Expert Report of Daniel S. Levy, Ph.D.

Public Redacted Version

IN THE SUPERIOR COURT OF THE STATE OF ARIZONA

IN AND FOR THE COUNTY OF MARICOPA

STATE OF ARIZONA, *ex rel.* MARK BRNOVICH, Attorney General, **Plaintiff,** **v.** **GOOGLE LLC, A Delaware Limited Liability Company,** **Defendant.**	No. CV2020-006219

EXPERT REPORT OF DANIEL S. LEVY, Ph.D.

May 4, 2022

HIGHLY CONFIDENTIAL – ATTORNEYS' EYES ONLY
PURSUANT TO PROTECTIVE ORDER

Contents

1) Statement of Research

I have been retained by counsel for the State of Arizona to provide my expert opinions with respect to monetary remedies related to the State of Arizona's claim that Google violated the Arizona Consumer Fraud Act. The State of Arizona sued Google in Maricopa County Superior Court, alleging that Google has violated the Arizona Consumer Fraud Act by deceiving and misleading consumers regarding Google's tracking of user location.[1] The State alleges several categories of deception related to Google's location-related settings.[2] The State also alleges that Google derives revenue from this deceptively obtained location data, as the data is used to place and service ads that are targeted to a user's location.[3] Thus, the State alleges that Google's revenue from location targeted ads were "driven" by Google's wrongful taking of location data.[4] The State further alleges that Google's violations were willful.[5] Google's revenue and income are derived from its geo-targeted advertisements. I have reviewed the State's Complaint and the November 16, 2021 Declaration of Dr. Seth Nielson, which allege and explain how personal location data of users was obtained by means that violate the Arizona Consumer Fraud Act.

It is my understanding that, under Arizona law (A.R.S. § 44-1522), "the act, use or employment by any person of any deception, deceptive or unfair act or practice, fraud, false pretense, false promise, misrepresentation, or concealment, suppression or omission of any material fact with intent that others rely on such concealment, suppression or omission, in connection with the sale or advertisement of any merchandise whether or not any person has in fact been misled, deceived or damaged thereby" is "an unlawful practice." I further understand that, under Arizona law (A.R.S. § 44-1528), if "a person has engaged in or is engaging in any practice declared to be unlawful" under A.R.S. § 44-1522, that person may be forced to disgorge

[1] See State of Arizona v. Google, LLC Complaint ("Complaint") generally.
[2] Complaint at pages 12-37, 42-44.
[3] Complaint at pages 6-10, 44
[4] Complaint at page 44.
[5] Complaint at page 34-36.

"any profits, gain, gross receipts or other benefit obtained by means of any practice." In addition, I understand that, under A.R.S. § 44-1531, if any person has willfully violated § 44-1522, the attorney general may recover from the person on behalf of the State "a civil penalty of not more than ten thousand dollars per violation." I have been asked to assess and provide certain opinions concerning two types of remedies: disgorgement, and civil penalties.

I understand that the State of Arizona has accused Google of using unfair and deceptive acts and practices to collect consumers' location information, which Google then exploits for its geo-targeting ads business. For my assignment, I was asked to assume that Google's conduct—including the manner in which it collects user location information in connection with the sale and/or advertising of (1) Android devices (including pre-loaded apps and software) and (2) sales of various Google's apps and services, in exchange for users' data—amounts to an unlawful practice under A.R.S. § 44-1522. I was asked to provide an expert assessment as to "any profits, gain, gross receipts or other benefit obtained by" the unlawful practice alleged by the State that should be disgorged from Google. I made a reasonable approximation of disgorgement by calculating the revenue and profit from advertising by Google in Arizona for 2013-2021 and applying estimates of the percentage of revenue that was derived from unlawful geo-locating. I refer to this analysis as "disgorgement."

I also understand that the State alleges Google's violations were willful, meaning that Google "knew or should have known its conduct was of the nature prohibited by the Arizona Consumer Fraud Act."[6] I was asked to provide some financial and economic perspective that would assist the jury in evaluating civil penalties, as discussed in more detailed below, including Google's financial condition.

If called to testify in this matter, I may prepare additional demonstrative exhibits or summarize the information I describe in this report, as permitted by the Court. I may also refer to documents and information on which I have relied or considered in may analysis, as disclosed in Appendix 2 and throughout this report.

[6] Complaint at page 34.

2) Summary of Findings and Opinions

As detailed below, this report discusses two main types of monetary remedies: disgorgement and civil penalties. I have also considered some alternatives, as mentioned below.

The State alleges that Google deceives and misleads consumers regarding Google's tracking of user location.[7] I understand that the alleged unlawful conduct that Google deceptively collects users' location data through (i) the sale of Android devices (with Google's preloaded software and apps) and (ii) through the apps and services that it provides to consumers more broadly (not just on Android phones, but all users of Google services) in exchange for collecting their location data. Google then monetizes and benefits from this location information through the sale of advertising. Advertising revenue is a substantial portion of Google's total revenue. In 2021, 81%[8] of Google's global revenue was derived from advertising. So while the products that Google provides and sells to customers are apps and the Android operating system for phones, Google benefits financially primarily through the sale of advertising which is driven by Google's deceptive gathering of location data.

I provide a summary of my disgorgement calculations in Table 2.1 presented below. As an initial matter, I calculated possible disgorgement values for both Arizona ad revenue and ad operating income based on a number of data points, as shown below. I explain, based on the materials provided, that 95% of Google's advertising revenue is tied to geotargeting, and provide calculations that show the amount of revenues (or "gross receipts") for geotargeting advertising. I also provide a similar calculation based on the operating profit numbers received from Google. I calculate disgorgement based on [redacted] of total revenue and operating income calculated from experiments run by Google employees. I discuss these calculations in greater detail later in the report but 95% is a conservative estimate of the number of ads that are served using geo-targeting data. I also choose [redacted] based on conclusion by Google engineers resulting from their tests of the effect of location data on revenues tha [redacted] of Search Ads, totaling [redacted] and [redacted] of Global Display Network ("GDN"), totaling [redacted], are driven by location data. I use [redacted] as the weighted average of these percentages for

[7] See State of Arizona v. Google, LLC Complaint ("Complaint") generally.
[8] According to Google's 10-Ks, Google global total revenue in 2021 is $257.6 billion and Google's global advertising revenue is $209.5 billion.

combined Ads[9,10]

Notes and Sources:
[A] Year calculations performed.
[B] Column [C] of Table 7.4
[C] Column [D] of Table 7.4
[D] Column [C] of Table 7.5
[E] Column [D] of Table 7.5

As explained below in Section 6, using these and other data points, I conclude that based on the data provided by Google the most accurate measure of the revenue Google obtained in connection with Google's unlawful activity is [redacted] without interest, from Q4 2013 through the end of 2021. Analogously for operating income, I calculate [redacted] in disgorgement damages through the same time period. Similarly, based on the data provided by Google, the most accurate measure of Google's additional revenue driven by collection and use of location data is [redacted] from Q4 2013 through 2021 and analogous operating income is [redacted] through the same period. I am reserve the right to calculate pre-judgment interest on these numbers, if asked to do so.

I also provide information that would assist the jury in calculating civil penalties. If it

[9] [redacted] The resulting weighted average percentage is slightly larger and has been rounded down to [redacted].
[10] GOOG-GLAZ-00232189.pdf (at 190)

finds that Google's actions are willful, I understand that the trier of act would first identify the number of violations. Based on the State's allegations, I have set forth some calculations to assist the jury with that, including 1) number of Arizona Android users, 2) the number of Arizona Android phone activations, 3) the number of ad impressions served in Arizona, and 4) the number of users of Arizona Google Accounts. I have also provided some economic analysis to assist the jury in evaluating the amount of penalties per violation. I understand the factfinder will determine the amount of civil penalties and what constitutes a violation of the Arizona Consumer Fraud Act and can then multiple the values in Table 2.2 by the appropriate penalty.

Notes and Sources:
[A] Year calculations performed.
[B] Column [D] of Table 7.8
[C] Column [D] of Table 7.9
[D] Column [B] of Table 7.10
[E] Column [D] of Table 7.11

3) Qualifications

I am the National Managing Director and a founder of Advanced Analytical Consulting Group, Inc. ("AACG"). I have a Ph.D. in Economics from The University of Chicago. I have designed and implemented economic, statistical and computing models for academic research, business analyses and litigations over the course of more than 35 years. I have provided testimony involving surveys, sampling, statistics, econometrics, economics, and business, among other topics, before state and federal courts. I have served as an expert for the US Department of Justice, the US Securities and Exchange Commission, the New York State Attorney General and served as an Expert Arbitrator for the Internal Revenue Service. A copy

of my curriculum vitae is listed in Appendix 1, which also includes a list of all publications I have authored in the previous 10 years, as well as a list of all other cases in which, during the previous 4 years, I testified as an expert at a hearing or trial.

For my work in the matter, AACG is being compensated my rate of $690 per hour. The rates of my staff assigned to this project, which worked at my direction and under my supervision, range from $205 to $690. Compensation to AACG (or my compensation from AACG) is not contingent on the outcome of the proceedings or on the substance of my conclusions.

4) Information Relied Upon

My opinions are based upon the review and analysis of various documents and data provided to me in this matter, publicly available data and information, academic references (see footnotes herein), and my education, expertise and experience in research consulting and financial analysis. The documents I received during the course of this matter are listed in Appendix 1 or are listed in footnotes to this report.

My opinions in this report are based on the financial and other information and documents Google has provided in this case (and in the State of Arizona's pre-suit investigation), including any information related to its revenue and profits, information related to the number of Android users in Arizona, and the number of Google devices sold in Arizona. I am advised that parties in Arizona are required to provide relevant documents and information. I also understand that the State requested documents, testimony, and written information, related to financial information, such as revenue and profits derived from location data.

I understand Google has responded by suggesting that certain financial information and documents do not exist and/or are not available to Google. On a number of occasions, Google has responded that it does not have or track revenue for geotargeted advertising. For example, I am advised that Google was ordered to produce "documents sufficient to show how User Location Data affects Google's revenues for Arizona on a product-by-product and

year-by-year basis from January 1, 2014, until the present. Google shall not withhold documents on the basis of any objection except on the grounds of privilege."[11] Google response that it "does not maintain in the ordinary course of business documents that show how location data 'affects Google's revenues for Arizona' and, accordingly, Google has no documents responsive to this Request that could be located after a reasonable search."[12] Similarly, in a May 10, 2021 response to an interrogatory requesting that Google describe how it generates revenue by use of location data that "Google does not directly generate revenue from the collection, storage, and/or use of User Location Data because it does not sell or disclose User Location Data to any third parties. Nor does Google track or quantify the role of location data, including User Location Data, in generating revenue.[13]

I understand that on March 22, 2022, the State wrote to Google's counsel that "Google must produce evidence of all profits, costs and other financial measures sufficient to calculate disgorgement, restitution and penalties in the event that the jury finds such remedies are warranted. For example, to the extent Google contends that some or all revenue related to advertisement sales should be excluded or apportioned, Google must provide evidence sufficient to make those calculations. Please confirm Google has provided and supplemented all such materials."[14] Google's counsel responded on March 28, 2022, that "Google does not maintain in the ordinary course records of profits, costs, or revenue in related to location data or geo-targeted advertisements."[15] After a further series of letters, Google responded that it had already produced the best available information, and it pointed the State back to written 30(b)(6) requests nos. 25 and 26.[16]

From what I have seen, Google has not produced even basic financial documents, such as management P&L statements, that are created in the ordinary course of business and are produced in any other litigation.

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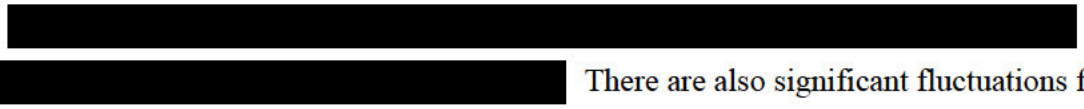
[11] Special Master's Report of Hearing on April 26, 2021 and Advisory Rulings (Including Discovery Issue 2) at 6.
[12] Google's April 27, 2021 Response to Amended Request for Production No. 7, at 4.
[13] Google's May 10, 2021 Supplemental Responses to the State's Non-Uniform Interrogatories, Set Three, at 6.
[14] March 22, 2022 Letter from Kenneth Ralston, counsel for the State of Arizona to Simona Agnolucci and Joshua Anderson, counsel for Google, at 2.
[15] March 28, 2022 Letter from Joshua Anderson, counsel for Google, to Kenneth Ralston, counsel for the State of Arizona, at 1-2.
[16] April 27, 2022 Letter from Joshua Anderson, counsel for Google, to Guy Ruttenberg and Kenneth Ralston,

I have not seen Google provide the normal financials and management spreadsheets/reports that one would normally expect to see from Google and similar businesses. I note that the written responses to request nos. 25 and 26 (as well as other written responses provided by Google) provide very little explanation as to how the numbers were calculated. From what I can see, none of the underlying data or documents have been provided. For example, Google lists a series of numbers that Google says represent "operating profit," but it has not provided the documents, information, or spreadsheets that would enable analysis of any specific cost items. In other instances, Google provide high-level annual numbers without itemizing the information on a month-to-month basis. Google has also not provided the type of raw data (in the form of spreadsheets) that I would expect to see in a case like this. Even the high-level numbers provided in response to written questions 25 and 26 do not appear to be endorsed by anyone at Google, except for its outside lawyers. Also, the limited financial data from Google was mostly provided in a non-native written response—in other words, numbers appear to have been manually transcribed into a discovery response—without any of the formatting of native data.

Apart from being insufficient and non-customary, the numbers also appear to contain transcription errors—some of them obvious. For example, on page 2 of Google 7/12/2021 responses to Rule 30(b)(6) questions, the first entry in the second chart has a misplaced comma that makes it impossible to determine the correct number.

[17] 2021-07-12 Google_s Responses to 30(b)(6) Questions.PDF, p.2

In that same chart (in response to topic 18), Google also provided the number of "on" and "off" events of location history for worldwide accounts. The results included unexplained fluctuations, that in light of the clear error mentioned above are suspicious and may well be either transcription errors or unexplained anomalies of several orders of magnitude, as show here.[18]



There are also significant fluctuations for the "Location Reporting" that may reflect transcription errors, as shown below.[19] Of course, there are also likely to be other errors that are simply less obvious.

Google has not produced the types of financial documents and financial information that are normally maintained in the ordinary course of business and are turned over in nearly every litigation of this magnitude. The limited data Google has produced is not in the form or format that is ordinarily maintained or produced. Google is a data-driven company. As noted below, Google even runs experiments for new launches to measure and report how changes to the technical user-facing settings or services would impact revenue.

Google has not provided the type of data of a nature in format commonly used by economists, statisticians and other scientists to determine how changes in product offerings, pricing and service features impact prices, volume of sale, revenues and profits at a company. This type of data could be used to calculate the impact of significant changes in location tracking technology as they rolled out at Google over time and across geographies

[18] 2021-07-12 Google_s Responses to 30(b)(6) Questions.PDF, p.2
[19] 2021-07-12 Google_s Responses to 30(b)(6) Questions.PDF, p.5

and platforms, while controlling for other economic factors evolving in different temporal and geographic patterns. The econometric methods to perform such analyses are well developed in the field of econometrics and are commonly used in academic research, policy analysis, business and litigation.[20]

I am advised that the Court has ordered (and Google has stipulated) that the State and its experts may rely on the data provided by Google in its written responses. As noted above, I understand Google has specifically pointed back to its responses to written questions nos. 25 and 26. For that reason, I rely on some of those responses in my report below, to the extent it is possible to do so.

5) Background

A. State of Arizona Claim

The State of Arizona sued Google in Maricopa County Superior Court, alleging that Google has violated the Arizona Consumer Fraud Act by engaging in deceptive and unfair practices, regarding Google's tracking of user location.[21] The State alleges several categories of deceptive and unfair conduct related to Google's location-related settings.[22]

At a high-level, I understand from the Complaint that the State accuses Google of engaging in deceptive and unfair practices relating to its collection of user location data in connection with the sale and advertising of Android phones, as well as the sale of various apps, services, software and accounts. I have reviewed the Nov. 16, 2021 Declaration of Dr. Seth Nielson (a technical expert retained by Arizona), which explains how Google gathers and utilizes of user location data. Mr. Nielson testified that Google uses devices, services, and software to track user location.[23]

According to Dr. Nielson, when consumers purchase an Android device, they receive "a device that has been configured to provide Google with the ability to collect, store, and exploit a

[20] See for example Jeffrey Wooldridge, Econometric Analysis of Cross Section and Panel Data, (MIT Press), 2010.
[21] See State of Arizona v. Google, LLC Complaint ("Complaint") generally.
[22] Complaint at pages 12-37, 42-44.
[23] Nielson Decl. ¶¶ 27–29.

user's location information through the software on the device."[24] In addition, "a user of an Android device needs to be signed into his or her [Google] account—or create an account—when purchasing an Android device in order to meaningfully use it."[25] I understand that "the vast majority of Android devices sold in the U.S. have Google's version" of the Android operating system, and Google precludes "third-party device manufacturers"[26] from "pre-installing its Google Play Store (*i.e.*, Google's app marketplace) or any Google apps (such as Search or Maps) on other versions of Android."[27] I understand that "Google's own version of Android contains the Google Mobile Services ("GMS"), which enables Google to collect location information from users."[28] For that reason, Google can use this pre-installed Software and Google Accounts to collect user location on "a vast majority of Android phones sold in the U.S."[29] And "When the user purchases a device and signs into her Google account during device setup, the device can immediately begin uploading location information".[30]

Dr. Nielson also explains that, through a "loophole" or "bypass,"[31] Google "collects users' location information" from its own pre-installed or downloaded app, whether on Android devices or IOS devices[32], even when apps' location permissions are denied[33] and all "location-related settings" are turned off or denied.[34] This has been noticed by "Google and its engineers" since "at least Android Marshmallow was released back in 2015."[35] However, "Google has not made any settings that would prevent this from occurring", and let it to be "on the ads revenue stream"[36] .

Dr. Nielson explains that Google also uses "location information provided by users who report it to determine the location of nearby users who have not reported their location."[37]

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[24] Nielson Decl. ¶ 29.
[25] Nielson Decl. ¶¶ 66.
[26] Nielson Decl. ¶¶ 41.
[27] Nielson Decl. ¶¶ 41-42.
[28] Nielson Decl. ¶¶ 43.
[29] Nielson Decl. ¶¶ 51.
[30] Nielson Decl. ¶¶ 64.
[31] Nielson Decl. ¶¶ 92.
[32] Nielson Decl. ¶¶ 31-32, 87, 114..
[33] Nielson Decl. ¶¶ 31.
[34] Nielson Decl. ¶¶ 32–34, 115.
[35] Nielson Decl. ¶¶ 95.
[36] Nielson Decl. ¶¶ 96.
[37] Nielson Decl. ¶ 109.

Despite the various settings, "there is nothing a user can do to prevent Google from using the location information collected from IP address."[38] Dr. Nielson explains this is something that users cannot "opt out."[39] As a result, "just about any transaction with Google (including with those users who have expressly declined to share their location) becomes an opportunity for Google to collect, store, and exploit the users' location information." [40]

The State also alleges that Google derives revenue from this deceptively obtained location data, as the data is used to place and service ads that are targeted to a user's location.[41] Thus, the State alleges that Google's revenue from location targeted ads were "driven" by Google's wrongful taking of location data.[42]

I understand that Google Ads covers "a number of products on what [Google] call[s] the advertiser tools or the advertiser solution set." [43] These include Search Ads, Display Ads, Video Ads, which "are all in the scope of kind of the brand or the content of Google Ads." [44] Search Ads refers to "ads that are shown to users in response to a Search query of various types." [45] Examples of this could be a query on Google.com or a query in the context of Google Maps." [46] Display Ads and Video Ads refer to "when advertisers purchase ad space that is visuals or that we display or images or video ads. So those would be videos that are shown to users in a video context in the context of other videos users are watching." [47] A Display Ad or Video Ad would appear within the context of "a website or an app that is in the context of content provided by that publisher. So that could be a third-party publisher like -- like a New York Times or it could be a Google property…, like on Gmail." [48] Google also has other Ads products, such as those are more targeted towards what it calls "enterprise advertise users," like Display & Video 360 or Campaign Manager.[49]

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[38] Nielson Decl. ¶¶ 32–34, 104.
[39] Nielson Decl. ¶ 116.
[40] Nielson Decl. ¶ 119.
[41] Complaint at pages 6-10, 44
[42] Complaint at page 44.
[43] Trans. of Karin Hennessy May 21, 2020 EUO, at 139:9-11.
[44] Trans. of Karin Hennessy May 21, 2020 EUO, at 139:12-15.
[45] Trans. of Karin Hennessy May 21, 2020 EUO, at 140:4-8.
[46] Trans. of Karin Hennessy May 21, 2020 EUO, at 140:8-14.
[47] Trans. of Karin Hennessy May 21, 2020 EUO, at 139:19-25.
[48] Trans. of Karin Hennessy May 21, 2020 EUO, at 140:18-141:1.
[49] Trans. of Karin Hennessy May 21, 2020 EUO, at 141:16-142:1.

Dr. Nielson explains that, as a technical matter, the location data that is obtained from these practices is used by Google to serve ads that are targeted to a user's location.[50] According to Dr. Nielson, Google "aggregates various signals... to calculate the user's 'best' location,"[51] which is then "used to inform most, if not all, of Google's products with a location"[52] and "250+ clients at Google."[53]

Other evidence further confirms that, from an economic perspective, Google's ad revenue is driven by the collection of location information, which the State alleges was accomplished unlawfully. Internal Google communications confirm Google's location information enhances both Search and Ads revenue.[54] [redacted][55] Google confirmed that geotargeting is an "important feature for any advertising platform" that is a "critical dimension for advertisers to scope where they are marketing to."[56] According to Google, "geotargeting" is "best understood as a way to scope what potential users that you want to reach. So this is if you're an advertiser, you want to set -- set the limits or set a specific target of the locations of customers that you want to see your ad."[57] For Google, "offering . . . features like geotargeting is important for driving customer adoption and spend on our products."[58] Google promises advertisers that they can target according to location.[59] It is "important for Google to offer" geotargeting as a feature in its Ads product because, "as far as marketers on the dollar value that they, you know, are willing to commit to advertising, geographic targeting is pretty essential."[60] "The user does not for Google have the ability to opt out of the use of IP-derived locations."[61] [redacted]

[50] Nielson Decl. ¶¶ 36, 53, 71-72, 77, 102, 105, 123.
[51] Nielson Decl. ¶ 123.
[52] Nielson Decl. ¶ 127.
[53] Nielson Decl. ¶ 128.
[54] GOOG-GLAZ-00232189.pdf
[55] Ex. 36, GOOG-GLAZ-00251597, at 598; Ex. 17, GOOG-GLAZ-00240239; Ex. 37, GOOG-GLAZ-00241399; Ex. 38, GOOG-GLAZ-00240871, at 875; Ex. 39, GOOG-GLAZ-00240855.
[56] Trans. of Karin Hennessy May 21, 2020 EUO, at 90:4–13. I understand from Ms. Hennessy was designated to testify on behalf of Google with respect to various topics relating to Google's monetization of user data. (Trans. at 15:21-16:18. Ms. Hennessy is also a Product Manager in the Ads group. (Trans. at 20:23-21:15).
[57] Trans. of Karin Hennessy May 21, 2020 EUO, at 30:14-20.
[58] Trans. of Karin Hennessy May 21, 2020 EUO, at 103:5-7.
[59] Ex. 2, GOOG-GLAZ-00302122.
[60] Trans. of Karin Hennessy May 21, 2020 EUO, at 44:6-15.
[61] Trans. of Karin Hennessy May 21, 2020 EUO, at 103:5-7.

[redacted][62]

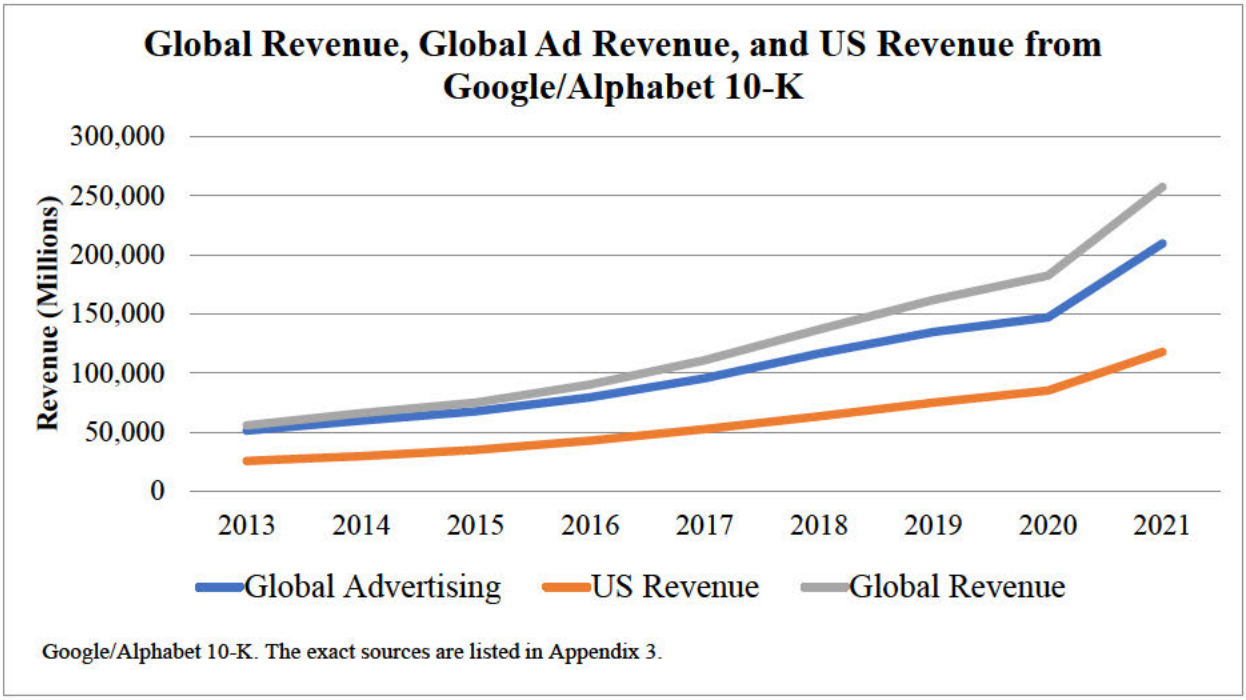
Geotargeting "is a common feature that many customers would use across all types of advertising."[63] For example, for search ads, a central system at Google called [redacted][64] "Display Ads and Video Ads "support geotargeting in the same way that Search supports geotargeting."[65] The other ads products like those for "enterprise advertise users" likewise "all support various types of geotargeting depending on the use case of that product." [66] Geotargeting is available for both instances where advertiser wants to place an ad "either on a publisher's website or on one of Google's own sites." [67]

B. Google's Financial Performance

Alphabet, a publicly traded company, has owned Google since 2016. Google has several product lines including internet search and advertising. As Google makes up a significant portion of Alphabet, and for the sake of consistency, I will not distinguish between these entities and refer to Google throughout this report. A significant portion of Google's global revenues, 81%[68] in 2021, was derived from advertising delivered to users of Google's internet services and Android phone users. Graph 1 below charts Google's global revenue, US revenue, and global ads revenue from 2013 through 2021, using data from Google's 10-Ks. Google's global revenue has more than tripled from below $60 billion in 2013 to over $250 billion in 2021.

[62] Ex. 13, GOOG-GLAZ-00166095, at 115.
[63] Trans. of Karin Hennessy May 21, 2020 EUO, at 31:5-23.
[64] Trans. of Karin Hennessy May 21, 2020 EUO, at 176:13-18, 114:13-115:4.
[65] Trans. of Karin Hennessy May 21, 2020 EUO, at 141:6-8.
[66] Trans. of Karin Hennessy May 21, 2020 EUO, at 142:3-7.
[67] Trans. of Karin Hennessy May 21, 2020 EUO, at 82:9-11.
[68] According to Google's 10-Ks, Google global total revenue in 2021 is $257.6 billion and Google's global advertising revenue is $209.5 billion.

Graph 1

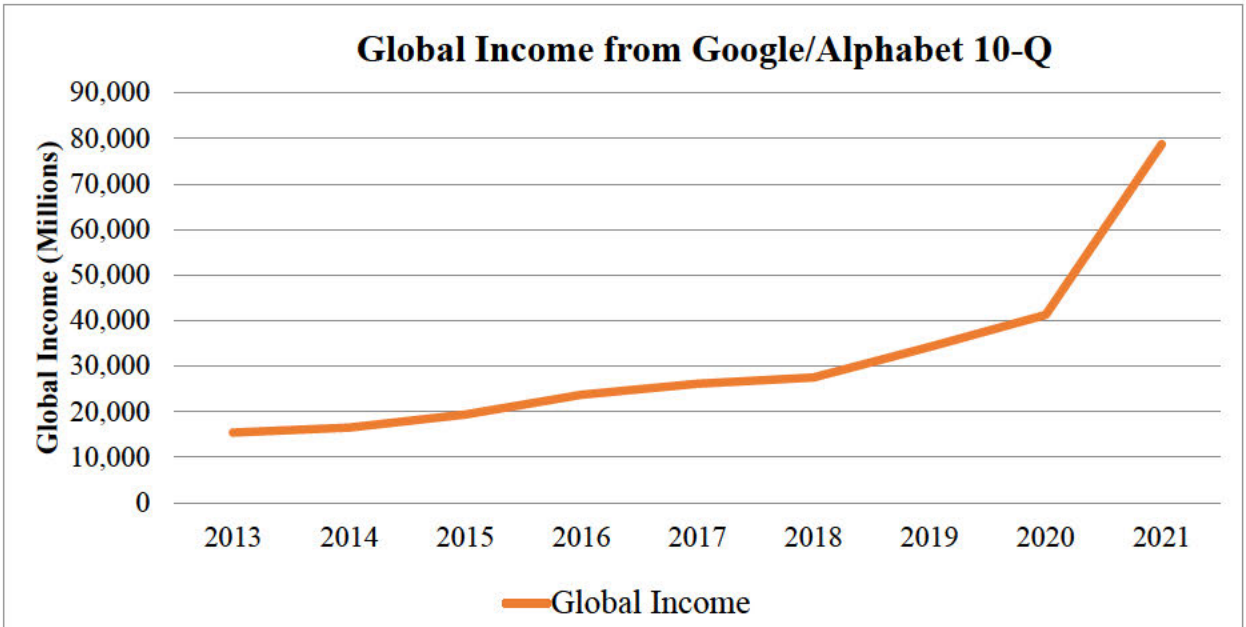


Google/Alphabet 10-K. The exact sources are listed in Appendix 3.

A major factor driving this revenue growth is the growth in Google's advertising revenue, which is the blue line in Graph 1 above. Global advertising revenue increased from about $50B in 2013 to more than $140B in 2020.

Google's profits more than quadrupled between 2013 and 2020. Graph 2 below charts Google's global operating income for 2013-2021. By 2020, Google's global operating income according to its 10-K filings was greater the $40 billion.

Graph 2



Google/Alphabet 10-K. The exact sources are listed in Appendix 3.

Per Google's August 25, 2017 response to an inquiry from the U.S. Securities & Exchange Commission inquiring about Google's Form 10-Q for the Quarterly Period Ended June 30, 2017, the nature of Google's revenue reported under the heading "Advertising" reflects "Online advertising on Google properties (such as Google.com, Gmail, YouTube and others) and on Google Network Members' properties."[69]

Another way Google looks at its advertising revenue is by display ads and search ads within the Google Network. The "Google Network" is "Google's name for the places where your ad can appear, including Google sites, web pages that partner with us, and other placements like mobile phone apps. It's as if you're presenting your message to a stadium full of fans -- Google collects a crowd of interested people and brings them to the stadium, then you start the show." [70]

According to Google's online materials, the Google Network is divided into "Search Network" and "Display Network."[71]

[69] https://www.sec.gov/Archives/edgar/data/1652044/000165204417000031/filename1.htm
[70] https://support.google.com/google-ads/answer/1721923
[71] https://support.google.com/google-ads/answer/1752334?hl=en

The "Search Network" includes "Google search results pages, other Google sites like Maps and Shopping, and search sites that partner with Google to show ads."[72] The "Google Search Network" is "a group of search-related websites. The Search Network includes Google.com, Google Maps, as well as other search sites that partner with Google to show ads, known as search partners."[73] In the "Google Search Network," ads "can appear beside, above, or below search results on Google Play, the Shopping tab, Google Images, Google Maps, and the Maps app."[74] According to the testimony of Google employee Karin Hennessey, "Search Ads as a business or as a -- as a property, you could come to understand as meaning ads that are shown to users in response to a Search query of various types. So that could be a query on Google.com. So if someone is looking for new sneakers. Or it could be a query in the context of Google Maps where they're looking to find a coffee shop near, you know, their house or in a city that they're visiting. So those would be examples of Search Ads."[75]

The "Display Network" includes "Google sites like YouTube, Blogger, and Gmail, plus thousands of partnering websites across the Internet."[76] "Display campaigns serve visually engaging ads on the Google Display Network. The Display Network helps you reach people as they browse millions of websites, apps, and Google-owned properties (such as YouTube and Gmail)."[77] "Display campaigns can reach people worldwide across 35 million websites and apps, and on Google-owned properties (YouTube and Gmail)."[78]

According to Ms. Hennessy, "display and video ads are what these sound like, which is when advertisers purchase ad space that is visuals or that we display or images or video ads. So those would be videos that are shown to users in a video context in the context of other videos users are watching." [79]

As noted above, display and video ads can be shown as part of the "Google Network" through Google-owned properties like YouTube and Gmail. But as Ms. Hennessy explained,

---

[72] https://support.google.com/google-ads/answer/1752334?hl=en
[73] https://support.google.com/google-ads/topic/3121771
[74] https://support.google.com/google-ads/answer/1722047?hl=en&ref_topic=3121771
[75] Hennessy Trans., May 21, 2020, at 140.
[76] https://support.google.com/google-ads/answer/1752334?hl=en
[77] https://support.google.com/google-ads/answer/2404190
[78] https://support..google.com/google-ads/answer/2404190
[79] Hennessy Trans., May 21, 2020, at 139.

Google display and video ads can also be shown on third-party sites like the New York Times. "So a display or video ad would appear within the context of, like, a website or an app that is in the context of content provided by that publisher. So that could be a third-party publisher like -- like a New York Times or it could be a Google property that we create content and/or manage as Google, like on Gmail for example."[80]

C. Google's Collection of Location Data

Google is the world's largest search engine[81] and its ads revenues continue to grow. Google recognizes the importance of location data for its ads business. In a document titled [redacted] Google listed at least four different benefits to its ads business from high quality location signals:[82]

[redacted]

As stated above, in the fourth bullet, [redacted]

In a September 2018 Google internal document, [redacted]

[redacted][83]

Data provided by Google in this matter shows [redacted]

[80] Hennessy Trans., May 21, 2020, at 140-41.
[81] https://gs.statcounter.com/search-engine-market-share
[82] "GOOG-GLAZ-00202413.R.pdf"
[83] GOOG-GLAZ-00248682.pdf

[redacted]

[redacted] This can be seen in the Graph 3 below, which shows the [redacted]

Graph 3

[redacted]

Similarly, as shown in Graph 4, [redacted][84]

Graph 4

Google indicated that it is looking to improve its geo-locating capabilities, as discussed in the quote above, and may only be limited by technical constraints. As confirmed by Pallavi Anderson, a Software Engineer in Google's search ads department, Google will not serve these geo-targeted advertisements unless it has location data for individuals in the targeted place.[85]

[84] Note that the Charges in GK_DOCS-#8635313-v1-Google_s Supplemental Response to Interrogatory No_ 19.PDF, Pp. 6-11 may not reflect the revenues captured by Google according to Anderson Deposition Transcript, 47: 15-20.

[85] Anderson Deposition Transcript, 14:6-18:20.

D. The Vast Majority of Google Ads use Location-Targeting

At least 95 percent of Google Ads revenue is generated through geo-located ads.[86] Google described its objective of improving location information quality by making more personalized ads in a document titled [redacted] Location targeting is one of the most basic targeting features in Ads, more than 95% of Display revenue are from Advertisers with location targeting."[87] Display Ads are the ads that appear based on the webpage the user is on. This is in contrast to search ads that are served to the user based on the search terms the user types into Google Search. Both display ads and search ads can be served based on geographic location. [redacted][88] Another internal Google document states that nearly all Ads revenue is affected by location. "User location affects experience across Google products. "99% of Ads revenue are affected by location."[89]

The large impact of location on search revenues is corroborated in another internal Google document that states, [redacted][90] The [redacted] figure is further described by Google Software Engineer, witness Pallavi Anderson, in her deposition:

> Q: How did you determine that [redacted]?
>
> A: We queried the [redacted] database which contains information about ad campaigns and only -- well, at the time that this was written, less than [redacted] of campaigns had a setting

[86] GOOG-GLAZ-00202414.R
[87] "GOOG-GLAZ-00202413.R.pdf" GOOG-GLAZ-00202414.R.pdf
[88] "GOOG-GLAZ-00284478.pdf" My understanding is that Geo is the department within Google that is in charge of determining user location for Google's various products and services. I further understand that Geo signals include the data and information Google uses to determine user location, such as GPS.
[89] "GOOG-GLAZ-00245936.pdf"
[90] "GOOG-GLAZ-00251926.pdf"

> called "all countries and territories" which means everywhere in the world. So that was how we -- if they have a particular check box or a setting for all countries and territories, in other words, they would like their ads to show globally without any sort of even country levels restrict, then they were -- that -- that was -- that accounted for less than [redacted] of search advertisers.[91]

The answer by Ms. Anderson is based on Google's [redacted] database that is a repository containing information about all of the ads that advertisers place via Google and the geolocation targeting each advertiser requests for their advertisements. As a user of Google Ads, I know that each advertiser can limit their advertisements to given geographic areas, from countries to postal code, vary advertising spend by location, alter advertisement content by location, and change the daily patterns of ads served by location. This same database available to advertisers (which contains many of the same variable listed in the F1 database) contains the amount each advertiser has spent, the average costs per impression, all by the location the ad was served, down to the smallest geolocation identifiable by Google for where the ad was served, even if the advertiser specified a broader area to serve the ad. This advertiser's database contains all of this information so that advertisers can "drill down" to the lowest level detail or aggregated up by date for all the ads each advertiser is attempting to place before users.

It is my understanding that Google maintains this data for advertisers to analyze the locations in which their ads are placed, the costs of those ads and the number of ads among other things, in part so advertisers can analyze the effectiveness of their ad campaigns over time and across regions.

A document authored by the same Google Software Engineer, Pallavi Andersen, states that "Location targeting *always* occurs."[92] So no matter what the condition or the permissions users provide on their devices Google will use the information it has captured and stored for a given device to deliver location targeted ads to that device even when location history or device location is turned off. So even if the user intends to perform a search without any device location delivered from the device, Google delivers location targeted ads to that device. There is

[91] Anderson Deposition Transcript, 23:8 - 20.
[92] GOOG-GLAZ-00314898.pdf

no way the user on that device can avoid that location targeting.[93]

C. The Impressive Value of Google's Location Data

Google performs experiments to measure the impact of changes in its location data, including the changes in volume of traffic and impact on revenues.[94] Through certain types of studies, known as "ablation" studies, Google alters the type of location information Google feeds into Google's computer systems/programs to determine the impact of the loss of that location information on revenues.[95] Google has found that "[a]ccuracy and coverage improvements for user location are indeed a critical piece of Local Ads growth story."[96]

In one such ablation study, Google blocked its location signals for search ads so that only country-level location data was fed into Googles user location identification systems for some users in the experiment.[97] In these ablation studies, [redacted][99] [redacted][100]

Google understands how impressive the impact of location information is on its revenues. Google's Senior Staff Software Engineer and Head of [redacted], Ankit Gupta, sent the results of this ablation study by email to [redacted], Google Geo Product Manager. In response to that email, Mr. [redacted], exclaimed "These are some astonishingly large numbers!" Of course they are, particularly considering that this more than [redacted] increase in yearly revenue due to location information, for search ads and display ads combined, does not stop after a single year, but rather is an ongoing flow of additional revenues derived from

[93] GOOG-GLAZ-00314898.pdf
[94] Deposition of Ingemar Erikson, Vol.2, 257:9-259:2
[95] Deposition of Pallavi Anderson, 78:21-78-25.
[96] Email from Garima Sahai, August 9, 2017, GOOG-GLAZ-00232189.pdf.
[97] GOOG-GLAZ-00232189.pdf at 00232190.
[98] GOOG-GLAZ-00232189.pdf at 00232190.
[99] GOOG-GLAZ-00232189.pdf at 00232190
[100] GOOG-GLAZ-00232189.pdf at 00232190

location data that continues into the future. Although the author of the original email cautioned against wide distribution of what he considered sensitive financial information, this impressive financial impact of location data on Google revenue eventually was circulated to more than 20 individuals in a single mass mailing.[101]

Another Google document reviewed by Ankit Gupta and Ingemar Eriksson notes that the effect of location data on ads revenue is actually higher than mentioned in his previous email because [redacted][102] As the statement by Mr. Gupta points out, Google's experiment to determine the effect of location data on Ads revenue is a conservative, underestimate.

Furthermore, in November 2017, Google's [redacted] emailed Ingemar Eriksson, copying Ankit Gupta and [redacted], that "My analysis found that [redacted] of search Ads revenue is driven by Geolocation data, which is inline with findings in your doc."[103] "My understanding from talking to Ankit is that your team believe this number is actually a little higher now because tests were performed a couple of years ago and we've had subsequent launches to improve this percentage."[104] Therefore for two years prior to November 2017, when the ablation test of location was performed the percentage of Ads revenue driven by location data had increased due to the new location related technology Google continued to develop.

This means that percentages of revenue I use in my damages calculation are lower bound estimates of the actual ads revenue attributable to Google's location tracking data, both because Google continued to improve the revenue generating benefits of location data and because the ablation tests performed did not fully remove the benefits of geolocation from the experiment, reducing the measured benefit of geolocation on Google Ads revenue.

I understand that other revenue metrics are available to Google, but have not been produced. For example, I understand that one of the practices challenged by the State in this case is Google's implementation of a strategy called "Off Means Course," which essentially means that Google still infers and logs a "coarsened" location for users even when they disable their device

[101] GOOG-GLAZ-00232189.pdf at 00232189.
[102] GOOG-GLAZ-00248685 in GOOG-GLAZ-00248682.pdf
[103] GOOG-GLAZ-00232926
[104] GOOG-GLAZ-00232926

location.[105] For example, in an email dated November 30, 2018, to Jen Fitzpatrick, the following discussions occur under the heading of "Off-Means-Off" (which appears to be a possible alternative to "Off Means Course" at the time):[106]

- [redacted]
- [redacted]

PDPO refers to the privacy and data protection office.[107] At the time, Jen Fitzpatrick was the senior vice president for the Geo group at Google, she reports directly to the CEO, and she testified that she had ultimate responsibility for Off Means Course.[108] Ms. Fitzpatrick testified that she does not know whether the revenue impact analysis was every created.[109] I have not seen it.

6) Disgorgement

A. Description of Disgorgement

I was asked to assess disgorgement as a remedy for Google's unlawful conduct alleged by the State. I understand that the applicable statute, A.R.S. § 44-1528, authorizes disgorgement of "profits, gain, gross receipts or other benefit obtained by means of" the unlawful practice. I am advised by counsel that a disgorgement calculation requires a reasonable approximation of the amounts causally connected to the violation. I have also been instructed that, in a disgorgement assessment, the amount of disgorgement should include all gains flowing from the illegal activities.

[105] Goog-Glaz-00171906.pdf
[106] Dep. Ex. 400 at GOOG-GLAZ-00315177.
[107] Fitzpatrick Dep. at 49:15-21.
[108] Fitzpatrick Dep. at 14:3-5, 14:17-20, 62:16-20].
[109] Fitzpatrick Dep. at 49:20-25].

I have been instructed that, in a disgorgement of profits analysis, profits include any form of use value, proceeds, or consequential gains that is identifiable, measurable, and not unduly remote. I am advised that the defendant may be allowed a credit for money expended in acquiring or preserving the property or in carrying on the business that is the source of the profit subject to disgorgement. By contrast, the defendant is ordinarily denied any credit for contributions in the form of services, or for expenditures incurred directly in the commission of the wrongful conduct.

As a damages expert, it is typical for me to assume the defendant's liability for the allegedly wrongful conduct. Here, I was instructed to assume that Google deceptively and unfairly collects, stores, and processes consumers' personal location data in connection with the sale and/or advertising of Android devices (including pre-loaded software and apps) and other Google apps and services violates the Arizona Consumer Fraud Act, A.R.S. § 44-1522. For example, I understand the State alleges that each time a consumer uses a Google service, like Search or Maps, there is a "sale" (*i.e.*, an exchange of data as consideration for receiving the service). Google allegedly misleads users into believing that it will only collect and use tracking information data in certain ways and that users have control over what information is collected. The State alleges that Google deceptively and unfairly takes location information from consumers and monetizes that information by selling targeted advertising.

As explained above and from my review of Dr. Seth Nielson's Declaration, I understand the State alleges that Google deceptively collects, stores and exploits consumers' location information for its geo-targeted advertising services. I briefly discuss my understanding as to how the deceptively collected user location is used by Google in its ad business. Next, to support my reasonable approximation for disgorgement, I start my disgorgement calculations by appropriating the total revenue from advertising by Google in Arizona for 2013-2021. Google provided high-level calculations of revenue and operating income figures for 2018-2021 but not for the earlier years.[110] To estimate advertising revenue and operating income for Arizona for 2013-2017, I applied the same method used by Google, as it described in the footnotes to

[110] "2021-07-12 Google_s Responses to 30(b)(6) Questions.pdf", "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics.pdf" and "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information.pdf"

Google's July 26, 2021 written response to Question 26, and discussed in detail below, to estimate values for earlier periods. Next, since Google has stated that it does not separately track geo-targeted ad revenues and it has not otherwise provided a basis to do so, I have provided a reasonable estimate as to the amount of revenue (or gross receipts) that is geo-targeted. I did so based on my review of the record that discusses the percentage of Google Ads that are geotargeted multiplied by the advertising revenue of Google for Arizona. As stated above, Google's internal documents indicate that nearly all of Google's advertisements have a geotargeting component. Additionally, Ms. Anderson testified that Google could not serve those advertisements without personal location data Google collected from its users. As such, although Google documents referenced above state that all or 99% of advertisements include a geo-targeting component, I have conservatively calculated the percentage of Google's ad revenue obtained in connection with the geotargeted advertisements to be 95% of Google's advertising income from serving advertisements in Arizona. This represents the gross receipts that flow to Google from serving these ads through its alleged unlawful collection of personal location data.

I am advised that it is Google's burden to specify and substantiate what, if any, apportionment is appropriate for the revenues that are geotargeted. Google has not provided any information about this, nor has it produced any approach for apportionment.

That said, I calculate an apportionment by considering information and calculations produced internally at Google as to the amount of advertising revenue that is specifically driven by geo-targeting. Based on the available information, I applied a multiple of [redacted] of Google's advertising revenue in Arizona as this number represents the increase in Google revenues due to location information in Google's ablation study discussed above.[111] This is the weighted average of the [redacted] and [redacted] increases in revenues due to location data for search ($70 Billion) and display ads ($15 Billion), respectively. Because the ablation studies are based on revenue as a function of all revenue (as opposed to a function of geo-targeted revenue), I apply this percentage to the total ad revenue as opposed to the total geo-targeted ad revenue.

[111] [redacted] The resulting weighted average percentage is slightly larger and has been rounded down to [redacted]

In other words, the [redacted] and [redacted] figures in the ablation study would already exclude non-geotargeted revenue, so it should not be excluded twice.

B. Identifying Revenue That Is Causally Connected

For my disgorgement calculations, I first set out to determine Google's revenue in Arizona that makes use of the consumer location information collected through the unlawful practices alleged by the State. From an economic analysis, extensive evidence confirms that Google uses the location information collected from consumers to power its ads business. I then considered whether or how that revenue should be apportioned to take into account other metrics, although I understand Google has not offered documents or written responses to support some sort of apportionment. I note that the statute authorizes disgorgement of "profits, gain, gross receipts or other benefit obtained by means of" the unlawful practice. Therefore, I provide calculations for both the revenues (or "gross receipts") and profits.

Google earns its advertising revenue by means of its collection, storage, and use of location data that it uses to serve geo-targeted advertisements. Google proclaims in its 10-K, "[w]e have built world-class advertising technologies for advertisers, agencies, and publishers to power their digital marketing businesses. Our advertising solutions help millions of companies grow their businesses through our wide range of products across devices and formats, and we aim to ensure positive user experiences by serving the right ads at the right time. . .Google Services generates revenue by delivering both performance and brand advertising that appears on Google Search & other properties, YouTube and Google Network partners' properties ('Google Network properties')."[112] These advertising services are a suite of tools and products called "advertising solutions" which advertisers can use to place their ads using Google's advertising solutions either on a third-party publisher's website (like the New York Times) or on Google's own websites (like Gmail). "[113] Advertisers can also request Google target consumers based on the consumers' location.[114] Google enables advertisers to "select geographies that they want to show their ads within" and enables them to geo-target an area as granular as "a small

[112] Google's 2021 10-K.
[113] May 21, 2020 Examination Under Oath of Karin Hennessey, at 25:7-23, 239:5-141:2.
[114] May 21, 2020 Examination Under Oath of Karin Hennessey, at 141:3-11.

radius around your business" or as large as "cities, states, or entire countries."[115]

The ability to geo-target is a "critical dimension" for advertisers.[116] Google ensures an ad is served to users in the relevant geographic area "based off of the user's location at the time that an ad request comes into the system."[117] Google even admits that "[g]eography is a necessary and important component of advertising for advertisers, ad sellers, and users. . . . While Google allows businesses who use its services to limit the geographic scope of their marketing, this use is subject to substantial privacy restrictions."[118] Advertisers can even use location data collected from Location History to "measure how often an online ad campaign helps drive traffic to physical stores or properties."[119]

In fact, Google makes money from its advertising services via a revenue share model: each time a user clicks on an ad, the advertiser pays some amount; Google "take[s] part of the transaction value when [it's] able to provide or sell ad space on behalf of a publisher and match those publishers with ads from advertisers on [its] platform."[120] The same is true when ads are shown on Google's own properties: "Google serves ads from advertisers and receives a share of the transaction when a user clicks an ad from a Google Search result."[121] But in the latter case, Google "receives the full value of the cost per click."[122]

I understand that Google collects user location data by several methods that it uses to serve these geo-targeted ads in a variety of ways. For example, Google uses user location information collected when Location History and Web & App Activity are enabled to provide advertising services to signed-in users.[123] Teams within Google access the location data stored by WAA in these repositories for various purposes. For example, a team called "Suggestions" uses the location saved by WAA to "power[] the suggestions that you see[] to a Web and App

[115] May 21, 2020 Examination Under Oath of Karin Hennessy, at 40:18-41:25, Ex. 122, at 1.
[116] May 21, 2020 Examination Under Oath of Karin Hennessey, at 90:4–9.
[117] May 21, 2020 Examination Under Oath of Karin Hennessey, at 44:17–45:2.
[118] Google LLC's Response to Plaintiff's Statement of Facts, at ¶ 8.
[119] Google LLC's Response to Plaintiff's Statement of Facts, at ¶ 33.
[120] May 21, 2020 Examination Under Oath of Karin Hennessey, at 36:10-37:1, 38:18-39:8.
[121] May 21, 2020 Examination Under Oath of Karin Hennessey, at 37:3-14.
[122] May 21, 2020 Examination Under Oath of Karin Hennessey, at 39:10-21.
[123] Google's Responses to Civil Investigative Demands 1–3, at 13.

Activity scoped search query."[124]

I have been informed that much of Google's collection of location data occurs through the Android operating system, which other manufacturers, such as Samsung and LG use for their smartphones and other devices.[125] Google tries to increase the "location attach rate," which is the "percent of devices that have the device location setting on," on Android devices as turning location on and off impacts the ability for Google and third-party developers to monetize usage, especially through advertising.[126]

By means of this collection, Google profits from serving geotargeted advertisements on its users. As explained in a document contextualizing Google's collection of location data, Google explains that: "We're (Google) providing free services to users through services that use their location, such as Search. We have a well-known (though often misunderstood) business model. Users know to expect targeted advertising on the basis of what we understand about users who use our services. It is relatively unlikely that users would be surprised to hear that Google derives some benefit from offering services to users – the question is how much."[127] Google's Vice President of Product for YouTube Ads, Jack Menzel, testified in an examination under oath taken during the State's investigation that Google's products, such as Search and Maps are only "free" because Google is able to display ads to users of these products.[128]

In fact, Google has diagramed this relationship, noting that it receives benefit by means of user contribution, such as location[129]:

[124] 7/12/2019 Examination Under Oath of David Monsees, at 98:19-100:9. Also, Google's Responses to Civil Investigative Demands 1-3, at 72-73.
[125] GOOG-GLAZ-00026768, at 783–786
[126] September 25, 2019 Examination Under Oath of Jennifer Chai, at 199:4-201:14.
[127] GOOG-GLAZ-00241698, at 700.
[128] March 6, 2020 Examination under Oath of Jack Menzel, at 141:18-24, 368:17-369:17.
[129] GOOG-GLAZ-00235728, at 734.

As explained above, I understand that the State alleges Google has engaged in deceptively and unfairly collecting consumers' location data in connection with the sale and advertising of Android devices, and Google apps, Accounts and Services. Google has not provided any information or data that would allow me to separate out advertising revenue associated with Android devices as opposed to advertising services associated with its Google apps and services (including the Android service) more globally. As a result, my analysis is based on the geotargeted revenue for the latter, which I understand includes the former.

C. Arizona Ad Revenues

i. Arizona Ad Revenues for 2018-2021

Google produced yearly, aggregate advertising revenue and operating income for 2018 through the first quarter of 2021 from Google's July 26, 2021 written response to Question 26, which I use as an input into disgorgement damages.[130] These figures produced by Google are presented in Figure 7.1 below.

[130] Answer to Question 26 "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics.pdf"

Figure 7.1 from Google Response to Q. 26 7-27-2021

Source: Answer to Question 26 "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics.pdf" See original Google document for footnotes within this Google table.

Google says, in Footnote 3 of the table above, that

> "Arizona figures were estimated using Census data, which provides that 86.2% of Arizona households have broadband Internet subscriptions as of 2018, the most recent available figure. Google then multiplied 86.2% by the Arizona population as provided in Census data for 2019 and 2020 to estimate the number of Arizona residents who have broadband Internet. Google then used the same methodology to estimate the number of U.S. residents who have broadband Internet. Google then calculated the ratio of the Arizona number to the U.S. number. Google applied this ratio to its estimated U.S. operating results to derive the estimated Arizona Revenue and Operating income (sic) listed above for the period ranging from FY18 - Q1'FY21."

These are the figures that Google provided to fulfill the State's request for Operating Income and Revenues for Arizona. I understand that the State asked for this data going back to 2013, however, Google did not provide that information.

Google says that the figures for 2018 needed an additional adjustment because Arizona Revenues and Operating Incomes are "only calculable for a rolling 36 month period."[131] Footnote 6 of that same table also states that Google was able to estimate Arizona operating

[131] Answer to Question 26 "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics.pdf"

income and Arizona revenue for 2018 based on Google's method as follows:

> As noted in FN1, 2018 full-year operating results were not calculable. Accordingly, 2018 figures were estimated by calculating the percentage of global revenue and operating profit represented by the Arizona estimated revenue and operating profit from Jan 1, 2019 through March 31, 2021 in the table above. Google then applied that percentage to 2018 global revenue and operating profit numbers to estimate 2018 Arizona revenue and operating profits.[132]

As Google states in the quote above, Google calculated Arizona Ads revenue for 2018 based on the ratio of Arizona Ads revenue to Global Ads revenue in later years and applied that ratio to the Global Ads revenue observed in earlier years to get the Arizona Ads revenue for the earlier period. Google used the same type of ratio calculation to calculate Arizona Ads operating income when it was missing during an earlier period, 2018.[133]

ii. Arizona Ad Revenues for 2013-2017

I understand the State requested Google's revenue and profits going back earlier than 2018 as discussed above. I further understand Google responded that this information is not available in the "ordinary course of business." Nonetheless, I was able to extrapolate revenue numbers for earlier years using the information Google provided and following the method laid out by Google in its own estimates of revenue and operating income, but applying the ratio of US Revenue to Global Revenue from 10-Ks to the Global Ads Revenue to obtain US ads revenue.

I also extrapolated the numbers for what Google calls Arizona Ads operating income for the same period. To perform these calculations, I used the same calculations provided by Google in the footnotes to Google's July 26, 2021 written response to Question 26, described in the previous section to extrapolate from US figures to Arizona figures.. I perform three steps to estimate annual Google Ads revenue in Arizona back to 2014. The result is presented in Table 7.1.

[132] Answer to Question 26 "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics.pdf"
[133] Answer to Question 26 "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics.pdf"

Notes and Sources:
[A] Year calculations performed
[B] Revenue from Ads - Global Internal Management View: Question 26 of "2021-07-12 Google_s Responses to 30(b)(6) Questions pdf" and for 2021 "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information pdf"
[C] US Revenue/Global Revenue, both from Alphabet/Google 10-K Documents
[D] Calculation = [B] x [C]
[E] Ratio of (US Population x US Broadband Penetration) / (AZ Population x AZ Broadband Penetration)
[F] Calculation = [D]/[E]
[G] Annual Arizona Revenue reported in Question 26 of "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics pdf" "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information pdf"
[H] Calculation = ([F] - [G])/[G]

1) As indicated in footnote 2 of the answer to Question 26 on July 26, 2021, the "Estimated portion of global ads revenue and operating profits generated by ads served to Arizona users is based on the same product set as that in Google's July 12 written response to Question 26." Column [B] of Table 7.1 provides these numbers for 2014 through 2020 obtained from the column titled "Ads - Global Internal Management View" of Google's July 12 written response to Question 26.
2) I obtain Global advertising revenues and estimate US advertising revenues by multiplying Column [B] by the ratio of US Google's US Revenue to Global Revenue as reported in Google's 10-K reports, Column [C]. This calculation of Google's US ad revenues is listed in Column [D].
3) I calculate the ratio of US Ads revenue to Arizona Ads revenue again based on footnote 3 of Google's July 26 written response to Question 26 which states "Arizona figures were estimated using Census data, which provides that 86.2% of Arizona households have broadband Internet subscriptions as of 2018, the most recent available figure. Google then multiplied 86.2% by the Arizona population as provided in Census data for 2019 and 2020 to estimate the number of Arizona residents who have broadband Internet. Google also used the same methodology to

estimate the number of U.S. residents who have broadband Internet. Google then calculated the ratio of the Arizona number to the U.S. number. Google applied this ratio to its estimated U.S. operating results to derive the estimated Arizona Revenue and Operating Income…"[134]

1) I perform the same calculation based on the Census data, which are updated each year, for years prior to 2018. These results are presented in Column [E] of Table 7.1. I divide estimated US ad revenue from column [D] by Google's population broadband ratio to estimate Arizona ad revenue. These values can be found in Column [F].

Table 7.1 compares my estimate of Arizona Ads revenue to the Arizona Ads revenue provided by Google in Google's July 26 written response to Question 26. These numbers from the responses to Google's July 26 written response to Question 26 numbers are presented in Column [G] of Table 7.1. The numbers are within 3.5% for the four complete years (2018-2021) for which Google provided data (Column [H]). In my opinion, this corroborates the reasonableness of my methodology.

Google's July 12 written response to Question 26 provides two different sets of global revenue and operating income numbers, titled "Ads - Global Internal Management View" and "Reported Global Segment Results." For the calculations in this report, I use the values reported in "Ads - Global Internal Management View" as these match global ad revenues reported in Google's 10-K more closely. Column [B] of Table 7.2 presents the global ad revenues from Google's 10-K, while Column [C] reports global ad revenues from "Ads - Global Internal Management View" in Google's July 12 written response to Question 26 while Column [E] presents revenues from "Reported Global Segment Result." Columns [D] and [F] calculate percent differences between the global ad revenue reported in Google's 10-K and the two measures of global ad revenue found in Google's July 12 written response to Question 26. Column [D] shows that the percent difference between "Ads - Global Internal Management View" revenue and global ad revenue from Google 10-K is at most 2.9%.

[134] Answer to Question 26 "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics.pdf"

Notes and Sources:
[A] Year calculations performed.
[B] Global Ad Revenue for Alphabet/Google 10-K.
[C] Revenue from Ads - Global Internal Management View: Question 26 of "2021-07-12 Google_s Responses to 30(b)(6) Questions.pdf" and "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information.pdf"
[D] Calculation = ([C]-[B])/[B].
[E] Revenue from Reported Global Segment Results: Question 26 of "2021-07-12 Google_s Responses to 30(b)(6) Questions.pdf" and "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information.pdf"
[F] Calculation = ([E]-[B])/[B].

The percent difference between "Reported Global Segment Results" and global ad revenue from Google 10-K is between 8.7% and 15.7%. Because of better matching when paired with the "Global Internal Management View" than with the "Reported Global Segment Results," I use "Global Internal Management View" revenue as the basis of my calculations.

The Arizona Ads revenue calculations presented above produce estimates of revenue from 2014 onward but I was also asked to consider monetary remedies for part of 2013. I am advised that, while Google's unlawful behavior dates back even earlier, the Arizona Consumer Fraud Act in its current form dates back to the end of September 2013. Therefore, I was asked to focus my analysis starting with the fourth quarter of 2013.

Google did not provide global ad revenue for 2013 in Google's July 12, 2021 written response to Question 26, so to calculate revenue for 2013 I divided revenue for 2014 by one plus the largest annual percentage increase in revenue observed between 2014 and 2020. This calculation uses the largest yearly increase in revenue between 2014 and 2020 to obtain the reduction in revenue from 2014 to 2013, providing a conservative, low, estimate of 2013 revenue, reducing damages as compared to using a lower annual percentage increase to calculate the revenue for the earlier year.

D. Arizona Ads Operating Income

As with Arizona Ads Revenue, Google provided yearly aggregated data for Arizona Ads Operating Income for the years 2018 -2021. Google's table is presented in Figure 7.1 on page 32 above. Google did not provide any breakdown for how it calculated "Operating Income," much less the numbers or raw data for assessing or validating that information. As with the revenues, Google uses an extrapolation method to produce the operating income, describe above for revenues.

i. Arizona Ad Operating Income for 2018-2021

I am advised that the applicable statute authorizes disgorgement of "gross receipts" as well as "profits." In any event, I have been instructed that, to the extent "profits" are used as a measure for disgorgement, it is the burden of the defendant to identify and substantiate costs that need to be subtracted from the revenue numbers. Here, as I explained above, Google has not explained or substantiated what costs should be subtracted or why. Instead Google has provided operating profits, which apparently subtract from revenues both costs which vary with the volume of revenue (variable costs) and costs which do not vary with the volume of revenues (fixed costs). Subtracting out allocated fixed costs from the revenues obtained through the location tracking alleged by the State underestimates the profits Google made through the acquisition of those revenues because it subtracts cost that were not incurred as those revenues were captured. It may also be subtracting the costs of the unlawful acts themselves, as well as legal and other costs incurred in defending this and other investigation. In limited cases, Google has provided high level conclusions from its lawyers stating what Google contends to be the "operating profit," but Google has not produced either the data or the documents to substantiate or even explain those numbers. As Google has not provided cost information about Arizona's revenue, I have presented above the revenue (or "gross receipts") for discouragement.

Even so, I have performed calculations to determine net operating profit using the high-level numbers Google provided in its written responses. Given the fixed costs which are apportioned to operating income, the operating income provide by Google result in underestimates of additional profit Google obtained from the acts alleged by the State.

ii. Arizona Ad Operating Income from 2013-2017.

Subject to the statements above, I perform a similar calculation to determine operating income from advertising for Arizona, again based on the method that Google used to apportion US Ads Operating Income to Arizona Operating Income.

Table 7.3 presents the results of the analysis.

Notes and Sources:
[A] Year calculations performed
[B] Operating Income from Ads - Global Internal Management View: Question 26 of "2021-07-12 Google_s Responses to 30(b)(6) Questions pdf" and for 2021 "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information pdf"
[C] US Revenue/Global Revenue, both from Alphabet/Google 10-K Documents
[D] Calculation = [B] x [C]
[E] Ratio of (US Population x US Broadband Penetration) / (AZ Population x AZ Broadband Penetration)
[F] Calculation = [D]/[E]
[G] Annual Arizona Operating Income reported in Question 26 of "2021-07-26 [AEO] Google's Written Responses to 30(b)(6) Topics pdf" and for 2021 "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information pdf"
[H] Calculation = ([F] - [G])/[G]

Column [F] reports the calculated Arizona operating income while Column [G] reports the values from Google's July 26 written response to Question 26. The differences between these two calculations are within [redacted] for the 2018-2020 time period for which Google provided full year figures. As with the revenue calculations, Google's July 12 written response to Question 26 did not provide global operating income for 2013. To calculate operating income for 2013, I divided operating income for 2014 by one plus the largest annual percentage increase in operating income during the 2014-2020 time period, which for the same reasons described above provides a conservative, lower estimate of 2013 Operating Income.

E. Disgorgement – Calculating Geo-targeted Revenue.

I calculate disgorgement of gross receipts based on Arizona ad revenue from Google's use of location data and the State's claim that each time Google collected location data from

Arizona users and served geotargeted ads on those users, Google violated the Arizona Consumer Fraud Act.

i. Disgorgement – Geotargeted Ad Revenue.

Based on Google's internal documents and the testimony of Google witness Pallavi Anderson, discussed above, I calculated Google's operating income earned from geotargeted advertisements as 95% of its operating income earned from ad revenue. To perform these calculations, I use the operating income provided by Google in Google's July 26 written response to Question 26 for 2018-2021, and the estimated operating income that I described above for the years from 2013 to 2017. I present disgorgement calculations for revenue in Tables 7.4.

Notes and Sources:
[A] Year calculations performed.
[B] Arizona Ad Revenue: Google provided for 2018-2021 and calculated 2013-2017.
[C] Calculation = [B] x 95%.
[D] Calculation = [B] x [redacted].

ii. Disgorgement –Ad Revenue That Is Driven by Geotargeting.

An alternative calculation is based the amount of revenue that Google says is driven by

location data. As discussed above, Google's Senior Staff Software Engineer and Head of [redacted], Ankit Gupta, provided a summary of an experiment performed by Google to determine the amount of Ads revenue driven by location data. The email states that [redacted] of search ads revenue and [redacted] of display ads revenue is driven by location.[135,136] As I discussed above, additional emails by Google show that this estimate is a lower bound because [redacted][137] Furthermore, additional enhancements to location data collection had occurred over the "couple of years" since the ablation study had been done and late 2017, which Google believed would [redacted].[138] I use the figures from Google's experiment, measuring the effect of location data on revenue in my disgorgement calculation of revenues and operating income caused by location data Google collects. As describe above this is [redacted] of Ads Revenue.

F. Disgorgement – Operating Income.

Analogous to the calculations for revenue in Table 7.4, Table 7.5 uses the calculation of operating income (Table 7.3) and apportions the damages 1) based disgorgement of Google Ads operating income captured in connection with the use of location data (95%) and 2) as Google Ads operating income that was driven by the use of location data at Google [redacted]) on the same methods used in Table 7.4. Table 7.5 provides damages calculations based on Operating income.

[135] GOOG-GLAZ-00232189.pdf (at 190)
[136] The [redacted] figure is further supported by GOOG-GLAZ-00245673 and GOOG-GLAZ-00178599. Again supported by GOOG-GLAZ-00237367 and GOOG-GLAZ-00207600.R at 640.R. Later estimates by Google indicate that approximately [redacted] for search ad revenue derived from geo-location data (GOOG-GLAZ-00232926). Another document indicates [redacted] of search ads revenue (GOOG-GLAZ-00248682, at 684) is derived from location.
[137] GOOG-GLAZ-00248685.pdf
[138] GOOG-GLAZ-00232926.pdf

Notes and Sources:
[A] Year calculations performed.
[B] Arizona Ad Operating Income: Google provided for 2018-2021 and calculated 2013-2017.
[C] Calculation = [B] x 95%.
[D] Calculation = [B] x [redacted]

G. Additional Disgorgement Calculations.

I have tried to evaluate whatever financial data has been made available. As discussed above, these materials are fairly limited. In Google's response to the State's Civil Investigative Demands 19 and 20, Google provided estimates for the revenue from Android devices and iOS devices from advertisements served on Google.com.[139] These Civil Investigative Demands requested that Google produce documents sufficient to show the revenue Google received from the use by consumers of Android and consumers of Google Accounts and Google-authored apps or Google websites on iOS mobile devices in Arizona. Google stated that because it "has not identified documents maintained in the ordinary course of business that reflect revenue on a state level," in order to satisfy the request, "Google has made an effort to estimate revenue for Arizona relating to mobile devices using Android OS [and iOS] by using nationwide data for Search Ads shown on Google.com for the period of January 1, 2014 – June 30, 2019." Google

[139] Google's February 2, 2020 responses to State's Civil Investigative Demands 1-3, at 51-54.

estimated that revenue was [redacted] When asked to clarify these responses, Google provided a breakdown of these numbers by year and further clarified that "'Search ads shown on Google.com' are ads that appear on the Google Search Results page on Google.com."

Using this information, I have applied the same methodology applied to Google's national ad revenue discussed above to these results for an alternative analysis of disgorgement. This calculation, however, does not represent the State's entire claim. I understand that the State's allegations include all geo-targeted ads, including all geo-targeted Search, Display and other ads, and not limited to displays on Google properties. The revenues stated here by Google represent a very small subset. For example, I understand these numbers exclude most of the geo-targeted Search Ad revenues, excludes all geo-targeted Display and Video Ad revenue, excludes all geo-targeted YouTube Ads, excludes all geo-targeted ads on Network members properties, and excludes all geo-targeted ads beyond Android and iOS devices. Further, Google only provided data from 2014 to 2019. This does not capture the entire time period for disgorgement as Google has not supplemented this data beyond 2019 and did not provide data earlier than 2013. These advertisements are subject to the State's disgorgement claims as well.

Still I provide these calculations as exemplary for a limited product segment in Tables 7.6 and 7.7. Table 7.6 provides the revenue of Android OS, iOS, and total revenue from search ads.

[redacted]

Notes and Sources:
[A] Year calculations performed.
[B] Revenue for Arizona relating to mobile devices using Android OS by using nationwide data for Search Ads "2020-02-21 Responses of Google LLC to CIDs 1-3 (Ex 202).pdf" p. 52
[C] Revenue for Arizona relating to mobile devices using iOS by using nationwide data for Search Ads "2020-02-21 Responses of Google LLC to CIDs 1-3 (Ex 202).pdf" p. 54
[D] Calculation = [B] + [C]
[*] Data for 2019 only available for the first half of the year.

To calculate disgorgement for these search ad revenues, I multiply the values in Table 7.6 by 95% and by [redacted] to calculate disgorgement (I use [redacted] rather than [redacted] because these revenues in Table 7.6 are only for search ads). The results are then presented in Table 7.7.

[redacted]

Notes and Sources:
[A] Year calculations performed
[B] Column [B] of Table 7 6 x 95% / 1,000,000
[C] Column [C] of Table 7 6 x 95% / 1,000,000
[D] Column [D] of Table 7 6 x 95% / 1,000,000
[E] Column [B] of Table 7 6 x [redacted]
[F] Column [C] of Table 7 6 x [redacted]
[G] Column [D] of Table 7 6 x [redacted]

H. Disgorgement Conclusions and Further Analysis.

In my disgorgement analysis, I present figures using 95% and [redacted] of Google's advertising revenue. Both represent correct assessments. The larger figure apportions advertising that has a geotargeting component. The smaller figure represents the advertising figure Google's engineers reached when ablating location signals. Google, however, does not show how or why its advertising customers would spend any revenue on ads if Google had no ability to offer geotargeting. To the contrary, as discussed above, Ms. Hennessy explains that geotargeting as a critical element for Google's advertising services. This is further evidenced by the fact that (more than) 95% of Google's advertising revenue includes some geotargeting component (as discussed above).

The lower figure [redacted] does not account for the fact that, without the location signals, it is not clear to what extent Google would attract the same end-user customer base that attracts advertisers. I have reviewed the principles outlined in the November 16, 2021 Declaration of Pablo Camacho, PhD, who explains that "Google operates a two-sided platform, connecting searches and advertisers. If the sale of ads to advertisers by Google is to be assessed, such assessment requires the inclusion of the delivery of Google online products to users, because the latter activity provides key inputs for the provision of the first."[140] Google's Chief Economist Hal Varian similarly explained at his deposition that "merchants go where the users are, the users go where the merchants are. Google is making the introduction between those parties. So it involves some aspects of being a two-sided or multisided platform."[141]

The unlawfully collected user location data is not just an input for advertisers, but it is also used by Google to create and improve the consumer-facing services themselves, which in turn are ultimately used to generate advertising revenue for the company. For example, Dr. Nielson explains that an internal Google service (called [redacted]) aggregates and combines various signals to determine a user's current location. [redacted]

[140] November 16, 2022 Declaration of Pablo Camacho, at ¶8.
[141] Deposition of Hal Varian, 77.

[redacted][142] He explains that users cannot do anything to prevent this.[143] Besides Google's Search and Ads products, Dr. Nielson explains that "the locations estimated by [redacted] is used by 250+ clients at Google."[144] He explained that [redacted] is 'marketed' within Google as the service to use if the app should change behavior based on location."[145] Dr. Nielson also explains the Google's Android operating system enables Google apps to obtain a user's location "even when a user denies those apps permission."[146] He also explains that "nearly all transactions with Google products and services become an opportunity for Google to collect and exploit the user's location information—even if the user has disabled the location related settings."[147] He explains that Google has internal services called IPGeo and [redacted] that lets Google use IP address data to locate users in a much more accurate way than is otherwise available to the public.[148] He explains that through these internal services, Google can "use location information provided by users who report it to determine the location of nearby users who have not reported their location," and he explains that user cannot "opt out."[149] He explains that Google can use additional information from users who are on the Android operating system,[150] but Google also collects, stores and exploits "location information from iOS users or users on any platforms, so long as the users are interacting with Google's services.[151] In other words, the user location data here is both "critical" to Google's competitive position in marketplace and to Google's ability to offer the services to users, who in turn attract the advertisers.

I also note that, based on the State's allegations and the declaration of Dr. Nielson, the scope of unlawful activities relates to Google's collection, storage and exploitation of users' location information. Also, as noted above, Google aggregates the various signals through its central service, which then transmits them to 250+ internal Google clients.

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[142] Declaration of Seth Nielson, at ¶¶ 123-126
[143] Declaration of Seth Nielson, at ¶ 126.
[144] Declaration of Seth Nielson, at ¶ 128.
[145] Declaration of Seth Nielson, at ¶ 129.
[146] Declaration of Seth Nielson, at ¶ 132.
[147] Declaration of Seth Nielson, at ¶ 34.
[148] Declaration of Seth Nielson, at ¶ 33.
[149] Declaration of Seth Nielson, at ¶¶ 109, 111.
[150] Declaration of Seth Nielson, at ¶¶ 38-53.
[151] Declaration of Seth Nielson, at ¶ 114.

Further, Google's internal documents confirm that success on the user-facing platforms is measured by the ability to increase ad revenue. As discussed above, I understand consumers provide their location data through the Android operating system (and other channels). Those technical teams are, in turn, evaluated in their ability to drive advertising revenue through the user location features. For example, an October 25, 2016 hiring document entitled "Jen Chai: Getting Started Guide," welcomes the engineer to the "Android Developer PM team, leading our Location area."[152] The "welcome" explains that "Location is a critical area of Android that has broad impact: on Android users & developers, on core Google mobile experiences like maps and search, on Google's ad business and innovative advertising products, and our third-party apps ecosystem." [153] The "welcome" document emphasizes, however, under Item #1, that [redacted][154] The document continues that this was a top priority because Google could "**monetize usage (especially through advertising).**" [155] It goes on to say that, "Android had offered a quick settings pane which made it easy for users to toggle location on and off. [redacted][156] Ms. Chai's "main focus initially" [redacted][157] According to Ms. Chai, the "location attach rate is the percent of devices that have the device location setting on."[158]

Google's Vice President of Product for YoutubeAds, Jack Menzel, testified that Google's products, such as Search and Maps, are only "free" (of monetary charge) because Google is able to display ads to users of these products.[159] Google's internal documents confirm the same point: "Essentially, we use data to make our products and services better and more relevant for you. This includes ads because ads are what enable us to make our services like

[152] GOOG-GLAZ-00026480.
[153] GOOG-GLAZ-00026480.
[154] GOOG-GLAZ-00026480 at 481.
[155] GOOG-GLAZ-00026480 at 481–482.
[156] GOOG-GLAZ-00026480 at 482.
[157] GOOG-GLAZ-00026480 at 482.
[158] EUO of Jennifer Chai, 198.
[159] Deposition of Jack Menzel, 141 (describing title at Google), 368–369 (describing Google's business model).

Search, Gmail and Maps available for free for everyone."[160] The use of consumers' data for geotargeting is implemented across Google's advertising business. Within the "Google Advertising" business, geotargeting is used for both "Google Properties" and "Google Network Members' properties." In other words, geotargeting is a feature that is available where advertisers want to place an ad "either on a publisher's website or on one of Google's own sites."[161] As discussed above, geotargeting is critical for both Search Ads, Display and Video Ads and all other ads across all platforms at Google.

Assuming (as alleged) that Google deceptively collects user location data through the sales of services, apps and Android phones to consumers, Google's geo-targeted advertising revenue are the gain flowing from Google's unlawful conduct, or the revenues obtained by Google by means of the unlawful practice. Based on the allegations described above, including the scope of the alleged unlawful actions and its collection into a single service that provides location, all of Google's geo-targeted advertising would be casually connected to its deceptive and unfair collection of user location data.

Further, it is my opinion that 95% of advertising revenue is a reasonable approximation of Google's geotargeted advertising revenue. Although I understand that it is not the State's burden to allocate that, I have also provisionally used an alternative, but understated, calculation that multiplies total advertising revenues by [redacted] for the reasons explained above. Further, in each case, I have also provided similar calculations using Google's stated operating profit, and although (again) I understand that it is Google's burden to substantiate those operating profits, it has not done so or provided me with any data to evaluate it. Therefore, I reserve the right to propose the gross receipts number to the jury as well.

7) Civil penalties

I was also asked to opine on civil penalties arising from the violation of the Arizona Consumer Fraud Act.[162] As noted above, the State alleges that Google deceptively and unfairly

[160] GOOG-GLAZ-00258813, at 820.
[161] Hennessy Trans. May 11, 2020, at 29.
[162] It is my understanding that the State seeks civil penalties pursuant to A.R.S. § 44-1531(A), which provides "that any person has willfully violated section 44-1522, the attorney general upon petition to the court may recover from the person on behalf of the state a civil penalty of not more than ten

collects user location information in connection with the sale and/or advertising of (1) Android devices (including pre-loaded apps and software) and (2) sales of various Google's apps and services, in exchange for users' data—amounts to an unlawful practice under A.R.S. § 44-1522. It is my understanding that civil penalties are legally available if Google's conduct amounts to a willful violation of the Arizona Consumer Fraud Act, and for purposes of this analysis I assume that it does.

Civil penalties under the Arizona Consumer Fraud Act, A.R.S. § 44-1531, can amount to up to ten thousand dollars per violation. I have been instructed that the amount of civil penalties per violation, as well as the number of violation, is something that will be determined by the trier of fact.

I provide some expert information and calculations to assist the jury in assessing and calculating civil penalties in the event that the jury concludes Google's conduct amounted to willful violations the Arizona Consumer Fraud act. The first step of the inquiry would be for the jury to determine the number of violations. The second step for the jury is to identify the amount of civil penalties that should be imposed, which I understand can be up to $10,000 per violation. Then, the jury would multiply these values to arrive at an overall amount of civil penalties.

A. Assessing the Number of Violations

I understand the State alleges a few different theories to explain how many different "violations" there have been by Google. The State also alleges that Google has acted willfully.

One theory looks at the number of Android users in Arizona. A second theory looks to the number of Google-licensed Android devices sold in Arizona. A third theory is based on the number of ad impressions delivered in Arizona. A fourth theory is based on the number of Google Accounts associated with users in Arizona. I was asked to consider and evaluate these estimates and assist the jury in deterring these numbers. For purposes of my discussion, I group the first two theories, and then I group the third and fourth theories.

The first and second theories relate to the State's claim accusing Google of deceptive

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thousand dollars per violation."

and unfair conduct in connection with the sale of Android devices (including preloaded apps and software). I understand that the State has alleged that Google sells, advertises and/or otherwise offers for consideration software services, including the Android operating system.[163] Dr. Nielson explains that the "vast majority of Android devices sold in the U.S." have Google's version of the Android operating system, includes Google Mobile Services, which enables Google to collect location information from users.[164] Dr. Nielson further explains that the location services are "pre-installed" on these Android devices.[165] He also explains, "From a technical perspective, much of the functionality that Google uses to track user's location is built into the operating system at the time that the device is sold."[166] "When a consumer purchases an Android device, he or she receives a device that Google uses to track that user's location."[167]

I provide two sets of calculations below relating to the number of Android devices and/or users. The first set is based on data received from Google in response to 30(b)(6) Question 21, showing the monthly number of active smartphones in the United States with a Google-licensed Android operating system from June 2012 to January 2022. To calculate the number of Android operating system users in Arizona, I used Google's written response to Question 21 from March 28, 2022, which provides a monthly report of the number of US users of the Google-licensed Android operating system from June 2013 to January 2022.[168] I calculated an annual average and multiplied it by the population broadband ratio used by Google and described earlier to calculate the number of Android users in Arizona. The results of my calculation are presented in Table 7.8:

[163] Complaint, at ¶ 25, 156-167.
[164] Nielson Decl. ¶¶ 41–43.
[165] Nielson Decl. ¶ 51.
[166] Nielson Decl. ¶ 29.
[167] Nielson Decl. ¶ 29.
[168] "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information.pdf"

[redacted]

Notes and Sources:
[A] Year calculations performed.
[B] US Android Accounts: Question 21 of
2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information.pdf
[C] Ratio of (US Population x US Broadband Penetration) / (AZ Population x AZ Broadband Penetration)
[D] Calculation = [B] / [C].

The second theory is based on the number of Google-licensed Android smartphone devices activated in Arizona. Google provided responses for 2016 to 2021, which I represent below in Table 7.9.

[redacted]

Notes and Sources:
[A] Year calculations performed.
[B] Source 1: "2020-02-21 Responses of Google LLC to CIDs 1-3 (Ex 202).pdf" p.46
[*] Data for 2019 only for January-July 2019.
[C] Source 2: "2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information.pdf"
[D] Use [B] for 2016-2018 and [C] for 2019-2021. Divided by 1,000,000 to report activations in millions.

The State also alleges that Google deceptively and unfairly collects user location data when Google exchanges its services in return for user data. With respect to the second theory (that Google violates the Consumer Fraud Act when it serves geotargeted ads to users in Arizona), I understand that the State has alleged that Google sells, advertises and/or otherwise offers for consideration software services, including Google apps, sites, and devices, like Search, YouTube, Google Home, the Chrome browser, the Android operating system, and products that are integrated into third-party apps and sites, like ads and embedded Google Maps.[169] I further understand the State has alleged that, in exchange for these services, Google collects user location data and serves geotargeted ads on its users.[170] The State further alleges that, through these services, Google willfully and deceptively collects this user location data.[171] Dr. Nielson explains that "nearly all transactions with Google products or services become an opportunity for Google to collect and exploit the user's location information."[172] Whereas the discussion above focuses on Android devices, this theory encompasses Apple (iOS) users and "users on any platforms, so long as the users are interacting with Google's services."[173] Therefore, based on these allegations, I provide two additional theories for evaluating the number of penalties.

For the third theory, I look to the number of ad impressions served on Arizona consumers each year. I understand that, under the State's theory of liability, each time Google trades location information a service (*e.g.*, the consumers' user of the Google Search engine or Maps) would amount to a violation. Those numbers are not available to me, but Google did provide annual impressions for 2009-2022 for Arizona by Location Type, which is described as the following:

> Google has located data from which it can estimate, on an annual basis, the number of advertising impressions served or rendered to geotargeting areas corresponding to Arizona or subdivisions thereof and the amount that could be charged for such

[169] Complaint, at ¶ 25, 156-167.
[170] Complaint, at ¶ 26-27, 156-167.
[171] Complaint, at ¶¶ 22, 42-78, 87-104, 129-131, 132-136.
[172] Nielson Decl. ¶ 33.
[173] Nielson Decl. ¶ 114.

impressions.[174]

The number of impressions, however, is lower than the number of times a user trades location for Google's services. Google does not necessarily serve ads each time a user interacts with Google's services, however, Google takes that user's location.[175] There are numerous Location Types reported for each year. I chose a single Location Type to ensure I did not double count if an impression was reported under two different Location Types. The Location Type with the largest value is the most conservative approach to use because it reflects the number of relevant events without the risk of double counting. Table 7.10 reports the number of impressions by year.

Notes and Sources:
[A] Year calculations performed.
[B] Annual impressions for largest Location_Type.
"2022-03-28 [AEO] Google's Amended and Supplemental Response to Interrogatory No. 19.pdf"

I also provide a fourth calculation for the jury's consideration. I understand that some of the settings that are implicated in Google's collection of location information (such as Location History and WAA) are account-level settings. Therefore, I use the number of average Google Account based on the information provided by Google in response to Rule 30(b)(6) Question 23. These figures are provided in Table 7.11.

[174] "2022-03-28 [AEO] Google's Amended and Supplemental Response to Interrogatory No. 19.pdf"
[175] Nielson Decl. ¶ 119.

Notes and Sources:
[A] Year calculations performed.
[B] Average US Monthly Number of Active Google Accounts (Google Accounts, Google-Authored Apps, Google Searches) Question 23 of "2021-07-12 Google_s Responses to 30(b)(6) Questions.pdf"
[C] Ratio of (US Population x US Broadband Penetration) / (AZ Population x AZ Broadband Penetration)
[D] Calculation = [B] / [C].

Again, I understand it is the jury's decision to access which of these is the correct number of violations.

B. Factors Relating to the Amount of Penalties

I am advised that various factors may inform the jury's consideration as to the amount of penalties that should be imposed per violation in the event that the jury concludes such penalties are warranted.[176] I am advised that these factors include the following: (1) the good or bad faith of the defendants; (2) harm to the public; (3) the defendants' ability to pay; (4) benefit to the violator, and/or the desire to eliminate the benefits derived by the violations; (5) deterrence of future violations by this violator and others; and (6) the necessity of vindicating the authority of the government entity or agency authorized to seek the penalties. I have been asked to provide economic and financial information with respect to the facts that relate to my areas of expertise. Specifically, I offer input on factor 3 (Google's ability to pay), factor 4 (eliminating the benefits to Google), and factor 5 (deterrence).

With respect to factor 4 (eliminating the benefits to Google), I would calculate this in the same way I calculated disgorgement. As explained above, however, the data I have received from Google is non-standard. I also have not receiving any breakdown to justify the operating

[176] A.R.S 44-1531

profit numbers Google provided.

Addressing factor 3 and 5, for more than fifty years, economists have recognized the effectiveness of penalties to deter misconduct. In his pioneering work, Nobel-Prize winning economists Gary Becker found that if the aim of policy makers was deterrence, the number of offenses could be reduced by raising the likelihood of conviction close to 100% or if the punishment could be made to exceed the gain from committing a crime.[177] Setting a penalty that exceeds the wrongdoer's gains increases the cost of committing the wrongdoing, thus reducing the incidence of malfeasance. Professor Becker writes "Actually, fines should exceed the harm done if the probability of conviction were less than unity. The possibility of avoiding conviction is the intellectual justification for punitive, such as triple, damages against those convicted."[178] Becker's insight, over 50 years ago, was that perpetrators would have an incentive to repeat the wrongdoing as long as the penalty multiplied by the odds of getting caught were less than the gain from the crime. This means that even if the penalties are issued on an ongoing regular basis, if they are not large enough, the perpetrator will simply continue to pay them, making them, in a sense, a cost of doing business, or in other situations more profitable of the alternative of acting legally. Therefore, the amount of the penalty must increase as the probability of getting caught declines so as to make it uneconomic for a wrongdoer to commit wrongful actions.

In this case, I understand that the wrongful conduct is alleged to have been on-going since 2013. I understand that the State only started an investigation after learning of some of these issues through after they were reported by an investigative journal and published by the AP in August 2018. I further understand that many aspects of the alleged wrongdoing were not publicly known, such as Google's use of the IPGeo and [redacted] services, Google's "off means course" policy, among others. I understand that much of this was only uncovered through the investigation itself, including the discovery process. From an economic perspective of deterrence, the ability of a wrongdoer to conceal the bad acts is important in assessing the amount of penalties that are necessary for deterrence. Importantly, when economists consider

[177] Gary S. Becker, Crime and Punishment: An Economic Approach, 76 Journal of Political Economy.169, 170 (1968). Paraphrasing page 14.
[178] Gary S. Becker, Crime and Punishment: An Economic Approach, 76 Journal of Political Economy.169, 170 (1968). Page 34 in footnote 55.

deterrence, it is not only the specific defendant who needs to be deterred, but also other prospective wrongdoers. Larger civil penalties decrease the likelihood that Google and other companies will engage in the deceptive practices called out here. The benefits of the civil penalties, therefore, will extend beyond just this litigation.

Google, as the one of the largest technology companies in the world, frequently has been accused of gaining enormous profit by taking advantage of its powerful market position. In November 2021, the General Court of the European Union upheld the decision of the Commission to "imposed a pecuniary penalty on Google of €2,424,495,000,[179] of which €52,518,000[180] jointly and severally with Alphabet, its parent company."[181] "The ruling from the EU's General Court confirmed that Google's parent company Alphabet had broken antitrust rules by favoring its own in-house price comparison tools over smaller European rivals."[182] Google "included the fines in accrued expenses and other current liabilities" on its financial report, and "provided bank guarantees (in lieu of a cash payment) for the fines"[183] in 2017. After that, Google also recognized other fines from European Commission for its infringement of European competition law in 2018 and 2019.[184]

[179] $2,556,048,099at April 30, 2022 exchange rates.
[180] $551,924,087 at April 30, 2022 exchange rates.
[181] General Court of the European Union, Press Release No 197/21, Luxembourg, 10 November 2021
[182] Google Loses Court Challenge Over EU $2.8 Billion Antitrust Fine, Forbes, https://www.forbes.com/sites/iainmartin/2021/11/10/google-loses-court-challenge-over-eu-28-billion-antitrust-fine/?sh=5ba2a0a57904.
[183] Alphabet Inc. 10-K Form for 2019 Fiscal Year, Page 78-79.
[184] Alphabet Inc. 10-K Form for 2019 Fiscal Year, Page 78.

Alphabet Inc.
CONSOLIDATED STATEMENTS OF INCOME
(In millions, except per share amounts)

	Year Ended December 31,		
	2017	2018	2019
Revenues	$ 110,855	$ 136,819	$ 161,857
Costs and expenses:			
Cost of revenues	45,583	59,549	71,896
Research and development	16,625	21,419	26,018
Sales and marketing	12,893	16,333	18,464
General and administrative	6,840	6,923	9,551
European Commission fines	2,736	5,071	1,697
Total costs and expenses	84,677	109,295	127,626
Income from operations	26,178	27,524	34,231
Other income (expense), net	1,015	7,389	5,394
Income before income taxes	27,193	34,913	39,625
Provision for income taxes	14,531	4,177	5,282
Net income	$ 12,662	$ 30,736	$ 34,343
Basic net income per share of Class A and B common stock and Class C capital stock	$ 18.27	$ 44.22	$ 49.59
Diluted net income per share of Class A and B common stock and Class C capital stock	$ 18.00	$ 43.70	$ 49.16

See accompanying notes.

(Source: Alphabet Inc. 10-K Form for 2019 Fiscal Year, Page 51)

Even with these fines the total value of Alphabet stock, (market capitalization) never fell below $500 Billion dollars, reaching as much as $1,988 Billion in November of 2021, and is over $1,500 Billion at the end of April 2021.[185] In addition, according to its SEC financial document (Form 10-K) and documents provided by Google, Google has a strong financial performance in recent years, with which Google is capable of paying appropriate civil penalties to victims.

Google has had substantial profit growth in its advertising business in which Google has been using users' location information to serve geo-targeting ads. The operating income of Google Services Segment was approximately $54.61 billion, in 2020.[186] In 2021, its generation of operating income increase pace to approximately $91.86 billion.[187] Google Advertising Business, as the major part of Google Services Segment, provides at least 87% of revenue of

[185] https://www macrotrends net/stocks/charts/GOOGL/alphabet/market-cap?msclkid=31baed14ca2111ecad8987c3b2116fc4
[186] Alphabet Inc. 10-K Form for 2021 Fiscal Year, Page 38.
[187] Alphabet Inc. 10-K Form for 2021 Fiscal Year, Page 38.

this segment in the past 3 years.[188]

Google also has a robust cash flow to pay for the civil penalties. Since 2017, Google's financials have been reported within Alphabet's 10-K Form since 2017. [189, 190] Google is the largest business of Alphabet, and it as reported in 10-K Form for 2021 fiscal year, 99.65% of Alphabet's $257.64 billion Global Revenue is from Google.[191] Moreover, this percentage has been constantly more than 99.3% for the Past 4 years.[192] Given Google's heavy weight in Alphabet's business portfolio, we could see the majority of Alphabet's 20.9 billion dollars cash and cash equivalents in 2021 fiscal year come from Google.[193]

C. Other Information Reviewed

I have also provided additional calculations, using data Google provided in 30(b)(6) responses 19 and 23, that may be helpful to the jury in assessing either the number of violations or the amount of penalties. Specifically, I understand one of the issues raised in the August 2018 AP Article (which led to the Attorney General's investigation) involved the interaction of certain settings known as Location History ("LH") and Web & App Activity ("WAA"). Specifically, the AP Article revealed that Google collects location information through the WAA setting, even if consumers pause or don't enable the setting called "Location History." This was particularly concerning because Google's disclosures explained, "With Location History off, the places you go are no longer stored."[194] Also, the WAA setting was defaulted to be "on," and I understand the user would not normally see any disclosure that WAA relates to location information. [195]

Google's response to Rule 30(b)(6) Question 19 discloses, on a monthly basis, the

[188] Calculated by the data from Alphabet Inc. 10-K Form for 2020 Fiscal Year, Page 66 and Alphabet Inc. 10-K Form for 2021 Fiscal Year, Page 33.
[189] Alphabet Inc. & Google Inc. 10-K Form for 2015 Fiscal Year, published in 2016.
[190] Alphabet Inc. 10-K Form for 2016 Fiscal Year, published in 2017.
[191] Alphabet Inc. 10-K Form for 2021 Fiscal Year, published in 2022.
[192] Calculated by the data in Alphabet Inc. 10-K Form for 2021 Fiscal Year, published in 2022.
[193] Alphabet Inc. 10-K Form for 2021 Fiscal Year, published in 2022.
[194] Ryan Nakashima, "AP Exclusive: Google tracks your movements, like it or not" (August 13, 2018), https://apnews.com/article/north-america-science-technology-business-ap-top-news-828aefab64d4411bac257a07c1af0ecb
[195] Ryan Nakashima, "AP Exclusive: Google tracks your movements, like it or not" (August 13, 2018), https://apnews.com/article/north-america-science-technology-business-ap-top-news-828aefab64d4411bac257a07c1af0ecb

number of U.S. accounts that had WAA on and LH off between August 2018 and June 2021.[196] It is my understanding that Google has not provided this analogous data for any other period, including for any time before the AP Article of since June 2021. In Google's response to Rule 30(b)(6) Question 23, Google disclosed, on a monthly basis, the average number of active Google accounts in the United States. Dividing the number of accounts that had WAA on and LH off by the total number of accounts provided the percentage of accounts with these same settings. This percentage ranges from approximately [redacted], increasing over time. I applied these same percentages to the values above for 2018 through 2021 in the Table 7.12 below:

[redacted]

Notes and Sources:
[A] Year calculations performed.
[B] US Android Accounts: Question 21 of
2022-03-28 [AEO] Google's Supplemental 30(b)(6) Written Responses and Additional Information.pdf
[C] Ratio of (US Population x US Broadband Penetration) / (AZ Population x AZ Broadband Penetration)
[D] Calculation = [B] / [C].
[E] Ratio of US accounts in Arizona that had WAA on but LH off to total accounts.
Question 19 and 23 of "2021-07-12 Google_s Responses to 30(b)(6) Questions.pdf"
[F] Calculation = [D] x [E].

Daniel S. Levy, PhD

May 4, 2022

[196] 2021-07-12 Google's Supplemental 30(b)(6) Questions.pdf

Appendix 1 – Curriculum Vitae

DANIEL S. LEVY, PhD

National Managing Director
Advanced Analytical Consulting Group, Inc.
112 Water Street | Boston MA 02109
Danlevy@AACG.com

617 330 AACG (2224)

Daniel S. Levy specializes in applications of economics and statistics in the study of corporate structures related to industrial organization/antitrust, intellectual property infringement and damages issues. His work includes detailed analyses and valuations of corporate functions, risks, and assets for international corporations in a wide range of industries. He has served as an expert witness in high technology industries for copyright litigation, patent disputes and associated antitrust allegations. He has designed and performed sampling protocols to review the composition of alleged copyrighted material. He has also designed consumer surveys to determine the consumers' value of products and services. As part of his business consulting, Dr. Levy has worked Fortune 500 companies developing economic, statistical and computing solutions for optimizing prices and detecting discrimination. He has analyzed lost profits in various business related situations. He has testified in Federal Court, presented statistical issues to Government Agencies and served as an Expert Arbitrator.

Prior to Advanced Analytical Consulting Group, Inc., Dr. Levy was the National Leader of the Economic and Statistical Consulting Group at Deloitte Financial Advisory Services and Global Leader of Economic Consulting at Arthur Andersen's Business Consulting Group. He also held research and consulting positions at Charles River Associates, The RAND Corporation, Needham-Harper Worldwide Advertising, SPSS Inc. and The University of Chicago Computation Center.

Dr. Levy and his team of economists and engineers design, build and implement pricing models and applications that help their clients optimize prices to improve revenues/profits.

Ph.D., Economics, The University of Chicago

EXPERT REPORTS, TESTIMONY

- Cisco Systems, Inc. v Zahid Hassan Sheikh, Case No. 4:18-CV-07602-YGR, United States District Court, Northern District of California, Oakland Division, 2020, Deposition.
- Infodeli, LLC. et al v Western Robidoux, Inc. et al, Case No. 4:15-cv-00364-BCW, United States District Court for the Western District of Missouri, Western Division, 2019, Expert Report and Testimony, 2020.
- The State of Washington v Jersey Mike's Franchise Systems, Inc. 2019.
- Zuniga v Alexandria Care Center, Case No. BC529776, Superior Court of California, Los Angeles, 2018, Declaration.
- Rimini Street, Inc. v. Oracle International Corporation, Case No. 2:14-cv-01699, United States District Court for the District of Nevada, 2018, Expert Report.
- Olvera v. El Pollo Loco, Inc., JCCP Case No. 4957, Superior Court of California, Orange County, 2018, Expert Report and Deposition

PROFESSIONAL EXPERIENCE

2009 – Present	National Managing Director, Advance Analytical Consulting Group, Inc.
2012 – Present	CEO, AAC-MA, Inc. DBA EquiCalc
2002 - 2009	National Leader of Economic and Statistical Consulting, Deloitte FAS LLP
2001 - 2002	Global Director of Economic and Statistical Consulting, Arthur Andersen: Value Solutions
1998 - 2001	National Director of Economic and Statistical Consulting, Arthur Andersen: Business Consulting
1996 - 1998	Regional Director of Economics, Arthur Andersen: CRCO
1995 - 1996	Economist, Arthur Andersen
1991 - 1995	Senior Associate, Charles River Associates
1988 - 1991	Associate Economist, The RAND Corporation
1985 - 1988	Computer Advisor, The University of Chicago Computation Center
1982 - 1985	Research and Teaching Consultant, SPSS Inc.
1981 - 1982	Research Consultant, Needham, Harper Worldwide Advertising

PROFESSIONAL HONORS and ACTIVITIES

- Earhart Fellowship for graduate research in economics, 1981 - 1982
- Hewlett Grant for research in developing countries, 1985 - 1986; renewed, 1986 - 1987
- CBS Bicentennial Scholarship for research on events leading to the American Revolution, 1986 - 1987
- Homer and Alice Jones Fellowship, University of Chicago, 1987 - 1988
- American Economics Association, 1988- Present
- Population Association of America, 1988-1991

PAPERS, PRESENTATIONS, AND PUBLICATIONS

- Levy, Daniel Franchise No-Poaching Clauses, Job Concentration, and Wages: A Natural Experiment Generated by a State Attorney General, Presented at the Association of Private Enterprise Educators, April 5, 2022.
- Levy, Daniel and Tardiff, Timothy J. and Zhang, Yiyuan and Yamron, Alex, No-Poaching Clauses, Job Concentration and Wages: A Natural Experiment Generated by a State Attorney General (January 23, 2020). Available at http://aacg.com/wp-content/uploads/Effect-of-No-poaching-Clauses-on-Wages-2020-01-23-1900.pdf
- Levy, Daniel and Tardiff, Timothy, Consistent Measurement of Broadband Availability FCC Data through December 2016, (March 2018), Available at https://aacg.com/wp-content/uploads/Consistent-Measurement-of-Broadband-Availability-FINAL.pdf.
- Levy, Daniel and Tardiff, Timothy J., Measurement of Market Concentration Faced by Labor Pools: Theory and Evidence from Fast Food Chains in Rhode Island with No-Poaching Clauses (September 14, 2018). Available at SSRN: https://ssrn.com/abstract=3247932 or http://dx.doi.org/10.2139/ssrn.3247932
- Levy, Daniel *et al.*," Is LIBOR Still Being Manipulated?: Identifying Colluders with Methods of Detecting LIBOR Tampering," December 27, 2016. Available at SSRN: https://ssrn.com/abstract=2884953 or http://dx.doi.org/10.2139/ssrn.2884953
- Daniel S. Levy and Timothy J. Tardiff "Pricing and Maximizing Profits within Corporations: Applications of Lester Taylor's Insights," Demand for Communications Services – Insights and Perspectives, Springer, New York, 2014.
- Timothy Tardiff, Daniel Levy, Audrius Girnius, and Karthik Padmanabhan, "Antitrust and Community Impact Report," Montana Commissioner of Securities, January 29, 2013.
- Daniel S. Levy and Timothy J. Tardiff "Pricing and Maximizing Profits within Corporations: Applications of Lester Taylor's Insights," Presented at Telecommunications Demand and Investment: The Road Ahead, Conference in Honor of Emeritus Professor Lester D. Taylor, Jackson Hole, Wyoming, October 10, 2011.

Appendix 2 – List of Documents Received and Relied Upon

Complaint and Exhibits
Answer
Hennessy EUO Transcript and Exhibits
Google's responses to CIDs 1-3
Google's Response to CID 4
30(b)(6) Notice
Google's Responses to Amended Request for Production #7
Supplemental Responses to Rogs set Three
Supplemental Responses to RFPs set three
Ruttenberg Letter re written responses to 30(b)(6) Topics 18-29 and 33 (5/13/21)
Agnolucci Letter to Eshaghian (01/05/2022)
Ralston Letter to Agnolucci and Anderson (03/22/2022)
Anderson Letter to Ralston (03/28/2022)
Anderson Letter to Ruttenberg and Ralston (04/27/2022)
GOOG-GLAZ-00155959
GOOG-GLAZ-00205702
GOOG-GLAZ-00206142
GOOG-GLAZ-00207414
GOOG-GLAZ-00207600
GOOG-GLAZ-00208498
GOOG-GLAZ-00108414
GOOG-GLAZ-00110988
GOOG-GLAZ-00114727
GOOG-GLAZ-00134554
GOOG-GLAZ-00162367
GOOG-GLAZ-00166095
GOOG-GLAZ-00200238
Google 7/12/21 Responses to 30(b)(6) Questions
Google's 7/26/21 Responses to 30(b)(6) Questions

Declaration of Hal Varian in Opposition of Class Certification
Starbucks Data
Google's Supplemental Response to Interrogatory No. 19
Deposition Transcript of Hal Varian
Google's Supplemental Initial Disclosures (11/17/21)
Google's Supplemental Initial Disclosures (12/13/21)
Eriksson Vol. 2 Transcript (Rasta details)
Eriksson Ex. 369 (GOOG-GLAZ-00242877)
Eriksson Ex. 370 (GOOG-GLAZ-00297297)
00238714
00245426
00251926
00289725
00296347
00312349
00312467
00312720
00312729
00312733
00312910
00312941
00313016
00313021
00297046
00297245
All of PROD055 (revenue-related studies, GOOG-GLAZ-00312315-313021)
All of PROD056 (GOOG-GLAZ-00313124-313329)
00151691
00154340
00236126
00236970

00238714
00245426
00274188
00283682
00289725
00314834
0314889
0314908
Google’s Supplemental Responses to Interrogatories Set Three
Google’s Responses to Interrogatories Set Five
Verification re Interrogatory No. 19
NOD Pallavi Anderson
00207600.R
00236970
00312910
00313016
00313021
00313605
00314898
00314929
00232189
0178599
00202413.R
00204220.R
00232926
00245673
00245936
00246666
00248682
00284478
00290590

00296347
Google’s Amended and Supplemental Responses to Interrogatory No. 19
Google’s Supplemental 30(b)(6) Written Responses and Additional Information
Deposition Transcript of Pallavi Anderson
00237367
00242808
00243126
00284478
00315472
Hennessy Litigation Depo Transcript
State’s Response to Google’s MSJ
State’s SSOF to Google’s MSJ
Pablo Declaration
Nielson Declaration
Google’s MSJ
Google’s SSOF
Google’s MSJ Reply
00302122 (location is parameter in ad auctions)
00301123 (Google runs an ad auction to determine how ads will be displayed)
State’s MSJ
State’s SSOF
Google’s Response
Google’s SSOF
State’s Reply
State’s Reply SSOF
Order on Google’s MSJ
GOOG-GLAZ-00240871
GOOG-GLAZ-00026768
GOOG-GLAZ-00026768.R
GOOG-GLAZ-00171906
GOOG-GLAZ-00235728

GOOG-GLAZ-00241698
Deposition Transcript of Jennifer Fitzpatrick
Special Master’s Report (04/26/2021)
Fitzpatrick Ex. 400 (GOOG-GLAZ-00315177)
GOOG-GLAZ-00251597
GOOG-GLAZ-00240239
GOOG-GLAZ-00241399
GOOG-GLAZ-00240855
Monsees EUO Transcript and Exhibits
Chai EUO Transcript and Exhibits
Menzel EUO Transcript and Exhibits
GOOG-GLAZ-00178599
GOOG-GLAZ-00258813
GOOG-GLAZ-00026480

Appendix 3 – List of Google/Alphabet Financials

A. Graph 1

Year	Variable	Source Document	Page Number
2013	Global Revenue	Alphabet Inc. & Google Inc. SEC 10-K Form for 2015 Fiscal Year	47
2013	Global Advertising Revenue	Alphabet Inc. & Google Inc. SEC 10-K Form for 2015 Fiscal Year	47
2013	U.S. Revenue	Alphabet Inc. & Google Inc. SEC 10-K Form for 2015 Fiscal Year	161
2014	Global Revenue	Alphabet Inc. SEC 10-K Form for 2016 Fiscal Year	45
2014	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2016 Fiscal Year	45
2014	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2016 Fiscal Year	141
2015	Global Revenue	Alphabet Inc. SEC 10-K Form for 2017 Fiscal Year	51
2015	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2017 Fiscal Year	51
2015	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2017 Fiscal Year	59
2016	Global Revenue	Alphabet Inc. SEC 10-K Form for 2018 Fiscal Year	51
2016	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2018 Fiscal Year	51
2016	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2018 Fiscal Year	57
2017	Global Revenue	Alphabet Inc. SEC 10-K Form for 2019 Fiscal Year	29
2017	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2019 Fiscal Year	29
2017	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2018 Fiscal Year	57
2018	Global Revenue	Alphabet Inc. SEC 10-K Form for 2019 Fiscal Year	29
2018	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2019 Fiscal Year	29
2018	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2019 Fiscal Year	34
2019	Global Revenue	Alphabet Inc. SEC 10-K Form for 2020 Fiscal Year	33
2019	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2020 Fiscal Year	33
2019	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2020 Fiscal Year	37
2020	Global Revenue	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	33
2020	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	33
2020	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	36
2021	Global Revenue	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	33
2021	Global Advertising Revenue	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	33
2021	U.S. Revenue	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	36

B. Graph 2

Year	Variable	Source Document	Page Number
2013	Operating Income	Google Inc. SEC 10-K Form for 2014 Fiscal Year	40
2014	Operating Income	Alphabet Inc. & Google Inc. SEC 10-K Form for 2015 Fiscal Year	160
2015	Operating Income	Alphabet Inc. SEC 10-K Form for 2016 Fiscal Year	140
2016	Operating Income	Alphabet Inc. SEC 10-K Form for 2017 Fiscal Year	138
2017	Operating Income	Alphabet Inc. SEC 10-K Form for 2018 Fiscal Year	142
2018	Operating Income	Alphabet Inc. SEC 10-K Form for 2019 Fiscal Year	88
2019	Operating Income	Alphabet Inc. SEC 10-K Form for 2020 Fiscal Year	32
2020	Operating Income	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	32
2021	Operating Income	Alphabet Inc. SEC 10-K Form for 2021 Fiscal Year	32