NorthWest Tower Engineering

September 26, 2018

Dusty Pilkington
Planner I
Kittitas County Community Development Services (CDS)
411 N Ruby St #4
Ellensburg, WA 98926

Re: **Hyak PSERN Cell Tower**
60-ft Self Support Tower, Extend to 90-ft
NWTE File: 181700.03
Kittitas County CDS File: ACU-18-00003

Dear Dusty,

Further to your letter dated September 24, 2018 in reference to the above project, NorthWest Tower Engineering (NWTE) would like to address the issue of fall zone/radius for the proposed 90-ft self supporting communications tower.

The existing tower with proposed extension has been designed to meet the requirements of the current ANSI / TIA-222-G design standard, "Structural Standard for Antenna Supporting Structures and Antennas." A rigorous structural analysis was performed using the provisions of the TIA-222-G standard. This standard is referenced in the 2015 International Building Code. The minimum basic wind speed of 85 mph (V_{asd}, 3-second gust) as listed in the standard for Kittitas County, Washington was used. A basic wind speed of 50 mph (V_{asd}, 3-second gust) in combination with a design ice thickness of 1 inch was also considered. Exposure Category C, Topographic Category 1 (no wind speed-up effect), and Structure Class III (structure used for essential communications) were used for the analysis.

Wind loads calculated using a basic wind speed of 85 mph (V_{asd}) with a wind load factor of 1.6 and importance factor of 1.15 for Class III structures per the TIA-222-G standard are similar to those calculated using an ultimate design wind speed of 115 mph (V_{ult}) for Risk Category IV with wind load and importance factors of 1.0 per the 2015 IBC and ASCE 7-10 standard.

A three-dimensional finite element model of the tower was created using *tnxTower Version 7.0.7.0 (Tower Numerics, 2016)*. This computer software program calculates and distributes wind and ice loads in the model.

The model indicates that after the tower is strengthened and extended, the maximum structural member strength ratio will be 79% of capacity, which provides a significant reserve capacity. Refer to NWTE structural analysis report no. 181700.3 dated February 9, 2018 for further details.

The tower structure will be 90ft tall. Per Kittitas County Code section 17.61.040, Communication facilities, "the property line setback shall be 1.2 times the height of the structure." In order to comply with that requirement the maximum set back from the tower is 108ft. When we draw a 108ft fall radius from the tower we find that we are inside the property boundary.

Collapse of self support towers is statistically rare with very few recorded incidences since the 1940's. Past failure of towers usually occurred during construction or on older structures that were designed to earlier standards that did not include ice loading or increasing wind pressure with tower height. Other failures have occurred due to over loading with antennas /feedlines and also due to little or no maintenance of major structural elements.

The WSDOT/PSERN tower is an essential public facility and as such is designed to have structural capacity in excess of normal communication towers. Any additional installation of equipment will require a full tower structural analysis prepared and stamped by a Washington Structural Engineer. The tower will also be maintained and inspected on a regular basis as recommended by NWTE.

In conclusion, it is NWTE's opinion that the design of the proposed self supporting tower is adequate to minimize the potential risk to the public from collapse. With the tower's enhanced structural capacity after structural modifications are completed, it is NWTE's opinion that the chance of a catastrophic tower failure is extremely low. The fall radius is also within the required setback from property boundaries.

If you have any questions please do not hesitate to contact me.

Sincerely,

Harvey Carlisle, S.E.