

Rebuttal Report of Jonathan Cervas

Wise v. State, 2516-CV29597 (Circuit Court of Jackson County, Missouri)

Wednesday, January 14, 2026

1. I submitted my expert report in this matter on December 22, 2025 (amended December 30, 2025). In that report, I analyzed the congressional district map enacted by the Missouri legislature ("2025 Map").

2. Plaintiffs' counsel has informed me that Missouri law requires districts to be "as compact ... as may be," which has been interpreted to mean that districts are drawn such that "closely united territory" are combined and deviations from compactness must be to comply with constitutional requirements for congressional redistricting in Article III, Section 45 of the Missouri Constitution, to comply with or resolve potential violations of the federal Voting Rights Act of 1965 or U.S. Constitution, or to abide by a set of recognized factors. These recognized factors include political subdivision boundaries, including counties, cities, and precincts; population density; natural boundary lines; and historical boundary lines of prior redistricting maps.

3. I created a set of eight illustrative maps that adhere to the requirements and factors listed above.

4. The alternative maps I created preserve the Missouri legislature's preferences about the configuration of congressional districts ("CD") by keeping all the non-challenged districts entirely or almost entirely intact while resolving the alleged violations in challenged CDs 4 and 5.

5. I found that CDs 4 and 5 in 2025 Map are together less compact than the 2022 Map and less compact than the eight illustrative maps I prepared in my opening report. My illustrative maps showed that the configuration of CDs 4 and 5 can be drawn to be significantly more compact, both quantitatively and qualitatively, while matching or beating the 2025 Map in terms of compliance with the requirements and recognized factors in Missouri law. Thus, they show that the requirements and recognized factors cannot account for the non-compact CDs 4 and 5 in the 2025 Map. I conclude that CDs 4 and 5 in the 2025 Map are therefore not "as compact ... as may be."

6. I also concluded that the legislative text of House Bill 1, which became the 2025 Map, does not provide clear guidance about which voting tabulation districts (VTDs) should be assigned to which district in the 2025 Map.

7. I have one addition and two corrections to my opening report.

(1) On Wednesday, December 24, 2025, I filed an expert report in *Driver et al. v. Houston County, GA et al*, 5:25-cv-00025 (M.D. Ga.), that should now be considered part of my list of engagements.

(2) In the first paragraph of page 8, I incorrectly include CD 4 in the list of districts I did not change in my illustrative maps.

(3) Page 10 has transcription errors in the second and third sentences of the first paragraph. Those sentences should read: “As shown in **Table 2**, the 2025 Map reduced CD 5’s Reock score from 0.42 to 0.29 and its Polsby-Popper score from 0.40 to 0.20. As for CD 4, the 2025 Map increased its Polsby-Popper score from 0.30 to 0.33 but significantly decreased its Reock score from 0.51 to 0.39.” This change does not affect my conclusions. The numbers reported in these sentences were intended to transcribe the data presented in Table 2, from which I drew my conclusions.

8. I have now been asked to respond to reports of Dr. Hood and Dr. Trende.

1. Summary of Responses

9. My report is almost entirely undisputed. Neither Dr. Hood nor Dr. Trende dispute that I have created eight illustrative maps that are each more compact than the 2025 Map, and that are consistent with federal and state law and constitutional provisions governing redistricting.

10. I will highlight Dr. Trende’s own words regarding my report: “Dr. Cervas’ report mostly serves to demonstrate that districts 4 and 5 could have been redrawn in such a way as to improve compactness scores. He does so while achieving certain goals: keeping core retention, compactness scores, and political subdivision splits within rough range of the Enacted Map.” (Trende at 27). These are among the recognized factors Missouri courts have previously said can explain a reduction of compactness. Even still, my plans *increased* the compactness of CDs 4 and 5 while accounting for these recognized factors.

11. Responding to my illustrative plans, Dr. Hood says, “It is certainly possible to create a hypothetical congressional districting plan for Missouri where the districts are more compact than those in the 2025 plan.” (Hood at 14). Though he says that I could not have accounted for all the criteria considered by the legislature, he fails to recognize that my plans are almost entirely deferring to the considerations of the legislature since I freeze as many as six out of eight districts. Moreover, he neglects, unlike Dr. Trende, that I have accounted for the recognized factors.

12. When comparing my illustrative plans and the 2022 Map to the 2025 Map, the reduction in compactness of the challenged districts is not a close call. These deviations from compactness are not minimal and cannot be explained by recognized factors.

2. Responses to Dr. Hood

13. I have read and reviewed Dr. Hood’s report, and his report serves to reinforce the opinions and conclusions from my opening report.

14. Dr. Hood does not provide any rebuttal to my report’s conclusions regarding “KC 811.” (Cervas at 26). His analysis of the contiguity of the 2025 Map is limited to a single sentence: “I will note that the eight congressional districts from the 2025 plan are contiguous.” (Hood at 4).

15. Dr. Hood and I agree that no single measure can capture all dimensions of compactness (Hood at 4). We further agree that it is “possible, however, to compare districts (or whole plans) in order to make a determination that a comparison set is more or less compact.” (Id.).

16. Dr. Hood and I disagree about “what should be compared to what.” (Id.). In his footnote 5, he cites to a paper which observes the following about appropriate comparisons: “Differences across states, for example, are inevitable and usually inconsequential because of differing initial shapes.” (Niemi et al., 1990 at 1176). I agree with this quote but would emphasize that even comparisons of one set of districts in a part of the state against another set in a different part are problematic for the same reason: they have “differing initial shapes.” Moreover, comparing across decades is less informative than comparing plans during the same time period because of shifts in population, population patterns, and population density over time. Importantly, the number of districts may change as well.

17. The rest of the section from that paper is worth quoting directly from as well, since it illustrates the utility (and limitations) for using measures of compactness: “...for largely the same reason, quantitative scores should be used to make comparisons, not to eliminate plans or districts that fail to meet a predetermined level. [fn16: While we emphasize comparisons of entire plans, there may be instances in which the compactness of specific districts is at issue (e.g., when it is alleged that specific districts and not others were gerrymandered).] There is no score for any one measure, much less for all of them, that on the face of it indicates unsatisfactory compactness; characteristics of the area being districted make identification of such level impossible. The fact that compactness is a relative measure does not render it meaningless. We deal with many such concepts every day. There is no precise temperature, for example, that marks the transition from cold to hot. Yet 10 degrees is rather uniformly regarded as cold and 90 degrees as hot.”

18. Dr. Hood compares challenged districts in the 2025 Map to non-challenged districts in the 2025 Map. (Hood at 8-9; Figures 1-3). This is an improper comparison in this instance. The challenged districts are in one part of the state, and non-challenged districts are in another. Those non-challenged districts are subject to different geographic constraints by virtue of where they are in the state and are of limited value in determining if CDs 4 and 5 were drawn to be “as compact... as may be.” Moreover, the low compactness in non-challenged districts might account for recognized factors.

19. Dr. Hood presents data in Figures 1-3 that show compactness scores for each of the eight districts across a range of plans but leave out important context and detail. From Dr. Hood’s figures, one cannot tell that CDs 4 and 5 both have become significantly less compact (using Reock) under the 2025 Map compared to the 2022 Map, and that CD 5 has become significantly less compact using Polsby-Popper (while CD 4 has become marginally more compact). My figures show this same data (though without the 2012 Map comparison), but with enough detail to recognize the increased compactness scores of non-challenged districts has been achieved at a cost of a huge decrease in compactness of the challenged districts. My Figures 2 and 3 also compare the eight illustrative plans I created and show that it was not necessary to reduce the compactness scores in CDs 4 and 5 to achieve increased compactness in the other six districts.

20. Dr. Hood compares districts in the 2025 Map to those in the 2012 Map. (Hood at 7). However, one should be careful when comparing plans that depend on different data, constraints, and circumstances. The population of different areas grows and shrinks across censuses, which require drawing different arrangements that might affect compactness. In addition, the characteristics of these districts might change over time. These all affect other recognized factors such as core preservation, accounting for natural boundaries, and others. Therefore, the most helpful comparisons are maps that are drawn under similar constraints, such as districts drawn with the same population data.

21. Dr. Hood's "zone of similarity" is not a concept I have seen in the literature. I understand it to mean a comparison between the minimum and maximum compactness scores of the challenged districts to any district with "similar" scores in other plans. As I described above (paragraph 18), this kind of comparison is of limited value. In Figures 2 and 3 of my opening report, I provide plots of the same data (with slight differences given our respective sources of data), but I provide context by showing the challenged districts' ranking against the other six districts in each plan (I understand that the Plaintiffs in *Wise v. State* are only challenging CDs 4 and 5). When adding labels for the challenged districts, one can see that CDs 4 and 5 can be drawn much more compactly (according to mathematical scores) than the 2025 Map without needlessly decreasing the compactness in other districts. Dr. Hood's figures obscure this fact by failing to identify the challenged districts in the 2022 Map.

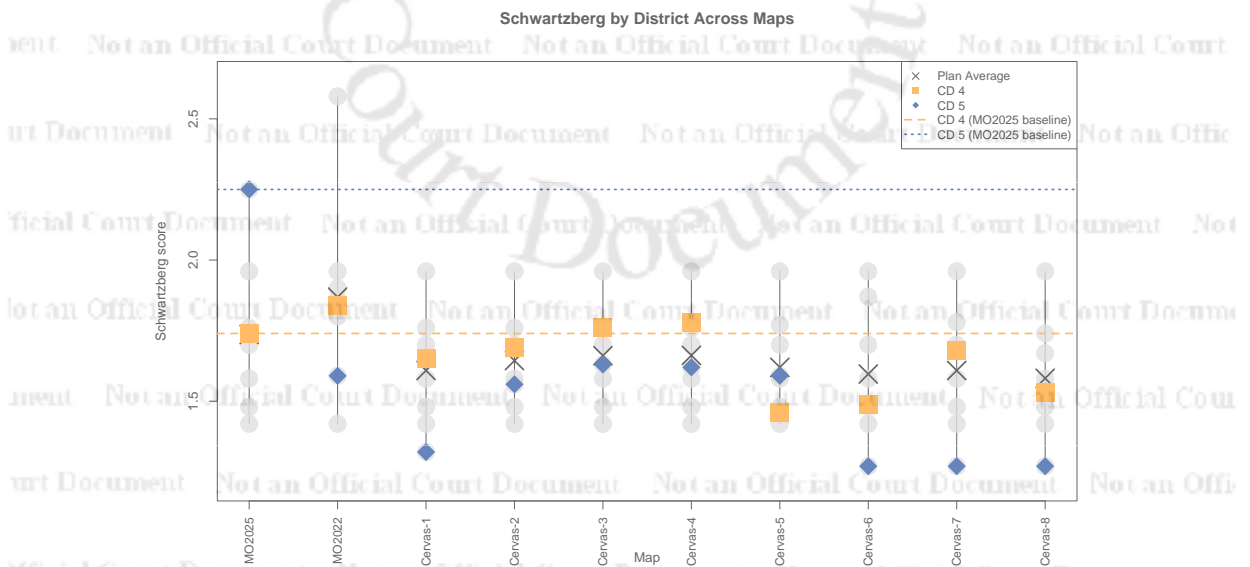
22. Dr. Hood suggests using a threshold for minimum compactness suggested by Professors Pildes and Niemi in their 1993 article (see Hood fn. 13 at 8). But the authors point out the thresholds suggested were somewhat arbitrary and designed to detect potential racial gerrymandering violations after *Shaw v. Reno* based on the bizarre appearance of districts. (Pildes and Niemi at 564). The authors did not suggest that these thresholds should be used to assess compliance with specific state compactness rules. The authors additionally warn "One must make comparisons carefully because of the effects of state shapes." (Pildes and Niemi at 565).

23. Dr. Hood also uses a measure of compactness similar to Polsby-Popper known as Schwartzberg. Under his unnormalized version of the measure, scores are always greater than one, lower scores mean more compact, and higher scores mean less compact. In other words, lower is better. Because the version of Schwartzberg Dr. Hood reports (which he calls Alternate Schwartzberg) is available only in Maptitude, I calculate Schwartzberg in R using a formula similar to the one available in Dr. Trende's disclosed code. My scores, like Dr. Hood's, are not normalized and are comparable to the scores found in Table 4 of Dr. Hood's report. I report these Schwartzberg scores in Table 1. For the alternative maps, the districts altered from the 2025 Map are shaded light grey. A red up arrow (▲) indicates an increase in the relevant score compared to the 2025 Map (*less compact*), an equal sign (=) indicates no change, and a green down arrow (▼) indicates a decrease (*more compact*).

Table 1 - District-wide Schwartzberg Scores

Schwartzberg	2022 Map	2025 Map	Cervas 1	Cervas 2	Cervas 3	Cervas 4	Cervas 5	Cervas 6	Cervas 7	Cervas 8
Mapwide Avg.	1.87	1.74	1.61 ▼	1.65 ▼	1.66 ▼	1.66 ▼	1.62 ▼	1.60 ▼	1.61 ▼	1.58 ▼
CD 4 & 5 Avg.	1.72	2.00	1.49 ▼	1.63 ▼	1.70 ▼	1.70 ▼	1.53 ▼	1.38 ▼	1.47 ▼	1.40 ▼
1	1.80	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
2	1.86	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
3	2.58	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.67 ▼
4	1.84	1.74	1.65 ▼	1.69 ▼	1.76 ▲	1.78 ▲	1.46 ▼	1.49 ▼	1.68 ▼	1.53 ▼
5	1.59	2.25	1.32 ▼	1.56 ▼	1.63 ▼	1.62 ▼	1.59 ▼	1.27 ▼	1.27 ▼	1.27 ▼
6	1.90	1.76	1.76	1.76	1.76	1.76	1.77 ▲	1.87 ▲	1.78 ▲	1.74 ▼
7	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
8	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96

Figure 1 - Plot of District-Level Schwartzberg Scores by Map



24. My opinion as to whether CDs 4 and 5 were drawn to be “as compact ... as may be” is reinforced after reviewing the Schwartzberg scores associated with each district and when compared to the 2022 Map and my eight alternative maps. CDs 4 and 5 on average in the 2025 Map are less compact on Schwartzberg compared to each of my illustrative plans and compared to the 2022 Map.

25. Dr. Hood states: “It is certainly possible to create a hypothetical congressional districting plan for Missouri where the districts are more compact than those in the 2025 plan.”

(Hood at 14). I agree. In fact, CDs 4 and 5 in my eight plans and the 2022 Map are more compact than those in the 2025 Map.

26. The legislature's preferences are reflected in the lines that they drew, and I adopted them by freezing districts as drawn in the 2025 Map. Dr. Hood asks "But could such a hypothetical plan take into account all of the criteria considered by the Missouri General Assembly? The answer is almost certainly no." (Id.). But I did incorporate most of the legislature's considered criteria. As I show in my opening report, my plans retain *at least* 82.4% of the legislature's choices in the 2025 Map. (Cervas at 7, Table 1). I made no changes to CDs 1, 2, 7, or 8 in any plan. I make changes to only CDs 4 and 5 in four of my illustrative plans, CDs 4, 5, and 6 in three plans, and CDs 3, 4, 5, and 6 in one plan. I also considered recognized factors and found that none of those criteria explain the non-compactness of CDs 4 and 5 in the 2025 Map. All my plans are illustrative of different choices the legislature could have made and are not exhaustive of all the potential choices they could make while creating a plan where CDs 4 and 5 were "as compact...as may be." All my plans show the legislature could have pursued largely the same redistricting objectives while creating a plan where CDs 4 and 5 were significantly more compact.

27. Dr. Hood says in footnote 21 on page 14: "The expert reports of Professor Cervas and Professor Stern do not include any interviews with legislators nor any examination of the legislative record regarding the 2025 congressional redistricting." Methodologically, talking to some or all legislators would not help to determine whether districts were drawn in compact ways or provide a full account of what the legislature sought to accomplish in configuring congressional districts. To the extent that I could account for the testimony of different legislators, it is unclear how an expert should weigh conflicting testimony or goals. What the legislature collectively wanted to achieve in congressional redistricting is reflected the congressional districts themselves. That is how my eight illustrative plans account for the legislature's prerogatives, by preserving the lines the legislature drew and retaining the cores of most of the districts. Moreover, on the latter point, Dr. Hood is incorrect. In my opening report, I considered recognized factors as well as other goals allegedly desired by proponents of the 2025 Map (such as avoiding pairing incumbents).

28. To the extent that Dr. Hood is arguing that CD 5 in the 2025 Map is made less compact to accommodate a more compact CD 4 or 6 (see Hood fn 8 at 5), it is unsupported by the facts. Table 2 in my opening report shows that CD 5 can improve on compactness scores while simultaneously increasing or keeping constant the compactness scores of adjacent districts. Comparing the 2025 Map to each of my eight illustrative plans, the Reock score is the same or increases in every single district. For Polsby-Popper scores, every district has the same or increased compactness score except for CD 4 in Cervas 3 and Cervas 4, which is less than the 2025 CD 4 by 0.01, and CD 6 in Cervas 6, which was 0.03 less than the 2025 Map. My maps Cervas 7 and Cervas 8 also increase the Reock and Polsby-Popper scores compared to the 2025 Map in every district, including CDs 4 and 6. The reduction in the compactness of CD 5 cannot be explained by a desire to increase the compactness of CD 4 or CD 6. My maps show that all three districts' compactness could be improved simultaneously.

3. Response to Dr. Trende

29. I have read and reviewed Dr. Trende's report, and his report serves to reinforce the opinions and conclusions from my opening report.

30. Dr. Trende agrees with my analysis that the text in House Bill 1 is ambiguous as to which district(s) the voting tabulation districts ("VTD") "KC 811" are assigned to. We both agree that there are two VTDs with the same name in the 2020 census and we both agree that they have a unique id.

31. Like Dr. Trende, I am not certain which "election officials would actually have discretion to prescribe a different outcome," nor should my report be read to indicate that I have a legal opinion on such a matter. I simply point out that the text of House Bill 1 does not clearly describe how these VTDs should be assigned to districts, based on the text. Only through assumption can one determine which districts the two VTDs "KC 811" should be assigned.

32. Dr. Trende states that I do not contemplate these two VTDs being assigned in a way in which they would not result in malapportioned and noncontiguous districts. (Trende at 16). However, in Table 1 of my opening report, I do note that the 2025 Map reflected in the shapefile available on the website of the Missouri Office of Administration, Division of Budget & Planning (<https://budplan.oa.mo.gov/redistricting-office/2025-us-congressional-house-maps>), assigns the areas labeled "KC 811" to CDs 4 and 5 in a way that makes both districts equally populated and contiguous. Additionally, I analyze the 2025 Map in my opening report using the contiguous version from the above website.

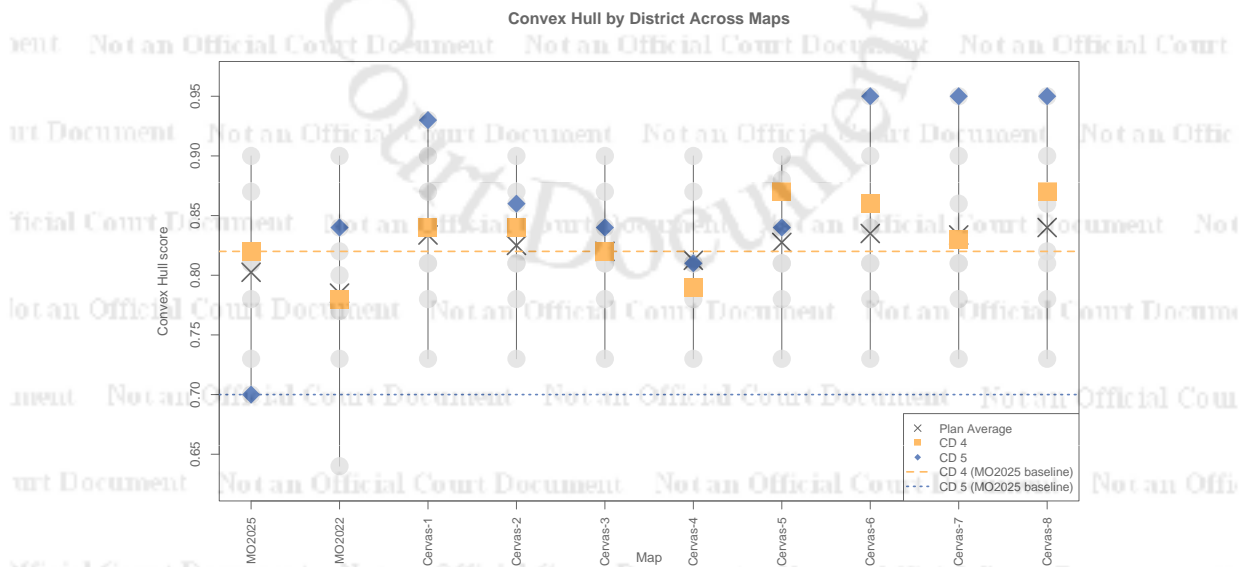
33. Dr. Trende and I both use Dave's Redistricting App to report Reock and Polsby-Popper compactness scores. There is no dispute about the suitability of these measurements for the purpose of comparison.

34. Dr. Trende also reports the "Convex Hull" and "IKIWISI" scores. He did not report these scores for my illustrative plans, nor did he provide the scores for each district individually in any plan. I have calculated these scores for each plan and each district.¹ The Convex Hull scores are provided in Table 2. The Convex Hull score is like the Reock score but instead of comparing the district to its smallest bounding circle, Convex Hull compares the district to its smallest bounding polygon. For the alternative maps, the districts altered from the 2025 Map are shaded light grey. A green up arrow (▲) indicates an increase in the relevant score compared to the 2025 Map, an equal sign (=) indicates no change, and a red down arrow (▼) indicates a decrease. The scores range from 0 to 1, where 1 is most compact.

¹ I used the algorithms found in Dr. Trende's production code to calculate Convex Hull scores. I compare the numbers I generated with those in his Table 1 on page 18 (Trende) and see that our numbers are comparable.

Table 2 - District-Level Convex Hull Scores

Convex Hull	2022 Map	2025 Map	Cervas 1	Cervas 2	Cervas 3	Cervas 4	Cervas 5	Cervas 6	Cervas 7	Cervas 8
<i>Mapwide Avg.</i>	0.79	0.80	0.83 ▲	0.83 ▲	0.82 ▲	0.81 ▲	0.83 ▲	0.84 ▲	0.83 ▲	0.84 ▲
<i>CD 4 & 5 Avg.</i>	0.81	0.76	0.89 ▲	0.85 ▲	0.83 ▲	0.80 ▲	0.86 ▲	0.91 ▲	0.89 ▲	0.91 ▲
1	0.77	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
2	0.80	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
3	0.64	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.82 ▲
4	0.78	0.82	0.84 ▲	0.84 ▲	0.82 =	0.79 ▼	0.87 ▲	0.86 ▲	0.83 ▲	0.87 ▲
5	0.84	0.70	0.93 ▲	0.86 ▲	0.84 ▲	0.81 ▲	0.84 ▲	0.95 ▲	0.95 ▲	0.95 ▲
6	0.82	0.87	0.87	0.87	0.87	0.87	0.88 ▲	0.84 ▼	0.86 ▼	0.86 ▼
7	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
8	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73

Figure 2 - Plot of District-Level Convex Hull Scores by Map

35. My opinion as to whether CDs 4 and 5 were drawn to be “as compact ... as may be” is reinforced after reviewing the Convex Hull scores associated with each district and when compared to the 2022 Map and my eight alternative maps. CDs 4 and 5 on average in the 2025 Map are less compact on Convex Hull compared to each of my illustrative plans and compared to the 2022 Map.

36. I report the district level and average scores for “IKIWISI” in Table 3. The “IKIWISI,” as the measure’s authors describe in their paper, is a “statistical model that predicts, with high accuracy, solely from the geometric features of the district, compactness

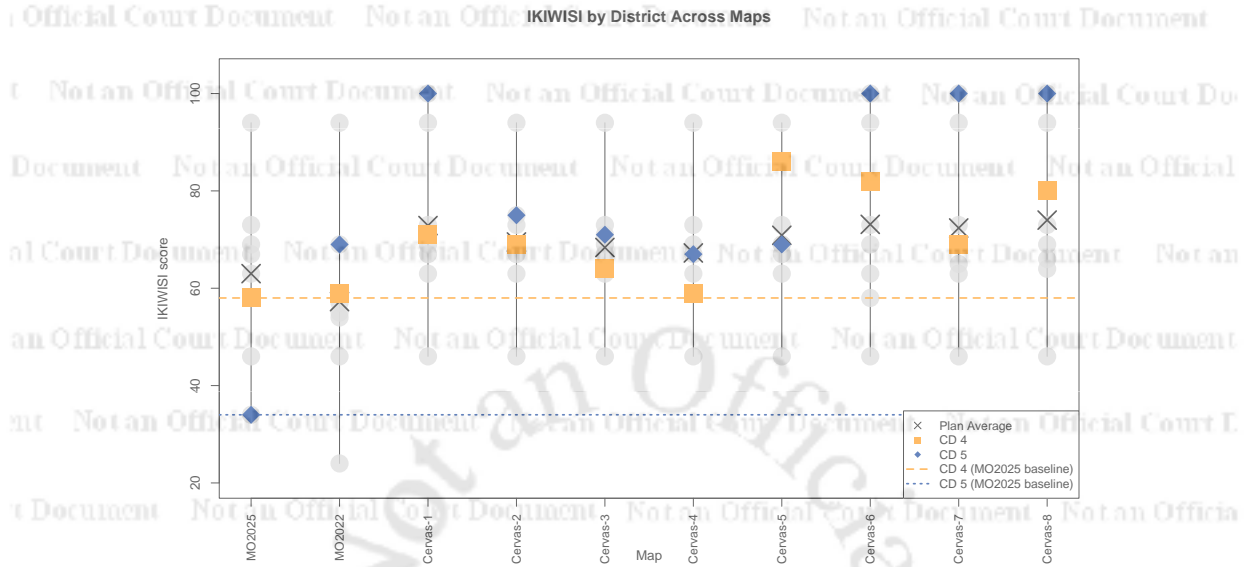
evaluations by judges and public officials.”² The scores range from 0 to 100, where higher scores indicate more compact districts. A green up arrow (▲) indicates an increase in the relevant score compared to the 2025 Map, an equal sign (=) indicates no change, and a red down arrow (▼) indicates a decrease.

Table 3 - District-Level “IKIWISI” Scores

District	2022 Map	2025 Map	Cervas 1	Cervas 2	Cervas 3	Cervas 4	Cervas 5	Cervas 6	Cervas 7	Cervas 8
<i>Mapwide Avg.</i>	57.3	63	72.9 ▲	69.5 ▲	68.4 ▲	67.3 ▲	70.9 ▲	73.1 ▲	72.4 ▲	74 ▲
<i>CD 4 & 5 Avg.</i>	64	46	85.5 ▲	72 ▲	67.5 ▲	63 ▲	77.5 ▲	91 ▲	84.5 ▲	90 ▲
<i>1</i>	57	73	73	73	73	73	73	73	73	73
<i>2</i>	55	69	69	69	69	69	69	69	69	69
<i>3</i>	24	63	63	63	63	63	63	63	63	64 ▲
<i>4</i>	59	58	71 ▲	69 ▲	64 ▲	59 ▲	86 ▲	82 ▲	69 ▲	80 ▲
<i>5</i>	69	34	100 ▲	75 ▲	71 ▲	67 ▲	69 ▲	100 ▲	100 ▲	100 ▲
<i>6</i>	54	67	67	67	67	67	67 =	58 ▼	65 ▼	66 ▼
<i>7</i>	94	94	94	94	94	94	94	94	94	94
<i>8</i>	46	46	46	46	46	46	46	46	46	46

² Kaufman, Aaron R., Gary King, and Mayya Komisarchik. 2021. “How to Measure Legislative District Compactness If You Only Know It When You See It.” *American Journal of Political Science* 65(3): 533–50. doi:10.1111/ajps.12603.

Figure 3 - Plot of District-Level “IKIWISI” Scores by Map



37. My opinion as to whether CDs 4 and 5 were drawn to be “as compact ... as may be” is reinforced after reviewing the “IKIWISI” scores associated with each district and when compared to the 2022 Map and my eight alternative maps. CDs 4 and 5 in the 2025 Map are less compact on average and individually on “IKIWISI” compared to each of my illustrative plans and compared to the 2022 Map.

38. I was also asked by Plaintiffs’ counsel to report the “IKIWISI” scores for the three maps created by another expert, and those which I adjusted in my opening report. That data is reported in Table 4.

Table 4 - District-Level “IKIWISI” Scores for Simulated Maps

IKIWISI	2022 Map	2025 Map	map71871	Adjusted	map11029	Adjusted	map11163	Adjusted
<i>Mapwide Avg.</i>	57.3	63	67.3 ▲	67.1 ▲	66.1 ▲	66.3 ▲	70.4 ▲	68.4 ▲
<i>CD 4 & 5 Avg.</i>	64	46	63 ▲	62.5 ▲	58.5 ▲	59 ▲	75.5 ▲	67.5 ▲
4	59	58	59 ▲	59 ▲	67 ▲	67 ▲	71 ▲	69 ▲
5	69	34	67 ▲	66 ▲	50 ▲	51 ▲	80 ▲	66 ▲

39. Dr. Trende makes the same conceptual mistake that Dr. Hood makes by comparing individual districts in the 2025 Map to those in other geographic areas of the state, or that use a different population baseline, like the 2012 Map. He compares CD 5 to individual districts across three plans: the 2012 Map, the 2022 Map, and the 2025 Map. In doing so, he attempts to show that some districts are less compact than CD 5 in the 2025 Map according to certain quantitative metrics. To the extent that these comparisons are at all proper, it is worth considering CD 5 against all the districts in the plans he is comparing it to. He compares CD 5

to the eight districts in each of the 2022 and 2012 Maps, and to the other seven districts in the 2025 Map (comparing CD 5 to 23 other districts in total). He shows that CD 5 in the 2025 Map is less compact than 83% of the districts using Reock (19 out of 23), 91% of the districts using Polsby-Popper (21 out of 23), 87% using Convex Hull (20 out of 23), and 91% of all districts using IKIWISI (21 out of 23).

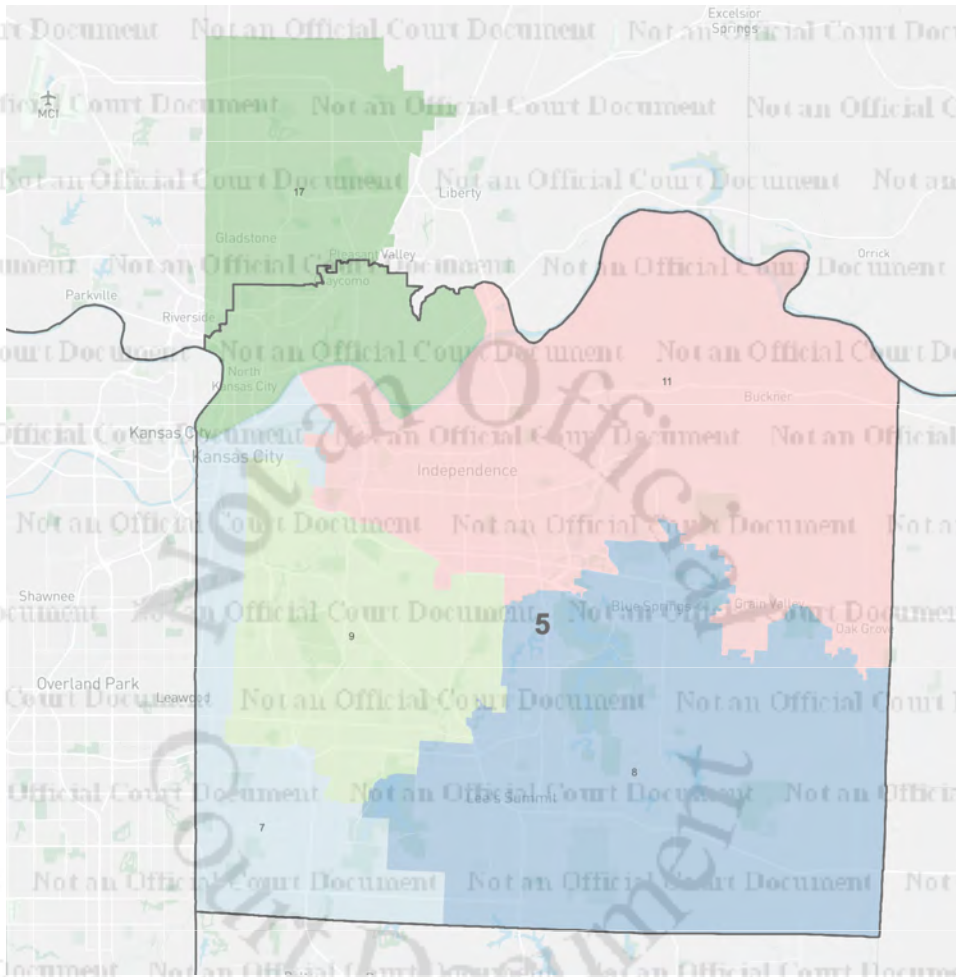
40. These numbers are reported by Dr. Trende without any context as to how the compactness of these districts is affected by their compliance with other requirements or recognized factors.

41. On page 21-23, Dr. Trende discusses the dividing line between CDs 4 and 5 in the 2025 Map. He seems to suggest that this line follows the boundaries of state senate districts ("SD"). State senate districts also must abide by the US Constitution's mandate of one person, one vote. In terms of population, a congressional district is more than four times as large as a state senate district in Missouri. It is therefore possible to keep most state senate districts fully contained within congressional districts.

42. It was possible to avoid splitting all but one senate boundary in CD 5 by keeping Jackson County whole. SDs 7, 8, 9, and 11 are wholly contained in Jackson County, while a piece of SD 17 is in Jackson County. The remaining population of SD 17 is in Clay County.

43. My alternative plans—Cervas 6, 7, and 8—all show that accounting for senate boundaries cannot explain the non-compact configuration of CDs 4 and 5 in the 2025 Map. Maps 7 and 8 match or improve on all criteria and recognized factors while making CDs 4 and 5 more compact. Additionally, CD 5 in these plans includes all of Jackson County, which means SDs 7, 8, 9, and 11 are fully contained in the district, as shown in Figure 4. In so far as preserving the state senate districts was among the legislature's priorities, it cannot explain the non-compact districts in and around Jackson County.

Figure 4 - Cervas 6/7/8 with Missouri State Senate Districts



44. Considering Dr. Trende’s comments about state senate districts, I measured across all the plans the number of senate districts divided between districts and the total number of divisions. Unlike counties or municipalities, senate districts all have roughly the same population. Each congressional district should have more than four but less than five senate districts inside them.

Table 5 - Senate District Splits

	2022 Map	2025 Map	Cervas 1	Cervas 2	Cervas 3	Cervas 4	Cervas 5	Cervas 6	Cervas 7	Cervas 8
# of Total Senate District Splits	17	17	15 ▼	15 ▼	17 =	16 ▼	16 ▼	14 ▼	14 ▼	14 ▼
# of Senate Districts Split	21	22	18 ▼	18 ▼	20 ▼	20 ▼	20 ▼	16 ▼	17 ▼	17 ▼

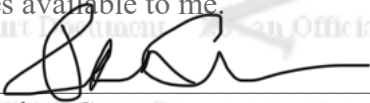
45. The 2025 Map either does the same (total senate district splits) or *worse* (an additional split senate district) than the 2022 Map. All eight of my maps have the same or fewer total senate district splits and split fewer senate districts.

46. Dr. Trende notes on page 27 that the downtown airport (“MKC”) is in CD 6. This downtown airport is also in CD 6 in each of my illustrative plans Cervas 1, 2, 3, and 4. I would further note that the Kansas City International Airport (“MCI”) is in CD 6 in the 2025 Map, the 2022 Map, and in each of my illustrative plans. Placing the airport in CD 6 cannot explain why CDs 4 and 5 were made less compact.

47. Dr. Trende writes that my illustrative plans “... demonstrate that districts 4 and 5 could have been redrawn in such a way as to improve compactness scores. He does so while achieving certain goals: keeping core retention, compactness scores, and political subdivision splits within rough range of the Enacted Map.” (Trende at 27). I agree.

* * *

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. I reserve the right to revise, update, or supplement my opinions as new information becomes available to me.



Dr. Jonathan Cervas