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November 15, 2019

**Via Electronic Filing**

Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 Twelfth Street SW  
Washington, DC 20554

**Re: *Wireless E911 Location Accuracy Requirements (PS Docket No. 07-114)***

Dear Ms. Dortch:

On November 14, 2019, Etienne Le Grand, Fiona Lee, Steve Malkos, and the undersigned of Google LLC met telephonically with David Furth, Deputy Chief, Public Safety and Homeland Security Bureau (PSHSB); Kenneth Carlberg, Chief Technologist, PSHSB; Erika Olsen, Senior Legal Counsel, PSHSB; John A. Evanoff, Deputy Chief, Policy and Licensing Division (PLD), PSHSB; Rasoul Safavian, Senior Technologist, PLD, PSHSB; Alex Espinoza, Attorney-Advisor, PLD, PSHSB; and Nellie Foosaner, Attorney-Advisor, PLD, PSHSB. We responded to questions about Google's proposal to modify the Commission's *Draft Order*<sup>1</sup> to include a floor label alternative in the vertical location requirement. Including this option would help to ensure that the regulation encourages rather than discourages the continued development of floor-identifying geolocation technologies. Most importantly, adding floor label language to the rule would bring more actionable information to first responders sooner, consistent with Google's previous arguments in this docket.<sup>2</sup>

The Commission staff asked Google for clarifications about transmission by Android's Emergency Location Service (ELS) of floor label data to first responders. We explained that since 2017 ELS has made available output height above ellipsoid (HAE) together with horizontal location data (all with uncertainty), but usage has been negligible due to barriers in operationalizing HAE data. We explained that the Commission's rule could provide that solutions selected by carriers to demonstrate their satisfaction of the 80% standard set out in the rule *must* provide HAE and *may* provide a floor label. Furthermore, where both HAE and floor label are provided for a given call, the information could be accompanied by a designation of which data should be considered in testing carriers' compliance with the 80% requirement.

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<sup>1</sup> See *In the Matter of Wireless E911 Location Accuracy Requirements*, Draft Fifth Report and Order and Fifth Further Notice of Proposed Rulemaking, PS Docket No. 07-114, FCC-CIRC1911-02 (rel. Oct. 29, 2019) (*Draft Order*).

<sup>2</sup> See Letter from Megan Anne Stull, Counsel, Google LLC, to Marlene H. Dortch, Sec'y, FCC, in PS Docket No. 07-114 (filed Nov. 8, 2019); Comments of Google LLC in PS Docket No. 07-114 (filed May 20, 2019) (urging the Commission to "get reliable and usable vertical location information into first responders' hands as soon as possible").

This approach would ensure that first responders receive the fullest possible location information without diluting the intended stringency of the 80% requirement.

***Floor Labels Offer Ease of Use to the 911 Community.***

Google agrees with commenters from the public safety community that the Commission's rules should ensure that usable elevation information is provided as soon as possible. Like many public safety groups, Google shares concerns that an HAE estimate may not provide actionable information in the short term, particularly with regard to identifying which floor to search.<sup>3</sup> It is Google's understanding that not every person in public safety is (or is on a clear path to be) equipped with technology capable of interpreting HAE information. As a number of recent ex parte submissions from public safety commenters explain, a "raw vertical estimate is of little operational value if it is relative to [HAE.]"<sup>4</sup> For example, a public safety answering point (PSAP) would require additional resources (e.g., a terrain elevation database or 3D map) to translate z-coordinates delivered as HAE into information that first responders could use. Lack of resources to quickly make these translations poses the risk of significantly delaying downstream use of elevation information. Adding floor labels as an either/or alternative to HAE in the rule, however, would facilitate provision of the most useful and accurate elevation information available during an emergency.

In this context, the term "floor label" is intended to mean the name of the floor that the caller is believed to be on in the particular building from which the call is originating. A floor label is the designation that would usually be indicated on elevator buttons, signs in stairwells, and/or building blueprints. A floor label provides actionable information that can be used to save lives, regardless of the technical capabilities of the dispatch centers and first responders.

***An Estimate of +/- 1 Floor Offers Equivalent Accuracy to an Estimate of +/- 3 Meters HAE.***

In practice, a floor label with a +/- 1 floor uncertainty will be at least as precise as a +/- 3 meters HAE estimate, and more likely to reduce first responders' search time. Whereas a floor label is immediately actionable, to leverage estimated HAE one of the following methods must be used, each of which may introduce additional errors and increase the final uncertainty:

- The HAE could be converted into a floor label based on building structure information. Any error contained in this data (e.g., incorrect drawings or inaccurate terrain elevation) will add to the Commission-approved error of +/- 3 meters when undertaking the floor conversion. For example, Google has found terrain elevation data to be particularly challenging because terrain elevation models from different sources often disagree by several meters. When these error sources are considered, HAE data provided in accordance with the Commission's *Draft Order* is unlikely to result in an estimate more accurate than +/- 1 floor.
- As a second option for first responders, the reported HAE could be compared to the estimated, real-time HAE of first responders equipped with HAE technology. Such

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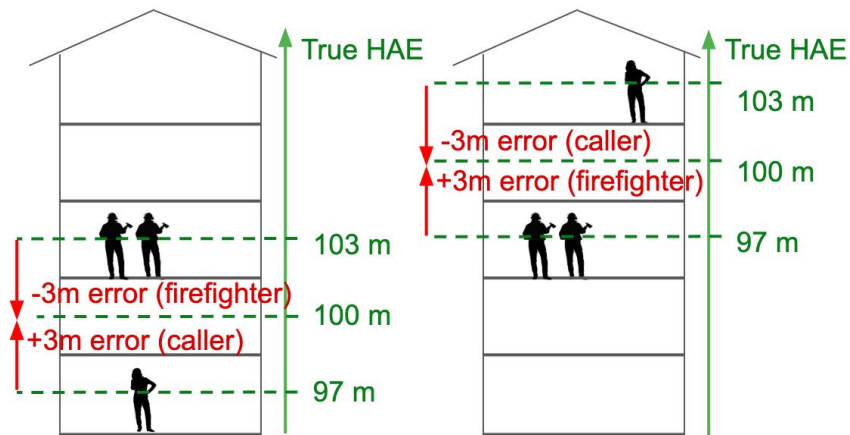
<sup>3</sup> See Letter from Robert Napolitano, Commanding Officer, NYPD Commc'ns Div, City of New York, to Marlene H. Dortch, Sec'y, FCC, in PS Docket No. 07-114 (filed Nov. 12, 2019) (*City of New York Letter*).

<sup>4</sup> See *City of New York Letter* at 1; see also Letter from Angela R. Bowen, Instructional Services Manager, Georgia Pub. Safety Training Center, to Marlene H. Dortch, Sec'y., FCC, in PS Docket No. 07-114 at 2 (filed Oct. 22, 2019) (*Georgia Pub. Safety Letter*).

technologies, if deployed, will suffer from their own errors that add to the error of the caller's reported HAE. For instance, as shown in the diagram below, if the caller's HAE elevation has an error of +3 meters and the first responder's elevation has an error of -3 meters, the total error would be +6 meters or +2 floors.<sup>5</sup> The diagram below illustrates the following scenario:

- Firefighters look for a caller whose reported HAE is 100m; and
- On the 3rd floor of the building, the firefighters' devices report HAE of 100m.

In this scenario, depending on the HAE errors of the caller's device and the firefighters' devices, the caller could be anywhere between floors 1 and 5.



***The Commission's Rules Should Promote Continued Floor-Label Innovation Ahead of April 2021.***

While providing accurate floor labels 100% of the time will not be feasible by April 2021, Google expects to quickly iterate and improve our services. Like the Commission, Google has heard from first responders about the barriers of operationalizing HAE reporting. As noted in recent filings, in order for first responders to “have the information they need to ensure that [they] arrive as quickly as possible,” they need at least a floor estimate.<sup>6</sup> Google’s proposal encourages delivery of that information by April 2021 in some circumstances, such as buildings that have been mapped or have well-known WiFi environments. With continued research, the number of use cases that benefit from floor label estimates will steadily increase, benefiting:

- first responders even if they are not equipped with HAE technology,
- PSAPs even if they lack access to accurate building structure information, and

<sup>5</sup> In technology demos where the same technology is used on both the caller's and the first responders' devices, both devices may have similar errors that will appear to cancel each other out. In a more realistic scenario, different technologies used on the caller's device and the first responders' devices will likely have uncorrelated errors, which will compound as seen in the illustrated example. If both the caller's and the first responders' technologies are accurate within 3 meters 80% of the time, the compounded error will typically only be accurate within  $\sqrt{(3^2 + 3^2)}$  = 4.2 meters 80% of the time.

<sup>6</sup> See *City of New York Letter* at 2; *Georgia Pub. Safety Letter* at 2.

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- callers even if they are outside of the top 25 or 50 CMAs encompassed by the *Draft Order*.

In response to questions about Google's experience with barometric technologies, we explained that Google has observed significant errors associated with those technologies in fast-changing weather conditions, such as when a potentially dangerous storm front dramatically changes air pressure conditions in a matter of minutes.

Finally, we observed that while a floor label with a +/- 1 floor uncertainty yields a more usable result than a +/- 3 meters HAE estimate, the Commission should aim to holistically improve location reporting through greater accuracy in all three dimensions. The Commission's current rules provide for 50 meters of horizontal accuracy, and the draft rule would set a vertical accuracy threshold of +/- 3 meters. While establishing a vertical location accuracy standard is a positive step forward, the Commission ultimately should work to ensure that first responders have confidence not only in their abilities to locate a caller on the right floor (z-axis), but also in the right building (x- and y-axis).

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Google's proposal to include the floor label alternative in the final vertical location accuracy rules advances the Commission's goal of ensuring "that all Americans using mobile phones—whether they are calling from urban or rural areas, from indoors or outdoors—have technology that is functionally capable of providing accurate location information so that they receive the support they need in times of an emergency."<sup>7</sup> The Commission should act to encourage investment in research to enable floor-level reporting in parallel to HAE reporting. Amending the draft rule to count reporting of floor labels as a means of compliance will help to ensure that innovation in floor identification and reporting continues to the benefit of public safety.

Please do not hesitate to contact me with any questions concerning this filing.

Respectfully submitted,



Megan Anne Stull  
*Counsel*  
Google LLC

cc: Meeting attendees

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<sup>7</sup> See *In the Matter of Wireless E911 Location Accuracy Requirements*, Third Further Notice of Proposed Rulemaking, 29 FCC Rcd. 2374, ¶ 6 (2014).