STATE OF NORTH CAROLINA
COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
FILE NO.: 18 CVS 014001

COMMON CAUSE, *et al.*,

Plaintiffs,

v.

DAVID LEWIS, IN HIS OFFICIAL CAPACITY AS SENIOR CHAIRMAN OF THE HOUSE SELECT COMMITTEE ON REDISTRICTING, *et al.*,

Defendants.

EXPERT REPORT OF THOMAS BRUNELL, Ph.D.

Pursuant to the North Carolina Rules of Civil Procedure and the Case Management Orders of the Court in the above-captioned matter, I, Thomas Brunell, provide the following written report:

I am a Professor of Political Science at the University of Texas at Dallas. I received a Ph.D. in political science from the University of California, Irvine in 1997. I have published a book and dozens of refereed journal articles on redistricting, elections, and representation. My research has been published in, among other outlets, the *American Political Science Review*, the *Journal of Politics, Electoral Studies, Election Law Journal,* and *Legislative Studies Quarterly*. A copy of my curriculum vitae, which lists my publications in the last ten years, is attached.

Over the past seven years, I have provided testimony in the following cases: *Dickson v. Rucho* (NC), *Guy v. Miller* (NV), *Egolf v. Duran* (NM), *Backus*

v. South Carolina (SC), *ALBC v. Alabama* (AL), and A. Philip Randolph Institute, et al. v. Householder, et al. (OH).

The opinions in this report are my own, and do not reflect the opinions of the State of Texas or the University of Texas at Dallas. I am being compensated for my work in this matter at a rate of $500 per hour. My compensation in this case is not contingent on my opinions expressed or on the outcome of the case. I was asked by counsel for Defendants to read and provide a response to the expert reports written by Professors Chen, Cooper, Mattingly, and Pegden.

Some General Considerations

Three of the four reports that I was asked to comment on use some form of simulation to compare the enacted plan to a set of alternative simulated maps in order to determine if the enacted map is an extreme partisan outlier. In order for these exercises to be useful the comparison group of maps has to be legitimate – apples must be compared to apples. For a variety of reasons, which I detail below, I am not at all convinced that these maps serve this purpose. If the maps are not legitimate alternatives to the enacted map then, regardless if we compare a thousand, a million, or even a trillion other maps, the ability to make conclusions about the enacted map(s) are seriously compromised.

First of all, the alternative maps by Chen and Mattingly are designed to be "non-partisan," which is to say partisan data are not part of the algorithm to draw the comparison maps. Rather, they rely on some, though not all, of the traditional redistricting criteria. But in my reading of the law on partisan gerrymandering,

courts have recognized that partisanship does and can play a legitimate role in the drawing of districts. Plaintiffs' experts have not shown us how much partisanship is too much and it isn't clear that their analyses are divining partisan intent or something else entirely. For example, in order to show that the map is an extreme outlier the appropriate comparison group is **other partisan maps**, not non-partisan maps. Of course the enacted map has more partisanship than non-partisan maps because the non-partisan maps do not have any partisanship. These comparisons do not tell what we need to know – has partisanship played too big of a role in drawing the boundaries. The necessary comparison is whether or not **relative to other partisan maps, the enacted map is an outlier** (i.e. **overly partisan)**.

Another major objection to these simulations is that they rely on some, though not all of the traditional redistricting criteria. Chen (page 3) indicates he uses "population equality, geographic compactness, contiguity, respecting county groupings, and preserving municipal and precinct boundaries." Incumbency protection is one of the adopted criteria and noticeably missing from some of Chen's simulations and the simulations of Mattingly and Pegden. Incumbency protection, while not required, is legal and an acceptable criterion for a state to use when drawing districts. While not pairing incumbents is a very basic form of incumbency protection, this criterion can extend far beyond simply avoiding incumbent pairs. For instance, incumbency protection can mean preserving the cores of districts – so that the incumbent's district is not radically different after redistricting, keeping the constituents who elected the incumbent in the same district as the incumbent. As much as possible, we want to maintain the ability of voters to remove their own

elected officials from office. Radically changing a district's boundaries every ten years (or more frequently) does not support that goal and a simulated map that would wreak havoc on voters' expectations of which district they live in is not a fair comparison to a plan enacted with core preservation in mind. The point being, the simulation processes used by these academic approaches do not take important variables into account including all traditional districting principles as applied by the North Carolina General Assembly, incumbency protection, and permissible levels of partisanship, which means the generated maps are not useful for comparison purposes. Statistically speaking, we cannot know that these outlier analyses are measuring partisan intent or some other confounding variable.

None of the simulations consider race in drawing their districts, which means that some unknown number of these districts are unsuitable due to noncompliance with Section 2 of the Voting Rights Act. While districts may be drawn without respect to race, this does not mean that overall the representation of ethnic and racial minorities is not considered prior to enacting a map. Since race has been ignored completely by Plaintiffs' experts, it is very likely that many of the simulated maps are not suitable as a comparison group for this reason.

Uniform partisan swing is also prominently featured in these comparisons. While this is a standard method in political science, it comes with baggage. It is important to note that assuming all districts across the state would increase or decrease in uniform amounts when the political tide swings to the left or the right is not reliable. The amount of swing ultimately depends on local or otherwise idiosyncratic variables – the split between Democrats and Republicans, the strength of

partisan identification among residents, the proportion of independent voters, the quality of local candidates, the strength of the incumbents at issue, the mood of the country, the state, the county, or other localities, etc.

Given the large number of fabricated maps generated in three of the reports, it is important to note that we have only seen a handful of examples of these maps. Looking at a sample of these maps is important to make sure they at least look like reasonable legislative maps. Speaking of the shape of districts, I think it is important to note that the legislative districts drawn this decade look significantly better (more compact) than the districts in North Carolina looked in the 1990's round and 2000's round of redistricting.

All of this is to say that these simulations might be useful in the future, but we aren't there yet because redistricting is a complicated process with many competing demands and variables and the algorithms developed thus far are overly simplistic to fully account for the complicated process of redistricting.

Prof. Chen

Prof. Chen indicates in his report that he verified that none of his simulated districts were identical to any other simulated districts. This is good but not good enough. In order to certify a truly random sample, Prof. Chen must be able to verify that his thousands of maps are not simply minor variations on several different themes. As it stands, we do not know to what extent these maps differ from one another. Given the number of restrictions – districts drawn by the Special Master in 2017 are frozen, the county grouping rules in North Carolina, the other various

criteria – the number of really unique simulated districts could be quite small. For instance, imagine that Prof. Chen's algorithm finds 5-6 different general ways to draw the maps in North Carolina and then each simulation fits into one of the 5-6 general categories with trivial differences from one another – perhaps there are two maps that are 99.9 percent the same and the only differences are a couple swapped voting tabulation districts between two districts. This is important because the simulation approach relies on large numbers of comparisons in order to make a point about whether the enacted map is an outlier or not. A thousand, or a million, or even a trillion different maps is a lot, but to the extent to which a very large proportion of these maps are near duplicates of other maps in the sample, then the relative location of the enacted map isn't all that surprising because the sample size is really a fraction of what we thought it was.

The output of Prof. Chen's simulations obviously depends on the algorithm that he develops. In the event that the values that he maximizes are substantially different from those that the state legislature uses, the simulated maps are not appropriate comparisons. For instance, on page 3 of his reporter, Prof. Chen mentions "maximizing geographic compactness" meaning that his computer code was trying to draw districts such that the metrics he uses to measure compactness are at a maximum. The state legislature explicitly did not try to maximize compactness of districts. Rather, they made "a reasonable effort to draw legislative districts in the 2017 House and Senate plans that improve the compactness of current districts" (Ex. 37 "2017 House and Senate Plans Criteria"). They were simply making an effort to improve compactness where and when they could – this

is a far cry from maximizing compactness. Thus, the goals in the simulated maps and the enacted maps are not aligned and this presents problems for making comparisons.

The same caveat applies to Prof. Chen's treatment of splitting voting tabulation districts (VTDs). His computer program tried to minimize these while the legislature was instructed to "make reasonable efforts to draw legislative districts in the 2017 House and Senate plans that split fewer precincts than the current legislative redistricting plans" (Ex 37). By instructing the computer to split the minimum number of VTDs this may have affected the overall results of Prof. Chen's comparison maps.

Prof. Chen argues that his method allows him to draw conclusions about the intent of the map-makers. More specifically he believes that his outlier analysis is able to prove that "an overriding partisan intent" rather than "follow[ing] non-partisan districting criteria" (page 10) underlies the motivations of the person or persons who drew the boundaries. Divining the intent of the map-maker is extraordinarily difficult because the process of redistricting is complex. There are a multitude of competing demands at work when lines are being drawn – districts have to be nearly equally populated; districts need to be compact and contiguous; incumbents' districts can be preserved; city and county splits need to be minimized; North Carolina's county grouping rules must be complied with, and so on. Beyond these requirements there can be various other factors that affect where the boundaries are placed. Incumbents regularly make requests with regard to their district including preserving their core constituency and more. For instance,

legislators may ask that their parents' house, or children's house be included in their district. Or they might ask that a specific business, or park, or landmark be drawn inside their district. Changes in one district can require adjustments to nearby districts if the initial changes affect the population totals. The complex process of redistricting makes drawing conclusions about the intent of the map-maker through statistical analyses incredibly difficult.

North Carolina's redistricting process is one of the most constrained in the nation due to the county groupings requirements. This additional requirement significantly restricts the universe of possible districts. Further, the county groupings rules appear to advantage the Republican Party because the vast majority of Democratic voters in the state reside in the most heavily populated counties, while Republicans are advantaged in rural counties. Table 1 contains the Democratic margin of victory in the 2016 presidential election for the seven most populated counties in North Carolina. Hillary Clinton's margin of victory ranges from 10.37 percent to 59.5 percent in these counties. If the county groupings rules did not exist, more Democratic leaning districts could be drawn by using Democratic population in heavily populated districts mixed in with more rural areas in contiguous districts. So Democrats are disadvantaged by these rules as it limits the number of Democratic leaning districts that are theoretically possible.

Table 1. Democratic Support in the Most Heavily Populated Counties

County	Population Rank	2016 Presidential Democratic Margin
Mecklenburg	1	29.41
Wake	2	20.21
Guilford	3	19.89
Forsyth	4	10.37
Cumberland	5	15.95
Durham	6	59.5
Buncombe	7	14.20

*Source https://ballotpedia.org/Pivot_Counties_in_North_Carolina and http://worldpopulationreview.com/us-counties/nc/

Table 2 presents additional data on this point. Again from the 2016 election, Hillary Clinton received over 50 percent of all of her votes in North Carolina from just seven of the 100 counties in the state. Compare this to Table 3 which has the data fro Donald Trump. He did not reach 50 percent of his total statewide vote until we add the top 17 counties in the state. The Democratic support is far more highly concentrated for Democrats in North Carolina compared to Republicans.

Table 2. Counties and Votes for Clinton from 2016 Election

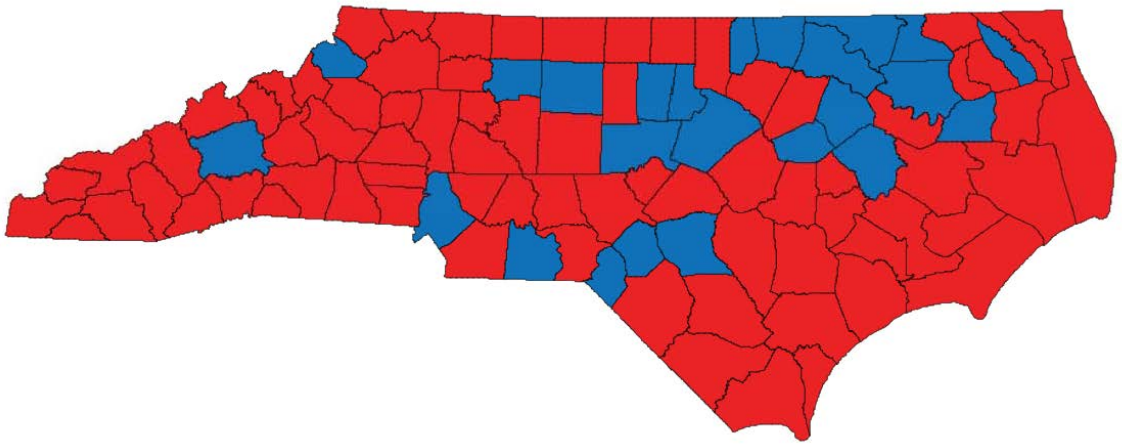
County	Votes for Clinton	Cumulative Votes	Cumulative Percent
Wake	302,736	302,736	13.83%
Mecklenburg	294,562	597,298	27.28%
Guilford	149,248	746,546	34.10%
Durham	121,250	867,796	39.64%
Forsyth	94,464	962,260	43.95%
Buncombe	75,452	1,037,712	47.40%
Cumberland	71,605	1,109,317	50.67%
Total Votes	2,189,316		

Table 3. Counties and Votes for Trump from 2016 Election

County	Votes for Trump	Cumulative Votes	Cumulative Percent
Wake	196,082	196,082	8.30%
Mecklenburg	155,518	351,600	14.88%
Guilford	98,062	449,662	19.03%
Forsyth	75,975	525,637	22.25%
Union	66,707	592,344	25.07%
Gaston	61,798	654,142	27.69%
Buncombe	55,716	709,858	30.05%
New Hanover	55,344	765,202	32.39%
Iredell	54,754	819,956	34.71%
Johnston	54,372	874,328	37.01%
Davidson	54,317	928,645	39.31%
Cabarrus	53,819	982,464	41.58%
Cumberland	51,265	1,033,729	43.75%
Randolph	49,430	1,083,159	45.85%
Catawba	48,324	1,131,483	47.89%
Rowan	42,810	1,174,293	49.70%
Brunswick	42,720	1,217,013	51.51%
Total Votes	2,362,631		

Finally, in Figure 1, the results of the 2016 presidential election by county in North Carolina demonstrate this phenomenon as well. Trump carried far more counties than Clinton, though he only carried the state by less than 200,000 votes. Democratic support is largely concentrated in the most heavily populated counties.

Figure 1. 2016 Presidential Election Voting by County



* Figure is coded blue for counties that Hillary Clinton carried in the 2016 presidential election, and red for the counties that Donald Trump carried.

Some of the results from Chen's simulations and comparisons support the notion that the enacted map is not an outlier at all. Take for example Figure 8 (pg. 48) that shows the enacted map produces 42 Democratic districts, just one seat less than the left-most boundary of his distribution. The critical question is whether Prof. Chen's simulations, if they more accurately reflected reality, would yield even more maps with fewer Democratic leaning districts or would, at the very least, show that the enacted plan is not an outlier. Prof. Chen's simulation set 2 for the state Senate yields similar results. Figure 20 (pg. 77) shows that the enacted map is just a single seat less than 25 percent of his results. Again, if the parameters of his simulations included more restrictions, his results may change. Further, compared to non-partisan maps, if a partisan map only yields one additional seat, this does not strike me as much of an outlier.

In Prof. Chen's county groupings analysis there are many instances in which the districts in the enacted map are in the middle of the distribution of simulated maps. In Figure 28 (pg. 93) for Cumberland County enacted districts 42 and 44 are not outliers. In Figure 29 (pg. 94) for the Forsyth-Yadkin County grouping, all five of the districts are contained in the cloud of grey dots that indicated the simulated outcomes. The results for Mecklenburg County in Figure 33 (pg. 98) show a remarkable similarity between the enacted map and the simulated maps. Moreover, for virtually every single county grouping analysis, the number of Democratic and Republican leaning districts is identical even when some of the districts are not within the cloud of simulated results. Figure 82 (pg. 152) is a good example – the two enacted districts are "outliers" but the distinction is not

substantively meaningful – the Republican district is more Republican than the simulated districts and the Democratic district is more Democratic than the simulated districts.

Prof. Cooper

Prof. Cooper relates the extremism of the state legislature in North Carolina to the alleged gerrymandering of state Assembly and state Senate districts. While redistricting is often mentioned as one of the usual suspects when it comes to the political polarization that we have been experiencing nationwide, it is fairly clear that redistricting has very little to do with the political extremism we have witnessed in modern American politics. First and foremost, both the U.S. House and U.S. Senate have polarized at similar rates. Since the former undergoes regular redistricting and the latter does not, this fact, in and of itself, calls into question if redistricting affects polarization. Second, if redistricting were the true culprit we should see far more polarization directly after a redistricting and very little movement for the other eight years in a ten-year redistricting cycle. This too, is not the case.

In a recent article, Seth Masket (2019) writes about what does and does not cause polarization in American state legislatures. Redistricting is one of five usual suspects that Masket argues **does not** cause polarization. He then lists three trends that are related to increasing polarization – income inequality, the quality of local news coverage, and finally the degree to which districts are ideologically heterogeneous. The final point could be related to redistricting so it bears a bit

more explanation. Masket is relying on an article by McCarty et al. (2018) that finds that districts with more ideological heterogeneity make it more difficult for a representative to figure out where his or her median voter stands on issues. When districts are more ideologically homogeneous, elected officials have an easier time discerning the public opinion in their district.

One of Prof. Cooper's main points in his report is that North Carolina is a moderate state **in the aggregate.** But it is important to note that this does not mean the constituent parts of the state are moderate. When you average across the millions of voters in the state the resultant may be moderate, but this doesn't tell us about the distribution of individual ideologies. State legislative districts are relative small sub-sets of the state and thus better reflect localized ideologies – which includes very liberal voters and very conservative voters in the state.

Prof. Pegden

Prof. Pedgen's report includes simulations that are a bit different from the other simulation approaches that have emerged recently for redistricting. Rather than writing an algorithm to draw random districts based on some set of criteria, he begins with the enacted map and then has an algorithm that makes changes to these districts and then after some amount of changes the new map is compared to the baseline enacted map. I am confused about the number of changes that happen before the new map is compared to the old map. He mentions that very small random changes are made, but I don't think the comparison is made after every very small change, but rather after many, many small changes. So it isn't clear to me the

extent of the changes to the enacted map prior to the comparison stage, nor is it clear to what extent it matters. Moreover, when the comparisons are made it is in terms of the number of districts that each party has an advantage, which would lead me to believe that in many, or at least some, of these comparisons the simulated maps would have the same number of Republican seats as the enacted map, but there is no indication that this is ever the case. What was the distribution of results in terms of partisanship? What percent of maps had 1 more Democratic district? What percent had 2 more Democratic districts? What percent of maps resulted in more Republican seats?

Prof. Pegden creates several new concepts for redistricting that have not been subject to close scrutiny by other scholars, so it isn't clear that these are useful. For instance, he creates a new geographic grouping – the "geounit" which is larger than census blocks but smaller than voting tabulation districts (VTDs). It isn't clear why we need this new level of clustering. He coins two other terms centrally related to the topic of judging partisan gerrymandering – *fragility* and *carefully crafted*. Since this is the first time I have been exposed to these terms, I am not clear exactly what he means – what is the separation from a fragile map and one that isn't fragile? What's the bright line between a set of districts that is carefully crafted and one that is just crafted?

Prof. Pegden (pg 3-4) writes: "Quantitatively, for both the enacted House and Senate plans of North Carolina, I find that they have a greater partisan bias than 99.999% of the trillions of districtings produced by my algorithm." The phrase "partisan bias" has a specific meaning in the political science literature (see Gelman

and King 1994; Grofman, Koetzle and Brunell 1997; Grofman & King 2007). Since the relationship between seats and votes in a single member district (SMD) system is not linear, it is difficult to say how many seats is too many for one party given some statewide vote total. So political scientists generally rely on the notion of symmetry – which basically means that both parties are treated equally by the set of districts. So if the actual election gives Democrats 60 percent of the seats with 55 percent of the votes statewide, then if hypothetically when the Republicans get 55 percent of the vote, they should also get 60 percent of the seats. To the extent this is not true, partisan bias exists. I don't think Prof. Pegden is using this term in the usual political science way, and if he is, the report isn't clear on how he is measuring bias.

If he is indeed measuring partisan bias in one of the ways implied by the use of this phrase he does not tell us which method he uses. Moreover, he relies on telling us about the statistical significance of the differences rather than the magnitudes of the differences. Finding a statistically significant difference in something **does not** also mean that the difference is substantively interesting. So while the enacted map may display more partisan bias than most of the generated maps, Prof. Pegden does not tell us what the differences are. Is the partisan bias different by enough that anyone should care that there is a difference at all?

Prof. Pegden chooses to use the results of just two elections for his simulations – the 2016 Attorney General's race for districts redrawn in 2017, and the 2008 Commissioner of Insurance election. These are somewhat interesting choices as both of them have Democratic winners. This means the simulations may

be more likely to return higher Democratic averages since they start with relatively high vote totals based on the elections picked by Prof. Pegden. Usually when drawing districts or evaluating districts the goal in picking election data is to find an election, or more likely a set of elections, that best represent the current underlying partisanship or voting behavior of the electorate. So Prof. Chen, for example, uses the same set of elections that the General Assembly picked for the 2017 remapping. I am not sure the two elections that Prof. Pegden used are the best ones to serve as the basis for his simulations.

Prof. Mattingly

Prof. Mattingly's approach is similar to that of Prof. Chen. He creates an algorithm with a limited number of criteria in order to draw many simulated legislative districts for the state.

Figure 1 (pg. 5) shows that the enacted map, relative to the simulations, is not all that different in terms of partisan outcomes. Fully 1.46 percent of the simulated maps elect the same number of seats for each party, and the vast majority of the simulations produce a map with just 2-3 more seats. To the extent that the simulation is a simplification of the redistricting process, it is fair to ask that if additional restrictions were put into the algorithm, would even more maps be created with the same partisan split as the enacted map?

Professor Mattingly's results vary dramatically depending on the election that he uses as the basis for his simulations. Table 3 (page 8) demonstrates this instability. While most of the elections end up with the enacted map as an outlier,

there are elections in which the enacted map is in the middle of the distribution. The last three elections in the table are all good examples: The simulations using the 2008 gubernatorial and Attorney General elections both end up with roughly 40 percent of the maps being as far or further from the median than the enacted plan.

His simulations for the House are also very dependent on which election he uses as the base data. There are several elections in which the enacted map is clearly not an outlier, including three (LG16, USS16, and AG08) in which there are 20 percent or more of the simulated maps that are as far away from the median or even further than the enacted map.

Conclusion

The various simulation approaches by Plaintiffs' experts do not have sufficient constraints to produce maps that are appropriate to compare to the enacted legislative maps in North Carolina. Comparing non-partisan maps to partisan maps cannot answer the question of whether or not there was too much partisanship. The parameters used by Plaintiffs' experts do not account for the complex processes that lie behind the legislative maps in North Carolina. The exclusion of these parameters further calls into question the comparability of the simulated maps to the enacted maps.

CERTIFICATION

I certify that the statements and opinions provided in this report are true and accurate to the best of my knowledge, information, and belief.

Date: April 30, 2019

Signature _____

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