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**Engineering Statement
K14SE-D McDermitt, NV
Statement regarding Protection of Land Mobile Radio Facilities
September 2019**

This Engineering Statement has been prepared on behalf of Quinn River TV Maintenance District ("Quinn River"), licensee of TV translator station K14SE-D, which holds a construction permit for a change of transmitter site. Construction of the displacement facility has been completed, and this exhibit has been prepared in order to address the condition on the construction permit which requires Quinn River to "take adequate measures to identify and substantially eliminate objectionable interference which may be caused to existing land mobile radio facilities in the 460 to 470 MHz band," and to provide documentation that objectionable interference will not be caused.

Analysis

The K14SE-D transmitting antenna is located at a transmitter site in the community of McDermitt, Nevada. We have conducted a search in the Commission's ULS database for fixed sites where 460 to 470 MHz band LMR frequencies are in use in the area surrounding the K14SE-D transmitter site, and the results of that study are shown in the following table.

Callsign	Licensee	Fixed Site	Distance from High Peak Site
KNFV331	Crawford, Eldon	(2) Winnemucca Mtn	109 km
		(3) Osgood Mountain	96 km

WNWC549	Nevada Gold Mines LLC	(1) Battle Mountain (3) North Peak (4) Lone Tree	135 km 154 km 136 km
WPGB212	Day Management Corp.	(1) South Mountain	106 km
WPGQ551	Intermountain Communications	(1) War Eagle Mtn	140 km
WPKT265	Day Management Corp.	(1) Stukel Mtn	324 km
WPVL388	Day Management Corp.	(1) War Eagle Mtn (4) French John Hill	140 km 174 km
WPYU924	State of Nevada, Dept. of Transportation	(1) Double H Mountains	64 km
WQBH868	Winnemucca Farms, Inc.	(1) One Potato Rd	116 km
WQUC742	Berrett Ranches	(1) Mahogany Mtn (2) McCutcheon Flat Hills	145 km 90 km

Among these licenses, several include channels above 469.000 MHz, including one license utilizing 469.800 MHz, which is only 0.2 MHz below the lower edge of Channel 14 (470 to 476 MHz). The highest frequencies (i.e. those closest to the bottom edge of the Channel 14 spectrum) are used to receive communications from mobile receivers.

A worst-case analysis has been performed, to evaluate protection of the closest frequency in use in the area (469.800 MHz), assuming use at the closest fixed site, WPYU924 site 1, which is located 64 km southwest of High Peak. (Note that 469.800 MHz is not in fact in use and received by WPYU924. This is simply a worst-case analysis, utilizing the highest 460-470 MHz band frequency and the nearest fixed LMR site in the band. In fact, the fixed base station listed on WPYU924 does not appear to receive any transmissions in the 460-470 MHz band.)

For K14SE-D operation with the authorized stringent emission mask, the attenuation requirement at 0.2 MHz from the channel edge is -47.0 dB. The station's assigned power on Channel 14 is 200 watts ERP (-6.99 dBk or 53.01 dBm). The total channel power within the 6 MHz DTV bandwidth needs to be adjusted to provide the equivalent channel power within the 12.5 kHz channel bandwidth used by the LMR station; the adjustment factor to provide the signal power in a 12.5 kHz bandwidth is $10 \cdot \text{LOG}(6000/12.5) = 26.8$ dB. Based on this adjustment factor, the

assigned digital ERP and the mask attenuation requirement shown herein, the worst-case out-of-band transmitter noise generated by the digital station within the receiver bandwidth at the highest land mobile receive frequency (469.800 MHz) is: (53.01 dBm – 26.8 dB – 47.0 dB) = -20.79 dBm. This spurious energy would appear at the front end of the LMR receivers as broadband noise.

The free space loss between the proposed High Peak Ch14 antenna and the nearest 460-470 MHz band fixed receive antenna (based on antennas with a dipole gain reference at each end of the path) is 117.7 dB for the 64 kilometer path distance.

$$\begin{aligned}FSPL(dB) &= 20\log(d) + 20\log(f) + 32.45 - (2 * 2.15 \text{ dB}) \\FSPL(dB) &= 20\log(64) + 20\log(469.8) + 32.45 - (2 * 2.15 \text{ dB}) \\FSPL(dB) &= 117.7 \text{ dB}\end{aligned}$$

Assuming an ERP of -20.79 dBm for the Ch14 station based on the out-of-band transmitter noise calculation shown above, the calculated interfering signal power level at the nearest fixed receive antenna is -138.5 dBm.

$$-20.79 \text{ dBm} - 117.7 \text{ dB} = -138.5 \text{ dBm}$$

The noise floor for a typical UHF land mobile base station operating in 12.5 kHz narrowband analog or digital mode is around -126 dBm. The interfering signal level power from K14SE-D would be 12.5 dB below the noise floor.

Conclusion

The foregoing calculations demonstrate that the interfering signal level power from K14SE-D would be 20 dB below the noise floor of the nearest fixed LMR station in the 460 to 470 MHz band, and thus interference to these LMR stations is highly unlikely. This was a worst-case analysis, which assumed:

- a) protection of the highest 460 to 470 MHz band LMR frequency in use in the area;
- b) the nearest fixed 460 to 470 MHz band LMR site in the area; and
- c) that K14SE-D would have its main lobe pointed at the LMR site.

Many of these LMR licenses also include mobile units, often permitted to operate at quite significant distances from their associated fixed stations, in one case up to 320 kilometers (200 miles). Given the significantly mountainous terrain in northern Nevada and southeast Oregon, with typical valley-to-summit heights of 600 meters (2000 feet) or more, it is highly questionable that any given mobile unit would be able to talk back to its associated fixed station throughout the entire service radius. Quinn River nevertheless commits to working with any existing LMR licensees in the 460 to 470 MHz band who may be impacted by operation of K14SE-D, to determine whether the translator does in fact cause any problem, and to determine what measures can be taken to resolve reports of interference.

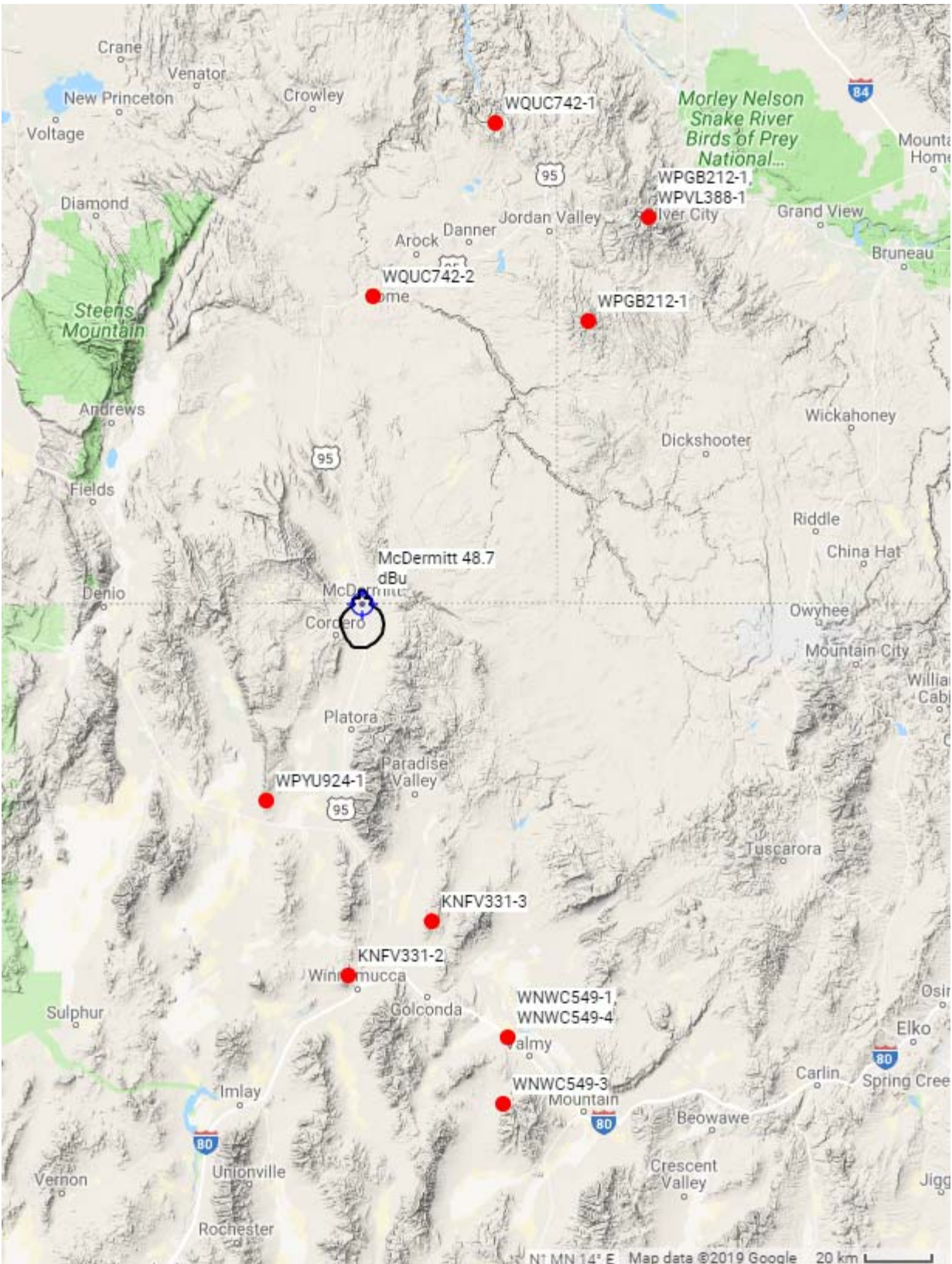
Statement of Engineer

This Engineering Statement has been prepared by the undersigned. I am a Partner in the firm of Hatfield & Dawson Consulting Engineers, and am registered as a Professional Engineer in the State of Washington. I hereby declare that the facts set out in the foregoing Engineering Statement, except those of which official notice may be taken, are true and correct.

Signed this 6th day of September, 2019



Erik C. Swanson, P.E.



Map of K14SE-D McDermitt 48.7 dBu contour, in relation to the nearest fixed sites using frequencies in the 460-470 MHz LMR spectrum.

Hatfield & Dawson Consulting Engineers