PUBLIC NOTICE

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445 12th St., S.W.
Washington, D.C. 20554

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Internet: https://www.fcc.gov
TTY: 1-888-835-5322

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OFFICE OF ECONOMICS AND ANALYTICS AND WIRELINE COMPETITION BUREAU SEEK COMMENT ON ADJUSTMENT FACTOR VALUES FOR THE 5G FUND

GN Docket No. 20-32

Comment Date: July 7, 2020
Reply Comment Date: August 6, 2020

I. INTRODUCTION

1. On April 23, 2020, the Commission proposed to adopt rules and a framework for establishing the 5G Fund for Rural America.[1] Using multi-round reverse auctions, the 5G Fund would provide up to $9 billion to support 5G service in rural areas of the country that otherwise would be unlikely to see unsubsidized deployment.[2] Every American, including those living in rural areas, should have access to high-speed, mobile wireless broadband networks that are capable of providing 5G service in order to facilitate the development of new technologies, foster economic growth, and ensure that educational opportunities are widely available.[3] To account for the relative costs of serving areas that vary in terrain characteristics and potential business cases, the Commission proposed to apply an adjustment factor to make the most difficult areas to serve more attractive at auction in order to encourage more bidding for these areas.[4] The adjustment factor also would be used to transition legacy high-cost support to 5G Fund support.[5] Below, the Office of Economics and Analytics (Office) and the Wireline Competition Bureau (Bureau) seek comment on proposed adjustment factor values and on three economic analyses that have informed our proposed adjustment factor values.

2. In the *5G Fund NPRM and Order*, the Commission declared its commitment to bridging the digital divide and proposed to dedicate universal service funds to bring 5G mobile wireless service to the rural areas where there is likely insufficient financial incentive for mobile wireless carriers to invest in 5G-capable networks absent support.[6] In proposing the 5G Fund as a replacement for Mobility Fund

[1] *See generally Establishing a 5G Fund for Rural America*, GN Docket No. 20-32, Notice of Proposed Rulemaking and Order, FCC 20-52 (Adopted Apr. 23, 2020) (*5G Fund NPRM and Order*).

[2] *Id.* at 3, para. 2.

[3] 47 U.S.C. § 254(b).

[4] *5G Fund NPRM and Order* at 22-23, para. 66 & n.97.

[5] *Id.*

[6] *Id.* at 1-2, para. 1.

Phase II (which focused on 4G LTE),[7] the Commission recognized that all American consumers, not just those living in urban areas, must have access to the most current and advanced technologies and services available in the marketplace in order to fully participate in today's society.[8] By supporting the construction and operation of 5G mobile broadband networks in areas that may otherwise go unserved, the Commission stated that it can help Americans living, working, and traveling in rural communities gain access to communication options on par with those offered in urban areas.[9]

3. For Phase I of the 5G Fund, the Commission proposed to use a multi-round, descending clock auction similar to the Connect America Fund Phase II to identify: (1) the areas that will receive support; (2) the provider that will be assigned to receive support in each such area; and (3) the amount of support that each winning bidder will be eligible to receive.[10] Further, the Commission proposed that bids for 5G Fund support would be accepted and winning bids would be determined based on a support price per adjusted square kilometer of the eligible area covered by the bid.[11] To determine the adjusted square kilometers of the eligible areas, the Commission proposed to incorporate an adjustment factor into the auction design. This factor would assign a weight to be applied to the actual square kilometers of eligible areas that would reflect, among other things, the relative cost of serving areas with differing terrain characteristics,[12] as well as the potential business case for serving each area.[13]

4. In addition, for purposes of transitioning legacy high-cost support to 5G support, the Commission proposed to disaggregate legacy high-cost support. To account for the relative costs of providing mobile service, the Commission proposed to apply an adjustment factor to these disaggregation steps.[14] This adjustment factor would determine how support will be treated during the transition across difference types of areas—for example, how support will be disaggregated across eligible and ineligible portions of the legacy support area, as well as in eligible portions of the legacy support area where a

[7] *See Connect America Fund; Universal Service Reform – Mobility Fund*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 2152 (2017) (*Mobility Fund Phase II Report and Order*).

[8] *5G Fund NPRM and Order* at 3, para. 6.

[9] *Id*.

[10] *Id.* at 21, 22, paras. 56, 61.

[11] *Id.* at 21, para. 57.

[12] In the *Mobility Fund Phase II Report and Order*, the Commission acknowledged that terrain could affect the cost of deploying service. *See Mobility Fund Phase II Report and Order*, 32 FCC Rcd at 2183, para. 71. As the Commission noted, more mountainous terrains with greater variations in slope are areas that tend to be more costly to serve than level plains. *Id.* A terrain factor was adopted in Mobility Fund Phase II to weight the area of each square kilometer within a Census block such that eligible areas in more mountainous areas would be allocated a greater amount of a competitive ETC's total legacy support to reflect the higher costs of serving such areas. *Id*. *See also Mobility Fund Phase II Report and Order*, 32 FCC Rcd at 2166, para. 33.

[13] *5G Fund NPRM and Order* at 22-23, para. 66. The Commission explained that the proposed auction format is one in which a uniform support rate is offered across all eligible areas, and carriers indicate which specific areas they would serve at that rate. *Id.* at 22-23, para. 66 & n.97. If the sum of all payments that would be made at a specific rate given carriers' expressed willingness to serve exceeds the 5G Fund budget, then the rate would decrease and carriers would express their willingness to serve at the lower rate. *Id.* This process would continue until the payment is less than or equal to the 5G Fund budget. *Id.* Under this process, carriers would be willing to serve fewer areas as the rate falls, but if the same rate is offered for all remaining areas, more support than is needed would flow to the less costly-to-serve and more profitable remaining areas. *Id.* The adjustment factor would, therefore, allocate a multiple of any given support rate to more costly and less profitable areas, thereby making them more attractive to serve and increasing the support to such areas. *Id.*

[14] *Id*.

bidder wins support and where there is no winner.[15] In other words, the Commission proposed to multiply the actual square kilometers of eligible areas and/or disaggregated areas of legacy support by an adjustment factor so as to increase the amount of support per actual square kilometer associated with more costly or less profitable areas.

5. The Commission directed the Office and Bureau to propose and seek comment on the appropriate adjustment factor values and the underlying methodologies that could be used to develop them.[16] In this *Adjustment Factor Comment Public Notice*, we propose specific adjustment factor values for purposes of bidding in the 5G Fund auction as well as for disaggregating legacy support. These proposed values reflect our evaluation of the costs and benefits of providing 5G services to different geographic areas, as informed and supported by three economic analyses developed by Commission staff and described in detail in Appendix B: Economic Analyses Supporting the Proposed Adjustment Factor. We seek comment on these adjustment factor values and specifically on whether these values are appropriate to achieve the Commission's objective of distributing 5G Fund and legacy support to a range of areas across the country that are geographically and economically diverse, and to ensure that the 5G Fund supports those areas that absent such support would be unlikely to reap the benefits of 5G deployment.[17]

II. DETERMINATION OF AN ADJUSTMENT FACTOR

6. In this section, we first describe the cost factors underlying the deployment of a 5G network in rural areas, as well as the potential expected revenues for each area. Next, we propose certain adjustment factor values and provide a summary of the three underlying economic analyses used to develop these values. In Appendix A: Terrain Elevation, we provide a terrain elevation map of the United States. In Appendix B: Economic Analyses Supporting the Proposed Adjustment Factor, we provide a detailed description of the three economic analyses under comment, which account for the expected variations in terrain and revenues across different geographic areas.

A. Factors Underlying an Adjustment Factor

7. Deploying 5G wireless networks in rural areas is a capital-intensive investment primarily driven by the costs of deploying base station cell sites.[18] The costs of constructing, operating, and upgrading tower sites, or leasing tower sites, will vary depending on factors such as the location's remoteness, distance to the nearest road, access to backhaul, variance in terrain elevation, land cover, and the cost of local construction and installation labor.[19] The potential coverage area of a site, and hence the

[15] *Id.* at 24-25, para. 71.

[16] *5G Fund NPRM and Order* at 22-23, para. 66. The Commission recommended that the Office and Bureau inform their proposals by using data from several sources, including the U.S. Geological Survey, historical coverage and infrastructure deployment data received by the Commission, data from the U.S. Census Bureau, spectrum holdings information, and Mobility Fund Phase I auction data. *See id.* at 23, 67, paras. 67, 202-03.

[17] *Id.* at 22-23, para. 66.

[18] *See, e.g.*, Edward J. Oughton & Zoraida Frias, *The cost, coverage and rollout implications of 5G infrastructure in Britain*, 42 Telecomm. Policy 636 (2018).

[19] Omnibus Broadband Initiative (OBI), *The Broadband Availability Gap: OBI Technical Paper No. 1* at Exh. 4-K, Exh. 4-L, Exh. 4-X (April 2010) (*OBI Technical Paper No. 1*), *available at* http://www.broadband.gov/plan/broadband-working-reports-technical-papers.html; *see also* OBI, *A Broadband Network Cost Model: A basis for public funding essential to bringing nationwide interoperable communications to America's first responders, OBI Technical Paper No. 2* at Appx. B, Appx. C (April 2010) (*OBI Technical Paper No. 2*), *available at* https://transition.fcc.gov/national-broadband-plan/broadband-network-cost-model-paper.pdf. OBI grew out of the American Recovery and Reinvestment Act of 2009 that established the Broadband Technology Opportunities Program for various specified purposes, including: (1) to provide broadband service to unserved areas of the United States: (2) to improve broadband service to underserved U.S. areas; (3) to provide broadband education, awareness, training, equipment and support to schools, outreach organizations, and job creating facilities; (continued….)

number of sites needed, in turn will depend on the specific site location, antenna height above average terrain, terrain variation,[20] foliage and the density of local structures, the spectrum band, and the number of subscribers served.[21]

8. *Site Costs.* The initial capital expenditure for deploying a wireless network base station includes site construction costs, such as site acquisition; site development; leasehold improvements; shelter, including the equipment shelter and installation services; structure cost including the tower structure, design, construction, and installation costs; radio frequency (RF) cost including the radio and baseband electronics, antennas, and cables; and backhaul cost including equipment and service to connect the site to the core network.[22] Collocation on an existing tower generally should cost less than building a new tower site, but it is less likely that existing towers are available in more remote and unserved areas.[23] In addition, deploying new sites in hillier terrain is likely to incur higher site costs due to the need to construct backhaul and leasehold improvement requirements such as constructing road and utility access, in addition to excavating a level space with proper drainage to construct a tower.[24] Remote site development costs are largely dependent on the specific location and the leasehold improvements required can vary significantly.[25] It is typically more expensive to provide service to rural subscribers due to the scarcity of utility and other services and the long distances required to travel to reach the sites in less densely populated areas, especially if terrain is more mountainous.[26]

9. *Spectrum.* Spectrum bands can be classified broadly as: low-band (below 1 GHz), mid-band (between 1 GHz and 6 GHz), and high-band.[27] Each band has unique coverage and capacity

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(4) to improve access to broadband service by public safety agencies; and (5) to stimulate the demand for broadband, economic growth, and job creation. Pub. L. No. 111-5, 123 Stat. 512, § 6001.

[20] Terrain variation can limit overall signal propagation and cell coverage depending on the specific location of the cell site due to the obstructions of the signal's path. For example, in a hilly area with terrain obstacles, signal propagation losses are more severe at higher frequencies, although a cell site would typically be located on higher ground in order to minimize terrain obstructions. Communications Research Centre Canada, *Comparison of Radio Propagation Characteristics at 700 and 2,500 MHz Pertaining to Macrocellular Coverage* 3-4 (April 2011), *available at* https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-005-11-bell-apndix3.pdf/$FILE/smse-005-11-bell-apndix3.pdf.

[21] *See, e.g.*, Yahia Zakaria & Lubomir Ivanek, *Propagation Modelling of Path Loss Models for Wireless Communication in Urban and Rural Environments at 1800 GSM Frequency Band*, 14 Info. & Comm. Tech. & Serv. 139 (2016); Abdulrahman Yarali, Saifur Rahman & Bwanga Mbula, *WiMAX: The Innovative Broadband Wireless Access Technology*, 3 J. Comm. 53 (2008).

[22] *OBI Technical Paper No. 1*, Exh. 4-AB: Cost Breakdown of Wireless Network over 20 Years; Exh. 4-AC: Breakdown of Total Site Costs for Wireless Network in Unserved Areas; *OBI Technical Paper No. 2*, Appx. B: Network Cost Model Assumptions, Appx. C: Underlying Equipment and Cost for Capital Expense Assumptions, *available at* https://transition.fcc.gov/national-broadband-plan/broadband-network-cost-model-paper.pdf.

[23] Letter from David LaFuria, Counsel to United States Cellular Corp., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-208 (filed Feb. 25, 2016) (United States Cellular Corp., Feb. 25, 2016 *Ex Parte*), Enc., CostQuest Associates, *Ongoing Support for Operations and Maintenance of Rural Mobile Networks*, at 5.

[24] Letter from David LaFuria, Counsel to United States Cellular Corp., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-208, at 1 (filed May 31, 2016).

[25] *Id*.

[26] *Id*.

[27] FCC, The FCC's 5G FAST Plan, *available at* https://www.fcc.gov/5G (last visited May 15, 2020); *see also Applications of T-Mobile US, Inc., and Sprint Corporation For Consent to Transfer Control of Licenses and Authorizations; Applications of American H Block Wireless L.L.C, DBSD Corporation, Gamma Acquisition L.L.C., and Manifest Wireless L.L.C. for Extension of Time*, Memorandum Opinion and Order, Declaratory Ruling, and Order of Proposed Modification, 34 FCC Rcd 10578, 10589, para. 28 (2019) (*T-Mobile-Sprint Order*).

properties; low-band spectrum is better suited for wider coverage (both in terms of range as well as better indoor penetration) and higher-band spectrum is better suited for higher capacity and throughput.[28] Frequencies below 1 GHz experience lower propagation losses and therefore can provide coverage over a larger area which leads to cost advantages for network deployment in rural areas.[29] Higher frequency bands, on the other hand, are typically available in larger channel bandwidths which lead to higher throughput speeds but the wavelength of the signal results in greater propagation losses.[30] Mobile wireless carriers, depending on their spectrum holdings, may be able to simultaneously deploy low and mid-band spectrum in rural areas to take advantage of both propagation and capacity capabilities, respectively.[31] In addition, 5G technology enables carrier aggregation to further optimize the desired coverage, throughput, and capacity.[32]

10. We propose to use various cost characteristics as outlined here and described in more detail in Appendix A: Terrain Elevation and Appendix B: Economic Analyses Supporting the Proposed Adjustment Factor—including terrain elevation, spectrum frequency and clutter—to capture the relative cost of serving areas with differing terrain characteristics. We seek comment on this proposal.

11. *Business Case: Demand Factors*. As well as being geographically diverse, the United States is economically diverse. As set out in the *5G Fund NPRM and Order*, in addition to relative cost characteristics, the adjustment factor values we propose should also capture the expected revenues that might be generated in each area.[33] We propose to use various economic characteristics—including income, GDP, and population density—as proxies for the demand factors in each of the economic analyses. We seek comment on this proposal.

[28] The wavelength of the signal, which is inversely proportional to frequency, impacts the signal's ability to propagate over and around obstacles and to penetrate various building materials and land cover such as trees and shrubs. A higher frequency signal is generally attenuated more at greater distances than a lower frequency signal due to antenna and atmospheric effects. *See e.g.*, Theodore S. Rappaport, Wireless Communications Principles and Practice 131-32, 162 (2002) (Rappaport (2002)); Daniel Y. Mitsutake Cueto, Luiz Alencar Reis da Silva Mello, & Carlos V. Rodríguez R., Comparison of Coverage and Capacity of LTE-Advanced Networks at 700 MHz and 2.6 GHz (2013), *available at* https://ieeexplore.ieee.org/document/6646573.

[29] *Policies Regarding Mobile Spectrum Holdings; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6133, 6162-63, para. 58 (2014) (*Mobile Spectrum Holdings Report and Order*); *see also Communications Marketplace Report et al*., Report, 33 FCC Rcd 12558, 12584, para. 31 & n.99 (2018) (*2018 Communications Marketplace Report*).

[30] A higher frequency signal generally encounters higher penetration losses as it propagates through obstructions such as buildings or trees; larger amounts of contiguous spectrum are typically available in higher operating frequencies than in lower frequencies. The additional contiguous spectrum, however, allows for assignment of larger channel bandwidths, thereby making available more capacity as compared to lower frequencies. *2018 Communications Marketplace Report*, 33 FCC Rcd at 12584, para. 31, *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6135, para. 3. *See also Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, 33 FCC Rcd 6915, 6917, paras. 4-5 (2018).

[31] *See, e.g.*, *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6163, para. 59. Note that if the cost of spectrum is lower in more rural areas, this could significantly offset many of the other higher site costs.

[32] Carrier aggregation enables the use of two different channels within the same frequency spectrum or in different spectra, allowing, for example, the augmentation of low band propagation capabilities with mid band capacity advantages. Ericsson Technology Review, *The Advantages of Combining 5G NR with LTE* (2018), *available at* https://www.ericsson.com/en/reports-and-papers/ericsson-technology-review/articles/the-advantages-of-combining-5g-nr-with-lte.

[33] *5G Fund NPRM and Order* at 22-23, para. 66.

B. Proposed Adjustment Factor Values

12. The Commission proposed in the *5G Fund NPRM and Order* to adopt an adjustment factor that would assign a weight to specific geographic areas.[34] The proposed adjustment factor values would increase the likelihood that 5G Fund support is distributed to geographically and economically diverse areas by taking into account the differences among such areas in the costs and benefits of providing services.[35] The Commission also proposed a process in the *5G Fund NPRM and Order* to disaggregate legacy high-cost support.[36] As the Commission explained, to disaggregate legacy support, it "would overlay the boundaries of eligible areas and the minimum geographic area for bidding over each legacy support recipient's service area[,]" in effect "subdivid[ing] the geographic boundary for each carrier's subsidized service area into the smallest constituent piece for which support must be disaggregated and transitioned separately" and then apply the adjustment factor to each such area.[37] In this way, we would assign a larger portion of a carrier's disaggregated legacy high-cost support to those portions of its subsidized service area that have a higher adjustment factor, using the same values calculated for bidding.[38] The *5G Fund NPRM and Order* directs the Office and Bureau to propose specific values for the adjustment factor and to detail the underlying methodologies that could be used to develop the weights.[39]

13. We seek comment on the adjustment factor values presented in Figure 1, which synthesize and are informed by the three economic analyses.[40] We seek comment generally on our proposed adjustment factor values. We recognize that the Commission does not intend that the adjustment factor that is ultimately adopted will capture the full differences between the costs and expected revenues of providing service to different types of geographic areas.[41] In addition, the Commission stated that, if necessary, the adjustment factor will be capped to ensure the funding allocation determined by the auction is both equitable and efficient.[42] Commenters are invited to address whether the specific proposed adjustment factor values are consistent with these stated intentions of the Commission.

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[34] *Id.*

[35] *Id.*

[36] *5G Fund NPRM and Order* at 24-25, para. 71.

[37] *Id.* at 24-25, para. 71 & n.100.

[38] For example, suppose that a carrier receives $100 in legacy high-cost support for its subsidized service area, the entirety of which is eligible for 5G Fund support. If 15 square kilometers of the service area falls within census tract A, which has an adjustment factor value of 2.0, and 70 square kilometers of the service area falls within census tract B, which has an adjustment factor value of 1.0, we would disaggregate its legacy support and assign $30 to the portion of the service area in census tract A and $70 to the portion of the service area in census tract B.

[39] *Id.* at 23, para. 67; *see also 5G Fund NPRM and Order* at 25, para. 71 ("In the companion Order, we direct the Office of Economics and Analytics and the Wireline Competition Bureau to propose and seek comment on how to apply an adjustment factor to these disaggregation steps to account for the relative costs of providing mobile service, as well as whether and how any adjustment factor should differ between bidding and the disaggregation process."). We accordingly seek comment on how to apply the adjustment factor to the disaggregation of legacy support.

[40] Each of the economic analyses estimates one or more sets of adjustment factor values. To generate the values presented in Fig. 1, essentially we considered a middle ground of the three specific analyses so as to take all three analyses into account. We then rounded for administrative simplicity. We believe this is the most reasonable way to integrate all the results generated by the Entry Model, the Cell Site Density Model and the Auction Bidding Model.

[41] *Id.* at 22-23, para. 66.

[42] *Id.*

Fig. 1: Proposed Adjustment Factor Values[43]

		Terrain Elevation		
		Flat	Hilly	Mountainous
Demand Factors	Low	1.2	2.4	3.8
	Medium	1.1	2.3	3.5
	High	1.0	2.0	3.0

14. We seek comment also on the three economic analyses that inform our estimated adjustment factor values.[44] We ask commenters to submit any analysis that alternatively or additionally might inform the adjustment factor values that we propose. Further, we seek comment on the data sources staff used, and we ask that commenters submit alternative data sources to the extent that they might better inform our analyses. In addition, we seek comment on whether, in determining whether an area would be likely to receive 5G service, we have identified appropriately the underlying factors that wireless carriers use in considering whether to deploy 5G service. Finally, we ask commenters to submit any alternative methodological approaches and analyses for determining the appropriate adjustment factor values.

15. *Entry Model Adjustment Factor*. In order to estimate how relative costs and revenues differ across geographic areas, our first analysis examines how geographic areas' physical and demographic characteristics affect carriers' network deployment decisions. We assume that carriers only enter areas where their long-run incremental revenues are greater than their long-run incremental cost of deploying wireless mobile service; this implies those areas with high demand and low costs attract a greater number of carriers than those areas with low demand and high costs. To understand what makes an area attractive to carriers, we estimate an ordered logistic regression of the number of carriers providing service.[45] To proxy for the carriers' expected revenue generated by entering the area and providing service, we include independent variables such as population, local GDP, and median household income.[46] To proxy for network deployment costs, we include independent variables such as terrain variation and the percentage of forested land. Finally, we include a variable that accounts for past universal service support. To construct the adjustment factor, we solve for the adjustments necessary to offset entry probability differences caused by variations in terrain and income. The Commission has proposed that the adjustment factor would be applied in the auction bidding system as a multiplicative factor on the number of square kilometers associated with a biddable area, so we estimate the adjustment factor values that, all else equal, would make the adjusted square kilometers in all areas equally attractive to bidders.[47]

[43] The explanation of the three terrain categories can be found in Appx. A: Terrain Elevation. The explanation of the demand factors can be found in Appx. B: Economic Analyses Supporting the Proposed Adjustment Factor.

[44] The technical descriptions of the three economic analyses which informed our proposal are found in Appx. B: Economic Analyses Supporting the Proposed Adjustment Factor.

[45] *See generally* Appx. B-I: Entry Model Adjustment Factor.

[46] *See* Timothy F. Bresnahan & Peter C. Reiss, *Entry and Competition in Concentrated Markets*, 99 J. Pol. Econ. 977 (1991). Similar broadband entry models have been estimated in the academic literature. *See, e.g.*, Mo Xiao & Peter F. Orazem, *Does the Fourth Entrant Make Any Difference? Entry and Competition in the Early U.S. Broadband Market*, 29 Int'l J. Indus. Org. 547.

[47] To ensure that the model's estimated parameters and resulting adjustment factors are robust to alternative assumptions, we report the estimation results and the accompanying factors from twelve different specifications of the model.

16. *Cell Site Density Model Adjustment Factor*. In our second analysis, we estimate the difference in the number of cell sites required to provide high-quality 5G service in hillier terrain areas compared to flat areas.[48] Since more variability in the terrain of a cell site service area tends to reduce the received signal strength at a given location, wireless carriers must, all else equal, build more cell sites in mountainous rural areas compared to flat rural areas to provide the same quality of service (e.g., speed). Using county-level cell site locations and coverage data, our model estimates differences in the average coverage area of a site due to the terrain of the site service area, holding all other determinants of cell site coverage areas fixed. To predict cell site coverage areas by terrain category, we first run a regression analysis of cell site coverage area on variables that account for network capacity, network load, signal propagation, and service quality. Then using the regression model estimates, we predict the average coverage area of a site in a typical rural area for our three terrain categories (flat, hilly, and mountainous) to calculate an adjustment factor that estimates how many sites per square mile on average are required to deploy comparable 5G mobile service in rural areas within each terrain category.[49]

17. *Auction Bidding Model Adjustment Factor.* In our third analysis, we use Mobility Fund Phase I (Auction 901)[50] sealed bid data (i.e., a firm's requested subsidy to provide mobile service to a specified unserved geographic area) to understand how terrain and other factors impact the bid amount requested by a carrier to deploy service. We assume that a carrier's bid amount is a function of its expected revenues, expected competition in the auction, and expected costs. We estimate adjustment factor values by applying a regression model that estimates the effect of terrain on the bid amount controlling for variables that determine revenues and costs. To calculate adjustment factor values, we divide our measure of terrain into the same three categories and then predict the expected ratio of bid amounts in the hilly and mountainous terrain categories over the bid amount in flat terrain while holding all other factors fixed.

III. PROCEDURAL MATTERS

18. *Ex Parte Presentations – Permit-But-Disclose.* This proceeding has been designated as a "permit-but-disclose" proceeding in accordance with the Commission's *ex parte* rules.[51] Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies).

19. Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter's written comments, memoranda, or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and must be filed

[48] *See generally* Appx. B-II: Cell Site Density Model Adjustment Factor; *see also OBI Technical Paper No. 1*, Exh. 4-Y, at 79.

[49] If cell site deployment costs are the same across terrain categories, the adjustment factor values estimate the cost differences in providing wireless service across terrain types. If sites cost more to deploy in more mountainous terrain, then the adjustment factor values are underestimated. We do not have information on deployment cost variation by terrain, so these potential cost differences are not accounted for in the estimated adjustment factors in the Cell Site Density Model.

[50] *See generally* Appx. B-III: Auction Bidding Model Adjustment Factor.

[51] 47 CFR § 1.1200 *et seq.*; *5G Fund NPRM and Order* at 69, para. 210.

consistent with rule 1.1206(b). In proceedings governed by rule 1.49(f) or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission's *ex parte* rules.

20. *Comments and Replies*. Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 CFR §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: https://www.fcc.gov/ecfs/.[52]
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing.
- Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.
    - Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.
    - U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington, DC 20554.
- **Effective March 19, 2020, and until further notice, the Commission no longer accepts any hand or messenger delivered filings. This is a temporary measure taken to help protect the health and safety of individuals, and to mitigate the transmission of COVID-19. *See FCC Announces Closure of FCC Headquarters Open Window and Change in Hand-Delivery Policy*, Public Notice, DA 20-304 (March 19, 2020). https://www.fcc.gov/document/fcc-closes-headquarters-open-window-and-changes-hand-delivery-policy.**
- **During the time the Commission's building is closed to the general public and until further notice, if more than one docket or rulemaking number appears in the caption of a proceeding, paper filers need not submit two additional copies for each additional docket or rulemaking number; an original and one copy are sufficient.**

21. Comments and reply comments must include a short and concise summary of the substantive arguments raised in the pleading. Comments and reply comments must also comply with section 1.49 and all other applicable sections of the Commission's rules. We direct all interested parties to include the name of the filing party and the date of the filing on each page of their comments and reply comments. All parties are encouraged to use a table of contents, regardless of the length of their submission. We also strongly encourage parties to track the organization set forth in the Notice of Proposed Rulemaking in order to facilitate our internal review process.

[52] Except when the filer requests that materials be withheld from public inspection, any document may be submitted electronically through the Commission's ECFS. *See* 47 CFR § 1.49(f)(3). Persons that need to submit confidential filings to the Commission should follow the instructions provided in the Commission's March 31, 2020 public notice regarding the procedures for submission of confidential materials. *See FCC Provides Further Instructions Regarding Submission of Confidential Materials*, Public Notice, DA 20-361 (rel. Mar. 31, 2020).

22. *People with Disabilities*. To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at (202) 418-0530 (voice), (202) 418-0432 (tty).

23. For further information, contact Kate Matraves, Economic Analysis Division, Office of Economics and Analytics, at Catherine.Matraves@fcc.gov, or Emily Burke, Auctions Division, Office of Economics and Analytics, at Emily.Burke@fcc.gov.

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