To: Special Masters, North Carolina Superior Court, Wake County

From: Eric McGhee

Re: Remedial state senate maps in *NCLCV* v *Hall* and *Harper* v *Hall*

Date: February 20, 2022

The Special Masters appointed by the North Carolina Superior Court of Wake County have asked me to provide my assessment of the partisan fairness of the remedial maps submitted by the parties to *NCLCV* v *Hall*, and *Harper* v *Hall*. I am a political scientist who studies elections, election administration, redistricting, public opinion, and legislative behavior. I am the creator of a popular measure of partisan gerrymandering called the efficiency gap, and co-creator with Nicholas Stephanopoulos of Harvard University of a legal test using the same. I am also a member of the Board of Directors of PlanScore, a nonpartisan website that scores redistricting plans on measures of partisan advantage. I have numerous published articles on the subject of partisan advantage in redistricting and am frequently consulted on the topic by policymakers and the media. I have a PhD in political science from the University of California, Berkeley.

In this memo I will evaluate the remedial state senate maps against each other and against the original enacted maps that were struck down. I will use four measures of partisan advantage: partisan symmetry (PS), the mean-median difference (MMD), the efficiency gap (EG), and the declination (D). I will also offer some evidence of the competitiveness of each plan, the compactness of the districts, and how many counties have been split.

In an earlier memo (mcghee_nc_remedial_metrics.pdf) I described the logic behind each of the fairness metrics, so I direct the reader to that memo for further information and I will not cover that topic here. However, it is worth mentioning that PS and MMD have special significance for this state legislative analysis. The two metrics offer a sense of how difficult it would be for a party with majority voter support to control a majority of the seats. Majority control of North Carolina's congressional delegation does not by itself dictate majority control of the U.S. House of Representatives. But majority control of state legislative seats *does* decide which party organizes chambers of the state legislature. This gives the PS and MMD a clearer nexus to the fair allocation of political power for state legislature in a competitive state like North Carolina, where majority support is a live issue.

I will use PlanScore to conduct the great majority of this analysis. In an earlier memo analyzing the congressional plans (mcghee_nc_remedial_congress.pdf) I offered an explanation of PlanScore's approach

to estimating partisan outcomes, so I direct the reader to that memo for most of the details on that topic. In my analysis of the congressional plans I mentioned that PlanScore also reports EG values using presidential and U.S. Senate votes, without any statistical modeling. I prefer the model predictions, but I will note how the presidential and U.S. Senate values compare for each of the plans.

The *Stephenson* rule

In North Carolina redistricting, the *Stephenson* rule controls how many counties may be split across multiple districts. Counties are grouped together before any lines are drawn, and boundaries are chosen within each of these county groups. In this particular litigation it appears that both sides agree on the parameters of the Stephenson constraint, so the precise groupings of counties is not at issue in this case.

The *Stephenson* rule does not fundamentally change the partisan fairness evaluation I will conduct here. The partisan fairness metrics used in this memo can tell us which party is advantaged by a plan, but not whether that advantage can be avoided without running afoul of other legal constraints like the *Stephenson* rule. That question can only be answered by identifying one or more alternative plans that *do* successfully avoid the bias. These plans might be submitted by other parties, or they might be generated randomly by a computer through an ensemble analysis that programs the *Stephenson* rule into its algorithm.

It is tempting to think that the *Stephenson* rule requires breaking the partisan fairness evaluation into a series of separate assessments, one for each county group. It certainly breaks up line drawing this way. But the fairness metrics are always a *plan-wide* consideration, because the overall effect is what matters for the allocation of political power and so for fairness. To evaluate each county group separately would be akin to deciding the winner of a basketball game by counting the number of quarters won by each team: it might say something about which team played better, but would miss the main point of the game.

Partisan fairness

Table 1 contains a comparison of PlanScore results for the original enacted plans that were struck down and each of the proposed remedial plans. The columns headed "Open" contain predictions that simulate what might happen if no incumbents ran for reelection and every seat was open. The columns headed "Incumb." place incumbents in the seats they were drawn into and treat as open any seat where the Legislative Defendants indicated the incumbent was retiring (see footnote 11 on p. 21 of the file "22.02.18 -

LD Memo re Remedial Maps and Related Materials.pdf”).[1] The difference between these columns in each case is the effect of incumbency on the outcome.

The PlanScore pages for these results can be found at each of the links below:

- **Enacted**
  - Open
  - Incumbent
- **Legislative Defendants**
  - Open
  - Incumbent
- **NCLCV**
  - Open
  - Incumbent
- **Harper**
  - Open
  - Incumbent

The metrics are on different scales (see the memo on metrics) so the best way to understand the values is to compare the plans to each other on the same metric, to compare the direction of the bias across different measures of the same plan, and to see how likely those directions are to persist over the life of the plan. To facilitate this last evaluation, I have added an asterisk ($*$) to those values that are likely to favor the same party over all five elections of the plan according to the model.

The original enacted plan is the most biased of the ones considered here, with similar Republican advantages when every seat is open (EG: 7.0%; MMD: 3.6%; PS: 7.3%; D: 0.30) and when incumbents are running (EG: 6.9%; MMD: 4.3%; PS: 7.5%; D: 0.32). These advantages would all be highly likely to favor Republicans throughout the decade. The MMD and PS values suggest the Democrats would find it difficult to win a majority of the seats without an extraordinary majority of popular support.

[1] A note is in order on “double bunking,” where more than one incumbent has a residence in the same district. When at least one Republican and one Democrat were double bunked, I treated these incumbency effects as offsetting, making the district functionally open for the purposes of the analysis. This occurred in District 37 in the Legislative Defendants’ plan and District 21 in the Harper plaintiffs’ plan. When only incumbents of the same party were double bunked, I treated such districts as having one incumbent of the doubled-bunked party. Every submission had at least one doubled-bunked district of this type.

Table 1: Legislative Defendants' plan is fairer than enacted plans but not plaintiff submissions

	Efficiency Gap		**Mean-Median Diff.**		**Symmetry**		**Declination**	
	Open	Incumb.	Open	Incumb.	Open	Incumb.	Open	Incumb.
Enacted	$7.0R^*$	$6.9R^*$	$3.6R^*$	$4.3R^*$	$7.3R^*$	$7.5R^*$	$0.30R^*$	$0.32R^*$
Legislative Defendants	$4.8R^*$	$4.5R^*$	$2.2R^*$	$3.0R^*$	$4.8R^*$	$5.1R^*$	$0.20R^*$	$0.20R^*$
NCLCV	$2.6R$	$2.2R$	$1.1R$	$1.3R$	$2.3R$	$2.4R$	$0.10R$	$0.10R$
Harper	$2.2R$	$2.4R$	$0.8R$	$1.4R$	$1.9R$	$2.6R$	$0.08R$	$0.11R$

Note: "Open" values are predictions from the PlanScore model that simulate an election where all incumbents stepped down and every seat was open. "Incumb." values assume incumbents will run in the district that contains their home residence. The districts containing the residences of the incumbents who are retiring—according to the Legislative Defendants—are treated as open in both calculations. * = value that is more than 50% likely to favor the same party over the course of the decade, using the uncertainty estimates from the PlanScore model.

The Legislative Defendants' remedial plan still favors Republicans when all seats are open, but somewhat less (EG: 4.8%; MMD: 2.2%; PS: 4.8%; D: 0.20). The EG value now clearly falls below the commonly identified threshold of 7%, though the MMD value falls well above the 1% number cited by the Legislative Defendants (see p. 7 of their brief). The values with incumbency factored in are substantially similar (EG: 4.5%; MMD: 3.0%; PS: 5.1%; D: 0.20). All the metric values for both the open seat and incumbency scenarios are more than 50% likely to favor Republicans throughout the decade. The model-free calculations using presidential and U.S. Senate votes are very similar to the PlanScore model results for this plan.

The remaining two remedial plans in Table 1 are very similar to each other on these metrics. The values are only fractionally different within the open seats and incumbency scenarios. Like the other plans in Table 1, these also favor Republicans in all cases. However, this Republican advantage is often less than half the size of the same advantage in the Legislative Defendants' plan. Neither of the plaintiffs' submissions is more than 50% likely to favor Republicans throughout the decade on any of the metrics. However, the MMD and PS values in the Harper plaintiffs' submission are close to 50% in the incumbency scenario, with probabilities higher than 40% in both cases. Once again, the model-free calculations with presidential and U.S. Senate votes are very similar to the numbers presented here.

Competition and traditional geography

In addition to these questions of partisan fairness, it is possible to evaluate the maps in terms of competitiveness and respect for traditional geography.

A plan can favor one party but have more or fewer competitive seats. PlanScore identifies districts that are more than 50% likely to switch party hands at least once in the five elections under the plan. As a practical matter, this works out to districts with expected two-party vote shares between about 45 and 55 percent.

For traditional geography, I look at two dimensions of the issue. The first is compactness: the extent to which the districts resemble a simple shape like a circle. I capture this concept with two different metrics: the Reock score and the Polsby-Popper score. Neither is dispositive of compactness, but they tend to capture some sense of what is meant by the concept and they are correlated with each other. I also report the total number of counties that have have been split across multiple districts, as reported by Dave's Redistricting App.

Table 2: Competition and compactness are largely similar across remedial plans

	Competitive Seats		**Compactness**		
	Open	Incumb.	Reock	Polsby-Popper	**Split Counties**
Enacted	9	7	0.42	0.34	15
Legislative Defendants	10	7	0.43	0.38	15
NCLCV	11	9	0.43	0.37	15
Harper	12	10	0.41	0.35	15

Note: "Open" values are predictions from the PlanScore model that simulate an election where all incumbents stepped down and every seat was open. "Incumb." values assume incumbents will run in the district that contains their home residence. The districts containing the residences of the incumbents who are retiring—according to the Legislative Defendants—are treated as open in both calculations. "Competitive Seats" are those more than 50% likely to favor the same party over the course of the decade, using the uncertainty estimates from the PlanScore model. The Reock and Polsby-Popper compactness scores both range from zero for not compact to one for maximally compact. "Split Counties" is the number of counties that have been divided into more than one district, as identified in Dave's Redistricting App.

Table 2 has the results. The enacted plan has the fewest competitive seats when all seats are open (9), followed by the Legislative Defendants' plan (10), the NCLCV plan (11), and the Harper plaintiffs' plan (12). Incumbents bring the number of competitive seats down somewhat, and there emerges a modest distinction between the number for the enacted and Legislative Defendants' plans (7 each), and the number

in the NCLCV (9) and Harper plaintiffs' (10) plans.

Likely reflecting the constraints of the *Stephenson* rule, all four plans do a reasonably good job of respecting traditional geographic principles. All four have very similar compactness on both measures considered here, and each splits 15 counties.

Conclusion

Much like with the congressional submissions, the Legislative Defendants' remedial senate plan appears to fall in between the original enacted plan and the plaintiffs' remedial proposals on the fairness metrics. The MMD and PS metrics, which are more relevant for a state legislative plan because they connect directly to control of the chamber, suggest that in a tied election Republicans would still hold 27 or 28 seats, and that Democrats would need to win as much as 53 percent of the vote to claim 25 seats. The odds are about three to one that Republicans would maintain this advantage throughout the decade. Over the course of the last decade, Republicans managed to win 53 percent of the state senate vote once, while the most Democrats achieved was just over 50 percent.

In the plaintiffs' submissions, Republicans would win about 26 seats in a tied election, and Democrats would need about 51 percent of the vote to tie Republicans at 25 seats. The odds are about two to one or better that Republicans would lose this advantage at some point over the next decade. This suggests that there is nothing foreordained about the advantages in the Legislative Defendants' plan. The question would seem to turn instead on whether the Legislative Defendants' plan is to be preferred for other reasons.

There is far less difference between the plans in competitiveness or traditional geographic criteria. The plans are virtually identical on geography, and while the number of competitive seats is lower in the enacted and Legislative Defendants' plans, the difference is small.