

**County of Dane, Wisconsin**  
**Wireless Communications Site Review**  
**Application for New Tower**

**CityScape**  
CONSULTANTS, INC.  
2423 S. Orange Avenue, #317  
Orlando, FL 32806  
Tel: 877.438.2851 Fax: 877.220.4593

January 17, 2024

Dane County Zoning & Land Regulation Committee  
c/o Dane County Planning & Development  
210 Martin Luther King Jr. Blvd.  
Madison, WI 53703

**Applicant/Provider:** TowerNorth Development LLC / Verizon Wireless

**Provider Site Name:** Lake Kegonsa

**Site Address:** 1896 Williams Drive, Stoughton, WI 53589

**Latitude:** N 42° 57' 02.18" **Longitude:** W 89° 13' 05.52"

**Proposed Structure:** 180' Lattice Tower with 5-foot Lightning Rod on Top

Dear Zoning & Land Use Regulation Committee Members,

At your request, on behalf of Dane County, Wisconsin ("County"), CityScape Consultants ("CityScape"), in its capacity as telecommunications consultant for the County, has considered the merits of an application submitted on behalf of TowerNorth Development LLC and Cellco Partnership d/b/a Verizon Wireless (collectively "Applicant"), requesting a Conditional Use Permit to construct a new one hundred and eighty (180) foot self-supporting *lattice tower* with a five (5) foot attached lightning rod, *see Figure 1*. This facility is intended to accommodate the antennas for Verizon Wireless ("Verizon") and three other future collocations. The subject property is located at 1896 Williams Drive in the Town of Pleasant Springs. It is zoned FP-35 (General Farmland Preservation) and is 35.9 acres in size. If approved, the proposed tower would be located about 730 feet east of the Williams Drive right-of-way line and 0.72 miles north of County Road B, just north of the City of Stoughton, *see Figure 2*.

The proposed tower height complies with the County's height limitation of one hundred and ninety-five (195) feet above ground for a new tower. Painting and lighting are not required for aviation safety.

The proposed Facility has been evaluated from the following perspectives:

- Whether the proposed tower facility, as specified, is justified due to technological reasons and is essential for the Applicant to provide its telecommunications service; and,
- Whether the proposed facility follows the guidelines of the Telecommunications Act of 1996 and subsequent federal legislation and is compliant with the State of Wisconsin and Dane County Codes and all other pertinent rules and regulations including the FCC rules; and,
- Whether the application is complete and complies with the application submittal requirements of the County Communications Tower Ordinance – Section 10.103(9) of the County Code.

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CityScape received the digital application materials from the Applicant on June 7, 2023. The County received paper copies of the application on June 9, 2023, making that the official filing date and on that day gave CityScape permission to review the submittal. CityScape deemed the application incomplete on June 16, 2023, and provided comments to the County via email detailing the items in the County's Code that needed to be addressed by the Applicant.

The Applicant resubmitted a new application on September 13, 2023, and CityScape completed the review and deemed the application incomplete on September 19, 2023, because certain deficiencies identified in the June email remained unresolved by the Applicant. One of CityScape's main concerns was related to the radio frequency propagation maps required in Section 10.103(9)(b)1.d. in the County's Code.

The before and after activation maps provided by the Applicant were identical and had the appearance of indicating wireless coverage across the entire map. Since the Applicant states the proposed facility is to address a "capacity" issue only, the Applicant should have demonstrated the need for additional capacity using engineering data in their application documents. Specifically, the Applicant should have provided the following:

- 1) Identification of the adjacent Verizon facilities and specific antenna sectors of those facilities that require capacity relief plus the coordinates of such facilities; and
- 2) Capacity Utilization Charts (core and non-core) to demonstrate connection capacities approaching/exceeding the maximum of the antenna sectors of adjacent Verizon facilities that need capacity relief. These charts should have been accompanied by a brief explanation in plain language by the RF engineer of what the charts show and how to read them; and
- 3) Two "best sector" maps, the first depicting Verizon's current service, with the coverage footprints of the individual antenna sectors color-coded to distinguish between them, and the second map an identical map depicting the sector service as a result of activating the proposed site. Both maps should have identified the locations of all Verizon's existing and proposed facilities and the individual antenna sectors marked and/or labeled; and
- 4) Conventional propagation maps, if such maps would show a discernable geographical expansion of service, prepared per industry standards along with the requirements of 10.103(9)(b)1.d.

The Applicant responded that Verizon considers the requested information by CityScape to be proprietary. After discussion with the County and the Applicant, CityScape entered into a Non-Disclosure Agreement ("NDA") on November 10, 2023, with Verizon to review the requested information that Verizon considers confidential.

On November 13, 2023, and December 7, 2023, the Applicant filed revised documents with the County and the County deemed the application complete on December 21, 2023.

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Evidence of Need for the Proposed Facility

The Applicant has provided certain documents, some required by the County Ordinance and others requested of the Applicant which in accordance with the NDA were provided only to CityScape, that demonstrate the justification for the proposed facility. The documents included a search ring map and existing tower search area map on Verizon letterhead (Exhibit C of the permit application), a sworn statement from the Verizon RF engineer (Exhibit D), and exhibits, provided by Verizon to CityScape under the NDA, that supports the need for the proposed facility to fill in a lack of *capacity* at a nearby Verizon facility. The following Applicant's statements, and CityScape's responses, are as follows:

- 1) "The search ring identifies the area within which a site could be located (assuming sufficient height is considered) that would have a high probability of addressing the significant coverage gap and/or meeting the capacity objectives established by the Verizon Wireless RF (Radio Frequency) engineers." *CityScape agrees with this statement in the RF Affidavit (Exhibit D).*
- 2) "Once a search ring is determined, Verizon Wireless' real estate specialists search within the proximity of the defined area — in this case within a ¼ [0.25] mile radius from the search ring center — for existing buildings, towers and other structures of sufficient height that would meet the defined objectives. The search ring center for this site is 42.94302, -89.2256. If none are found, then the focus shifts to 'raw land' [undeveloped] sites." *CityScape generally agrees with this approach described by the RF engineer, and the size of the search ring is common for capacity-driven sites; however, what was left out of this statement is that the search ring also is used to identify parcels of undeveloped land that would meet the defined objectives. If there are no existing towers within the search ring, the search turns to "raw land" within the search ring for constructing a new antenna structure. If there are no parcels suitable for building a tower nor any landowners willing to lease land in the search ring, the search must expand beyond it.*

*The Applicant chose a site that is 0.39 mile beyond the search ring, inferring that within the search ring, the Applicant could not find an existing tower on which to collocate nor a parcel of land on which a tower could be built. CityScape confirmed that there are no structures more than 100 feet in height within the search ring. Regarding raw land options, the Applicant provided a parcel map of the properties in the search ring which indicates that all of the parcels in the search ring either A) are unavailable due to non-interest from the owner, or B) were rejected by the Applicant "due to parcel size or setback restrictions." The Applicant did not specify the adverse conditions of any of the rejected properties; however CityScape found that all but four of the 23 properties that were rejected are zoned Single Family or Multi-Family Residential. The other four are Farmland Preservation or Rural Residential.*

- 3) "The proposed site gives coverage to Lake Kegonsa better than the [SBA] Tower located at 42.96259, -89.17975 [at the intersection of County Road B and Spring Road], which was considered, but rejected. The proposed site will provide for greater coverage with the areas surrounding Lake Kegonsa than the vetted [SBA] Tower does. The [SBA] tower [would be]

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missing key areas around Lake Kegonsa compared to the proposed site. The proposed site will alleviate the capacity needs in the area compared to the [SBA] tower.” *CityScape agrees with this determination. The SBA tower<sup>1</sup> is much farther from Lake Kegonsa and the City of Stoughton where increased capacity is needed.*

- 4) “Although Verizon has coverage in the area, there are serious capacity constraints that can only be addressed with a new facility. Once the new site is on air, utilization of available capacity will drop from the current level to a level which will allow for excess capacity for future increases in network usage.” *The proprietary exhibits provided by Verizon, in CityScape’s opinion, do demonstrate that the proposed facility is essential for providing much-needed additional capacity to the Verizon network.*
- 5) The Applicant’s stated service objectives, described in the *Summary of Proposed Conditional Use* statement in the Application, is as follows: “The purpose of the facility is to allow Verizon to improve its customer experience in the vicinity of the proposed facility, specifically to increase the capacity of the network in this area.” Further, the Applicant states: “[T]his project is to increase *capacity* of the network, *not coverage*.” (Emphasis added.) A lack of *capacity* of a provider’s wireless network to process connections can result in dropped calls, inability to complete a call, and slow data speeds. *From time to time, wireless providers add macro cell sites to resolve coverage gaps between existing towers. As more and more consumer wireless devices are deployed in a given wireless service area, increasing network capacity becomes the driving factor to build additional sites that are localized closer to the wireless provider’s subscribers. This will involve the construction of additional wireless facilities that may overlap signal footprints with one or more of the provider’s existing facilities. These new facilities are necessary to offload wireless connection requests coming into the existing adjacent towers so that the provider network does not operate over its capacity to handle the volume of subscriber connection requests. This practice has been ongoing in urban and suburban areas for many years and will continue in rural agricultural and residential areas.*

The engineering documents provided by Verizon demonstrate that the proposed facility will serve as a capacity-driven site that will offload wireless connection traffic from an existing nearby Verizon facility.

**Review of Other Special Requirements for Communication Towers**

Per the County’s Code, collocation on an existing structure is preferred over new construction, and the Applicant states collocation is not an option. According to Verizon’s engineering sworn statement, there are no viable candidates for collocation within one and a half (1.5) miles of the center of the search ring.

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<sup>1</sup> This tower was built by Central States Tower in 2017 for Verizon, but neither Verizon nor any other wireless provider has installed their equipment on the tower. The tower, now owned by SBA Communications, remains vacant.

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Searching both public and private communications tower databases, Cityscape has verified that there are no collocation opportunities at communications towers that are known to exist within the 1.5 mile radius circle, see **Figure 3**. The nearest structure is an existing Verizon facility, which is not shown in **Figure 3** due to the NDA constraints. As Verizon's sworn statement alluded, expanding capacity at an existing maxed-out wireless facility is not technically possible. Thus, the Applicant appears to have met the threshold set by the County Ordinance for justifying new construction for the proposed facility.

Therefore, CityScape has determined there is a preponderance of evidence that no existing tower currently is adequately serving or would adequately serve Verizon subscribers in the area that Verizon intends to serve, and a new wireless tower is needed in this region of the County for Verizon to make needed improvements to its wireless service.

The Applicant proposes to build a *lattice* tower. The County has the authority to regulate the type of tower to be used, and the Applicant is expected to address the necessity of a lattice tower as opposed to a monopole in the hearing before the Zoning Commission.

The proposed tower 185-foot tower height complies with the County's height limitation of one hundred and ninety-five (195) feet above ground for a new tower. The proposed tower has been reviewed by the FAA for aviation safety, and that agency has given the proposed tower a Determination of No Hazard (DNH)<sup>2</sup>. Painting and lighting are not required for aviation safety.

According to the Applicant's application documents, the proposed Verizon antennas would be at an elevation of one hundred and seventy-five (175) feet above the ground, and up to three future collocators' antennas would be accommodated at the site, which exceeds the County Code requirement of a minimum of two collocations, (see **Figure 1**). All future collocation applications submitted by other providers must be reviewed to assure compliance with structural limitations and local, state, and federal law including FCC regulations.

According to a letter submitted by the Applicant from Sabre Industries, presumably the vendor for the proposed structure, see **Figure 4**, in an extreme wind event resulting in structural failure, the tower would fall within a radius of 127.5 feet from the base of the structure with the top portion of the tower buckling over the bottom portion that remains standing, thus falling within the underlying property line. A tower setback distance of 127.5 feet from the northern property line (equal to the engineered 127.5-foot fall radius) is shown in the location plan sketch, Sheet LP-1 of the Construction Drawings done by Terra Consulting Group dated 12/08/22, see **Figure 5**.

In the Radio Frequency (RF) Affidavit, the Verizon RF engineer stated the following:

- "Verizon Wireless certifies that the proposed facility will not cause interference to any lawfully operating emergency communication system, television, telephone or radio, in the

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<sup>2</sup> The DNH letter is dated 04/18/2023 and the FAA Aeronautical Study No. is 2023-AGL-3797-OE.



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surrounding area...As a condition of the FCC licenses, Verizon Wireless is prohibited from interfering with other licensed devices that are being operated in a lawful manner. Furthermore, no emergency communication system, television, telephone or radio is licensed to operate on these frequencies, and therefore interference is highly unlikely.”

- “Verizon confirms that this site will comply with all applicable FCC regulations regarding radio frequency safety and exposure limits.”

Based on CityScape’s experience, if the facility is built as proposed and in accordance with industry standards, it is unlikely to cause interference to other authorized radio services, and it will not create levels of human RF exposure at ground level that would exceed FCC limitations. However, the Applicant should be aware of its obligation as an FCC licensee to *resolve* any interference caused to other radio services by the proposed Verizon facility in accordance with the FCC’s Best Practices Guide in the unlikely event that such interference does occur.

The Applicant proposes to build a 12-foot-wide gravel access drive off Williams Drive to access the proposed sixty-five by sixty-five (65 x 65) foot equipment ground compound within which the tower and ancillary equipment are proposed to be built, see **Figure 6**. An eight-foot-high chain link fence is proposed for installation on the perimeter of the compound with a 12-foot wide double-swing locked gate on the north side of the compound. **Figure 6** shows equipment areas designated for Verizon and three future tenants.

Around the outside of the proposed fence, the Applicant proposes to plant a total of forty-five (45) American Arborvitae trees. As per the County Ordinance, the Zoning Committee may require a modified landscaping plan.

Summary

CityScape concludes there is a preponderance of evidence that the construction of a new personal wireless communications facility in the area is technically justified and is essential for the Applicant to achieve its objective of continuous service in the area. CityScape also believes the location and height proposed are technically appropriate.

If the County elects to approve the new wireless facility, it should do so with the following conditions:

- 1) Prior to permitting, the Applicant shall submit a structural analysis report, signed by a Professional Engineer licensed in Wisconsin, certifying that the tower will have the structural capacity for the proposed Verizon equipment and collocations of at least two other wireless providers with similar equipment; and,

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- 2) Prior to permitting, the Applicant shall submit final construction drawings for the facility which shall be certified by a Wisconsin-registered Professional Engineer; and,
- 3) The Applicant shall construct the tower so as to accommodate a minimum of two additional antenna arrays for collocation in similar in size and function to that placed on the tower by the Applicant; and,
- 4) At the County's discretion, the tower, antennas and all other ancillary equipment mounted on the tower shall be painted a color deemed the least visually obtrusive; and,
- 5) The tower shall not be artificially illuminated unless required by the FAA or any other applicable authority; and,
- 6) If a valid complaint of interference to an authorized County or municipal public safety radio facility is found to be associated with Verizon's installation at the proposed facility, the Applicant shall comply with all applicable rules regarding radio-frequency interference as mandated by the Federal Communications Commission (FCC), and in accordance with the FCC's Best Practices Guide.

The undersigned certifies that, to the best of our knowledge, all the information included herein is accurate at the time of this report. CityScape is employed only by public entities and has unbiased opinions. All recommendations are based on technical merit without prejudice or bias per prevailing laws and codes.

Respectfully submitted,



B. Benjamin Evans  
Senior Project Engineer  
CityScape Consultants, Inc.

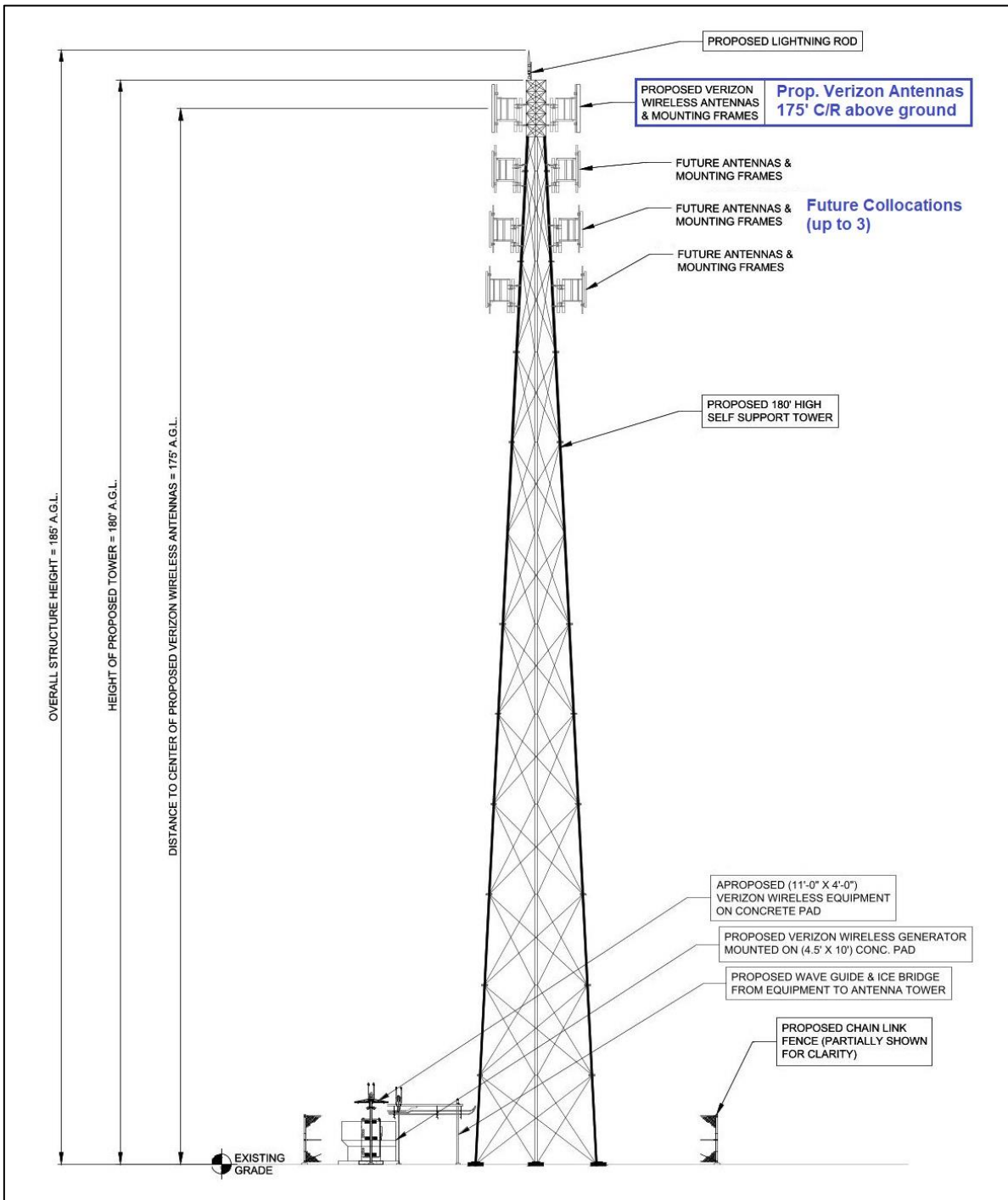


Susan Rabold  
Project Manager  
CityScape Consultants, Inc.

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**Figure 1. Tower Elevation Sketch**



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**Figure 2. Vicinity Map of Proposed Facility Location (Google Map)**

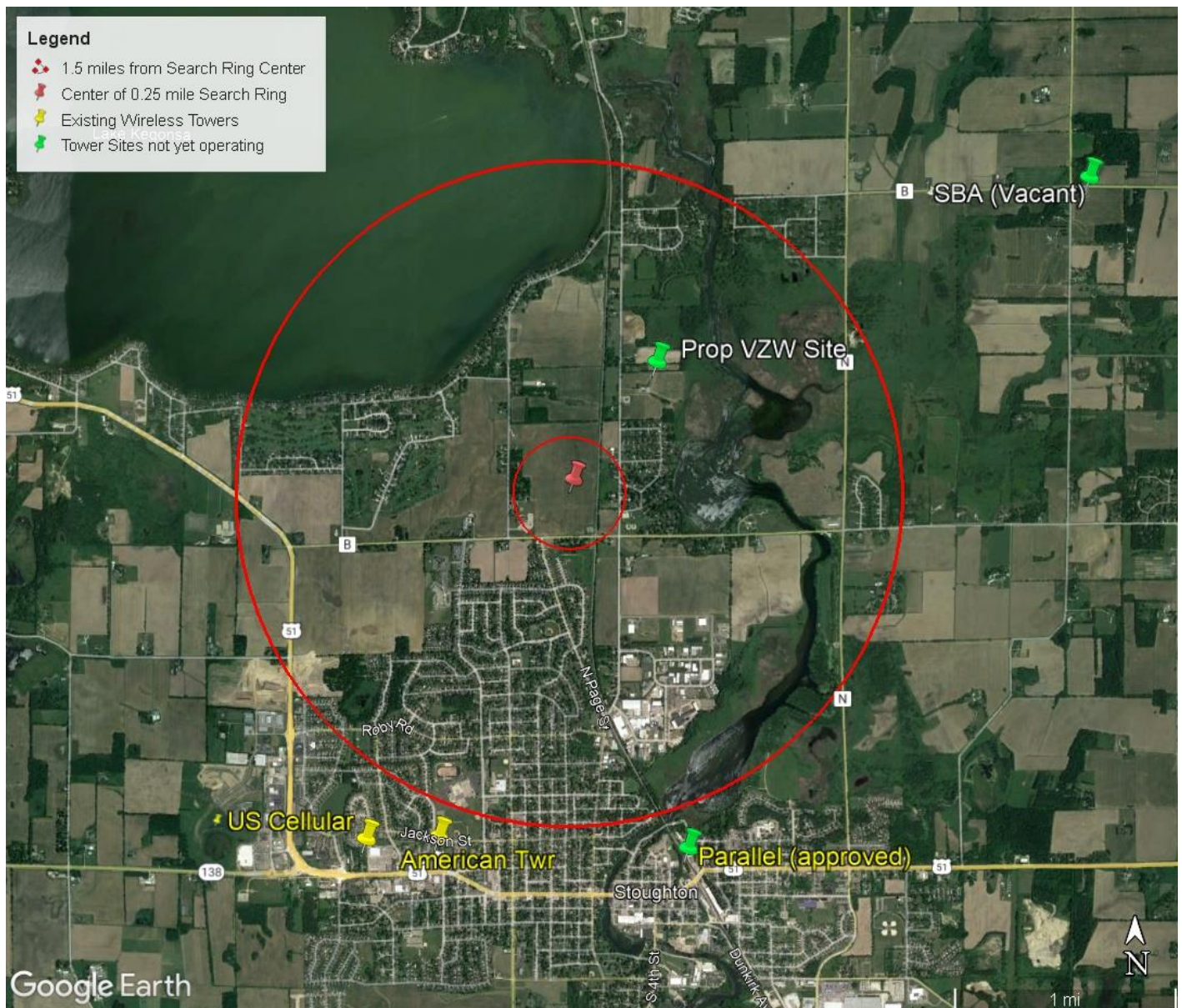


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**Figure 3. Google Map showing Search Ring and Existing Sites within 1.5 Miles**

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November 29, 2023

Ms. Mary Caulfield  
Site Development Manager  
TowerNorth

RE: Proposed 180' Sabre Self-Supporting Tower for WI1040-A Lake Kegonsa, WI

Dear Ms. Caulfield,

Upon receipt of order, we propose to design a tower for the above referenced project for an ultimate Wind Speed of 115 mph and 40 mph + 3/4" radial ice, Structure Class II, Exposure Category D, and Topographic Category 1 in accordance with the Telecommunications Industry Association Standard ANSI/TIA-222-G, "Structural Standard for Antenna Supporting Structures and Antennas". The tower will be designed to support a total of four (4) wireless carriers at the following elevations: 175', 163', 153' and 143' (AGL).

When designed according to this standard, the wind pressures and steel strength capacities include several safety factors. Therefore, it is highly unlikely that the tower will fail structurally in a wind event where the design wind speed is exceeded within the range of the built-in safety factors.

Should the wind speed increase beyond the capacity of the built-in safety factors, to the point of failure of one or more structural elements, the most likely location of the failure would be within one or more of the tower members in the upper portion. This would result in a buckling failure mode, where the loaded member would bend beyond its elastic limit (beyond the point where the member would return to its original shape upon removal of the wind load).

Therefore, it is likely that the overall effect of such an extreme wind event would be localized buckling of a tower section. Assuming that the wind pressure profile is similar to that used to design the tower, the tower is most likely to buckle at the location of the highest combined stress ratio in the upper portion of the tower. This would result in the portion of the tower above the failure location "folding over" onto the portion of the tower below the failure location.

*Please note that this letter only applies to the above referenced tower designed and manufactured by Sabre Towers & Poles. In the unlikely event of total separation, this would result in a fall radius less than or equal to 127.5'.*

Sincerely,

Amy R. Herbst, P.E.  
Senior Design Engineer



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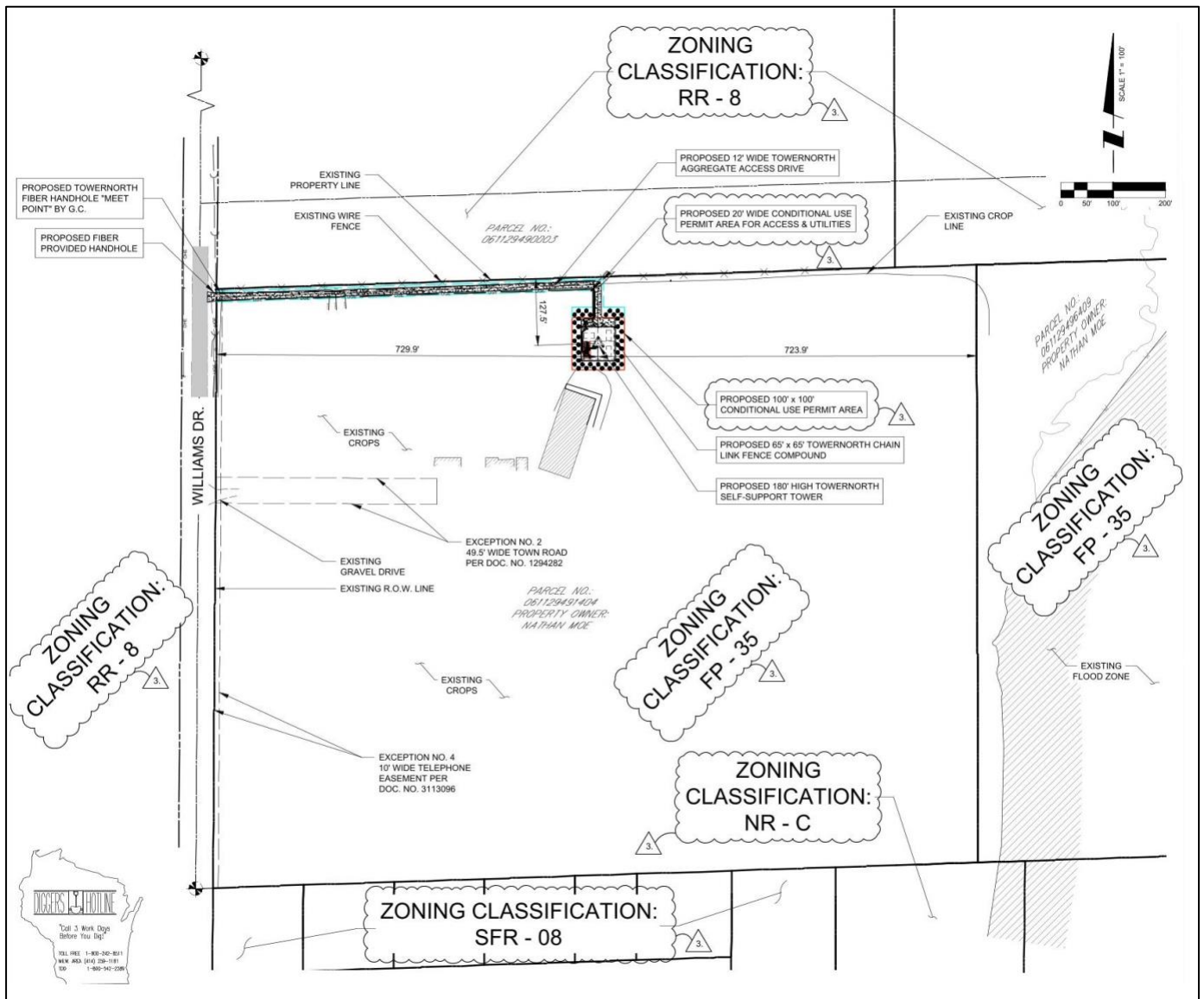
**Figure 4. Fall Zone Letter**



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**Figure 5. Overall Location Plan**

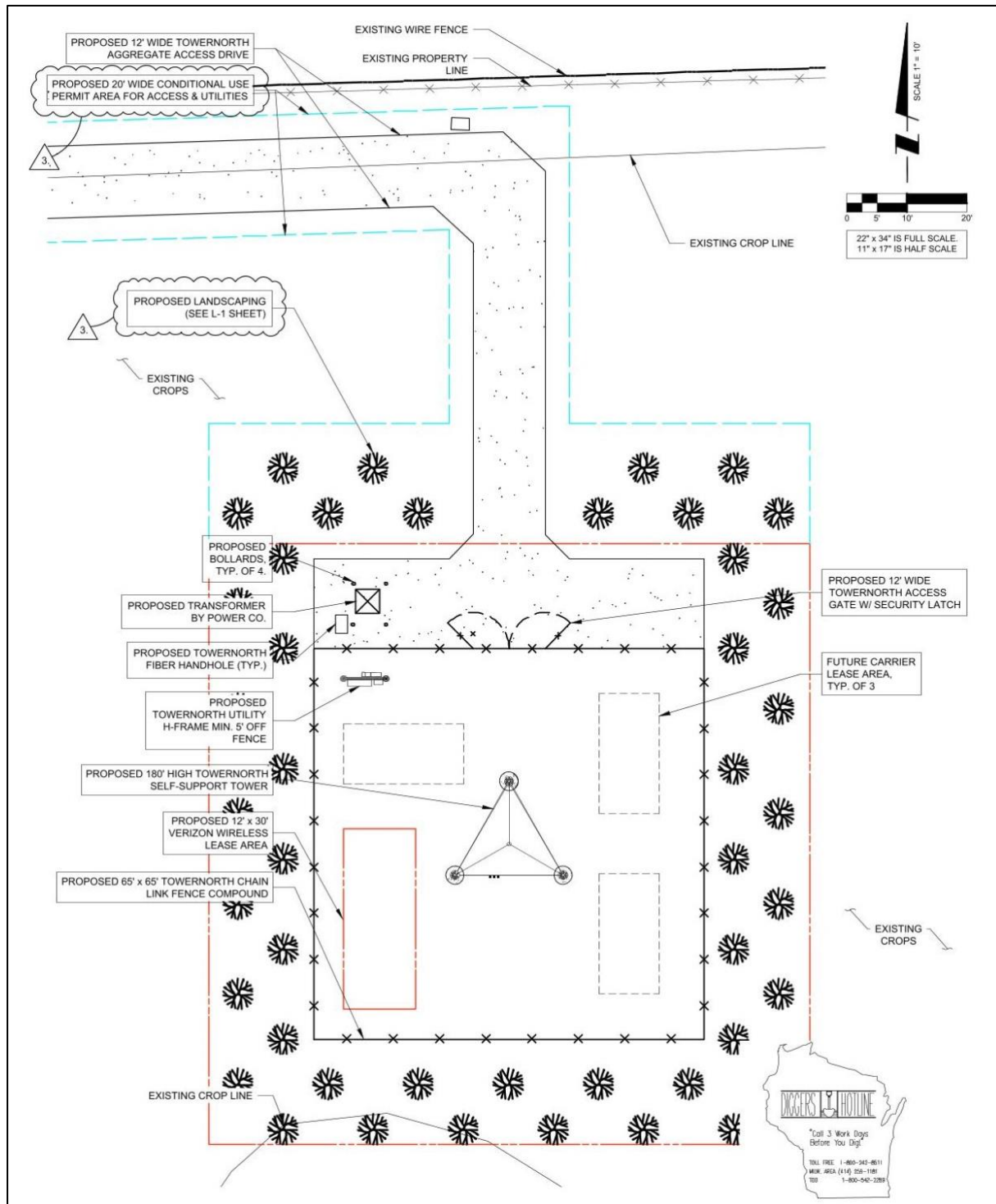
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**Figure 6. Ground Compound Detail**