April 25, 2017

Electronically filed via IBFS

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street S.W.
Washington, DC 20554

Re: Ex Parte Letter

Dear Ms. Dortch:

The Association of American Railroads (“AAR”) submits this letter in support of the Applications for Review and Motion for Stay of the above-referenced order granting the application and waiver request of Higher Ground LLC (“Higher Ground”) for authority to operate mobile earth terminals (“SatPaqs”) in the 5925 to 6425 MHz band (the “6 GHz Band”). The International Bureau, Office of Engineering and Technology, and Wireless Telecommunications Bureau (collectively, the “Bureaus”) erred in concluding that Higher Ground’s proposed use of up to 50,000 SatPaqs in the 6 GHz Band

1 AAR is a voluntary non-profit membership organization whose freight railroad members operate 83 percent of the line-haul mileage, employ 95 percent of the workers, and account for 97 percent of the freight revenues of all railroads in the United States. AAR members also include Amtrak, the nation’s principal intercity passenger railroad, and Metra, the primary commuter railroad serving the Chicago metropolitan area. More information on AAR is available at its website: [https://www.aar.org/Pages/Home.aspx](https://www.aar.org/Pages/Home.aspx).


3 Higher Ground LLC Application for Blanket Earth Station License, Fixed Wireless Communications Coalition, Motion for Stay, File No. SES-LIC-20150616-00357 (filed Feb. 10, 2017) (“FWCC Motion for Stay”).

pursuant to a waiver of the table of allocations would protect existing fixed service operators from “risk of harmful interference.”\(^5\)

As discussed below, there are significant deficiencies in the Higher Ground technical analysis submitted with its application. For example, the analysis fails to consider the potential interference impact to microwave receivers from multiple SatPaqs transmitting at the same time from similar locations. Higher Ground also does not precisely explain how protection zones will be modified for microwave sites that have unique interference environments and does not consider microwave sites that may have antenna configurations that do not match Higher Ground’s assumed parameters. As a result, for many fixed service operators, including the members of AAR, the SatPaqs pose an unacceptable risk of interference to critical and potential safety-of-life communications.\(^6\) AAR therefore requests that the full Commission review the Higher Ground Order and deny Higher Ground’s application and waiver request.

Railroads rely on various communications technologies, including private fixed microwave systems that operate in the 6 GHz Band, to ensure the safe passage of trains across the United States, including in rural areas where Higher Ground’s SatPaqs are more likely to operate.\(^7\) For example, Union Pacific Railroad uses a 6 GHz Band microwave system, which spans from the Mississippi River to California and from the Texas border to the Canadian border and includes many rural areas. BNSF Railway (“BNSF”) operates several hundred 6 GHz Band point-to-point microwave stations located throughout the BNSF territory, including in rural areas, such as from Fargo, North Dakota to Havre, Montana and Galesburg, Illinois to Lincoln, Nebraska. Similarly, Canadian National Railway operates over sixty 6 GHz Band point-to-point microwave stations in the United States, including in rural areas, such as from Gilman, Illinois to Carbondale, Illinois and Holly, Michigan to Port Huron, Michigan. These microwave systems serve as critical backbones for the transport of railroad communications, including dispatch radio traffic, centralized train control systems, positive train control, phone systems, and crew train orders.

These communications carry potentially life-saving information regarding train signals and remote switching of tracks and routing of trains through rights-of-way and through depots and freight yards.\(^8\) These railroad systems also relay critical telemetry data from trackside defect detectors located throughout the rail network. For example, information about damaged rails, overheated wheel bearings, dragging equipment, and rock slides is automatically transmitted from these detectors via mobile radio links to crew members, who can then take the necessary actions to prevent derailments, and via fixed microwave links to dispatchers in distant locations. Microwave systems also are vital to coordination of operations among the different railroads.

Such critical communications are typically designed for availabilities greater than 99.999%. Modern microwave systems, such as the ones used by railroad operators, require clear channels to be able to transmit large amounts of data. Accordingly, even a small amount of interference will negatively

\(^5\) See Higher Ground Order at ¶ 19.

\(^6\) AAR previously submitted an ex parte letter in this proceeding supporting denial of the Higher Ground application. See Letter from Michele Farquhar, Counsel to AAR, to Marlene H. Dortch, FCC Secretary (filed Dec. 22, 2016).

\(^7\) See Higher Ground Order at ¶ 11.

\(^8\) Study of Spectrum Use by Energy, Water and Railroad Service Providers, Comments of the Association of American Railroads, NTIA Docket No. 010327080-1080-01, ¶ 6 (2001); see also Letter from Mitchell Lazarus, Counsel for the Fixed Wireless Communications Coalition, to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 02-10, at 3 (filed Nov. 19, 2004).
impact the microwave system, degrading the radio link or causing it to fail completely. Such
interference could disrupt, delay, or otherwise impact the safe operations of railroads. Accordingly,
grant of the Higher Ground application is not in the public interest, convenience and necessity.

In particular, AAR has significant concerns with the Technical Appendix submitted by Higher
Ground, upon which the Bureaus relied to conclude that the SatPaqs would sufficiently protect
critical microwave links and not cause harmful interference that would interrupt vital public safety and
critical infrastructure communications. For example, although Section A.7.2 of the Technical
Appendix discusses limiting concurrent SatPaq transmitters for the purpose of staying within the
emissions mask required in §25.218(d), there is no mention in Section A.8 of the effect of
simultaneous transmissions from two or more SatPaq transmitters located in the same general
vicinity of a microwave receiver. Just two SatPaqs transmitting from similar locations at the same
time can double the interference power to a microwave receiver (an increase of 3 dB), and four
SatPaqs could quadruple it (an increase of 6 dB). Considering that SatPaqs are likely to be used
when other modes of wireless communication are unavailable, one can easily envision multiple
scenarios in which commercial cellular networks are suddenly unavailable, either due to a disaster or
otherwise, and several SatPaq owners find themselves in the same general location with a need to
communicate.

In addition, Higher Ground does not precisely explain how protection zones will be modified for
microwave sites that have unique interference environments and does not consider sites that may
have antenna configurations that do not match the parameters used in section A.8.1.6 to calculate
the size of the standard protection zone. For example, in Section 8.2 the length of the standard
protection zone is set at 50 miles, but a parenthetical states “or longer if necessary.” Note 6 then
adds that “[x]treme differences in antenna height may require the computation of a longer triangle,”
but there is no explanation of what the definition of an “extreme difference” is or how a larger
protection zone may be calculated due to this atypical height differential. Therefore, although Higher
Ground appears to acknowledge that a “one size fits all” approach may not be sufficient for all cases,
the Technical Appendix does not explain how or when custom protection zones will be calculated.

Similarly, when a microwave site uses an antenna smaller than the two-meter dish assumed in the
calculation of the Close Proximity Circle, as is allowed by FCC rules, that site will require a larger
circle of protection. But Higher Ground is silent on whether this larger circle will actually be
calculated; and if it is, when, how, and under what circumstances. In fact, such a calculation may
prove extremely difficult since the FCC’s Universal Licensing System database does not include the
antenna size or the actual radiation pattern needed to perform a precise calculation of the Close
Proximity Circle. Without the ability to calculate the actual protection zone needed for each potential
victim site, Higher Ground is obligated to use worst-case calculations to ensure that all sites are
protected. Assuming a two-meter dish at every microwave site is far from a worst-case assumption.

Furthermore, Higher Ground’s Technical Appendix leaves several serious questions unanswered.
For example, Section A.8.1.4 explains that a SatPaq will initially transmit its coordinates to the
satellite using the hailing frequency 5927.5 MHz “or an alternate, pre-arranged frequency.”
Presumably, one instance in which a pre-arranged alternate frequency may be used is when the
SatPaq is within the protection zone of a microwave site that is receiving on the hailing frequency.
However, Higher Ground does not explain how, when, or under what circumstances this alternate
frequency would be assigned. Even worse, Figure A-7 implies that the hailing frequency will be
used regardless of the location of the hailing SatPaq, since the satellite and “Single Point of Control”

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9 Higher Ground LLC Application for Blanket Earth Station License, File No. SES-LIC-20150616-00357
(filed June 16, 2015).
will not know the SatPaq’s location until after it uses the hailing frequency to transmit its coordinates. Also, note 10 states that updates will be sent to each SatPaq to keep current the list of microwave sites using the hailing frequency, and although these updates imply that the SatPaq will be able to use this information to avoid interference to microwave sites that use the hailing frequency, the precise method that SatPaqs would use to do this is not explained. Further, the Technical Appendix does not specify when or how often these updates will be sent to each SatPaq, only that “PtP information [will be] updated regularly” (emphasis added). This lack of critical detail casts serious doubt on how up-to-date SatPaqs will actually be kept on changes to the microwave database.

Higher Ground also ignores several realities that will put microwave systems at great risk of interference. First, many microwave licenses are area licenses, rather than site-specific licenses. These licenses often cover a large geographic area and ULS does not maintain a list of the actual site locations or specific frequencies. Since Higher Ground appears to be relying solely on ULS data to determine protection zones, microwave site locations associated with area licenses will not be included in their database and therefore will not be protected. Also, atmospheric anomalies such as temperature inversions can cause radio frequency signals to travel further than they would normally. This effect, known as tropospheric ducting, has frustrated frequency coordinators for decades. Given the proximity with which SatPaq terminals may be transmitting on co-channel frequencies used by microwave sites and the critical nature of those transmissions, ducting is an effect that should be included in Higher Ground’s analysis but was not.

There are several other omissions and inconsistencies in Higher Ground’s Technical Appendix that are cause for concern. For example, Higher Ground does not address the issue of device or system security. Higher Ground does not provide any assurance that its SatPaq devices or Single Point of Control are secure from hackers and other nefarious acts that may compromise their ability to fully protect microwave sites. Also, there is a discrepancy between the bandwidth of channels used for data and channels used on the hailing frequency. Specifically, Higher Ground states that channels will be 8 MHz and calculates radiated power based on that bandwidth. However, the hailing frequency is centered at 5927.5 MHz and according to Section A.8.1.5 appears to operate in a 5 MHz bandwidth. Applying the same power to this smaller bandwidth results in 2 dB more power spectral density, but this discrepancy is not addressed by Higher Ground. Finally, Higher Ground’s blanket exclusion of all microwave antennas pointing south ignores the effects of reflection and refraction, which could change the direction of interfering signals. This could be especially harmful in conjunction with a ducting event as described above.

For all of the above reasons and those raised in the Applications for Review of the Higher Ground Order, AAR respectfully requests that the Commission review the Bureaus’ decision and deny Higher Ground’s application and waiver request. For the same reasons, the Commission should grant the FWCC Motion for Stay and immediately halt the deployment of Higher Grounds’ SatPaqs.

Respectfully submitted,

/s/ Michele C. Farquhar

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CERTIFICATE OF SERVICE

I, Noah Cherry, hereby certify that on April 25, 2016, true and correct copies of the foregoing letter were sent by United States mail, first-class postage prepaid, to the following:

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