STATE OF NEW MEXICO
COUNTY OF LEA
FIFTH JUDICIAL DISTRICT

REPUBLICAN PARTY OF NEW MEXICO, DAVID GALLEGOS, TIMOTHY JENNINGS, DINAH VARGAS, MANUEL GONZALES, JR., BOBBY AND DEE ANN KIMBRO, and PEARL GARCIA,

Plaintiffs,

v.

Cause No.
D-506-CV-2022-00041

MAGGIE TOULOUSE OLIVER, in her official capacity as New Mexico Secretary of State, MICHELLE LUJAN GRISHAM, in her official capacity as Governor of New Mexico, HOWIE MORALES, in his official capacity as New Mexico Lieutenant Governor and President of the New Mexico Senate, MIMI STEWART, in her official capacity as President Pro Tempore of the New Mexico Senate, and JAVIER MARTINEZ, in his official capacity as Speaker of the New Mexico House of Representatives,

Defendants.

ADDENDUM NO. 1 TO LEGISLATIVE DEFENDANTS' FINDINGS OF FACTS AND CONCLUSIONS OF LAW

EXHIBITS 31 to 35

HINKLE SHANOR LLP

/s/ Richard E. Olson
Richard E. Olson
Lucas M. Williams
Ann Cox Tripp
P.O. Box 10
Roswell, NM 88202-0010
575-622-6510 / 575-623-9332 Fax
rolson@hinklelawfirm.com
lwilliams@hinklelawfirm.com
atripp@hinklelawfirm.com

PEIFER, HANSON, MULLINS & BAKER, P.A.

Sara N. Sanchez
20 First Plaza, Suite 725
Albuquerque, NM 87102
505-247-4800

ssanchez@peiferlaw.com

STELZNER, LLC
Luis G. Stelzner, Esq.
3521 Campbell Ct. NW
Albuquerque NM 87104
505-263-2764
pstelzner@aol.com

Professor Michael B. Browde
751 Adobe Rd., NW
Albuquerque, NM 87107
505-266-8042
mbrowde@me.com

Attorneys for Mimi Stewart and Brian Egolf

CERTIFICATE OF SERVICE

I hereby certify that on September 15, 2023, I caused the foregoing Addendum along with this Certificate of Service, to be served and filed electronically through the Tyler Technologies Odyssey File & Serve electronic filing system, which caused all parties or counsel of record to be served by electronic means, as more fully reflected on the Notice of Electronic Filing.

HINKLE SHANOR LLP

/s/ Richard E. Olson

EXHIBIT 31

STATE OF NEW MEXICO

COUNTY OF LEA

FIFTH JUDICIAL DISTRICT

REPUBLICAN PARTY OF NEW MEXICO, *et al.*,

Plaintiffs,

vs. **Case No. D-506-CV-2022-00041**

MAGGIE TOULOUSE OLIVER, *et al.*,

Defendants.

DECLARATION OF DR. JOWEI CHEN

I, Jowei Chen, declare as follows:

1. I am over the age of eighteen years old, am otherwise competent to testify to the matters contained in this Declaration, and have personal knowledge of the same.

2. Attached hereto is a true and correct copy of the Expert Report that I prepared in the above-captioned matter.

I affirm on this 14th day of September, 2023, under penalty of perjury under the laws of the State of New Mexico, that the foregoing is true and correct.

By: _____
Dr. Jowei Chen

EXHIBIT 31

STATE OF NEW MEXICO
COUNTY OF LEA
FIFTH JUDICIAL DISTRICT

REPUBLICAN PARTY OF NEW MEXICO, DAVID GALLEGOS, TIMOTHY JENNINGS, DINAH VARGAS, MANUEL GONZALES, JR. BOBBY AND DEE ANN KIMBRO, and PEARL GARCIA,

Plaintiffs,

v. **Cause No. D-506-Cv-2022-00041**

MAGGIE TOLOUSE OLIVER, in her official capacity as New Mexico Secretary of State, MICHELLE LUJAN GRISHAM, in her official capacity as Governor of New Mexico, HOWIE MORALES, in his official capacity as New Mexico Lieutenant Governor and President of the New Mexico Senate, MIMI STEWART, in her official capacity as President Pro Tempore of the New Mexico Senate, and JAVIER MARTINEZ, in his official capacity as Speaker of the New Mexico House of Representatives,

Defendants.

EXPERT REPORT OF JOWEI CHEN, Ph.D.

EXHIBIT 31

1. I am an Associate Professor in the Department of Political Science at the University of Michigan, Ann Arbor. I am also a Research Associate Professor at the Center for Political Studies of the Institute for Social Research at the University of Michigan and a Research Associate at the Spatial Social Science Laboratory at Stanford University. In 2004, I received a B.A. in Ethics, Politics, and Economics from Yale University. In 2007, I received a M.S. in Statistics from Stanford University, and in 2009, I received a Ph.D. in Political Science from Stanford University.

2. I have published academic papers on legislative districting and political geography in several academic journals, including *Yale Law Journal*, *Stanford Law Review*, *The American Journal of Political Science*, *The American Political Science Review*, and *Election Law Journal*. My academic areas of expertise include legislative elections, spatial statistics, geographic information systems (GIS) data, redistricting, racial politics, legislatures, and political geography. I have expertise in the use of computer simulations of legislative districting and in analyzing political geography, elections, and redistricting. In 2019, Common Cause honored me as a "Defender of Democracy" for developing the use of random computer-simulated districting maps in partisan gerrymandering court challenges around the country. [1]

3. I have authored expert reports in the following redistricting court cases: *The League of Women Voters of Florida v. Detzner* (Fla. 2d Judicial Cir. Leon Cnty. 2012); *Romo v. Detzner* (Fla. 2d Judicial Cir. Leon Cnty. 2013); *Missouri National Association for the Advancement of Colored People v. Ferguson-Florissant School District & St. Louis County Board of Election Commissioners* (E.D. Mo. 2014); *Raleigh Wake Citizens Association v. Wake County Board of Elections* (E.D.N.C. 2015); *Brown v. Detzner* (N.D. Fla. 2015); *City of Greensboro v. Guilford County Board of Elections* (M.D.N.C. 2015); *Common Cause v. Rucho*

[1] https://www.commoncause.org/press-release/common-cause-honors-four-defenders-of-democracy/

(M.D.N.C 2016); *The League of Women Voters of Pennsylvania v. Commonwealth of Pennsylvania* (No. 261 M.D. 2017); *Georgia State Conference of the NAACP v. The State of Georgia* (N.D. Ga. 2017); *The League of Women Voters of Michigan v. Johnson* (E.D. Mich. 2017); *Whitford v. Gill* (W.D. Wis. 2018); *Common Cause v. Lewis* (N.C. Super. 2018); *Harper v. Lewis* (N.C. Super. 2019); *Baroody v. City of Quincy, Florida* (N.D. Fla. 2020*); McConchie v. Illinois State Board of Elections* (N.D. Ill. 2021); *Adams v. DeWine* (Ohio 2021); *Harper v. Hall* (N.C. Super. 2021); *Rivera v. Schwab and Abbott* (Wyandotte County D. Ct. 2022); *Norelli v. David Scanlan* (Hillsborough County Super. Ct. 2022). I have testified at deposition or at trial in the following cases: *Romo v. Detzner* (Fla. 2d Judicial Cir. Leon Cnty. 2013); *Missouri National Association for the Advancement of Colored People v. Ferguson-Florissant School District & St. Louis County Board of Election Commissioners* (E.D. Mo. 2014); *Raleigh Wake Citizens Association v. Wake County Board of Elections* (E.D.N.C. 2015); *City of Greensboro v. Guilford County Board of Elections* (M.D.N.C. 2015); *Common Cause v. Rucho* (M.D.N.C. 2016); *The League of Women Voters of Pennsylvania v. Commonwealth of Pennsylvania* (No. 261 M.D. 2017); *Georgia State Conference of the NAACP v. The State of Georgia* (N.D. Ga. 2017); *The League of Women Voters of Michigan v. Johnson* (E.D. Mich. 2017); *Whitford v. Gill* (W.D. Wis. 2018); *Common Cause v. Lewis* (N.C. Super. 2018); *Baroody v. City of Quincy, Florida* (N.D. Fla. 2020); *McConchie v. Illinois State Board of Elections* (N.D. Ill. 2021); *Harper v. Hall* (N.C. Super. 2021); *Rivera v. Schwab and Abbott* (Wyandotte County D. Ct. 2022).

4. ***Research Question:*** Defendants' counsel asked me to evaluate the partisanship of New Mexico's Congressional districting plan, as enacted in December 2021 by the State Legislature in Senate Bill 1 (hereinafter: "The SB 1 plan"). Specifically, Defendants' counsel asked me to determine whether the partisan characteristics of the SB 1 plan could have plausibly

emerged from a partisan-neutral map-drawing process adhering to certain non-partisan districting criteria. The non-partisan districting criteria that I was asked to incorporate into my analysis include population equality, district contiguity, precinct preservation, municipal boundary considerations, Indian (Native American) reservation considerations, avoiding county splits, oil industry considerations, and district compactness. These districting criteria are described in detail later in this report in Paragraph 9. Defendants counsel asked me to determine how likely a map-drawing process following these criteria could have produced a map with the partisan characteristics of the SB 1 plan.

5. ***Summary of Findings:*** I programmed a partisan-blind computer algorithm to generate a large number of random districting plans while strictly adhering to the aforementioned districting criteria. The partisan characteristics of the SB 1 plan are well within the normal range of these computer-generated districting plans drawn with the partisan-blind algorithm. Thus, the SB 1 plan is neither extreme nor a statistical outlier in terms of its partisanship. The partisan characteristics of the SB 1 plan could reasonably have emerged from a partisan-neutral map-drawing process adhering to all of the aforementioned districting criteria.

6. ***The Use of Computer-Simulated Districting Plans:*** In conducting my academic research on legislative districting, partisan and racial gerrymandering, and electoral bias, I have developed various computer simulation programming techniques that allow me to produce a large number of partisan-blind districting plans that adhere to any set of specified districting criteria using US Census geographies, such as precincts, as building blocks. This simulation process ignores all partisan and racial considerations when drawing districts. Instead, the computer simulations are programmed to draw districting plans following any set of specified districting considerations, such as population equality, avoiding county splits, protecting

municipal boundaries, and pursuing geographic compactness. By randomly generating a large number of districting plans that adhere to a specified set of districting criteria, I am able to assess an enacted plan drawn by a state legislature and determine whether its partisanship is similar to or different from the sorts of plans that would naturally emerge from the specified set of districting criteria. More specifically, by holding constant the application of these districting criteria through the computer simulations, I am able to determine whether the enacted plan could have naturally emerged from these specified districting criteria, without any intentional partisan manipulation by the map-drawer.

7. Defendants' counsel asked me to use this approach to analyze the partisanship of the SB 1 plan. Defendants' counsel gave me a list of partisan-neutral districting considerations and asked me to determine the partisan distribution of districting maps that naturally emerge from a map-drawing process adhering strictly to these considerations. I programmed a computer algorithm adhering only to these specified districting considerations, and the algorithm produced a set of 1,000 random computer-simulated maps for New Mexico's congressional districts. I analyzed the partisanship of these computer-simulated maps, and I found that the SB 1 plan is well within the normal distribution of the computer-simulated plans in terms of its partisanship. In other words, the partisan characteristics of the SB 1 plan are typical of partisan characteristics exhibited by the random computer-simulated plans. Hence, the SB 1 plan does not exhibit extreme partisan characteristics when accounting for the various non-partisan districting criteria that I incorporated into the computer algorithm.

8. These computer simulation methods are widely used by academic scholars to analyze districting maps. For over a decade, political scientists have used such computer-simulated districting techniques to analyze the racial and partisan characteristics of legislative

and congressional districting maps.[2] Several courts have also relied upon computer simulations to assess claims of partisan bias in enacted districting plans.[3]

9. ***Redistricting Criteria:*** I programmed the computer algorithm to create 1,000 independent simulated plans adhering to the following eight districting criteria:

a) Population Equality: Because New Mexico's 2020 Census population was 2,117,522, districts in every three-member congressional plan have an ideal population of 705,840.7. In the SB 1 plan, the most-populated district (CD-2) and the least-populated district (CD-1) have a difference in population of only 14 people. Defendants' counsel instructed me to follow this same degree of population equality by requiring that all computer-simulated districts deviate from perfect equality by no more than seven people. Therefore, every computer-simulated district that my algorithm produced is required to have a population of between 705,834 and 705,847, resulting in a total difference between the highest-populated district and the lowest-populated district of no more than 14 people.

b) Precinct Boundaries: New Mexico is divided into 2,163 precincts. These precincts are the lowest geographic unit at which elections are administered in New Mexico. Defendants' counsel informed me that precincts serve as the primary building block for congressional districting plans in New Mexico, and the SB 1 plan was intentionally drawn to avoid splitting any of New Mexico's 2,163 precincts. Therefore,

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[2] *E.g.*, Carmen Cirincione, Thomas A. Darling, Timothy G. O'Rourke. "Assessing South Carolina's 1990s Congressional Districting," Political Geography 19 (2000) 189–211; Jowei Chen, "The Impact of Political Geography on Wisconsin Redistricting: An Analysis of Wisconsin's Act 43 Assembly Districting Plan." Election Law Journal.

[3] *See, e.g.*, *League of Women Voters of Pa. v. Commonwealth*, 178 A. 3d 737, 818-21 (Pa. 2018); *Raleigh Wake Citizens Association v. Wake County Board of Elections*, 827 F.3d 333, 344-45 (4th Cir. 2016); *City of Greensboro v. Guilford County Board of Elections*, No. 1:15-CV-599, 2017 WL 1229736 (M.D.N.C. Apr 3, 2017); *Common Cause v. Rucho*, No. 1:16-CV-1164 (M.D.N.C. Jan 11, 2018); *The League of Women Voters of Michigan v. Johnson* (E.D. Mich. 2017); *Common Cause v. David Lewis* (N.C. Super. 2018); *Harper v. Hall* (N.C. Feb 14, 2022).

Defendants' counsel instructed me to similarly avoid splitting any precincts in the construction of the computer-simulated plans. Every computer-simulated district is composed entirely of whole precincts, with no precinct split across two or more districts.

c) Contiguity: The simulation algorithm required all congressional districts to be geographically contiguous.

d) Municipality Considerations: Defendants' counsel instructed me to program the computer algorithm to consider municipal boundaries in the following ways: First, Albuquerque, Las Cruces, and the Santa Fe metro area were each primarily assigned to their own respective districts. Las Cruces and the Santa Fe metro area were always kept intact and not split across two or more districts. Due to the large size of the Albuquerque metro area, Albuquerque could be partially split across districts, but at least 60% or more of Albuquerque's population was required to be assigned to a single district. Finally, the South Valley and the Rio Grande River Valley were required to be kept together in the same district. Collectively, these municipality considerations resulted in computer-simulated plans in which one district contains the entire Santa Fe metro area, a second district contains all of Las Cruces, and a third district contains most of Albuquerque.

e) Indian Reservation Considerations: Defendants' counsel instructed me to program the simulation algorithm to treat Indian (Native American) reservations as follows: First, the Mescalero Apache Reservation was always split apart, such that Precinct 11 was always placed in a different district than Precinct 56 in Otero County. Next, the Zuni Indian Reservation (The Pueblo of Zuni) was always split apart, such that Precincts 27, 29, 30, 64 and 66 in McKinley County were always placed in a different

district than Precinct 28 in McKinley County. Finally, in order to keep the Navajo Nation together, San Juan County and most of McKinley County were always kept together in the same district, with the exception of the aforementioned Zuni Pueblo portion of McKinley County.

f) Oil Industry Considerations: Defendants' counsel informed me that due to the economic importance of the oil production industry in New Mexico, a policy consideration in the state's congressional districting process was to spread out the state's oil wells across multiple districts. Therefore, Defendants' counsel instructed me to require that no single congressional district in any computer-simulated plan contains more than 60% of the state's active oil wells. I was instructed to use geospatial data from New Mexico's Oil Conservation Division to identify the locations of all active oil wells in the state.[4]

g) Minimizing County Splits: Following instructions from Defendants' counsel, I programmed the simulation algorithm to avoid splitting New Mexico's 33 counties, except when doing so was necessary to avoid violating one of the aforementioned criteria. Most commonly, splitting counties was necessary for the purpose of achieving population equality across districts, as well as satisfying the Indian Reservation considerations described earlier.

h) Geographic Compactness: The simulation algorithm favored the drawing of more compact district boundaries whenever doing so does not violate any of the aforementioned criteria.

10. On the following three pages of this report, Map 1, Map 2, and Map 3 display three examples of computer-simulated plans produced by the computer algorithm. The upper

[4] https://ocd-hub-nm-emnrd.hub.arcgis.com/

portion of each Map also reports the total population and the Republican partisanship of each of the three districts in the computer-simulated plan. Specifically, the partisanship of each district is measured using both the district's Republican Performance Index and the district's Republican two-party share of registered voters ("Republican Registered Voters %"). Both of these two measures of district partisanship are explained in more detail in the following section of this report.

EXHIBIT 31

Map 1 : Example of a Computer−Simulated Congressional Plan

District:	Population:	Republican Performance Index:	Republican Registered Voters %:
1	705,841	46.7%	42.6%
2	705,836	45%	39.3%
3	705,845	45.4%	40.3%

Plan Average: 705,840.7

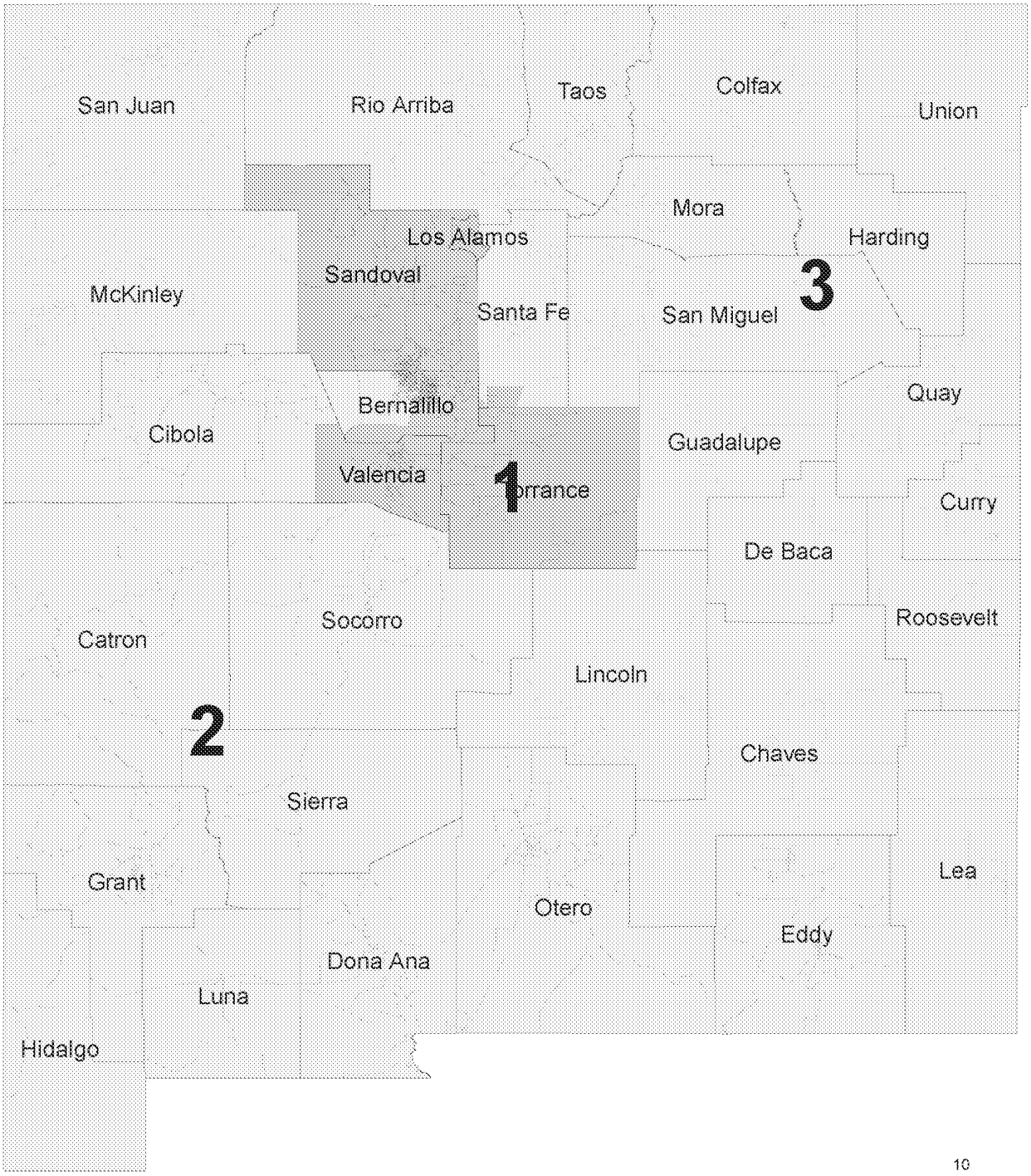


EXHIBIT 31

Map 2 : Example of a Computer−Simulated Congressional Plan

District:	Population:	Republican Performance Index:	Republican Registered Voters %:
1	705,840	45.7%	40.6%
2	705,842	46%	41.3%
3	705,840	45.7%	40.7%

Plan Average: 705,840.7

EXHIBIT 31

Map 3 : Example of a Computer−Simulated Congressional Plan

District:	Population:	Republican Performance Index:	Republican Registered Voters %:
1	705,844	45.1%	40.6%
2	705,838	46.8%	41.3%
3	705,840	45.7%	40.7%

Plan Average: 705,840.7

EXHIBIT 31

Measuring the Partisanship of Districting Plans

11. In this report, I measure the partisanship of districts in the SB 1 plan and compare them to the partisanship of districts in the computer-simulated congressional plans. By using the same measure of partisanship for both the SB 1 plan and for the computer-simulated plans, I am able to assess whether or not the partisanship of SB 1 plan districts are typical of and within the normal distribution of the computer-simulated plans' districts. As explained below, I use past results from New Mexico's statewide election contests as well as voter registration numbers for each political party to measure and compare the partisanship of districts in the SB 1 plan and the computer-simulated plans.

12. In most states, redistricting map-drawers commonly measure the partisanship of congressional and legislative districting plans by using election results from several recent, statewide election results. It is common practice to aggregate together election results from several recent elections because in general, the most reliable method of comparing the partisanship of different districts within a state is to consider whether these districts have tended to favor Republican or Democratic candidates in recent, competitive statewide elections.

13. ***The Republican Performance Index:*** In New Mexico, the most commonly recognized formula for measuring the partisanship of districts using recent statewide elections is the "Performance Index" developed by Research & Polling, Inc. The Performance Index used during the 2021 redistricting cycle is simply an aggregation of results of all competitive statewide general elections from 2012, 2014, 2016, 2018, and 2020. Non-competitive elections, defined as those contests in which the victor won by more than 20 percentage points, were

[6] The 2018 US Senate, the 2018 Secretary of State, and the 2018 Attorney General elections were excluded because the victor won by more than 20 percentage points.

excluded from the Performance Index.[6] There were a total of 26 competitive statewide election contests held during these years, and the election results for these contests are available at the level of New Mexico's 2,163 precincts.[7] For any given geographic area, such as a congressional district, the Republican Performance Index is calculated as the Republican share of two-party votes (Republican and Democratic candidates' votes) cast across all 26 election contests. In other words, one would first sum the total number of votes cast in favor of the Republican candidates in these 26 contests and the total number of votes cast in favor of the Democratic candidates in these same contests. The Republican candidates' total share of the two-party votes across all 26 contests is referred to as the Republican Performance Index.

14. The election data necessary for calculating the Republican Performance Index were reported in the Legislature's 2021 precinct-level geographic files, which the Legislature made publicly available as part of its 2021 congressional redistricting process.[8] Across the entire state of New Mexico, there were a total of 10,194,444 votes cast in favor of the Republican candidates in these 26 contests and 12,064,492 votes cast in favor of the Democratic candidates. Therefore, the Republican Performance Index for the entire state is 45.8%. For the three individual districts in the SB 1 plan, the Republican Performance Index is as follows:

SB 1 Plan Districts:	Votes for Republican Candidates in the 26 Contests:	Votes for Democratic Candidates in the 26 Contests:	Republican Performance Index:
CD-1	4,038,053	4,643,322	46.5%
CD-2	2,918,452	3,294,911	47.0%
CD-3	3,237,939	4,126,259	44.0%

[7] These 26 competitive statewide election contests were: The 2012 US Presidential, 2012 US Senate, the 2012 Supreme Court, the 2012 Court of Appeals, the 2014 US Senate, the 2014 Governor, the 2014 Secretary of State, the 2014 Attorney General, the 2014 Auditor, the 2014 Treasurer, the 2014 State Land Commissioner, the 2014 Court of Appeals, the 2016 US Presidential, 2016 Secretary of State, the 2016 Supreme Court, the 2016 Court of Appeals, the 2018 Governor, the 2018 Auditor, the 2018 Treasurer, the 2018 State Land Commissioner, the 2018 Court of Appeals, the 2018 Supreme Court, the 2020 US President, the 2020 US Senate, the 2020 Supreme Court, and the 2020 Court of Appeals elections.

[8] https://www.nmlegis.gov/sessions/div_redistricting/2021/

15. ***Partisan Affiliation of Registered Voters:*** In addition to measuring the partisanship of districts according to their Republican Performance Index, Defendants' counsel also instructed me to measure the partisanship of each district using the Republican Party's two-party share of registered voters. In other words, for each district, I count the number of registered Republican voters residing within the district as a share of all registered Republicans and Democrats in the district. These registered voter counts were calculated and reported in the Legislature's 2021 precinct-level geographic files, which the Legislature made publicly available as part of its 2021 congressional redistricting process.[9]

16. Across the entire state, there were a total of 414,327 registered Republicans and 600,720 registered Democrats as of 2021. Therefore, the Republican two-party share of registered voters for the entire state was 40.8%. This percentage does not count anyone who was neither a Republican nor a Democrat. For the three individual districts in the SB 1 plan, the Republican share of registered voters was as follows:

SB 1 Plan Districts:	Registered Republicans:	Registered Democrats:	Republican Share of Registered Voters:
CD-1	157,461	211,916	42.6%
CD-2	123,390	177,183	41.1%
CD-3	133,476	211,621	38.7%

17. In the following section of this report, I use both the Republican Performance Index as well as the Republican share of registered voters to measure the partisanship of districts. I compare the SB 1 plan districts to the districts in the computer-simulated plans in order to assess whether the SB 1 plan exhibits partisan characteristics which could reasonably have arisen from a map-drawing process based on the districting criteria that were programmed into the simulation algorithm.

[9] https://www.nmlegis.gov/sessions/diy_redistricting/2021/

EXHIBIT 31

District-Level and Plan-Wide Partisan Comparisons of the SB 1 Plan and Simulated Plans:

18. In this section, I present partisan comparisons of the SB 1 plan to the computer-simulated plans at both a district-by-district level as well as a plan-wide level, with partisanship measured using both the Republican Partisan Index as well as the Republican share of registered voters. First, I compare the district-level Republican partisanship of the SB 1 plan's districts to the partisanship of the districts in the computer-simulated plans. Additionally, I compare the partisanship of the SB 1 plan containing Las Cruces (CD-2) to the partisanship of the district in each simulated plan containing Las Cruces. Finally, I compare the total number of districts in the SB 1 Plan and in each of the computer-simulated plans with a Republican Performance Index between 46-54%.

19. Overall, I find that all three of the districts in the SB 1 plan exhibit partisan characteristics that are typical of and could have reasonably emerged from the partisan-neutral computer-simulated districting process adhering to non-partisan districting criteria. In particular, the partisan composition of CD-2, which is the most Republican-favorable district in the SB 1 plan, is well within the normal range of the simulated plans' most-Republican districts. None of the three districts in the SB 1 plan are statistical outliers when compared to the computer-simulated plans' districts. Additionally, CD-2 in the SB 1 plan exhibits a partisan composition that is quite typical among the Las Cruces-based districts in the computer-simulated plans. Finally, the total number of districts with a Republican Performance Index between 46-54% is greater in the SB 1 plan than in most of the computer-simulated plans. I describe each of these findings in detail below:

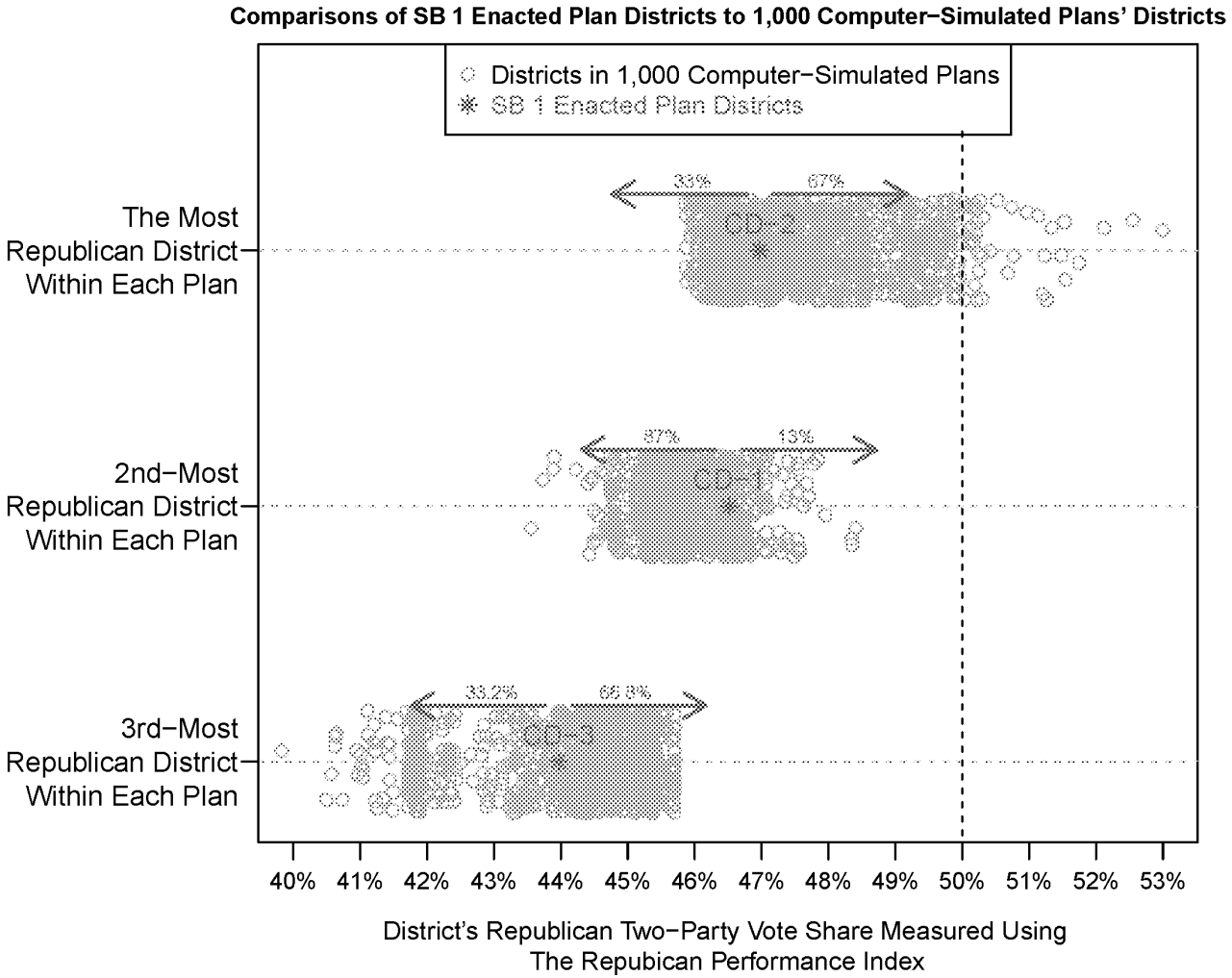
EXHIBIT 31

20. ***District-By-District Comparisons Using the Partisan Index***: In Figure 1, I directly compare the partisan distribution of districts in the SB 1 plan to the partisan distribution of districts in the 1,000 computer-simulated plans. I first order the SB 1 plan's districts from most-Republican to least-Republican, as measured by Republican vote share using the Performance Index. The most-Republican district appears on the top row, the second-most-Republican district appears on the second row, and the least-Republican district appears on the bottom row. Next, I analyze each of the 1,000 computer-simulated plans and similarly order each simulated plan's districts from the most- to the least-Republican district

21. I then directly compare the most-Republican SB 1 plan district (CD-2) to the most-Republican simulated district from each of the 1,000 computer-simulated plans. In other words, I compare one district from the SB 1 plan to 1,000 computer-simulated districts, and I compare these districts based on their Republican Performance Index. I then directly compare the second-most-Republican district in the Enacted Plan (CD-1) to the second-most Republican district from each of the 1,000 simulated plans. And finally, the third row compares the least-Republican district in the SB 1 plan (CD-3) to the least-Republican district from each of the 1,000 simulated plans. In each row of this Figure, the SB 1 plan's district is depicted with a red star and labeled in red with its district number; meanwhile, the 1,000 computer-simulated districts are depicted with 1,000 gray circles on each row.

EXHIBIT 31

Figure 1:



Note: Percentages in red above arrows indicate the percent of simulated districts in each row with a lower/higher Republican vote share than each Enacted Plan district.

22. In the top row of Figure 1, I directly compare the most-Republican SB 1 plan district (CD-2) to the most-Republican simulated district from each of the 1,000 computer-simulated plans. In other words, I compare one district from the SB 1 plan to 1,000 computer-simulated districts, and I compare these districts based on their Republican Performance Index. In the second row of Figure 1, I then directly compare the second-most-Republican district in the Enacted Plan (CD-1) to the second-most Republican district from each of the 1,000 simulated plans. And finally, the third row compares the least-Republican district in the SB 1 plan (CD-3) to the least-Republican district from each of the 1,000 simulated plans. In each row of this Figure, the SB 1 plan's district is depicted with a red star and labeled in red with its district number; meanwhile, the 1,000 computer-simulated districts are depicted with 1,000 gray circles on each row

23. The top row of Figure 1 illustrates that the most-Republican district in the SB 1 plan (CD-2) has a Republican Performance Index of 47.0%, which is well within the normal partisan distribution of the most-Republican district in the 1,000 simulated plans. The red percentages above the two arrows in the top row of this Figure report that in 33% of the simulated plans, the most-Republican district has a lower Republican Performance Index than CD-2, while in 67% of the simulated plans, the most-Republican district has a higher Republican Performance Index than CD-2.

24. In other words, CD-2 in the SB 1 plan is less favorable to Republicans than 67% of the simulated plans' most-Republican districts, and CD-2 is more favorable to Republicans than 33% of the simulated plans' most-Republican districts. Hence, CD-2 is squarely within the normal partisan distribution when compared to the most-Republican districts created by the 1,000 computer-simulated plans. It is clearly not a statistical outlier in terms of its partisanship.

The partisan composition of CD-2 is quite typical among the most-Republican districts in the computer-simulated plans.

25. The second row of Figure 1 illustrates a similar finding regarding CD-1, the second-most-Republican district in the SB 1 plan. CD-1 has a Republican Performance Index of 46.5%, which is higher than 87% of the simulated districts' second-most-Republican districts. In other words, CD-1 is more favorable to Republicans than most of the simulated plans' second-most-Republican districts, but CD-1 is still within the normal partisan distribution of these simulated districts. Hence, it is clear that CD-1 is not a statistical outlier in terms of its partisanship.

26. Finally, the bottom row of Figure 1 illustrates a similar finding regarding CD-3, the least-Republican district in the SB 1 plan. CD-3 has a Republican Performance Index of 44.0%, which is higher than 33.2% and lower than 66.8% of the simulated districts' least-Republican districts. In other words, CD-3 is more favorable to Republicans than one-third of the simulated plans' second-most-Republican districts and less favorable to Republicans than two-thirds of the simulated districts. Hence, CD-1 is very much within the normal partisan distribution of the simulated plans' second-most Republican districts. It is therefore clear that CD-1 is not a statistical outlier in terms of its partisanship.

27. Overall, I conclude that a non-partisan map-drawing process adhering to the non-partisan districting criteria outlined in Paragraph 9 could reasonably have resulted in a congressional plan with the SB 1 plan's district-level partisan characteristics. The partisan characteristics of all three districts are clearly quite typical of districts produced by the partisan-blind computer-simulation process. None of the three districts are partisan outliers, nor are they extreme when compared to the partisanship of the simulated plans' districts.

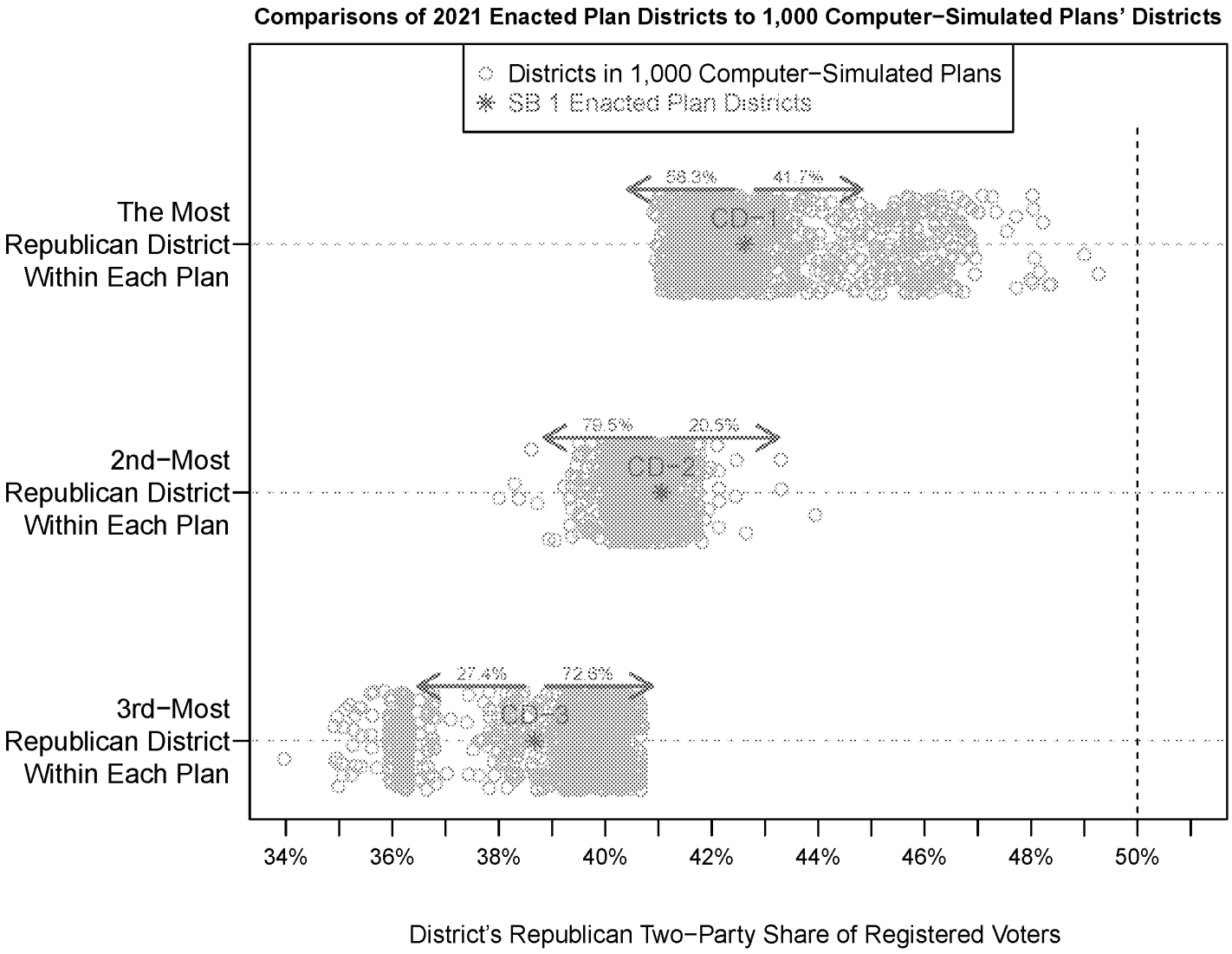
28. ***District-By-District Comparisons Using Voters' Party Registration:*** Figure 2 presents a similar partisan comparison of the SB 1 plan's districts to the districts in the 1,000 computer-simulated plans, but in this Figure, partisanship is measured using each district's Republican share of registered voters. When the partisanship of districts is measured using registered voters, the most-Republican district in the SB 1 plan is CD-1, which has a 42.6% Republican two-party share of registered voters. The second-most-Republican district in the SB 1 plan is CD-2, which has a 41.1% Republican two-party share of registered voters. And finally, the least-Republican district in the SB 1 plan is CD-3, which has a 38.7% Republican two-party share of registered voters.

29. The top row of Figure 2 illustrates that the most-Republican district in the SB 1 plan (CD-1) is well within the normal partisan distribution of the most-Republican district in the 1,000 simulated plans. The red percentages above the two arrows in the top row of this Figure report that in 58.3% of the simulated plans, the most-Republican district has a lower Republican share than CD-1, while in 41.7% of the simulated plans, the most-Republican district has a higher Republican Performance Index than CD-1.

30. In other words, CD-1 in the SB 1 plan is less favorable to Republicans than 41.7% of the simulated plans' most-Republican districts, and CD-1 is more favorable to Republicans than 58.3% of the simulated plans' most-Republican districts. Hence, CD-1 is very close to the median of the distribution when compared to the most-Republican districts created by the 1,000 computer-simulated plans. It is clearly not a statistical outlier in terms of its partisanship. The partisan composition of CD-1 is quite typical among the most-Republican districts in the computer-simulated plans.

EXHIBIT 31

Figure 2:



Note: Percentages in red above arrows indicate the percent of simulated districts in each row with a lower/higher Republican share of registered voters than each Enacted Plan district.

31. The second row of Figure 2 illustrates a similar finding regarding CD-2, the second-most-Republican district in the SB 1 plan. The Republican share of registered voters in CD-2 is higher than 79.5% of the simulated districts' second-most-Republican districts. In other words, CD-2 is more favorable to Republicans than most of the simulated plans' second-most-Republican districts, but CD-2 is still within the normal partisan distribution of these simulated districts. Hence, it is clear that CD-2 is not a statistical outlier in terms of its partisanship when measured using party registration.

32. Finally, the bottom row of Figure 2 illustrates a similar finding regarding CD-3, the least-Republican district in the SB 1 plan. The Republican share of registered voters in CD-3 is higher than 27.4% and lower than 72.6% of the simulated districts' least-Republican districts. Hence, CD-3 is very much within the normal partisan distribution of the simulated plans' second-most Republican districts, when partisanship is measured using voters' party registration. It is thus clear that CD-3 is not a statistical outlier in terms of its partisanship.

33. Overall, Figure 2 illustrates that even when partisanship is measured using voters' party registration, my earlier conclusions do not change: A non-partisan map-drawing process adhering to the non-partisan districting criteria outlined in Paragraph 9 could reasonably have resulted in a congressional plan with the SB 1 plan's district-level partisan characteristics. The Republican share of registered voters within each of the SB 1 plan's districts are typical of districts produced by the partisan-blind computer-simulation process. None of the three districts are partisan outliers, nor are they extreme when compared to the partisanship of the simulated plans' districts.

34. ***Partisanship of the District Containing Las Cruces:*** In the SB 1 Plan, Las Cruces is assigned to CD-2, which has a 47.0% Republican Performance Index and a 41.1%

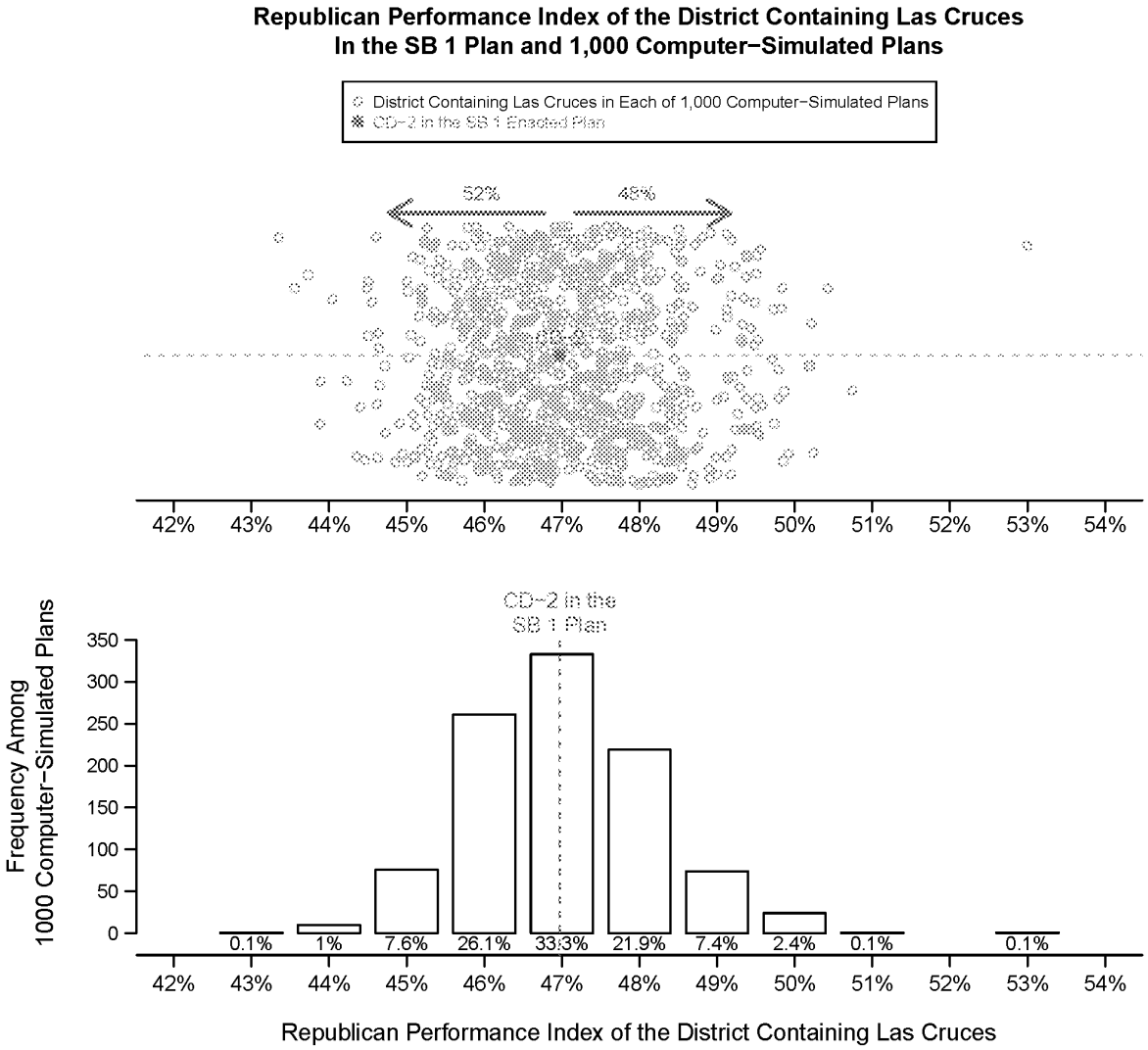
Republican two-party share of registered voters. In Figures 3 and 4, I analyze how the partisanship of CD-2 compares to the district in each computer-simulated plan that similarly contains Las Cruces. These comparisons allow me to determine whether or not the partisanship of the Las Cruces-based district in the SB 1 plan is within the distribution of all of the Las Cruces-based districts in the 1,000 computer-simulated plans.

35. Figure 3 compares CD-2 from the SB 1 plan to the simulated plans' Las Cruces-based districts along each district's Republican Performance Index. The upper half of this Figure is a plot depicting each district's precise Republican Performance Index, while the lower half of the Figure is a histogram showing the statistical distribution of the Performance Index across all computer-simulated plans. In the upper half, the red star depicts CD-2 from the SB 1 plan, while in the lower half, the red dotted line indicates the Performance Index of CD-2.

36. Figure 3 illustrates that CD-2 from the SB 1 plan is almost perfectly at the median of the distribution of the computer-simulated districts in terms of their Republican Performance Index. 48% of the simulated plans produce a Las Cruces-based district that is more favorable to Republicans than CD-2, while 52% of the simulated plans produce a Las Cruces-based district that is less Republican favorable. In other words, CD-2 is extremely close to the median of the distribution of the simulated districts. I therefore conclude that the partisanship of the SB 1 Plan's Las Cruces-based district could very reasonably have emerged from a non-partisan districting process adhering to the criteria outlined in Paragraph 9.

EXHIBIT 31

Figure 3:



37. Figure 4 illustrates the same comparisons as Figure 3, except that in Figure 4, the partisanship of each district is measured using the district's Republican two-party share of registered voters. Figure 4 illustrates that my conclusions do not change when using voter registration to measure district partisanship. In the upper half of Figure 4, 63.1% of the simulated plans produce a Las Cruces-based district that is more favorable to Republicans than CD-2, while 36.9% of the simulated plans produce a Las Cruces-based district that is less Republican favorable. In other words, CD-2 is very much within the normal distribution of the simulated plans' Las Cruces-based districts when using voter registration to measure partisanship. Therefore, using either measure of partisanship, I conclude that the partisanship of CD-2 in the SB 1 Plan is neither extreme nor a statistical outlier when compared to Las Cruces-based districts created by the non-partisan computer simulation algorithm.

EXHIBIT 31

Figure 4:

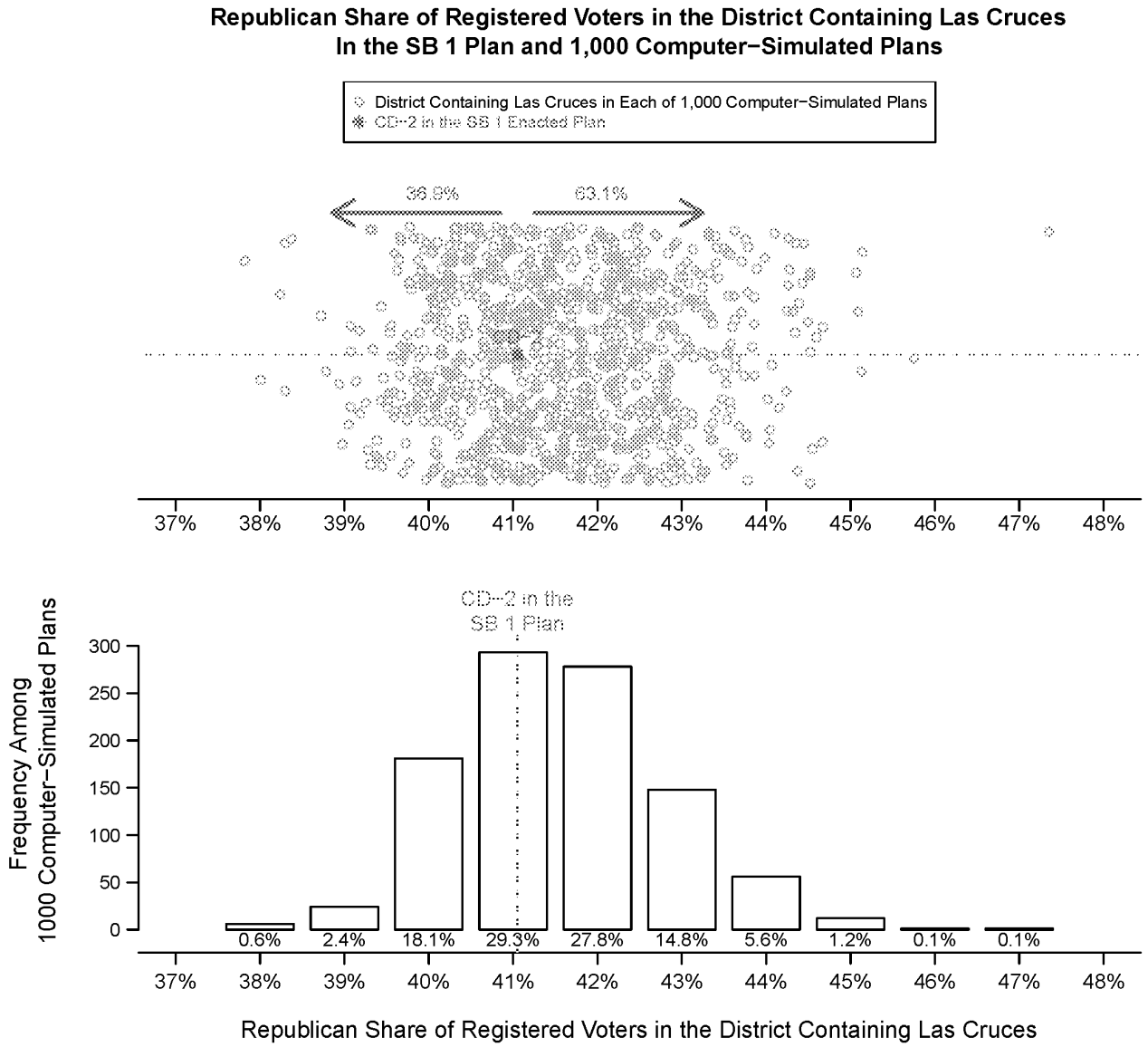


EXHIBIT 31

38. ***Statewide Comparisons:*** The histogram in Figure 5 reports the number of districts in each computer-simulated plan exhibiting a Republican Performance Index of 46–54%. Within this range of partisanship, a district has relatively close to the same number of Democrat and Republican voters. The vast majority of the computer-simulated plans contain either zero or one such district, while only 31.3% of the simulated plans contain two districts with a Republican Performance Index of 46–54%. No simulated plan contains more than two such districts. Meanwhile, the SB 1 plan, which is depicted in this Figure with a dashed red line, contains two districts with a Republican Performance Index of 46–54%, thus equaling the highest number of such districts ever achieved in the computer-simulated plans. The SB 1 plan contains more such districts than over two-thirds of the computer-simulated plans. Compared to the SB 1 plan, over two-thirds of the computer-simulated plans produced fewer districts with relatively close to the same number of Democrat and Republican voters.

EXHIBIT 31

Figure 5:

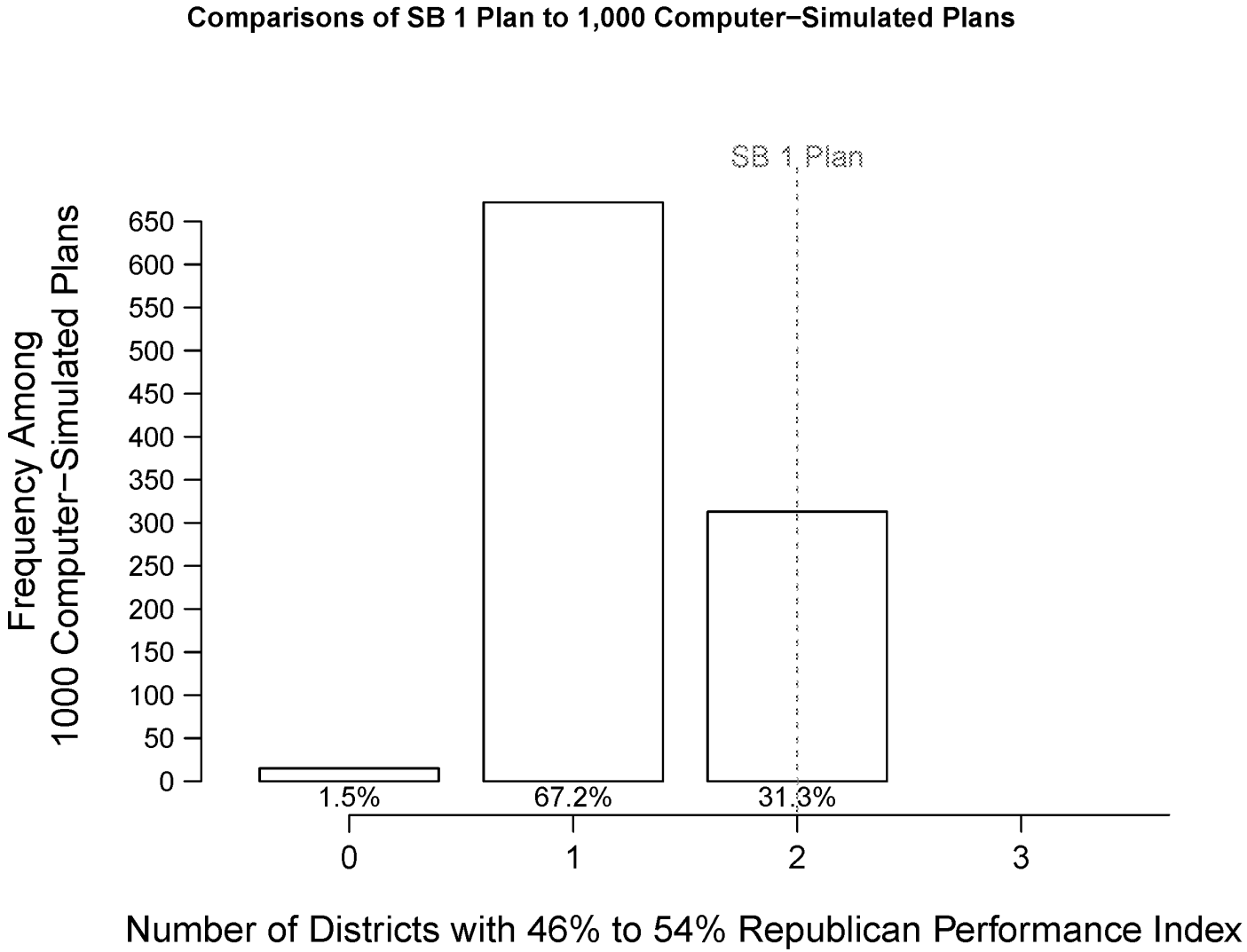


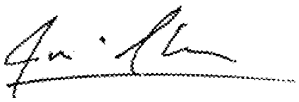
EXHIBIT 31

Conclusion:

39. In summary, I programmed a partisan-blind computer algorithm to produce random maps for New Mexico's congressional plan by adhering only to non-partisan districting criteria. I then analyzed the partisan characteristics of these computer-simulated maps as well as the SB 1 plan. I concluded that the partisan characteristics of the SB 1 plan are well within the normal range of these computer-generated districting plans drawn with the partisan-blind algorithm. The SB 1 plan is neither extreme nor a statistical outlier in terms of its partisanship. The partisan characteristics of the SB 1 plan could plausibly have emerged from a partisan-neutral map-drawing process adhering to non-partisan districting criteria.

EXHIBIT 31

This 25th day of August, 2023.



Dr. Jowei Chen

EXHIBIT 31

Jowei Chen
Curriculum Vitae

Department of Political Science
University of Michigan
5700 Haven Hall
505 South State Street
Ann Arbor, MI 48109-1045
Phone: 917-861-7712, Email: jowei@umich.edu
Website: http://www.umich.edu/~jowei

Academic Positions:
Associate Professor (2015-present), Assistant Professor (2009-2015), Department of Political Science, University of Michigan.
Research Associate Professor (2016-present), Faculty Associate (2009-2015), Center for Political Studies, University of Michigan.
W. Glenn Campbell and Rita Ricardo-Campbell National Fellow, Hoover Institution, Stanford University, 2013.
Principal Investigator and Senior Research Fellow, Center for Governance and Public Policy Research, Willamette University, 2013 – Present.

Education:
Ph.D., Political Science, Stanford University (June 2009)
M.S., Statistics, Stanford University (January 2007)
B.A., Ethics, Politics, and Economics, Yale University (May 2004)

Publications:

Chen, Jowei and Neil Malhotra. 2007. "The Law of k/n: The Effect of Chamber Size on Government Spending in Bicameral Legislatures."
American Political Science Review, 101(4): 657-676.

Chen, Jowei, 2010. "The Effect of Electoral Geography on Pork Barreling in Bicameral Legislatures."
American Journal of Political Science, 54(2): 301-322.

Chen, Jowei, 2013. "Voter Partisanship and the Effect of Distributive Spending on Political Participation."
American Journal of Political Science, 57(1): 200-217.

Chen, Jowei and Jonathan Rodden, 2013. "Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures"
Quarterly Journal of Political Science, 8(3): 239-269.

EXHIBIT 31

Bradley, Katharine and Jowei Chen, 2014. "Participation Without Representation? Senior Opinion, Legislative Behavior, and Federal Health Reform."
Journal of Health Politics, Policy and Law, 39(2), 263-293.

Chen, Jowei and Tim Johnson, 2015. "Federal Employee Unionization and Presidential Control of the Bureaucracy: Estimating and Explaining Ideological Change in Executive Agencies."
Journal of Theoretical Politics, Volume 27, No. 1: 151-174.

Bonica, Adam, Jowei Chen, and Tim Johnson, 2015. "Senate Gate-Keeping, Presidential Staffing of 'Inferior Offices' and the Ideological Composition of Appointments to the Public Bureaucracy."
Quarterly Journal of Political Science, Volume 10, No. 1: 5-40.

Chen, Jowei and Jonathan Rodden, 2015. "Cutting Through the Thicket: Redistricting Simulations and the Detection of Partisan Gerrymanders."
Election Law Journal, Volume 14, Number 4: 331-345.

Chen, Jowei and David Cottrell, 2016. "Evaluating Partisan Gains from Congressional Gerrymandering: Using Computer Simulations to Estimate the Effect of Gerrymandering in the U.S. House."
Electoral Studies, Volume 44 (December 2016): 329-340.

Chen, Jowei, 2017. "Analysis of Computer-Simulated Districting Maps for the Wisconsin State Assembly."
Election Law Journal, Volume 16, Number 4 (December 2017): 417-442.

Chen, Jowei and Nicholas Stephanopoulos, 2021. "The Race-Blind Future of Voting Rights."
Yale Law Journal, Forthcoming, Volume 130, Number 4: 778-1049.

Kim, Yunsieg and Jowei Chen, 2021. "Gerrymandered by Definition: The Distortion of 'Traditional' Districting Principles and a Proposal for an Empirical Redefinition."
Wisconsin Law Review, Forthcoming, Volume 2021, Number 1.

Chen, Jowei and Nicholas Stephanopoulos, 2021. "Democracy's Denominator."
California Law Review, Accepted for Publication, Volume 109.

Non-Peer-Reviewed Publication:

Chen, Jowei and Tim Johnson. 2017. "Political Ideology in the Bureaucracy."
Global Encyclopedia of Public Administration, Public Policy, and Governance.

EXHIBIT 31

Research Grants:

"How Citizenship-Based Redistricting Systemically Disadvantages Voters of Color". 2020 ($18,225). Combating and Confronting Racism Grant. University of Michigan Center for Social Solutions and Poverty Solutions.

Principal Investigator. National Science Foundation Grant SES-1459459, September 2015 – August 2018 ($165,008). "The Political Control of U.S. Federal Agencies and Bureaucratic Political Behavior."

"Economic Disparity and Federal Investments in Detroit," (with Brian Min) 2011. Graham Institute, University of Michigan ($30,000).

"The Partisan Effect of OSHA Enforcement on Workplace Injuries," (with Connor Raso) 2009. John M. Olin Law and Economics Research Grant ($4,410).

Invited Talks:

September, 2011. University of Virginia, American Politics Workshop.
October 2011. Massachusetts Institute of Technology, American Politics Conference.
January 2012. University of Chicago, Political Economy/American Politics Seminar.
February 2012. Harvard University, Positive Political Economy Seminar.
September 2012. Emory University, Political Institutions and Methodology Colloquium.
November 2012. University of Wisconsin, Madison, American Politics Workshop.
September 2013. Stanford University, Graduate School of Business, Political Economy Workshop.
February 2014. Princeton University, Center for the Study of Democratic Politics Workshop.
November 2014. Yale University, American Politics and Public Policy Workshop.
December 2014. American Constitution Society for Law & Policy Conference: Building the Evidence to Win Voting Rights Cases.
February 2015. University of Rochester, American Politics Working Group.
March 2015. Harvard University, Voting Rights Act Workshop.
May 2015. Harvard University, Conference on Political Geography.
Octoer 2015. George Washington University School of Law, Conference on Redistricting Reform.
September 2016. Harvard University Center for Governmental and International Studies, Voting Rights Institute Conference.
March 2017. Duke University, Sanford School of Public Policy, Redistricting Reform Conference.
October 2017. Willamette University, Center for Governance and Public Policy Research
October 2017, University of Wisconsin, Madison. Geometry of Redistricting Conference.
February 2018: University of Georgia Law School
September 2018. Willamette University.
November 2018. Yale University, Redistricting Workshop.

November 2018. University of Washington, Severyns Ravenholt Seminar in Comparative Politics.
January 2019. Duke University, Reason, Reform & Redistricting Conference.
February 2019. Ohio State University, Department of Political Science. Departmental speaker series.
March 2019. Wayne State University Law School, Gerrymandering Symposium.
November 2019. Big Data Ignite Conference.
November 2019. Calvin College, Department of Mathematics and Statistics.
September 2020 (Virtual). Yale University, Yale Law Journal Scholarship Workshop
September 2021, Duke University, Redistricting and American Democracy Conference
July 2022, ICPSR Blalock Lecture, University of Michigan

Conference Service:

Section Chair, 2017 APSA (San Francisco, CA), Political Methodology Section
Discussant, 2014 Political Methodology Conference (University of Georgia)
Section Chair, 2012 MPSA (Chicago, IL), Political Geography Section.
Discussant, 2011 MPSA (Chicago, IL) "Presidential-Congressional Interaction."
Discussant, 2008 APSA (Boston, MA) "Congressional Appropriations."
Chair and Discussant, 2008 MPSA (Chicago, IL) "Distributive Politics: Parties and Pork."

Conference Presentations and Working Papers:

"Ideological Representation of Geographic Constituencies in the U.S. Bureaucracy," (with Tim Johnson). 2017 APSA.

"Incentives for Political versus Technical Expertise in the Public Bureaucracy," (with Tim Johnson). 2016 APSA.

"Black Electoral Geography and Congressional Districting: The Effect of Racial Redistricting on Partisan Gerrymandering". 2016 Annual Meeting of the Society for Political Methodology (Rice University)

"Racial Gerrymandering and Electoral Geography." Working Paper, 2016.

"Does Deserved Spending Win More Votes? Evidence from Individual-Level Disaster Assistance," (with Andrew Healy). 2014 APSA.

"The Geographic Link Between Votes and Seats: How the Geographic Distribution of Partisans Determines the Electoral Responsiveness and Bias of Legislative Elections," (with David Cottrell). 2014 APSA.

"Gerrymandering for Money: Drawing districts with respect to donors rather than voters." 2014 MPSA.

EXHIBIT 31

"Constituent Age and Legislator Responsiveness: The Effect of Constituent Opinion on the Vote for Federal Health Reform." (with Katharine Bradley) 2012 MPSA.

"Voter Partisanship and the Mobilizing Effect of Presidential Advertising." (with Kyle Dropp) 2012 MPSA.

"Recency Bias in Retrospective Voting: The Effect of Distributive Benefits on Voting Behavior." (with Andrew Feher) 2012 MPSA.

"Estimating the Political Ideologies of Appointed Public Bureaucrats," (with Adam Bonica and Tim Johnson) 2012 Annual Meeting of the Society for Political Methodology (University of North Carolina)

"Tobler's Law, Urbanization, and Electoral Bias in Florida." (with Jonathan Rodden) 2010 Annual Meeting of the Society for Political Methodology (University of Iowa)

"Unionization and Presidential Control of the Bureaucracy" (with Tim Johnson) 2011 MPSA.

"Estimating Bureaucratic Ideal Points with Federal Campaign Contributions" 2010 APSA. (Washington, DC).

"The Effect of Electoral Geography on Pork Spending in Bicameral Legislatures," Vanderbilt University Conference on Bicameralism, 2009.

"When Do Government Benefits Influence Voters' Behavior? The Effect of FEMA Disaster Awards on US Presidential Votes," 2009 APSA (Toronto, Canada).

"Are Poor Voters Easier to Buy Off?" 2009 APSA (Toronto, Canada).

"Credit Sharing Among Legislators: Electoral Geography's Effect on Pork Barreling in Legislatures," 2008 APSA (Boston, MA).

"Buying Votes with Public Funds in the US Presidential Election," Poster Presentation at the 2008 Annual Meeting of the Society for Political Methodology (University of Michigan).

"The Effect of Electoral Geography on Pork Spending in Bicameral Legislatures," 2008 MPSA.

"Legislative Free-Riding and Spending on Pure Public Goods," 2007 MPSA (Chicago, IL).

"Free Riding in Multi-Member Legislatures," (with Neil Malhotra) 2007 MPSA (Chicago, IL).

"The Effect of Legislature Size, Bicameralism, and Geography on Government Spending: Evidence from the American States," (with Neil Malhotra) 2006 APSA (Philadelphia, PA).

EXHIBIT 32

FIFTH JUDICIAL DISTRICT COURT
COUNTY OF LEA
STATE OF NEW MEXICO

NO. D-506-CV-2022-00041

REPUBLICAN PARTY OF NEW MEXICO, DAVID GALLEGOS, TIMOTHY JENNINGS, DINAH VARGAS, MANUEL GONZALES, JR., BOBBY AND DEE ANN KIMBRO, and PEARL GARCIA,

Plaintiffs,

vs.

MAGGIE TOULOUSE OLIVER, in her official capacity as New Mexico Secretary of state, MICHELLE LUJAN GRISHAM, in her official capacity as Governor of New Mexico, HOWIE MORALES, in his official capacity as New Mexico Lieutenant Governor and President of the New Mexico Senate, MIMI STEWART, in her official capacity as President Pro Tempore of the New Mexico Senate, and JAVIER MARTINEZ, in his official capacity as Speaker of the New Mexico House of Representative,

Defendants.

DEPOSITION OF SEAN P. TRENDE
September 6, 2023
9:00 a.m.

VIA REMOTE VIDEOCONFERENCING

PURSUANT TO THE NEW MEXICO RULES OF CIVIL PROCEDURE this deposition was:

TAKEN BY: LUCAS M. WILLIAMS
ATTORNEY FOR THE DEFENDANTS

REPORTED BY: KAREN RODRIGUEZ, CCR #55
KMR Court Reporting, LLC
Post Office Box 11505
Albuquerque, New Mexico 87192

A P P E A R A N C E S

For the Plaintiffs:

MOLLY DiRAGO
Troutman Pepper
227 W Monroe Street
Suite 3900
Chicago, Illinois 60606
(312) 759-1926
molly.derago@troutman.com

CARTER B. HARRISON
Harrison & Hart, LLC
924 Park Avenue, SW
Suite E
Albuquerque, New Mexico 87102
(505) 295-3261
carter@harrisonhartlaw.com

For the Defendants Michelle Lujan Grisham and Howie Morales:

HOLLY AGAJANIAN
KYLE DUFFY
The Governor's Office
490 Old Santa Fe Trail
Santa Fe, New Mexico 87501
(505) 476-2200
holly.agajanian@eec.nm.gov
kyle.duffy@exec.nm.gov

For the Defendants Mimi Stewart and Javier Martinez:

LUCAS M. WILLIAMS
ANN COX TRIPP
Hinkle, Hensley, Shanor & Martin, L.L.P.
400 Penn Plaza
Suite 700
Roswell, New Mexico 88202
(575) 622-6510
lwilliams@hinklelawfirm.com

SARA SANCHEZ
ABIGAIL PACE
Peifer, Hanson, Mullins & Baker PA
20 First Plaza, NW
Suite 725
Albuquerque, New Mexico 87102
(505) 247-4800
ssanchez@peiferlaw.com
apace@peiferlaw.com

Also Present:

JOWEI CHEN

I N D E X

E X H I B I T S

SEAN P. TRENDE

after having been first duly sworn,

testified as follows:

EXAMINATION

BY MR. WILLIAMS:

Q. Good morning, Mr. Trende. My name is Lucas Williams. I'm an attorney with the Hinkle Law Firm. I represent the legislative defendants in this case. You and I have never met; is that correct?

A. That's right.

Q. All right. You've probably been deposed a few times. I've read a bunch of your depositions. How many times would you say you've been deposed, Mr. Trende?

A. Twenty.

Q. Twenty? So you know the ground rules. I'm going to ask you questions. I hope to get answers. I'm going to do my best to ask my question and then be quiet while you answer. I hope you will do me the same courtesy of not answering while I'm trying to ask you a question.

I ask remarkably poor questions. So when I do, feel free to stop me and let me know you don't understand, and I'll try to articulate something that is more clear.

If you answer my question, I'm going to assume you understood the question. If you need a break,

EXHIBIT 32

Q. Okay. I want to point you to your expert report. I want to walk through portions of this. All right. On page 9 of your report, Exhibit 1.13, you discuss -- I believe this is section 5.1 where you're talking about Justice Kagan's opinion. Do you see that?

A. Yes.

Q. All right. I'm going to highlight the first full paragraph on page 9, Exhibit 1.13, that begins, "As discussed in more detail below..." Do you see that?

A. Yes.

Q. All right. You represent that in Rucho, there is a total of 24,518 total maps, while your report offers several million maps for analysis using more sophisticated techniques. Do you see that?

A. Yes.

Q. Is there something deficient in using the 24,518 maps as opposed to the several million maps for analysis that you reference here?

A. A bigger sample size is always useful for you, but I don't think there's necessarily anything wrong with 24,518.

Q. I'm looking at page 48 of your report, Exhibit 1.52. Do you see that?

A. Yes.

Q. You have a sentence that says "In short, you

cannot plot 3 million dots on a 8.5 by 11 inch page without a significant amount of overplotting." Do you see that?

A. Yes.

Q. Is that 3 million dots that is referenced there -- first, does that reflect maps that were generated by your software?

A. So each dot is a district from a map, is a representation of a district from a map.

Q. So when you say "3 million dots," that would be 1 million maps?

A. Correct.

Q. Okay. So at page 48, Exhibit 1.52, you're referencing again the 1 million maps that you say that you did in this project?

A. That's right.

Q. On page 1.82, your report page number 78, there is a sentence that reflects "Across millions of maps, under multiple assumptions and scenarios, the Enacted Map presents as an extreme outlier." Is that sentence part of your report?

A. Yes.

Q. And with this sentence, you're hoping to communicate to the Court that SB-1 is an extreme outlier as compared to the millions of maps you generated in

this simulation?

A. Yes.

Q. All right. Okay. Let's look at section 6.4.1, titled "Baseline Simulations." I'm going to go to your report page number 44, exhibit page 1.48. Is that correct? Do you see that?

A. Huh-huh.

Q. All right. I'm going to highlight the sentence that begins on the prior page, "After unifying the data at the precinct level, I instructed the simulation to create 1,000,000 sets of three reasonably compacted districts, which respect county subdivisions." Does that reflect the code that you produced to us?

A. It should, unless I changed the n_sims after I wrote the report, to check something, and never changed it back. But yeah, if you look at the histogram on page 46, that has the counts of maps. I mean, that is going to hit a million pretty quick when you're going over 40,000 in those bars every time. So yeah, it was a million maps.

Q. Let's look at your source code, Doctor. So I am looking at Exhibit 12, which is your part 05, which is the first simulation. Do you see that?

A. Huh-huh.

Q. Let's look at line 2. I've highlighted that.

What number do you see there being assigned to n_sims?

A. That's 100,000.

Q. Is 100,000 a million?

A. No.

Q. So the code that you sent us, does it generate a million maps?

A. If a competent computer programmer changes 100,000 to a million, it will, but not run in its raw form, no.

Q. Do you think a competent expert would produce monkey code?

MS. DIRAGO: Objection.

A. I don't know what monkey code is, but it appears that I changed it from a million to 100,000 for some purpose and didn't change it back for you. It's obvious, from the histograms in the report, that it was a million maps.

Q. (By Mr. Williams) Well, do you have those maps so that we can verify that?

A. No.

Q. Could you have saved those maps, Mr. Trende?

A. Not the maps themselves. You can save the block assignment files for them.

Q. Well, let's walk through your code and discuss the choices you made about this. I am looking at line 4

EXHIBIT 32

of Exhibit 12. Do you see that?
A. Yes.
Q. Can you describe to me what line 4 of your code does?
A. It creates the map file that is used to generate the simulation software.
Q. All right. What does line 5 of your code do?
A. That runs the simulation.
Q. So line 5 would output the results of the simulation into a variable called "results." Is that correct?
A. Correct.
Q. And it would be somewhat trivial, would it not, to convert that object "results" into a matrix or a table? Is that right?
A. Right. You can turn it into a matrix, although it would be a, depending which way you put it, 1 million by 2,200 matrix, but yeah.
Q. And in fact, you have code that, in part, does that at line 7; is that right?
A. That's correct.
Q. And you could take the matrix and save that to a CSV file; is that correct?
A. That's correct.
Q. And do you know how to do that?

A. I guess you would do "save_csv," whatever you want to call it and then "get_plans_matrix(results)."
Q. So between line 5, which when executed creates some number of maps, and when you turned off your computer or turned off your R environment, those maps existed; correct?
A. A file that contains the assignments for the maps existed, not the maps themselves.
Q. Well, the data that would be used to generate the maps; is that correct?
A. Correct.
Q. The output of your simulations; is that correct?
A. Correct.
Q. Which you refer to repeatedly in your expert report as "the maps." Is that correct?
A. Correct.
Q. All right. So that existed after the execution of line 5, and you chose not to save that output; is that correct?
A. That's correct. That's typically how this stuff has been produced in cases I've been involved in. And so I didn't save it. I just ran it this last time and reported the output.
Q. All right. Let's look at line 177 of that same source code. Do you see that there?

A. Yes.
Q. All right. That line of code says set.seed(8675309)." Did you choose that seed or did somebody else choose that seed for you?
A. I think one of my professors used that seed in code once, and I thought it was funny. So I will use that, or sometimes I'll do the date. It doesn't matter what seed you choose. That's a reference to a Tommy Tutone song.
Q. I am old enough to be familiar with it. All right. And the very next line, 178, again, sets up a simulation; is that correct?
A. Correct.
Q. And then line 179 runs that simulation; correct?
A. Correct.
Q. And in line 179, it uses the same variable, "n_sims." Do you see that?
A. Correct.
Q. Which, as we know, is 100,000. Is that right?
A. Unless your competent coding expert realizes it's producing 100,000 and changes it to a million, but yes, running the code straight through, it would be 100,000 maps.
Q. Mr. Trende, I am taken aback somewhat by your notion that someone else should fix the code that you

produced to us. Why should anybody other than you, Sean P. Trende, have to fix the code you produced?
MS. DIRAGO: Objection.
MR. WILLIAMS: You can answer the question, Mr. Trende.
A. Well, because, presumably, your expert will want to see and reproduce the maps that were created and, noticing that n_sims is 100,000, would realize that to replicate that would be set to a million and would do so, perhaps --
Q. Do you think it would be reasonable --
A. Can I finish my answer?
Q. Sure.
A. -- perhaps sending a clarification through counsel, "Hey, was this supposed to be a million?"
Q. Mr. Trende, you understood that, when you produced this, you were supposed to produce what you used to generate your report; is that right?
MS. DIRAGO: Objection.
Q. (By Mr. Williams) Is that right?
A. When I produced this, I produced the code from my report. There is, obviously, something that was changed at some point after the fact for some purpose that I didn't change back.
Q. And definitionally, this is not the code that you

EXHIBIT 32

used to generate your report; correct?
A. Definitionally, it has an easily correctable mistake in it.
Q. Are there any other mistakes in this code that you're aware of, Mr. Trende, that you changed after you generated your report?
A. Well, as I said before, I wouldn't have thought of this one until we went over it or the fact that the titles produce in this but not in my report. So I don't know, but I don't think so.
Q. So based upon the code that you produced to us or that you produced to your counsel and they produced to us, if I run this code, I will not get the results that you did in your report; is that correct?
A. If you run this code, you will get 100,000 maps, not the million from the report.
Q. Yeah, but we don't know that there was a million, because you didn't save them; is that correct?
A. Well, we know there's a million because you can look at the histograms and see it was a million, unless you're trying to suggest that I made up the histograms. But yeah, we know there's a million just as much as we would know there was 100,000 if we ran this through.
Q. I want to talk to you about line 177, Doctor, "set.seed(8675309)." Do you see that?

A. Yes.
Q. What is the purpose of setting the seed to 8675309 at line 177?
A. 8675309 would set it up so that it would make the same random choices every time you ran the code through.
Q. Do you know how a pseudorandom number generator works?
A. Oh, gosh, I used to before. I think it is set off of the time on your computer's clock and there's some algorithm it goes through for making the transformation necessary. I learned that one, like, six years ago and have since dumped it. I just know that if you put in "set.seed," it will produce the same random choices as you run the code every time.
Q. And I believe you testified earlier, Mr. Trende, that you were conversant with R, including its base packages. Is that correct?
A. That's correct.
Q. And is "set.seed" within the base packages of R?
A. I believe so.
Q. Okay. Is it your understanding that when you set the seed to any explicit value, you will then get a random distribution of numbers in a reproducible way? Is that fair?
A. Right. That's the point, is that now every time

you run through your code, every random choice is going to produce the same value.
Q. What is your understanding of the scoping of the set.seed operator in R?
A. I don't understand your question.
Q. Well, I see that you set the seed at line 177. Do you see that?
A. Yes.
Q. Immediately before performing a simulation; is that correct?
A. That's right.
Q. Well, let's look up here at lines 1 through 5 of this same code where you purport to perform another 100,000 simulations. Do you see that?
A. It was a million simulations, but yes, the number there says "100,000."
Q. Do you see those lines?
A. I do see those lines.
Q. What was the seed for that simulation?
A. 8675309.
Q. How do you know that, Mr. Trende?
A. Because it was in part 2 of the code.
Q. Well, let's get back to my question about scoping, Mr. Trende. What is the scoping of the set.seed operator in R?

A. If you run the code through like I suggested, the first time you set the seed, it sets the seed and it will reproduce every time you run it through. So --
Q. And I believe you testified -- go ahead.
A. So the code is meant to be run in order.
Q. I believe you told me earlier in your deposition that you would run files 01 and 02; is that correct?
A. Yes.
Q. And then you would not want to run them again, and you would perform iterative simulations; is that correct?
A. Every time I was writing code and running it, I wouldn't want to reproduce the data every single time or produce maps. But when you're running it through for the final part, you definitely want to run them in order, in part, because the set.seed at the top of the script.
Q. And did you save your work history so that we could verify how you ran these, Mr. Trende?
A. Oh, no. You have my sworn testimony.
Q. Okay. So we don't know how you ran this. Did you run it using the interactive prompt on your RStudio?
A. I would have run it from the script window.
Q. All right. So you would have launched the first code and then run the second code and then the third,

EXHIBIT 32

all the way through the seventh; is that correct?
A. That's right, with the titles hash tagged out, because I produced these titleless documents when I put this in to LaTex.
Q. Was there any interaction on your part while that code was running?
A. Can you rephrase that question?
Q. Were you interacting with the scripting environment in any way while you were running that code?
A. I don't believe so.
Q. Is there any portion of the code that you produced to us that does nothing?
A. No, I don't know if anything is commented out. It wouldn't do anything.
Q. Well, let's look at line 7 of this code. Do you see line 7 on the screen there?
A. Yes.
Q. What does that code do, Mr. Trende?
A. It tells you how many of the plans are duplicated.
Q. All right. And in what way does it tell you how many of the plans are duplicated?
A. It goes through the block assignment files and looks for columns with identical output.
Q. Columns or rows?

A. Columns. That's why you have to do the transpose.
Q. Okay. And how would it report that information to you, Mr. Trende?
A. It would print it out.
Q. In the interactive console?
A. Yeah, that's where it would be printed.
Q. All right. Do you do anything with that information?
A. Not really. If it duplicated, like, 999,000 maps, you might have a problem. But I think the duplication rate here is way lower than that.
Q. How many were duplicated, Mr. Trende?
A. Fewer than half, I think.
Q. Fewer than half a million?
A. Fewer than half of the maps. So half a million.
Q. Okay. So when you were talking about millions of simulated maps, it's really more like about half a million?
A. No, because whenever you do these -- I mean, Dr. Chen's maps have duplicates, too. Whenever you do these, you're sampling with replacement. So just like if you were to sample heights of US males, you would get a bunch of numbers around 5-11, 6 foot, whatever, and then fewer and fewer out on the tails.

It's the same thing with these maps. When you add constraints to them, there are certain ways that the simulation enjoys drawing them, and so you'll get duplicates. That is part of the reason you wouldn't do an ensemble of, like, 500, the way you might do a traditional poll.
Q. In any of your other expert work using ensemble analysis, Mr. Trende, have you ever experienced duplicates in the amount of half of your dataset?
A. Oh, I don't know about that. Duplicates happen all the time.
Q. Have you ever experienced a 50 percent duplicate rate?
A. Like I said, I don't know. I do know that duplicates are common, both in mine and Dr. Chen's work. So it doesn't bother me, unless it gets extreme to where you end up having, like, 20 maps.
Q. What is a confidence interval in a statistical analysis?
A. A confidence interval is a measure of, if you repeated the experiment, what percentage of the time the true value would be contained within that interval. Or I guess I'm explaining more of what a p-value is.
You have a certain alpha that you set, which is your tolerance for false positives or for errors, and

it's a measurement -- assuming you choose 0.05 as your alpha, which is typically what is chosen, it means that, if you repeated the experiment a hundred times, 95 percent of the time your confident interval would contain the true value.
Q. What is the confidence interval using the simulation methods you have employed in this case for developing three congressional districts?
A. I don't know.
Q. Do you think it would require a sample size of less than a million maps?
A. Oh, I'm sure you could do it with fewer than a million maps. But you know, when you have a million draws and over a half million unique draws, you get a pretty good sense of what the sample is. I'm not sure of any statistical metric that suggests you need more than that.
Q. Are you aware of any statistical metric that suggests you need a million maps?
A. Oh, as I've said, I don't know if you need a million maps. But whenever you're increasing your N, it's good. You get a better sense of what the distribution really looks like.
Q. If you had selected a half million maps, Mr. Trende, would it have made any difference as opposed

EXHIBIT 32

to a million?
A. I doubt it.
Q. What about 1,000, would it have made a difference?
A. You know, 1,000 is getting pretty small. I know when Dr. Imai runs his version of simulations, he typically does 5- to 10,000, sometimes 50,000. But 1,000, when you're getting repeats, you really are kind of reducing your number of observations pretty low.
Q. So would it be fair to say that when you ran, I guess, an arbitrary number of 1 million maps with approximately a half million repeats, that half of those weren't terribly useful to you?
A. No, because you're not doing a regular poll. You can analogize it to a poll to help explain it, but all of these simulation metrics are doing sampling with replacement, and so all of them produce duplicates. Dr. Chen's ensemble in this case has duplicates in it. So they are useful, because they help flesh out the underlying distribution.
Q. Would you agree or disagree, Mr. Trende, that the reason -- well, first, did you pick the million number?
A. I did.
Q. All right. So would you agree or disagree, Mr. Trende, with the notion that when you picked the

million number, it was done so you could say, "SB-1 was worse than millions of maps"? Is that why you picked a million?
A. No.
Q. Have you ever done an ensemble analysis with millions of maps before, Mr. Trende?
A. No. When I was in New York, one of the opposing expert's criticisms was that 5,000 maps weren't enough. So I ran 35,000. And he said, "Well, I'm not really sure 35,000 maps is enough."
So I decided I would run as many maps as the machine could comfortably handle in a reasonable period of time, and that was a million here, which I figured no one could complain about the sample size being too small with a straight face at that point.
Though I've not done millions, in the Maryland case that I was involved in, I think we produced 750,000, which I think does the same thing.
Q. Let's talk about the New York case. You said you initially did 5,000 simulations; is that right?
A. I think that is right.
Q. How much duplicates did you encounter running 5,000 simulations?
A. I don't remember.
Q. Was it 50 percent?

A. I don't remember.
Q. Was it more or less than 50 percent?
A. I don't remember.
Q. Was it 100 percent?
A. No.
Q. Was it 99 percent?
A. I don't remember.
Q. All right. So somewhere between 100 percent and 99 percent is fair?
A. Would you repeat that question as a complete sentence?
Q. Never mind. In the 35,000 simulations, Mr. Trende, how many duplicates did you have there?
A. I don't remember.
Q. Would you expect it to have been as high as half million?
A. I have no idea.
Q. You've testified today that you've run these simulations in 6-4 in two ways, that you've run them at a million and you've run them at 100,000. Is that correct?
A. Oh, I'm sure I've run them in more ways than that.
Q. When you ran them at 100,000, how many duplicates did you have, Mr. Trende?

A. I don't remember, but I would assume it was around 50,000.
Q. Did you save that work product somewhere?
A. No, I didn't rely on it.
Q. Why would you have produced this modified code rather than the code that you say you actually used to render your expert report?
MS. DIRAGO: Objection.
A. I probably looked at something after I was done writing the report and forgot to change it back between the time the report was written and the time I produced it.
Q. (By Mr. Williams) What do you think that was, Mr. Trende?
A. I have no idea.
Q. Do you keep some sort of work log of what you do?
A. No. I mean, I've run these with different numbers. As you can see, the --
Q. I can, I can see --
A. Well, you know, you can see, if you let me finish my explanation, which we agreed to do out of courtesy at the beginning of this deposition, the truncated simulations are labeled "500k," which is probably where I had it initially, before I realized I could run it at a million comfortably on my computer. So that "n_sims"

EXHIBIT 32

is put there so that it's relatively easy to change the number of simulations, rather than going through and having to do it over and over and over again in the code.

Q. Why did you reset the seed at line 177?

A. Probably, when I was writing the code, I was running just the truncated portion at some point, and I wanted to make the same result over and over again. So I set a seed there and never took it out.

Q. Okay. And we don't have your work history, but if the Court believes what you've said, when we start running the sim here at part 05, it had been set in part 02; is that correct?

A. That's right.

Q. And your understanding is that the scope would have continued onward for the seed generator; is that correct?

A. Right. When you run the scripts in order, the seed will continue.

Q. What did you do to verify that you were generating identical results at line 5 run to run?

A. Well, I know when you set a seed in R, it produces the random numbers and draws from them again and again and again, until you set a different seed. So by running the script straight through, you should not

disturb the run of the random numbers that are generated.

Q. When you do not set an explicit seed, Mr. Trende, what is the seed that your system will use?

A. I don't know.

Q. Do you know how your system will choose a random seed when you do not explicitly set one?

A. No, I don't think it is -- I mean, no, I don't know. As I said, I think it chooses it off of the clock of the computer, but that was explained to me a long time ago.

Q. Absent setting an explicit seed, will you be able to reproduce the results of any algorithm that uses a random number generator?

A. You won't produce them explicitly, but you'll get the same distribution, especially given the large number of draws.

Q. So you will not get the same results. You anticipate getting something with the same distribution of random numbers. Is that correct?

A. Right. If we want to use the poll analogy, a random seed means you call the same people over and over, the same set of 1,000 people over and over and over again, and for whatever reason you want to conjecture they aren't able to change their answer. If

you don't have the random seed, you'll get, presumably, different samples each time, but the whole point of sampling is that the bottom line/the mean on the shape of the distribution should be the same each time.

Q. Let's go back and look at your report.

MS. DIRAGO: Hey, Lucas, can we take a break? Is now a good time?

MR. WILLIAMS: Sure. We'll come back at 11:00.

(A recess was taken from 10:45 a.m. to 11:00 a.m.)

Q. (By Mr. Williams) Mr. Trende, we have returned from a break. I want to refer you to page 16 of your expert report. That is Exhibit 1.20. That's a section titled "Regions of New Mexico Utilized." Do you see that?

A. Yes.

THE COURT REPORTER: You're muted, Mr. Trende.

Q. (By Mr. Williams) So I was at Exhibit 1.20, page 16 of your report. Do you see that in front of you, Mr. Trende?

A. Yes.

Q. All right. And I am talking about the section titled "5.4 Regions of New Mexico Utilized." Do you see that?

A. Yes.

Q. All right. How did you come to adopt the regions from the Tourism and Travel Board?

A. Well, I thought it would be useful to refer to -- instead of trying to just say Southeast New Mexico and have it either be my thoughts about it or some other arbitrary definition, I would try to use someone else's definition.

So I looked online, and I found the newmexico.org representation of it, and that seemed like a fair common way of speaking of things. It also seemed similar to other options that people had selected or had suggested.

Q. What were the other options that people had selected?

A. I don't remember.

Q. Who were the people who had made those suggestions?

A. I don't remember.

Q. At page 27 of your report, Exhibit 1.31, tell me when you get over there.

A. Yes.

Q. The second sentence below the figure reads, "The resulting map showed less respect for New Mexico's regions, dividing the Central and Northeastern regions up three ways." Do you see that?

EXHIBIT 32

Q. All right. Let me know when you find something else.

A. On page 6, the second full paragraph, I don't know that the entrenchment was as important to Justice Kagan's test as it's made out to be here. It's been a while since I've read that case.

I do know that, in other contexts, the Supreme Court suggested that things such as simulation analysis can be useful for determining -- or at least, justices of the Supreme Court have suggested that simulation analysis can be useful for interpreting or finding intent. But it's ultimately a legal thing for lawyers to fight about and judges to decide. That's just not my recollection of how I read the Rucho dissent.

Q. I have highlighted the first paragraph following paragraph 1, titled "SB-1 does not entrench the Democratic party in power." Is that the paragraph you were talking about?

A. Yes.

Q. All right. Anything else?

A. Let's see. We could quibble about the definition -- I think we've already quibbled about the definition of competitiveness. I don't know what this 54 to 46 percent range he sets out really means. There is no citation to anything that suggests that, you know, if

you go above 54 percent, it no longer is a competitive district or, if you're one point below, it is something we would consider competitive, especially since the exclusion of Democratic landslide wins is making these districts look more favorable to Republicans than they really are.

I think if you take the loosest possible sense of competitiveness, that it's possible, under certain circumstances, for Republicans to win a district. You could probably use that definition.

But going back to his definition of entrenchment in the last sentence, it's not that it has to be impossible for Republicans to win, it could be difficult or impossible. And the fact that a Republican incumbent lost in an otherwise favorable Republican environment suggests that it will certainly be difficult for Republicans to win that seat back, especially as the Democratic incumbent becomes increasingly entrenched in it.

Q. Anything else in that paragraph?

A. No. Would you like me to proceed?

Q. Oh, yes. I'm here to learn your opinions.

A. The next paragraph about the highly competitive nature of CD 2, I agree that it was extremely close. You know, if it were a marginally more Republican

district, Herrell probably would have been reelected.

But I disagree strongly that the very close outcome demonstrates that this is a district that can be -- well, I guess the way he worded it is literally true. But the suggestion that this is something that is not going to be difficult for Republicans to win back, I just think is wrong, especially once you get a Democratic incumbent in there and less favorable environments to Republicans.

So on the next sentence, which is the first sentence on page 7 -- or the first paragraph on page 7, he says "...CD 2 is by no means a 'safe' Democratic district."

And, again, I can imagine scenarios where a Republican might win that district if the Democratic incumbent, you know, has some major scandal and/or we end up in an environment like 2010 where Democrats are just wiped out.

But I mean, I don't think, as a general matter, it is a competitive toss-up district that could be won by a candidate of either party, except using the broadest definition of competitive -- well, certainly not toss-up, but the broadest definition of competitive that I can think of. It's not impossible for a Republican to win it, but it's definitely going to be

difficult. And the 2022 outcome illustrates that.

So on page 8 where he says "However, it is interesting to note...", again, I think this is missing important context, which is that after the 2008 elections, once Steve Pearce ran and the seat was open, the Democrat was able to win it. And in 2018, when Steve Pearce ran for Governor, the Democrat was able to win it.

And you see his point, that once the powerful incumbent was no longer a factor, a Democrat could win it. Again, this ties in with the previous point, that once someone establishes incumbency, it can be difficult to win the election.

It also misses the point or the broader context that 2008 and 2018 were disasters for the Republican party of almost biblical proportions. They are two of the worst years Republicans have had in the past 70, just because, you know, the world was ending for the first time in my lifetime in 2008 on election day, and then in 2018, the world was not ending, but Donald Trump was the president, which engaged Democrats to an extreme extent and gave them a very big win in that year.

So yeah, Democrats were able to win that district in kind of a perfect storm, where the Republican president was in catastrophic political shape and the

EXHIBIT 33

NM Congress
CD_187963.2_Egolf_Executive

2010 Census
Redistricting

				Non-Hispanic Origin				
District	**Pop**	**Deviation**	**Hispanic**	**White**	**Native American**	**Black**	**Asian**	**Other Races**
1	686,393	0 0.0%	329,665 48.0%	288,234 42.0%	24,773 3.6%	16,016 2.3%	14,313 2.1%	13,392 2.0%
18+	523,776		227,802 43.5%	245,413 46.9%	18,281 3.5%	12,598 2.4%	11,348 2.2%	8,334 1.6%
2	686,393	0 0.0%	355,689 51.8%	275,607 40.2%	30,590 4.5%	10,725 1.6%	4,844 0.7%	8,938 1.3%
18+	508,648		238,436 46.9%	230,511 45.3%	21,756 4.3%	8,306 1.6%	3,962 0.8%	5,677 1.1%
3	686,393	0 0.0%	268,049 39.1%	269,969 39.3%	120,005 17.5%	8,721 1.3%	7,148 1.0%	12,501 1.8%
18+	508,083		185,088 36.4%	221,924 43.7%	81,925 16.1%	6,549 1.3%	5,646 1.1%	6,951 1.4%
Totals	2,059,179	Ideal: 686,393	953,403 46.3%	833,810 40.5%	175,368 8.5%	35,462 1.7%	26,305 1.3%	34,831 1.8%
18+	1,540,507		651,326 42.3%	697,848 45.3%	121,962 7.9%	27,453 1.8%	20,956 1.4%	20,962 1.4%

EXHIBIT 33

NM Congress **2010 Census**
CD_187963.2_Egolf_Executive **Redistricting**

District Profile

District	Total Population	Deviation		Total Adult Native American	Adult Hispanic	Adult Non-Hispanic White	Adult Non-Hispanic Native American	Adult Non-Hispanic Black	Performance Measure Dem	Performance Measure Rep	Registered Voters Total	Registered Voters % Dem	Registered Voters % Rep	Registered Voters % DTS	Registered Voters % Other
1	686,393	0	0.0%	5.2%	43.5%	46.9%	3.5%	2.4%	53.9%	46.1%	412,594	47.3%	32.3%	16.8%	3.6%
2	686,393	0	0.0%	5.8%	46.9%	45.3%	4.3%	1.6%	46.6%	53.4%	350,612	46.0%	35.7%	15.9%	2.4%
3	686,393	0	0.0%	18.1%	36.4%	43.7%	16.1%	1.3%	57.5%	42.5%	396,009	54.3%	28.2%	15.0%	2.5%
NM	2,059,179	Ideal:	686,393	9.6%	42.3%	45.3%	7.9%	1.8%	53.0%	47.0%	1,159,215	49.3%	31.9%	15.9%	2.9%

EXHIBIT 34

New Mexico Voter Registration Statistics by Congressional District

As of November 30, 2022

DISTRICT	DEMOCRATIC		LIBERTARIAN		REPUBLICAN		OTHER		TOTAL	
DISTRICT 1	215,074	43 %	6,253	1 %	161,205	32 %	118,803	24 %	**501,335**	37 %
DISTRICT 2	178,414	43 %	4,493	1 %	129,296	31 %	104,348	25 %	**416,551**	30 %
DISTRICT 3	211,587	47 %	4,206	1 %	136,611	30 %	98,940	22 %	**451,344**	33 %
Total	**605,075**	44 %	**14,952**	1 %	**427,112**	31 %	**322,091**	24 %	**1,369,230**	

STATE OF NEW MEXICO
COUNTY OF LEA
FIFTH JUDICIAL DISTRICT

REPUBLICAN PARTY OF NEW MEXICO, DAVID GALLEGOS, TIMOTHY JENNINGS, DINAH VARGAS, MANUEL GONZALES, JR., BOBBY AND DEE AN KIMBRO, and PEARL GARCIA,

Plaintiffs,
vs. No. D-506-CV-2022-00041

MAGGIE TOLOUSE OLIVER, in her official capacity as New Mexico Secretary of State, MICHELLE LUJAN GRISHAM, in her official capacity as Governor of New Mexico, HOWIE MORALES, in his official capacity as New Mexico Lieutenant Governor and President of the New Mexico Senate, MIMI STEWART, in her official capacity as President Pro Tempore of the New Mexico Senate, and JAVIER MARTINEZ, in his official capacity as Speaker of the New Mexico House of Representatives,
Defendants.

VIDEO-RECORDED ZOOM DEPOSITION OF JOWEI CHEN, Ph.D.
September 10, 2023
12:30 P.M. - 5:55 P.M.

PURSUANT TO THE NEW MEXICO RULES OF CIVIL PROCEDURE, this deposition was:
TAKEN BY: MOLLY DiRAGO
Attorney for PLAINTIFFS

REPORTED BY: Sarah R. Padilla, RPR, CSR, NM CCR#525
TRATTEL COURT REPORTING & VIDEOGRAPHY
P.O. BOX 36297
ALBUQUERQUE, NEW MEXICO 87176

Page 66

Q How have you been using it for five years if it hasn't been around that long?
A I am just not sure I understand the question. You are asking me how have I been using sequential --
Q Something that wasn't created when you say you were using it.
A Okay. So you are asking me how was I using an SMC in 2017? Is that -- that is the question?
Q Yes, that is a great question.
A Okay. Sure. That makes sense. I certainly did not call the algorithm a Sequential Monte Carlo in 2017. I definitely was -- was constructing districts sequentially in the sense that we now refer in the literature to as Sequential Monte Carlo. But I certainly did not -- did not come up with that term myself.
Q Do you know what Wilson's algorithm is?
A I don't know what you are referring to.
Q So you don't know how Wilson's algorithm plays into the MCMC technique you are using?
A I understand what Wilson's algorithm is referring to in the context of the spanning tree portion of the SMC, if that is what you are referring to.
Q Do you know what Wilson -- now you confused me. Do you know what Wilson's algorithm is?

Page 67

A In the context of the spanning tree of the SMC, sure.
Q Why did you answer no when I originally asked you?
A I didn't know the context that you were using that term, I am sure.
Q Okay. So have you run your core methodology against a sample set to validate it?
A What do you mean by sample set?
Q Have you done anything to validate it?
A Sure. When I review the simulations using my algorithm, I save the maps, I output the maps, and then I look at those maps, and I make sure that those maps are actually random, that they are doing what I programmed the algorithm to do, and I make sure I save that work. So that is how I look at the maps that are being produced by the algorithm.
Q That is the only thing you do to validate the maps that you produce from the algorithm?
A It is not the only thing that I do that validates the algorithm. But I would say that saving the work, actually looking at the maps, and analyzing those maps are part of what I do.
Q And what are you looking for specifically when you do that?

Page 68

A Certainly, when I -- I look for a lot of things. Obviously I am looking to make sure that the algorithm actually saves maps and outputs them. I look at the maps and certainly I look to make sure that they are not duplicates. I look to make sure that the maps are actually producing districts that are equally populated. There are any number of things that I would do to just check the work. But, certainly, at the core of that is just saving the maps and outputting them, saving those map files so that they can be checked.
Q So you saved the maps to check them and you said you look for duplicates and you see if the districts are equally populated. Do you do anything else to validate them?
A There may be a lot of other steps. I would say those are some of the most important. Certainly, I would look at other characteristics of them. Obviously, I analyze them in terms of their partisanship. But those are some of the most important things.
Q Did you do that with the 1,000 maps that are the subject of your expert report here?
A Well, sure, I certainly outputted the maps, saved the maps, saved the simulation output, I saved those files. I check to make sure that they were actually equally-populated districts. Those are a part

Page 69

of the things that I normally check for. I guess, necessary to that, like I said earlier, I checked the simulated maps to make sure it is not producing a large number of duplicates.
Q Okay. So if we can look back at page 33 of your expert report, which were the articles that you said were peer reviewed.
A Okay. The one -- when we were talking about this page earlier, I pointed you to two articles.
Q Yes.
A It is the California Law Review article, and then there is in 2021 -- there is a Yale Law Journal article in 2021.
Q Those are peer reviewed? I actually went to California -- University of California Law School. And I didn't realize that law review articles are peer reviewed.
A It is my understanding that they are. My -- I definitely know for sure Yale Law Journal is peer reviewed. I can't say I specifically remember for sure about the California review. I definitely know for sure Yale -- I'm sorry -- Yale Law Journal is peer reviewed.
Q I guess the other article that I referred to earlier was -- or that we were talking about earlier is Election Law Journal?

Page 90

A So I have not -- and sorry. I am just to going finish my answer and be brief here. So my algorithm produces maps on actual jurisdictions, say, for example, an actual state. And so I am not checking it by running -- I am not validating it against a -- say, a 25-precinct map. That is not the entirety of Florida. That is not the purpose or that is not the point of my algorithm. And so I am not doing that.

Q Is it because you are not able to do it?

A No. You certainly could. I mean, I certainly could look at or produce simulations for a not real state. But that is not the work that I do. I use the algorithm to produce actual maps for an actual state. So that is what I am interested in.

Q So you have never been able to validate that your algorithm actually produces a wide -- a reliable set of data and compare maps to; correct?

A That is incorrect. I am going to stick with my earlier answer, which is that when I use my simulation algorithm, I am able to because I have programmed the algorithm to output maps to save these maps, to save the files, to save the output files, so that I can actually look at them and I can actually check them. And importantly, I am able to look at the entire map for the entire state, for every map that my algorithm is

Page 91

producing. I am interested in checking the entire map for the entire state of New Mexico that my algorithm has produced, not, say, a 25-precinct subset that is not describing the entire state. So that is what I am interested in doing. So that is why I do the work that I do with producing a map for the entire state, saving it, looking at it, and checking the entire map, and making sure that those maps are output and saved.

Q So you have never validated your maps against a known sample set; right? I mean, you said you validate it. But you are talking about looking at it and making sure there are no duplicates, but I am talking about more of a rigorous scientific validation.

A Okay. My answer is that I think this is a rigorous scientific examination that I am doing here. I am looking at the actual maps that are produced for an actual state. So I am sticking with my previous answer to that question.

Q How do you know that your algorithm is producing a reliable set of maps?

A So when I produce an algorithm, I make sure that the map -- that those maps are outputted and saved. And that is the most important thing. That is the most important step I take is I save these maps and that I or somebody else is able to look at those maps. And so I

Page 92

check. I, of course, know what went into the algorithm. But I check the actual maps. I can check, for example, to make sure that the algorithm produced a diverse set of maps. I check, for example, to sake make sure that it is not producing duplicate maps over and over and over again. I check to make sure that those maps are not the same and essentially just producing the same map in every different simulation or every run of the simulation. Those are the things that I check for.

I, of course, check to make sure that the populations of the districts are what I have programmed or essentially it is drawing districts that are equally populated. So I check the district populations. And I check to make sure that there are not, say, significant population deviations. And, certainly, I check other features.

But in order to do that check, I need to look at the actual map for the entire state of New Mexico that the computer is producing. I have to look at the entire state and the map that is being produced for that entire state. So in order to do that, I need to make sure that, one, the algorithm is actually producing, outputting, and saving those maps; and, two, that I am actually looking at those maps for the entire state. That is the most important thing.

Page 93

Q So all that that you just mentioned that you look at to validate your maps, did you do that with the algorithm that you used that is referenced in the 2015 Election Law Journal?

A I don't specifically remember the steps that I took for that 2015 article. I am sure I did -- I produced an algorithm that actually saved or outputted maps. Of course, it was a 2015 article. So that is eight years ago. And I don't specifically remember everything that I did. But, certainly, I would have outputted the maps and looked at those maps in the ways that I have described here.

Q Okay. But that wasn't good enough, was it?

A I am not understanding the question.

Q Well, I think you know that your -- the algorithm that you used to use has been discredited by your peers. So what I am trying to figure out -- and in this article -- and I can -- maybe I will sort of point you to what they say about it. But they really recommend validating algorithms against a known sample so that you understand if your output is reliable or not. And that goes way beyond just eyeballing it.

So I guess I am asking, did you -- the same methods that you used to validate your core methodology now, did you use to validate your methodologies that you