally self-evident within the “search area.” As wireless phone use increases, the incidence of emergency and safety of life communications also increases, making high-penetration levels mandatory in both urban and rural areas. In order to improve coverage geographically, some new construction is to be expected. Federal regulations require that local communities treat all carriers identically with respect to permit requirements.

On the other hand, co-location issues, public safety<sup>2</sup>, land use and other environmental considerations must be addressed at the local level, along with conformance to planning requirements. Accordingly, the proposed site has been analyzed carefully from the standpoints of regulatory history, service necessity and availability of alternative sites. The conclusions reached herein represent the most complete engineering evaluation we are able to perform. This document and the attached exhibits are true and accurate to the best knowledge and belief of Evans Associates.

The LEASE PARCEL is described as follows:

A part of the Northwest Quarter (NW1/4) of the Southeast Quarter (SE1/4) of Section One (1), Township Six (6) North, Range Twelve (12) East, Town of Christiana, Dane County, Wisconsin containing 10,000 square feet (0.229 acres) of land and being described by:

Commencing at the East Quarter Corner of said Section 1; thence S00°-21'-54" W 203.39 feet along the East line of the SE1/4 of said Section 1; thence N89°-38'-06"W 1328.14 feet to the point of beginning; thence S87°-12'-38" W 100.00 feet; thence N02°-47'-22"W 100.00 feet; thence N87°-12'-38"E 100.00 feet; thence S02°-47'-22"E 100.00 feet to the point of beginning, being subject to any and all easements and restrictions of record.

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<sup>2</sup> Except *Radio Frequency (RF) Exposure* issues, which are regulated by the FCC.

## **II. SITE ANALYSIS**

The following paragraphs represent our analysis of the instant US Cellular application, which was conceived out of a need to fill an obvious coverage gap and provide uninterrupted cell service to the community, including future 4G LTE (new generation) services such as US Cellular telephone service, voice paging, Internet and wireless data transmission.

The tower height proposed, 196' AGL, has been requested by US Cellular in order to provide minimally acceptable coverage for emergency calls. The US Cellular antennas will be mounted upon the proposed lattice tower at the top. Additional co-locators' antenna arrays could be placed below the US Cellular array. Due to the topography of the area, a shorter structure would invite additional tower proliferation, which is not recommended. Relatively taller structures are required to serve areas behind hills and dense trees, especially for the co-locators that may be mounted lower on the tower.

The proposed site adds area and population to the existing propagation area, shown in Figure 1, in all directions surrounding the antenna's location. This location will facilitate construction of the US Cellular high-speed network in Dane County.

In US Cellular's opinion, a new structure located southeast of the Town of Cambridge will represent the appropriate height and location that will achieve the required technical objectives, which is to provide and stabilize service along County Highways. Since the propagation maps reviewed by this consultant shows good network coverage, this consultant agrees.

### **2.1. Validation of RF Information**

The proposed site utilizes a twelve-antenna array, representing omnidirectional coverage. The tower profile is shown in Figure 2.

### **2.2. RF Exposure**

The proposed site will meet FCC RF exposure requirements with respect to the general population as long as no high-power antennas are installed below 60 feet above ground level (more than approximately 6 kilowatts ERP).

Accordingly, with the RF energy exposure standards utilized in previous evaluations by this consultant, and as per previous concurring opinions from the Medical College of Wisconsin, it is concluded that there is no credible concern related to RF health risks with respect to the described site as long as the industry standard construction practices are followed.

### **2.3. Alternative Ways of Addressing a Particular Service Area Void**

There do not appear to be viable alternative sites close to the search area defined by US Cellular within the original search ring.

It is the intent of the Dane County Zoning Ordinance §10.255(2)(h) to populate the county with the minimum number of structures. In order for US Cellular to be in conformance with the county's ordinance, it has prepared an analysis discussing the feasibility of these alternative sites.

#### **2.4. Conformance to Industry Standards**

A six (6) foot high chain link fence will surround the tower and equipment building for security reasons. The fence will include barbed wire at the top for a total of seven (7) feet in height.

Assuming no serious malfunction of US Cellular wireless transmitters or public safety radio receivers, interference to public safety or other RF services is not expected. In any case, all transmitters and receivers located at common sites should observe good engineering practice with respect to tower bonding and grounding.

#### **2.5. Proposed Height Verification**

As per the above discussion, the tower height is dictated by the antenna height necessary for reliable coverage, which is influenced by topography and "look angle." This proposal appears to meet the minimum height requirements in the Dane County ordinance. The proposed height will be sufficient to address the needs of possible future co-locators.

#### **2.6. Response to Nearby Residents' Questions**

None received by Evans.

#### **2.7. Validation of Adequate Support Structure**

US Cellular has provided drawings of the proposed tower. A set of detailed design drawings has been reviewed and stamped by a structural engineer, licensed by the State of Wisconsin, to verify that the latest EIA/TIA standards are being observed, and that the tower will support the antennas of at least three additional possible future co-locators at a height of 100 to 150 feet.

#### **2.8. Visual Impact Assessment**

The proposed tower would be configured as a tapered lattice structure.

#### **2.9. Alternative Sites**

*"In accordance with §10.194(2)(A), US Cellular was unable to locate any other existing towers within its search area. After a comprehensive evaluation of the area, (the) RF engineers determined that the proposed site location was the sole acceptable location in the area, as other sites: i. were not available for lease by their owners; ii. were in locations which would provide sub-optimal service and or coverage functionality."*

### **2.10 Co-location Capabilities**

US Cellular's Conditional Use Application states that the proposed tower has been designed to accommodate at least three future additional carriers, for a total of four, or more, carriers. It is the intent of US Cellular to allow future PCS or cellular antenna arrays to be added.

### **2.11 Network Propagation Analysis**

The color scheme used for the propagation maps is as follows, and reflects Signal Level;

Green.....<=-100 DB  
Blue.....<=70 DB  
Salmon.....<=-81 DB  
White.....<-110 DB

## **III. RECOMMENDATIONS**

The following recommendations are made with respect to the proposed US Cellular tower site:

1. Based upon the information available, it is the opinion of Evans Associates that the US Cellular application is a reasonable addition to the Dane County infrastructure and should thoroughly address the individual co-location capabilities of most new carriers in this area in the future.
2. If the tower is approved, all tower components, appurtenances and transmission lines should be bonded securely and grounded to prevent RF interference caused by stray signals.

Respectfully submitted,

A handwritten signature in blue ink that reads "Ralph E. Evans III".

Ralph E. Evans III  
Senior Consultant  
Evans Associates

### **Attached Figures**

- Figure 1 --- Proposed Propagation Map**  
**Figure 2 --- Site Plan and Tower Elevation**

Figure 1 – Proposed Propagation Map



