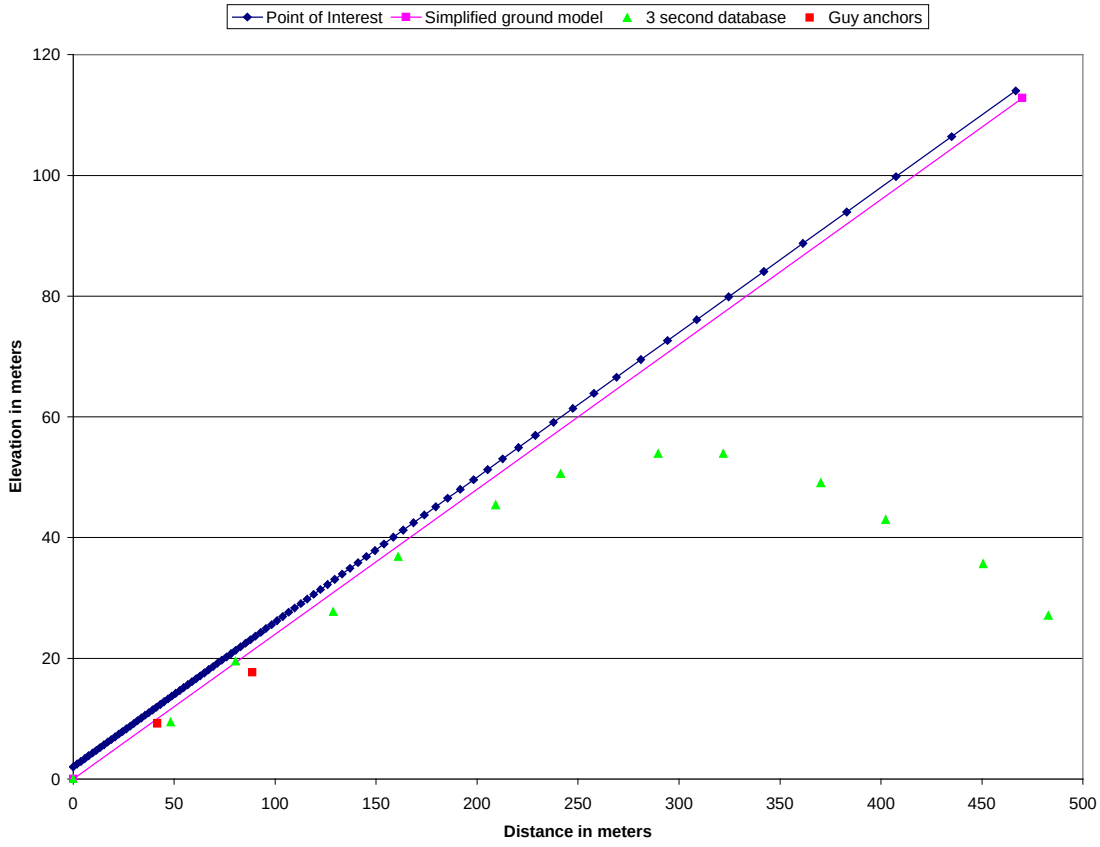
KWPZ NIER Analysis

Main Site Facilities

The KWPZ main site utilizes a 6-bay full wave spaced Kathrein 6 X 3 754 154 circularly-polarized omni-directional panel antenna side mounted on a 160m guyed tower (ASRN 1032381) on Mt Constitution, on Orcas Island, Washington. The center of radiation is 114m above ground level. The effective radiated power is 68.0KW in both the horizontal and vertical planes with 1.5 degrees beam tilt.

Elevation Considerations

The tower on which KWPZ's antenna is mounted is not at the top of the hill. There is a substantial upslope just east of the tower, bringing ground level substantially closer to the KWPZ antenna. To simplify the evaluation of hazards due to KWPZ's signal, the terrain was modeled as a consistent .24 upward slope from the antenna base to each point of interest. A series of points taken from the USGS 3 second terrain database in the direction of the steepest slope from the antenna base is plotted on the graph below, showing that the simple .24 upward slope is consistently higher than the actual terrain. There are two guy anchors on this slope, and the survey data used to locate these anchors is also plotted, showing that the simplified terrain model will consistently exaggerate the calculated signal levels.



NIER Calculations

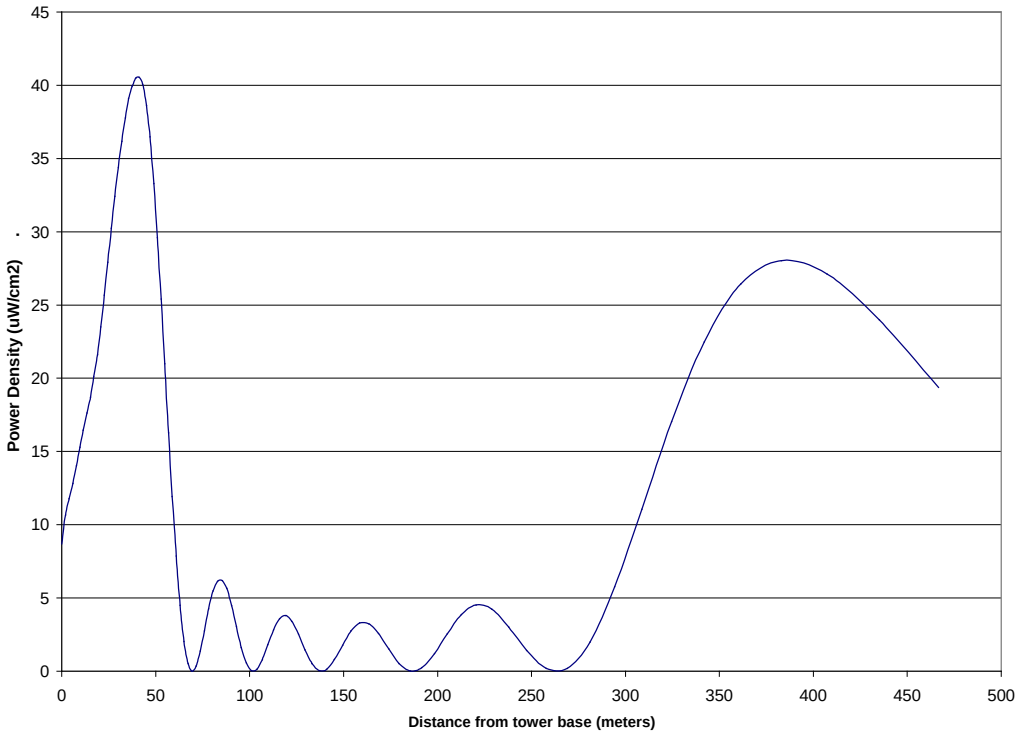
"Ground Level" power density is calculated at a reference height of 2 meters above ground to provide a worst-case estimate of exposure for persons standing on the ground near the tower base (assuming a .24 slope throughout the area of interest). Equation (10) from page 23 of OET Bulletin 65 was used to calculate this exposure.

$S = 33.4 \bullet F^2 \bullet ERP / R^2$

where: S = power density in $\mu W/cm^2$
F = relative field factor (relative numeric gain)
ERP = power in watts (all polarizations)
R = distance in meters

The vertical pattern for the proposed antenna was obtained from the manufacturer, providing the "relative field factor" at one degree increments from horizontal through –90 degrees (straight down). The distance (R) from the center of radiation to the point of interest (2m above ground) and the distance (D) from the tower base for each of these one degree increments was calculated with standard trigonometry.

Power Density vs Distance was graphed to determine where the highest ground level power density is found.



The graph ends at 467m because this is where the simplified ground model reaches the same elevation as the center of radiation. The plot has passed the peak in the main lobe, and the signal levels can only go down from here.

The highest ground level power density (40.5 $\mu W/cm^2$) is found 41m from the tower base.

Other Signals

KWPZ shares a tower with KBCB TV and with several 2-way type services.

KBCB's Application for Construction Permit (Ch 24) states "The calculated power density at a point 2 meters (6.6 feet) above ground level is 0.0025 mW/cm^2. This is less than 5% of the FCC's recommended limit of 0.36 mW/cm^2 for channel 24 for an "uncontrolled" environment" and (Ch 19) "The calculated power density at a point 2 meters (6.6 feet) above ground level is 0.0013

mW/cm^2. This is less than 1% of the FCC's recommended limit of 0.34 mW/cm^2 for channel 19 for an “uncontrolled” environment”, so KBCB will not be considered further.

The lowest 2-way antenna on the KWPZ tower is more than 30m above ground, and even considering the uphill slope east of the tower, these are well beyond the 10m exemption, so these will not be considered further.

There is another tower 170m NE of KWPZ’s tower. This tower supports antennas for KAFE, KISM and another bunch of 2-way services. This tower is on top of the hill, so the standard FMModel evaluation is sufficient. The 2-way services on this tower are 170m away from the KWPZ tower, and at least 19m above ground… well over the 10m exemption, so they will not be considered here.

KISM is 50 KW ERP at 103m AGL using a 6 bay full wave spaced Shively 6810. FMModel shows a maximum field of 16.7 $\mu W/cm^2$ @ 34m from the tower base.

KAFE is 60 KW ERP at 64m AGL using a 6 bay full wave spaced Shively 6810. FMModel shows a maximum field of 53.0 $\mu W/cm^2$ @ 22m from the tower base.

If the peak ground level power densities for KWPZ, KAFE and KISM were present at the same point (they aren’t, but if…), this power density would be 111 $\mu W/cm^2$ (41 + 17 + 53). This is 55.5% of the 200 $\mu W/cm^2$ limit for uncontrolled areas.

Conclusion
The calculations show that the worst case maximum calculated power density at two meters above ground level from the KWPZ, KAFE and KISM facilities will be less than 56% of the applicable FCC limits at all locations (controlled and uncontrolled).

Access to the KWPZ site is restricted by a locked gate on the access road and a fence with a locked gate around the tower base. The site is currently posted with warning signs, and the applicant will cooperate with other users of the site to reduce power or discontinue operation as necessary to limit human exposure in compliance with FCC rules.

Tim Vik
Staff Engineer