

September 22, 2021

BY ELECTRONIC FILING

Kerry E. Murray
Federal Communications Commission
45 L Street, N.E.
Washington, DC 20554

Re: *E202122 (Roll, AZ)*

Dear Ms. Murray:

This letter is in response to requests from the Federal Communication Commission to provide supplemental information with regard to the earth station application referenced above. Specifically, this supplemental pleading features an updated analysis and supporting files/figures for 47 CFR § 25.136. The letter is organized as follows:

1. Summary of changes between initial analysis and updated analysis
2. CFR§25.136(a)(4)(i)
3. CFR§25.136(a)(4)(ii)
4. CFR§25.136(a)(4)(iii)
5. CFR§25.136(a)(4)(iv)
6. Appendix

1) Summary of changes between initial analysis and updated analysis

The following table summarizes changes made from the analysis in the initial license application (SES-LIC-20200701-00686), to the analysis in this supplemental pleading. The updated analysis features assumptions that are: more accurate, more closely aligned with FCC recommendations, and considerate of the latest information from other gateway operators located in the same UMFUS license area.

Variable	Initial Analysis (June 2020)	Updated Analysis (Sept. 2021)
Clutter	None	ITU P.452 model
Antenna sidelobe level	-1	-8
Worst-case aggregate EIRP	-11.7 dBW/MHz (without site shielding)	-18.7 dBW/MHz (without site shielding)
Extra site shielding	4dB	0dB

These changes are explained in further detail below:

Clutter: In the updated analysis, SpaceX accounted for clutter using the ITU P.452 model, as recommended by the Commission¹. The ITU P.452 clutter category used in the analysis for this earth station was found to be the most appropriate category based on satellite and street view imagery in Google Earth, as well as in-person survey at the proposed earth station location. SpaceX used clutter assumptions of 4m nominal height and 100m nominal distance, which are associated with the most-conservative ITU P.452 clutter category of “irregularly spaced sparse trees” and “sparse houses.”

Antenna sidelobe level: There have been changes over time in the antenna sidelobe level toward the horizon used in SpaceX’s earth station applications. The changes are due to improvements in SpaceX earth station antenna design over time – newer antennas have a lower antenna sidelobe level toward the horizon. While previous applications may feature an antenna sidelobe level towards the horizon of -1 dBi or -3 dBi, the updated analysis features an antenna sidelobe level towards the horizon of -8 dBi. For the reasons explained above, an antenna sidelobe level towards the horizon of -8 dBi is a more accurate representations of reality for this earth station than values of -1 dBi or -3 dBi that may have been used in previous applications. See appendix Figure 4 for detail on antenna sidelobe measurements and related methodology.

Worst-case aggregate EIRP: Much like the change in antenna sidelobe level, this change is a result of changes in SpaceX earth station antenna design over time.

Extra site shielding: Based on the updated analysis, it was found that no extra site shielding is needed.

¹ See Report No. SPB-281; published June 16, 2020

2) CFR§25.136(a)(4)(i)

- The SpaceX earth station in Roll, AZ is located in Yuma County, AZ
- There are two earth stations in the Yuma County:
 1. SpaceX Services, Inc. (Callsign: E202122)
 2. Hughes License Sub, LLC (Callsign: E170167)
- Therefore, the SpaceX earth station is in compliance with CFR§25.136(a)(4)(i)

3) CFR§25.136(a)(4)(ii)

- Yuma County, AZ has a population of 213,787², which translates into a maximum permitted aggregate population within -77.6 dBm/m²/MHz PFD contour of earth stations of 450 people
- According to a supplemental pleading filed by Hughes License Sub, LLC on 1/31/20, the Hughes earth station PFD covers 300.20 people
- According the SpaceX's updated analysis (see table above and Figure 2 below), the SpaceX earth station PFD contour covers 7.29 people
- Therefore, the aggregate population within -77.6 dBm/m²/MHz PFD contour of earth stations is 307.49, which is below the 450 maximum

4) CFR§25.136(a)(4)(iii)

- The PFD contour of this earth station does not overlap any major event venues, urban mass transit routes, passenger railroad, nor cruise ship ports
- In addition, SpaceX certifies that the PFD contour of the earth station related to this supplemental pleading will not cross any roads classified as "Other Freeways and Expressways or Other Principal Arterials."
- To make this certification regarding roadways, SpaceX uses QGIS software to conduct an analysis of a comprehensive dataset of roadways obtained from the 2017 release of the HPMS3 ARNOLD4 dataset, belonging to the Federal Highway Administration of the Department of Transportation. To ensure compliance with 47 CFR § 25.136(a)(4)(iii), SpaceX analysis considers the following categories within the dataset: "Interstate," "Principal Arterial – Other Freeways and Expressways," and "Principal Arterial – Other". SpaceX uses QGIS and the comprehensive dataset of roadways to ensure that the PFD contour does not cross any roads classified as "Other Freeways and Expressways or Other Principal Arterials." According to the website from which the dataset is obtained⁵: "[the dataset] derives and is collected from State DOT road data. ARNOLD consists of locations of all roads in the U.S." Therefore, relevant state roadways are considered in our analysis.

² Source: <https://www.census.gov/quickfacts/yumacountyarizona>

³ Highway Performance Monitoring System

⁴ All Road Network of Linear Referenced Data

⁵ Source: <https://www.bts.gov/geography/geospatial-portal/NTAD-direct-download>

5) CFR§25.136(a)(4)(iv)

- Frequency coordination has been completed for this earth station prior to the initial license application
- The revised PFD contour from the updated analysis (see Figure 1-3) is entirely contained within the boundaries of the PFD contour from the initial analysis
- Therefore, the earth station remains in compliance with coordination requirements, and no additional frequency coordination is required

Sincerely,

David Liptsyn

David Liptsyn
Gateway Site Acquisition Analyst
SpaceX

Appendix

Figure 1: PFD Contour with county boundaries and distance/mileage scale

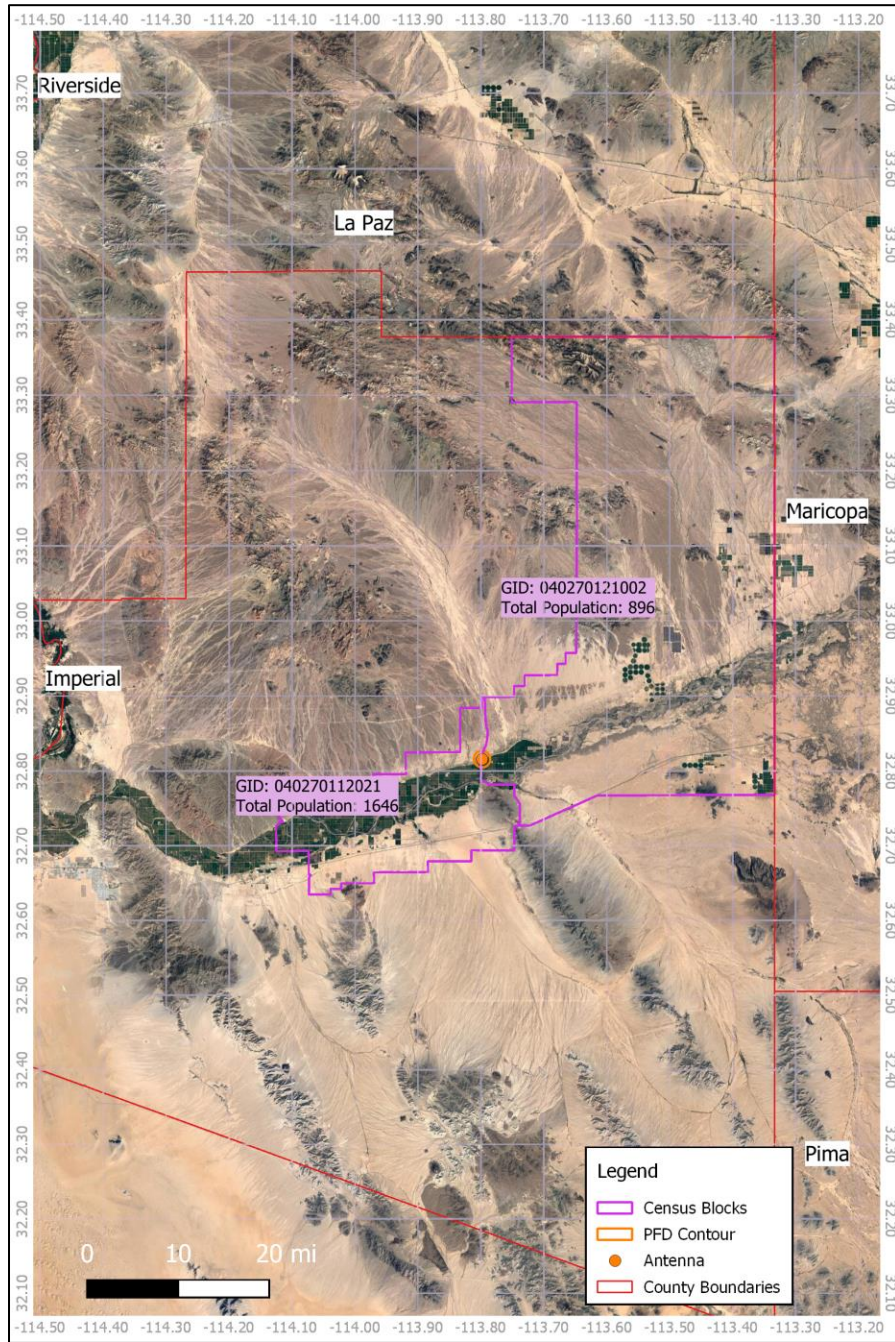


Figure 2: PFD Contour with distance/mileage scale and population coverage

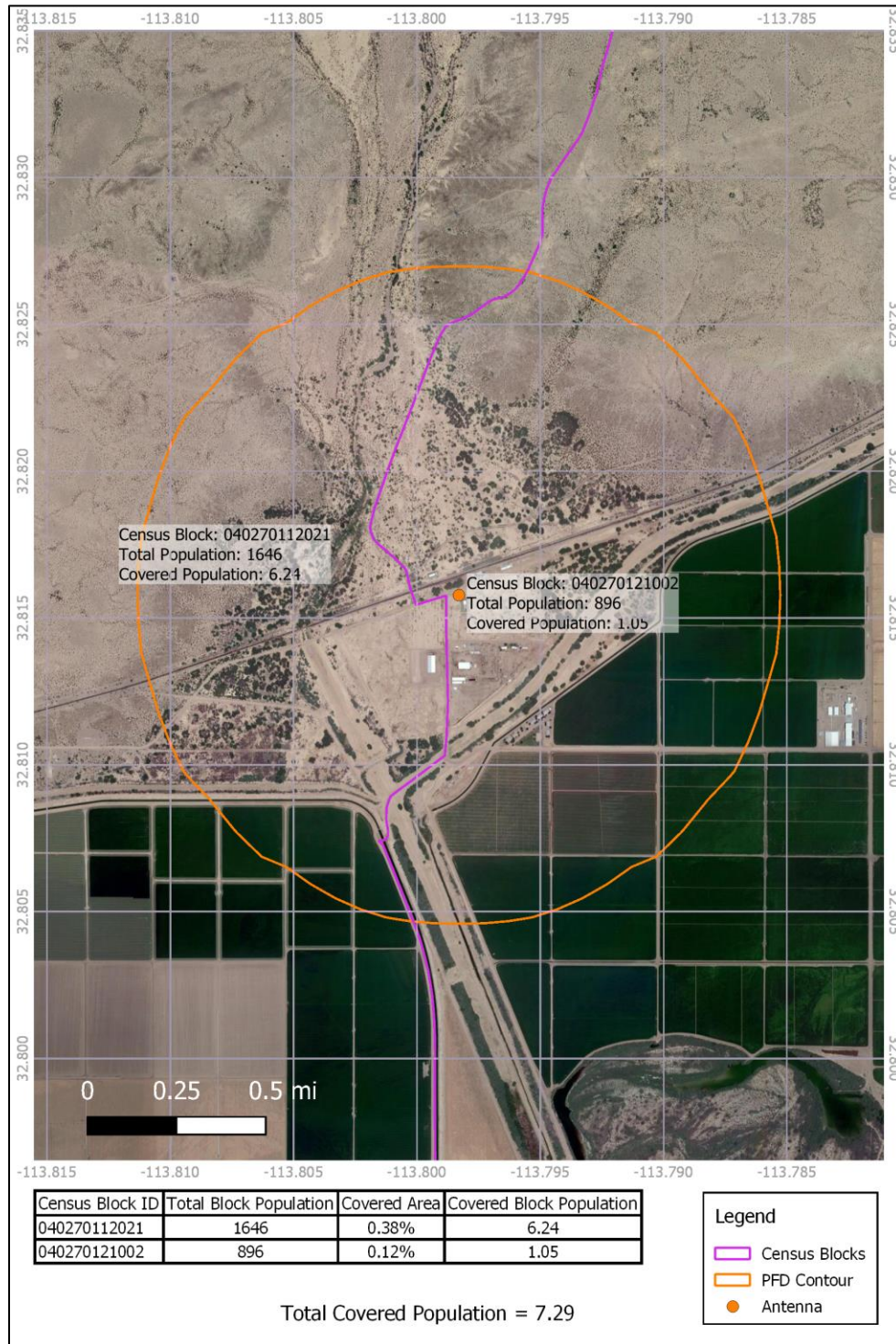


Figure 3: PFD Contour with population density and distance/mileage scale

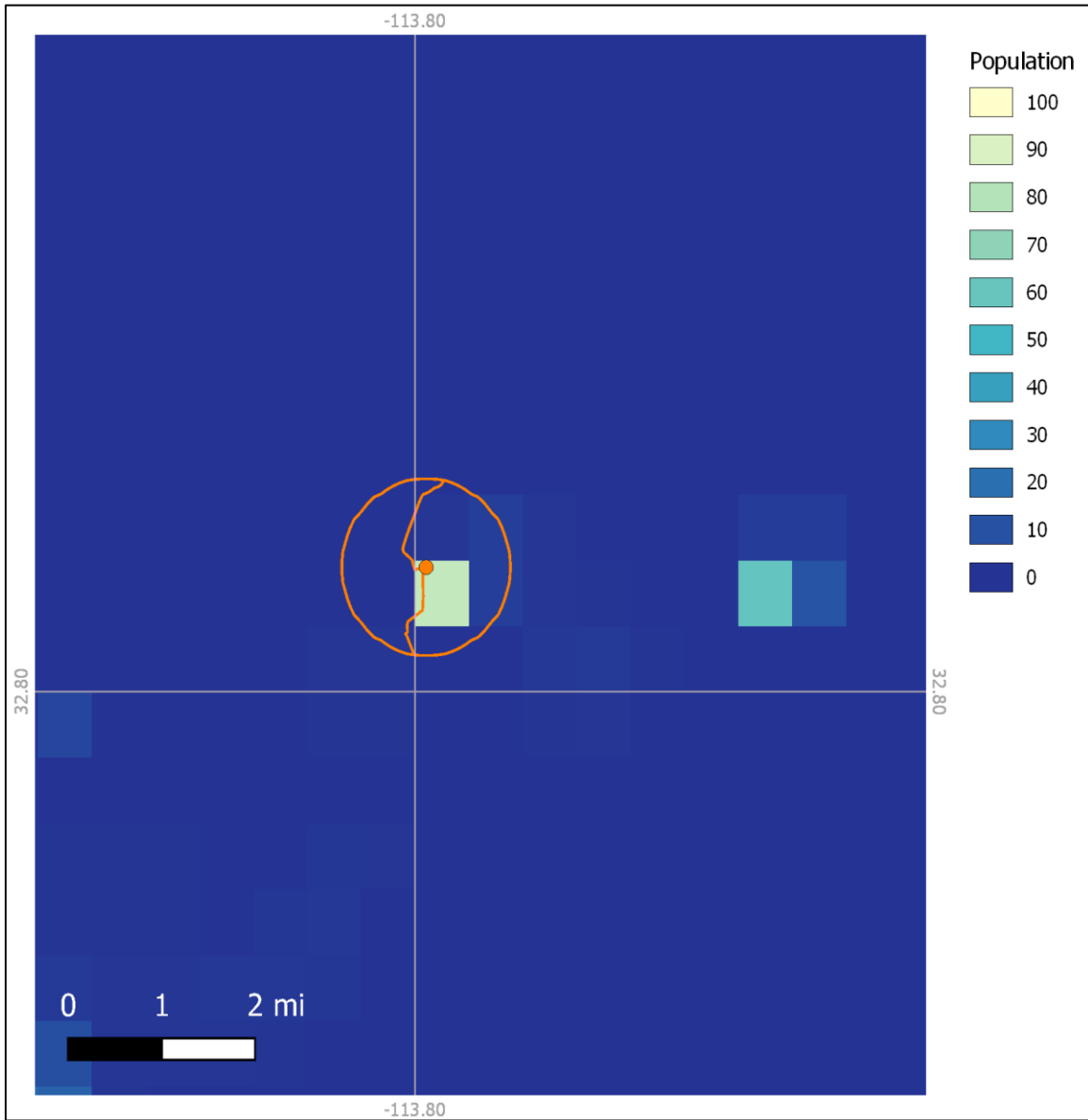


Figure 4: A measured antenna pattern is shown below for relevant off-axis angles that intersect the horizon. The maximum observed sidelobe level is -8.37 dBi. This measurement was completed by an independent third party (NSI-MI Technologies) at the NSI-MI Compact Antenna Test Range at the NSI-MI Technologies facilities in Atlanta, GA. All measurement equipment was also manufactured by NSI-MI to ensure accuracy and precision.

