

**IN THE UNITED STATES DISTRICT COURT  
FOR THE MIDDLE DISTRICT OF FLORIDA  
TAMPA DIVISION**

KÉTO NORD HODGES, *et al.*,

*Plaintiffs,*

v.

Case No. 8:24-cv-00879

KATHLEEN PASSIDOMO, in her official  
capacity as President of the Florida Senate,  
*et al.*,

*Defendants.*

**EXPERT REPORT OF CORY McCARTAN, Ph.D.**

**I. INTRODUCTION AND SCOPE OF WORK**

1. My name is Cory McCartan, Ph.D., and I am an Assistant Professor in the Department of Statistics at the Pennsylvania State University. Among other areas, I specialize in the study of legislative redistricting in the United States.

2. I have been retained by counsel representing the Plaintiffs to redraw a portion of the Florida Senate district map to keep District 16 wholly contained in Hillsborough County while complying with all other statutory and constitutional districting standards. My methodology in drawing three illustrative plans is described in Section IV.

3. After completing that assignment, I was asked to compare aspects of the illustrative plans that I have prepared with the enacted plan and past adjustments made during legislative

and congressional redistricting in Florida. My findings from these comparisons are detailed in Section V.

## II. QUALIFICATIONS

4. I have a B.A. in mathematics from Grinnell College (2019) and an M.A. (2021) and Ph.D. (2023) from Harvard University in statistics. My research focuses on developing and applying statistical methodology to problems in the social sciences. Specifically, I have extensively studied redistricting in the United States, publishing eight peer-reviewed journal articles and working papers related to redistricting in the last three years.

5. As part of my redistricting research agenda, I have developed a simulation algorithm (the “SMC algorithm”) that can generate many randomly sampled redistricting plans.<sup>1</sup> I have also developed and continue to maintain a variety of open-source software packages for using census data and studying redistricting plans.

6. I have previously submitted expert reports and testified by trial or by deposition in four other cases:

- *GRACE v. City of Miami*, No. 1:22-cv-24066 (S.D. Fla. 2024), involving city council districts.

I testified at trial and by deposition regarding the demographic and geographic features of the districts.

- *Nairne v. Ardoin*, No. 3:22-cv-00178 (M.D. La. 2024), involving state legislative districts and the Voting Rights Act. I testified at trial and by deposition regarding the proper use of redistricting simulation tools.

- *Callais v. Landry*, No. 3:24-cv-00122 (W.D. La. 2024), involving congressional districts and

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<sup>1</sup>Cory McCartan and Kosuke Imai, “Sequential Monte Carlo for Sampling Balanced and Compact Redistricting Plans,” *Annals of Applied Statistics* 17, no. 4 (2023): 330–3323.

alleged racial gerrymandering. I testified at trial and by deposition regarding the proper use of redistricting simulation tools.

- *McClure v. Jefferson County Commission*, No. 2:23-cv-00443-MHH (N.D. Ala. 2024), involving alleged racial gerrymandering of county commission districts. I testified by deposition about redistricting simulations investigating the alleged gerrymandering.

7. A copy of my curriculum vitae, detailing my experience and qualifications, including a list of all publications authored in the last 10 years, is attached as Exhibit A. I am being compensated for my work on this report at an hourly rate of \$125 per hour. No part of my compensation depends on the outcome of this case or on the opinions that I provide.

### III. SOFTWARE AND DATA

8. I performed initial adjustments and district drawing using the Dave's Redistricting App (DRA) software, developed by a non-partisan group of volunteers. I then performed additional adjustments and final drawing using the Florida Legislature's online redistricting software, version 2.36.<sup>2</sup>

9. The map-drawing software I used includes 2020 decennial census data about total population, voting-age population, and racial demographics of the voting-age population, as well as the geographic boundaries of counties, municipalities, census Voting Tabulation Districts, and census blocks. I used these data in drawing the illustrative plans.

10. The geographic boundaries of the enacted Florida Senate districts (Plan 8058) I obtained from the Florida Legislature's online redistricting software. The Legislature's online software also includes data on voter registration, turnout, and past election results, including

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<sup>2</sup>Available at <https://web.floridaredistricting.esriemcs.com/redistricting/>.

registration and turnout by party and race. I used the built-in functionality of the software to generate reports about the illustrative plans based on these data, which are included here as appendices.

11. Finally, to make comparisons to historical plans, I obtained past legislative district boundaries for both the Florida House and Senate plans via ESRI maps on the Legislature's website.<sup>3</sup>

#### **IV. METHODOLOGY**

12. As instructed by counsel for the Plaintiffs, my goals in drawing the three illustrative plans were to adjust District 16 to be wholly contained in Hillsborough County, while altering surrounding districts only to the extent necessary to accomplish this change, and complying with both tiers of Florida constitutional standards for redistricting. I was provided with a memorandum from Senator Ray Rodrigues, to Jay Ferrin, Staff Director of the Florida Senate's Committee on Apportionment, which contained detailed interpretations of these constitutional criteria.

13. In drawing the illustrative plans, I consulted no partisan data, and only consulted racial demographic data to the extent required to ensure that Black voters' ability to elect representatives of their choice was not diminished.

14. The redrawn districts in each illustrative plan are shown in Figure 2 (Plan A), Figure 3 (Plan B), and Figure 4 (Plan C). The redrawn area of the enacted plan is shown in Figure 1. No area outside of the maps shown below has been adjusted from the enacted plan.

15. I began drawing Illustrative Plan A by removing any areas of District 16 outside of Hillsborough County, i.e., across Tampa Bay, in St. Petersburg, and assigning these areas to District 18. I then moved population to the southern portion of District 21 from District 18 until the latter's population was within 1.0% of the ideal population of 538,455 people, pursuant to the Senate memo.

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<sup>3</sup>Available at <https://storymaps.arcgis.com/stories/82253febdee14d8db197a7e1615a6477> and <https://storymaps.arcgis.com/stories/a6e8253d71d94a7681df346a6baba2f2>.

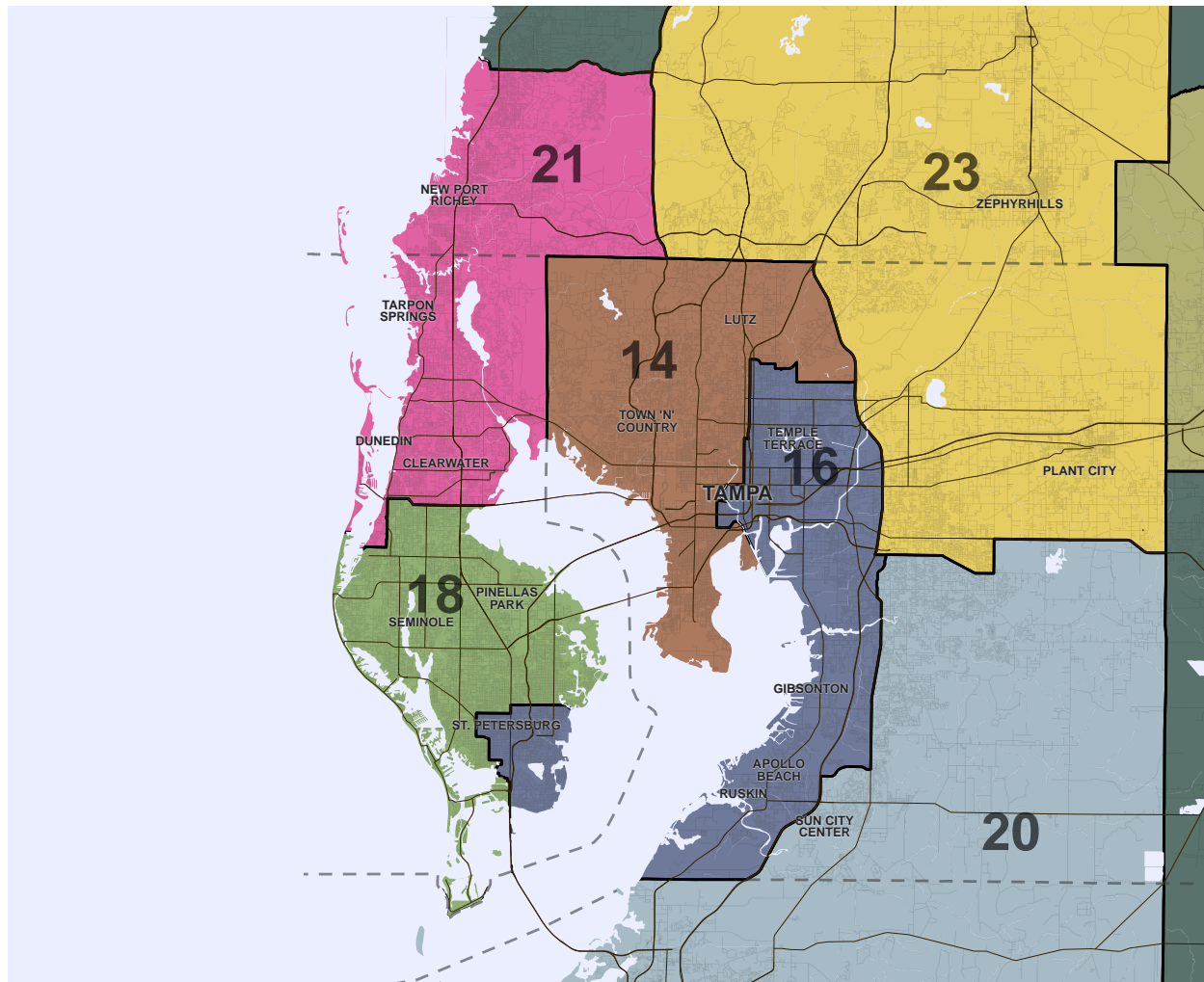


Figure 1: Redrawn area of the enacted plan.

In setting the boundary between Districts 21 and 18, I attempted to follow major roadways and incorporated city boundaries as much as possible.

16. District 21 then had too much population. Since the western and northern boundaries of District 14 are coincident with the boundaries of Hillsborough County, I did not need to adjust the boundaries of District 14 at all in drawing the illustrative plans. I instead added population to District 23 from the northern portion of District 21, again following major roadways where possible, and attempting to draw a relatively straight north-south boundary between the portions of the districts in Pasco County while avoiding splitting incorporated cities.

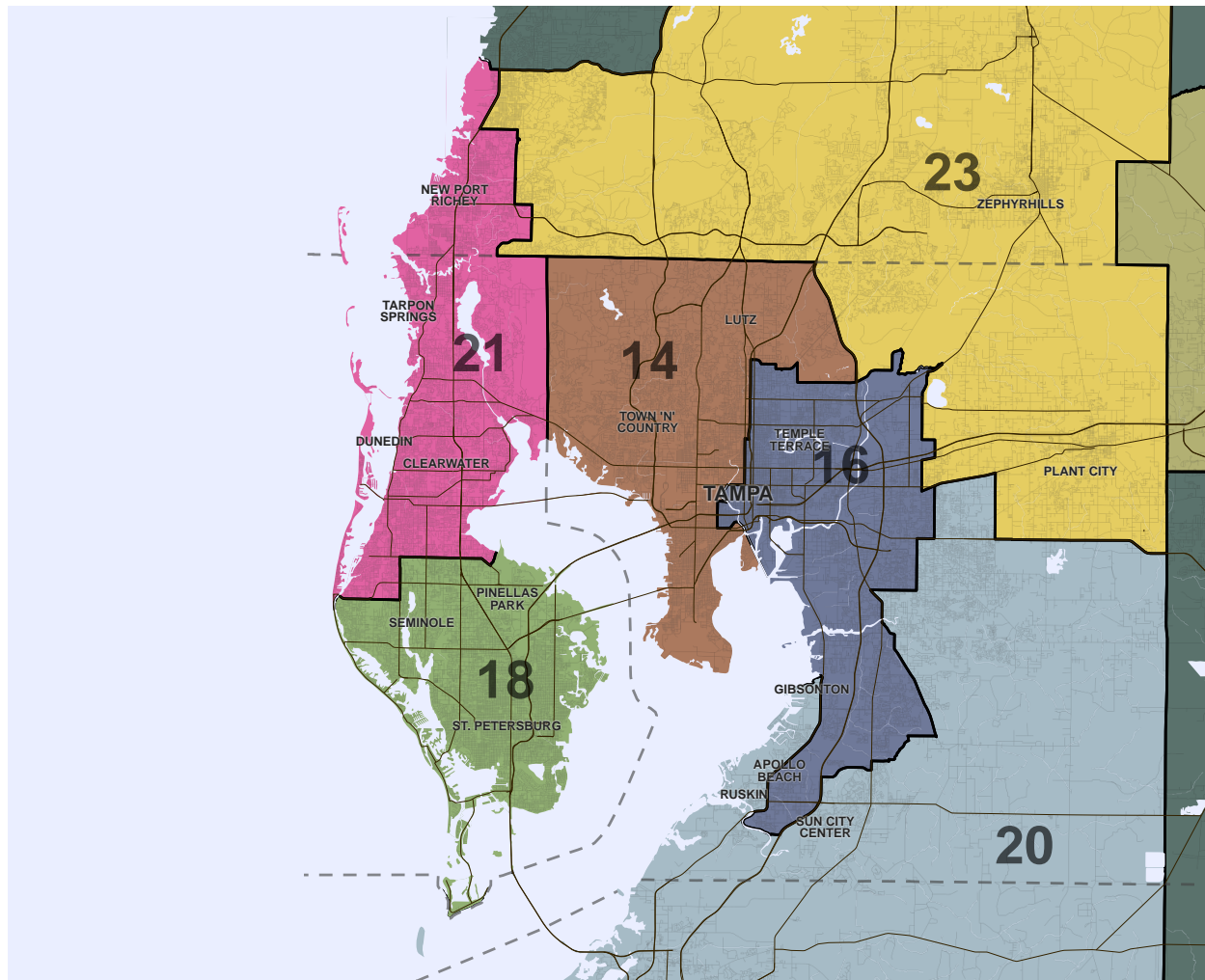


Figure 2: Redrawn districts in Illustrative Plan A. District 14 was not adjusted.

17. District 23 then had too much population, and so I adjusted the boundaries of District 16 and District 20 to balance the populations of those two districts and District 23, keeping all within 1.0% of the ideal population. In Illustrative Plan A, this involved moving the eastern boundary of District 16 further east and transferring some population from the southern portion of District 20 to District 16. I also adjusted the northern boundary of District 20, ensuring that Plant City was not split. In all of these adjustments, I attempted to follow major roadways, railways, and natural boundaries such as rivers and the Bay, while avoiding splitting incorporated cities.

18. I developed Illustrative Plan B by extending the northwestern boundary of District



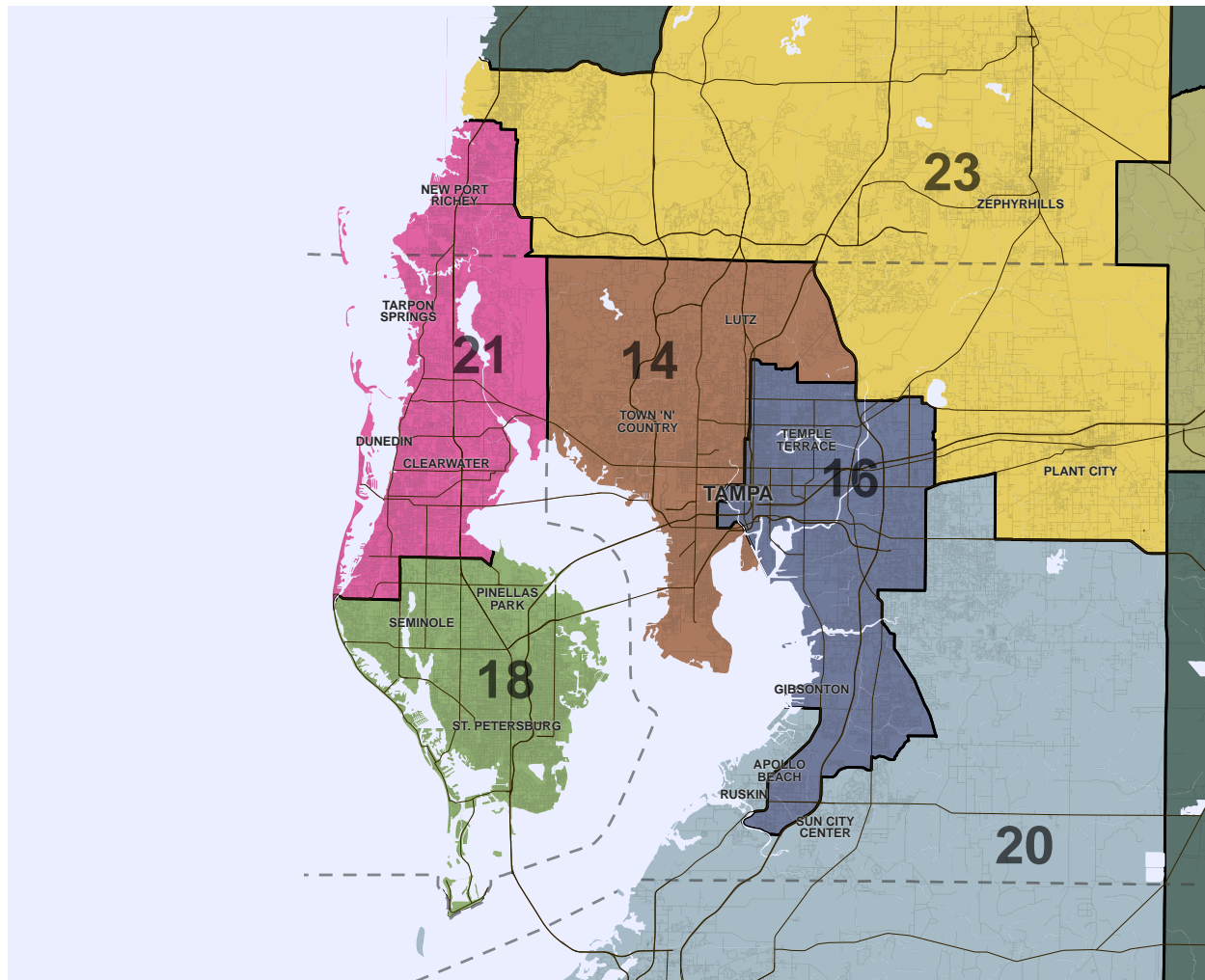


Figure 3: Redrawn districts in Illustrative Plan B. District 14 was not adjusted.

23 out to the coast, straightening the boundary south of that region within Pasco County. I also straightened the boundary of District 16 and made minor adjustments to the boundary between Districts 16 and 20 to balance the populations of District 16. Finally, I made a slight adjustment to the boundary between Districts 21 and 18, around St. Pete–Clearwater International Airport. These changes increased the geographic compactness of Illustrative Plan B.

19. I developed Illustrative Plan C by adjusting the southern boundary of District 16 so that it extended to Tampa Bay, and straightened the remaining boundary with District 20. These changes further increased the geographic compactness of Illustrative Plan C.

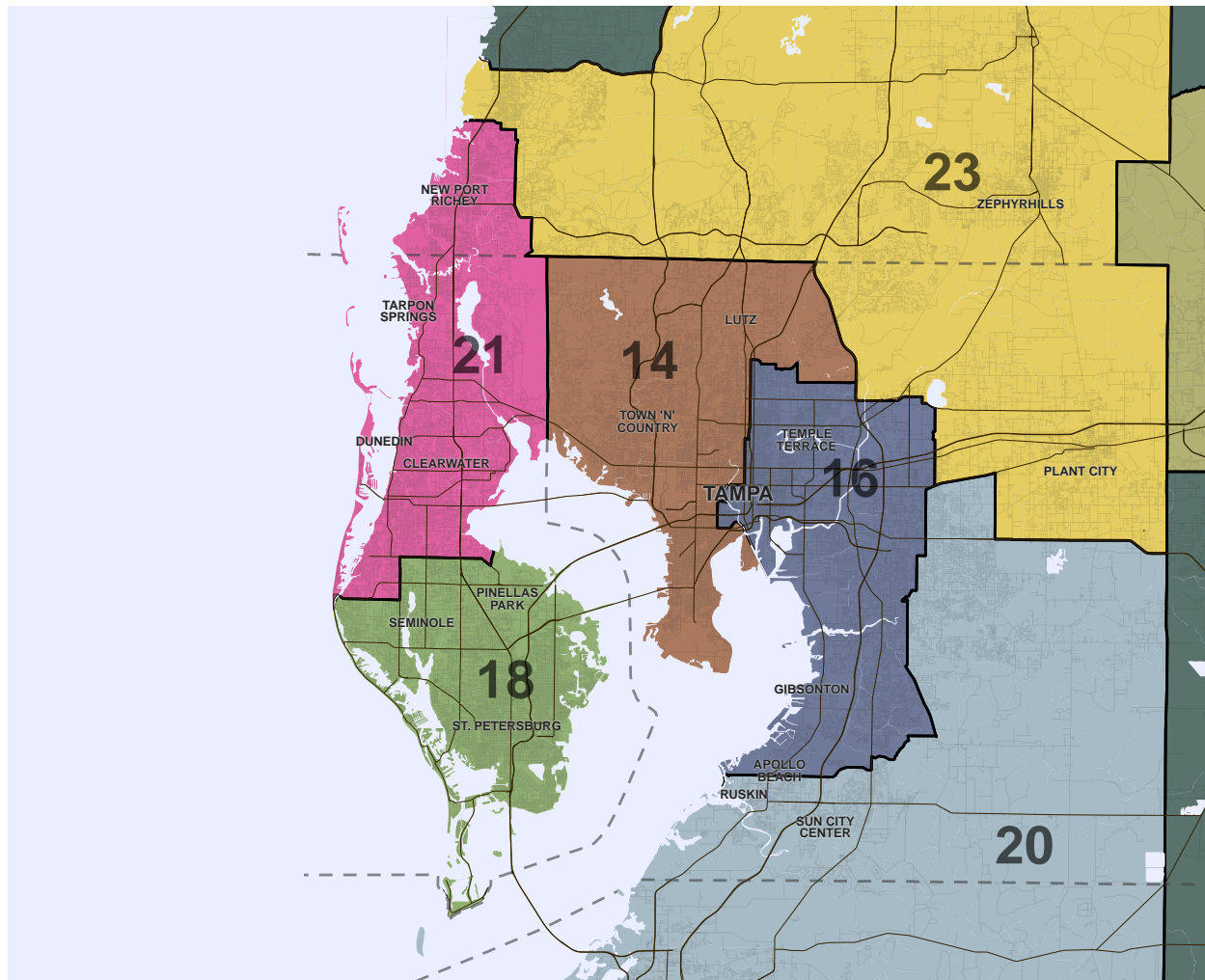


Figure 4: Redrawn districts in Illustrative Plan C. District 14 was not adjusted.

## V. PLAN CHARACTERISTICS

### A. Demographics and Tier Two Statistics for the Illustrative Plans

20. I used the Legislature's software to produce reports on the population, demographics, compactness, and boundaries of the illustrative plans. These are attached as Exhibit B (population and demographics), Exhibit C (compactness), and Exhibit D (boundaries).

21. All population deviations were within the 1.0% threshold required by the Senate memo, and were lower than the maximum deviation in the enacted plan, which was 0.97%.



**B. Comparison with Enacted Districts**

22. Compared to the enacted plan, all three illustrative plans keep District 18 “wholly within” Hillsborough county, as required by the Senate memo. Rodrigues memorandum at 2. As a result, the boundaries of Districts 16 and 18 also respect the major geographic boundary that is Tampa Bay, and avoid splitting the major municipality of St. Petersburg, while the enacted Districts 16 and 18 don’t follow Tampa Bay to the same extent and do split St. Petersburg. These changes increase the visual compactness of these two districts while keeping the surrounding districts compact.

23. Compactness can also be measured numerically in a number of ways. The Legislature has historically used three specific compactness measures: the Polsby–Popper score, the Reock score, and the convex hull score. These scores are the ones calculated by the Legislature’s software, as reported in Exhibit C. The Polsby–Popper score compares the area of a district to the area of a circle with the same perimeter. The Reock score compares the area of a district to the area of the smallest circle that can cover the entire district. Informally, the convex hull score compares the area of a district to the area covered by a rubber band stretched around the edge of the district. For all three scores, larger values indicate greater compactness.

24. None of the scores is perfect, and each can be affected to a greater or lesser extent by natural boundaries, such as irregular and meandering rivers or the inclusion of large areas of coastal waters. Moreover, changes in one district can affect compactness scores of surrounding districts in different amounts. It can therefore be helpful to average compactness scores across a few districts as a summary measure.

25. The Polsby–Popper score of District 18 is 0.53 for the enacted plan and 0.64 for

Illustrative Plans A–C. The Reock score of District 18 is 0.63 for the enacted plan and 0.62 for Illustrative Plans A–C. The convex hull score of District 18 is 0.86 for the enacted plan and 0.89 for Illustrative Plans A–C. Thus for two out of the three measures, the redrawn District 18 has a higher compactness score for two of the three measures than the enacted District 18.

26. The Polsby–Popper score of District 16 is 0.36 for the enacted plan, 0.27 for Illustrative Plan A, 0.32 for Illustrative Plan B, and 0.37 for Illustrative Plan C. The Reock score of District 16 is 0.36 for the enacted plan, 0.32 for Illustrative Plan A, 0.35 for Illustrative Plan B, and 0.42 for Illustrative Plan C. The convex hull scores of District 16 is 0.69 for the enacted plan, 0.7 for Illustrative Plan A, 0.74 for Illustrative Plan B, and 0.74 for Illustrative Plan C. The changes to District 16 in the illustrative plans have by and large increased the compactness scores of the district, though for Plan C more than Plan A, and with more variation by compactness score.

27. We can also look at the average compactness score across the five redrawn districts. The average value of the Polsby–Popper score is 0.500 for the enacted plan, 0.442 for Illustrative Plan A, 0.466 for Illustrative Plan B, and 0.492 for Illustrative Plan C. The average value of the Reock score is 0.502 for the enacted plan, 0.488 for Illustrative Plan A, 0.488 for Illustrative Plan B, and 0.500 for Illustrative Plan C. The average value of the convex hull score is 0.804 for the enacted plan, 0.808 for Illustrative Plan A, 0.816 for Illustrative Plan B, and 0.812 for Illustrative Plan C.

28. Thus overall, across the three compactness measures, the three illustrative plans have comparable scores to the enacted plan.

29. The legislative software also produces boundary analysis scores which are calculated using the lengths and classifications of each segment of a district’s geographic boundary. These boundary analysis scores are reported overall and also by type of boundary: city boundaries, water boundaries, etc. These scores do not measure how much these component major boundaries are

respected or utilized; rather, they measure only what percentage of a district's boundary tracks the categories of boundaries incorporated into the software. The enacted District 16 has an overall boundary analysis score of 82%; District 18 has a score of 92%. For Illustrative Plan A, the overall boundary analysis scores are 58% for District 16 and 98% for District 18. For Illustrative Plan B, the overall boundary analysis scores are 59% for District 16 and 97% for District 18. For Illustrative Plan C, the overall boundary analysis scores are 56% for District 16 and 97% for District 18.

30. The detailed boundary analysis scores of enacted District 16 are 19% for city boundaries, 6% for county boundaries, 39% for roads, and 31% for water boundaries. The boundary analysis scores of enacted District 18 are 24% for city boundaries, 52% for county boundaries, 16% roads, and and 71% for water boundaries.

31. In comparison, the boundary analysis scores of District 16 in Illustrative Plan C are 26% for city boundaries, 8% for county boundaries, 16% roads, and 35% for water boundaries. The boundary analysis scores of District 18 in Illustrative Plan C are 30% for city boundaries, 66% for county boundaries, 11% roads, and 86% for water boundaries. These are all higher than the corresponding values for the enacted plan, with the exception of the road score, reflecting the decision to split St. Petersburg and Pinellas county along major roadways, and connecting the Tampa and St. Petersburg portions of District 16 via Interstate 75 and U.S. Highway 301, in the enacted plan.

32. Illustrative Plans A and B similarly score higher on city, county, and water boundary analysis scores in District 18 than the enacted plan, and lower on the road boundary analysis score, for the same reason.

33. The enacted District 16 has the lowest overall boundary analysis score of districts in the enacted plan. This is also the case for District 16 in the three illustrative plans. The three

illustrative plans have similar or higher city, county, and water boundary analysis scores for District 16 than the enacted plan, due to the configuration choices described elsewhere in this report.

### **C. Comparison with Other Protected Legislative Districts**

34. I also compared the redrawn districts to other districts in plans adopted by the Florida Legislature or Florida courts. Specifically, I was provided by counsel for the Plaintiffs with a list of districts that were designated by the Legislature as protected under the Tier One minority group standards.<sup>4</sup> These districts are labeled in the figures below.

35. I obtained shapefiles for each of these protected districts as well as any surrounding districts which partially enclosed them.<sup>5</sup> For example, in the redrawn districts, District 16 is protected and is partially enclosed by Districts 14, 20, and 23.

36. I then calculated the average Polsby–Popper, Reock, and Convex Hull compactness in each group of protected districts and their enclosing districts. Because the shapefiles for this analysis were obtained via separate online maps and not the Legislature’s dedicated redistricting software, the compactness scores I calculated for the districts do not agree completely with those calculated by the legislature’s software. This is likely due to different definitions of Florida’s water boundaries, different resolution of the underlying geographic data, and potentially different map projection methods. However, all of the calculations I make for the analysis in this section are internally consistent—I only make comparisons here using the compactness numbers that I have calculated in the exact same way for all of the plans and districts. Thus any discrepancies with the Legislature’s software do not affect my conclusions.

37. Figures 5, 6, and 7 show the results of these calculations. Each labeled ‘X’ indicates

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<sup>4</sup>To avoid a conflict, this list excluded certain districts in South Florida that I have been retained to study in other potential litigation.

<sup>5</sup>I considered District A to partially enclose District B if the convex hull of District A overlapped District B at least ten square miles.

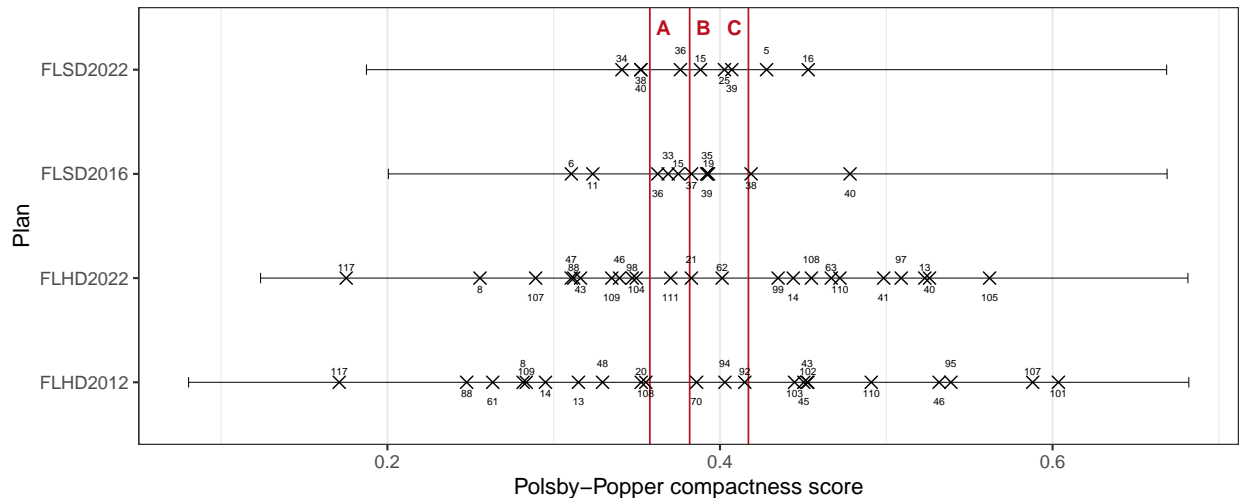


Figure 5: Average Polsby–Popper score in protected districts and any districts partially enclosing them. The range of all district Polsby–Popper scores for each plan is indicated by the horizontal black line. The vertical red lines mark the average scores for District 16 and its enclosing districts in the illustrative plans.

the average compactness score of a protected district and its enclosing districts. The average Polsby–Popper score for Districts 14, 16, 20, and 23 in the illustrative plans is 0.358 for Plan A, 0.382 for Plan B, and 0.417 for Plan C. The average Reock score for Districts 14, 16, 20, and 23 in the illustrative plans is 0.436 for Plan A, 0.438 for Plan B, and 0.451 for Plan C. The average convex hull score for Districts 14, 16, 20, and 23 in the illustrative plans is 0.759 for Plan A, 0.771 for Plan B, and 0.766 for Plan C.

38. As the figure makes clear, the average scores for the three illustrative plans are extremely typical compared to the set of protected districts in the last two House and Senate redistricting plans adopted by the Legislature.

#### D. Comparison with Past Changes During Redistricting

39. The changes made to District 16 in the three illustrative plans are also well in line with historical adjustments made by the Legislature or courts during redistricting to other districts that the legislature recognized as protected for minority voters under the Voting Rights Act and/or



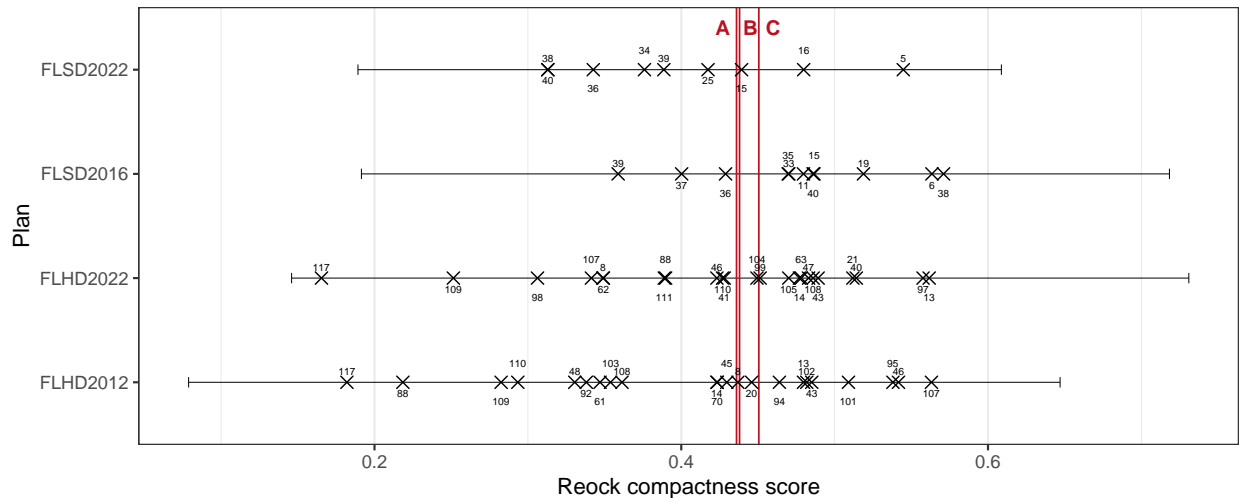


Figure 6: Average Reock score in protected districts and any districts partially enclosing them. The range of all district Reock scores for each plan is indicated by the horizontal black line. The vertical red lines mark the average scores for District 16 and its enclosing districts in the illustrative plans.

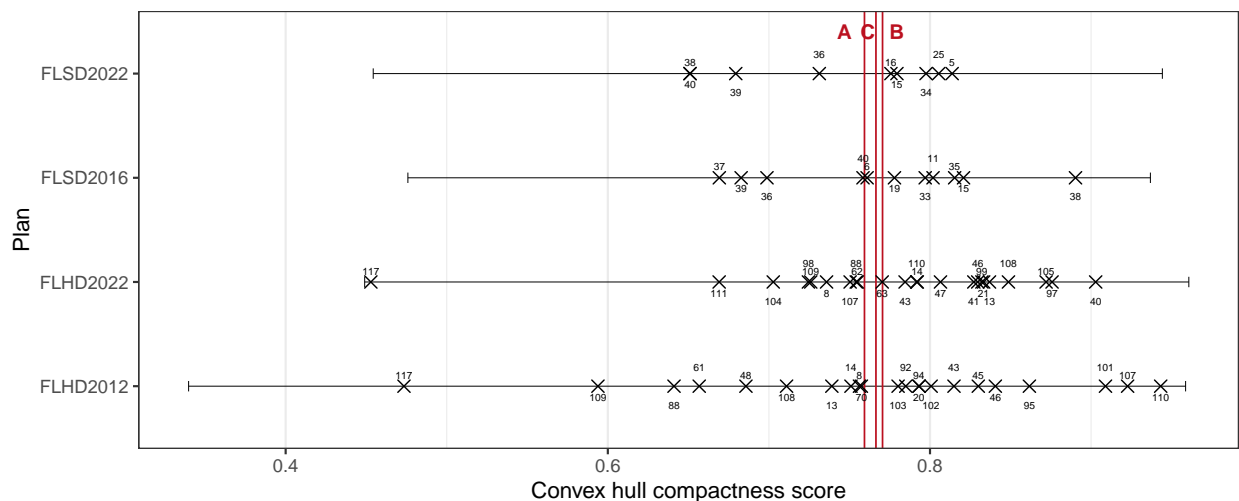


Figure 7: Average convex hull score in protected districts and any districts partially enclosing them. The range of all district convex hull scores for each plan is indicated by the horizontal black line. The vertical red lines mark the average scores for District 16 and its enclosing districts in the illustrative plans.

Tier One of the Fair Districts Amendments.

#### D.1. Historic Senate Districts in the Tampa Bay Area

40. Figure 8a shows the plan (FLSD2002) in place from 2002 to 2012, and Figure 8b the plan (FLSD2012) that was in place from 2012 to 2016. In FLSD2002, District 18, corresponding

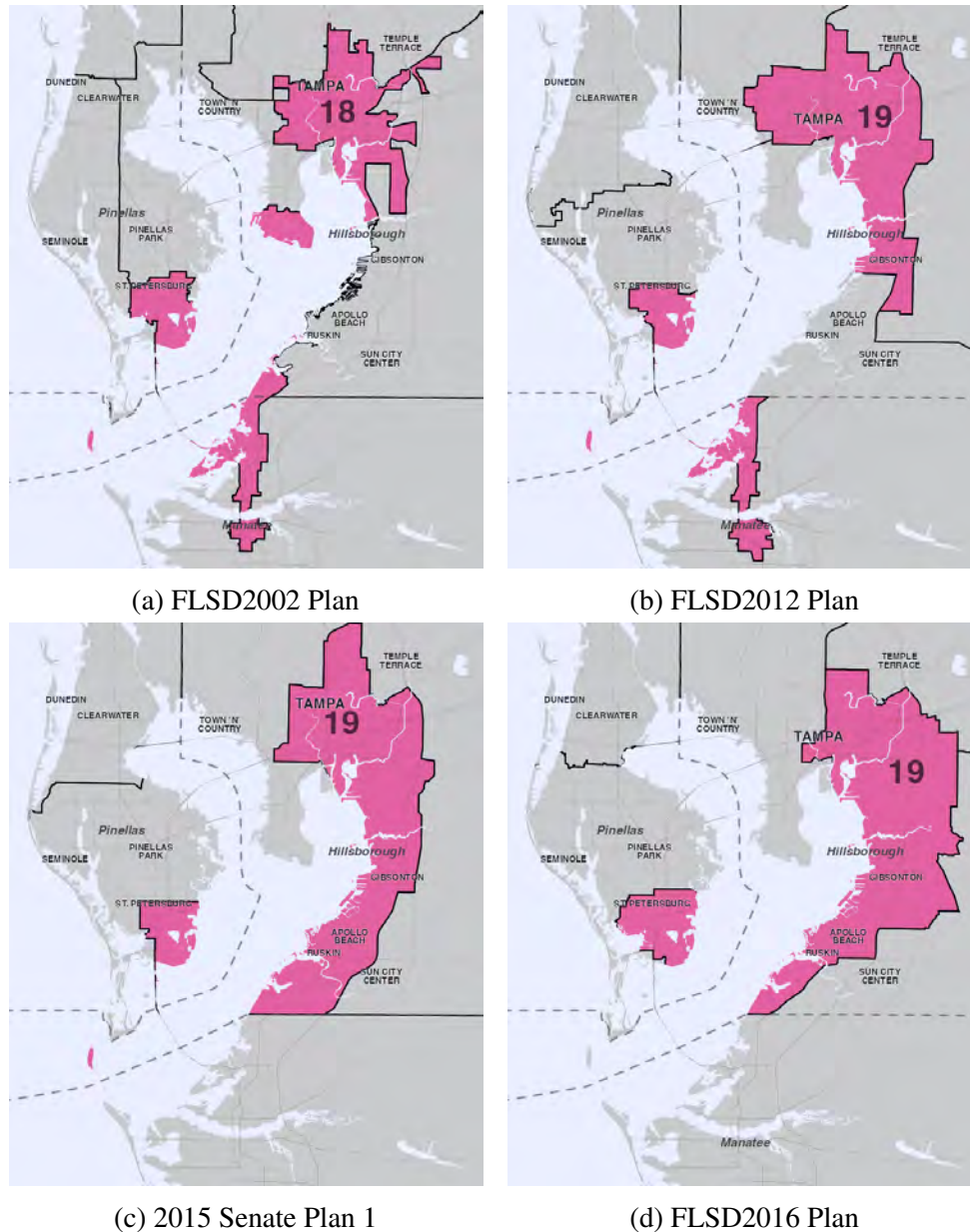


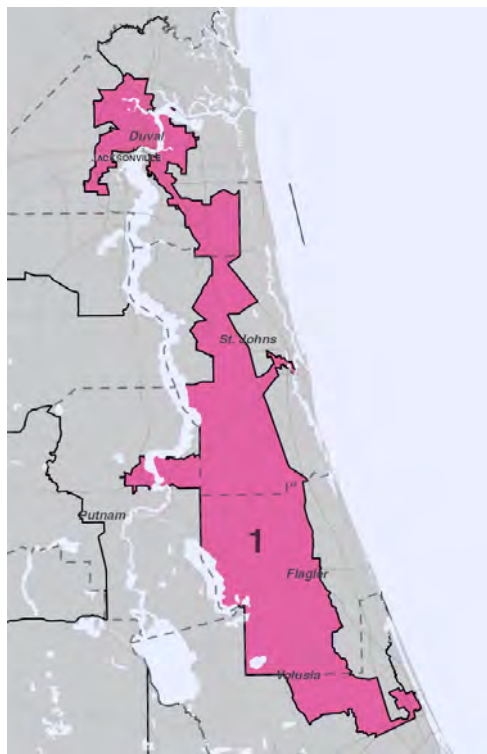
Figure 8: Historical Senate plans, Tampa Bay region.

to District 16 in the enacted plan, was split into *four* pieces connected only by water, with areas in Pinellas County, Hillsborough County, and Manatee County. In FLSD2002, MacDill Air Force Base was included in District 18, but in FLSD2012, it was removed from District 19 (corresponding to District 16 in the enacted plan). The legislature also made the western boundary of District 18 significantly more regular in redrawing it to form District 19 in FLSD2012.

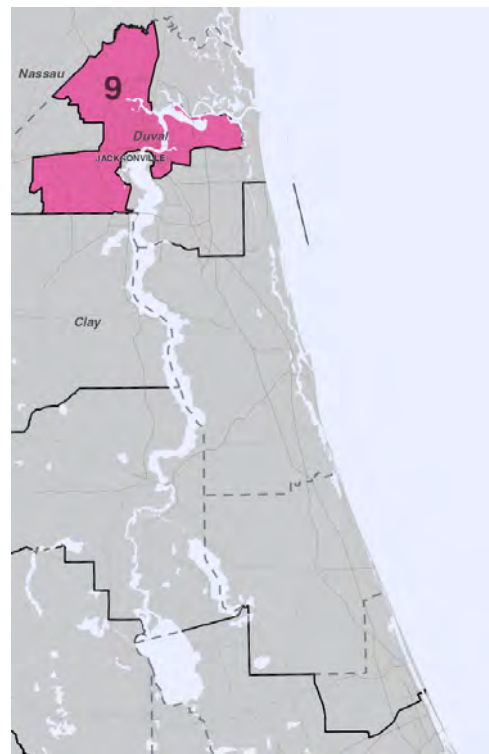
41. The FLSD2012 plan was later invalidated by court order and redrawn. Figure 8c shows the plan (2015 Senate Plan 1) that the Florida Senate submitted to the court during this litigation. Figure 8d shows the plan (FLSD2016) in place from 2016 to 2022, which was put in place by a court order. Both the Senate and the court decided to adjust District 19, corresponding to District 16 in the enacted plan, to remove the portion lying in Manatee County. Beside this change, from FLSD2012 to FLSD2016, significant adjustments were also made to the northern portion of District 19.

## D.2. Historic Senate Districts in Northeast Florida

42. Figure 9a shows District 1 (a district the Legislature recognized as protected for Black voters) and its surrounding districts in the FLSD2002 plan; Figure 9b shows the corresponding districts in the FLSD2012 plan.



(a) FLSD2002 Plan



(b) FLSD2012 Plan

Figure 9: Historical Senate plans, Jacksonville region.

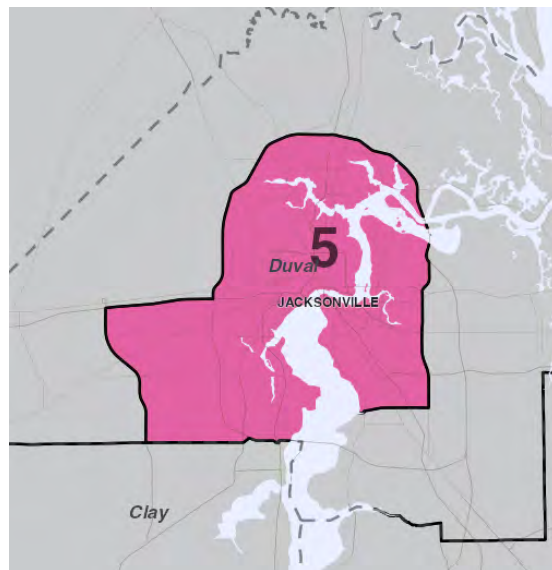
43. In FLSD2002, District 1 stretched across five different counties (Duval, St. Johns, Putnam, Flagler, and Volusia) and was noticeably noncompact. In FLSD2012, the Legislature—responding to a court order—significantly adjusted the boundaries of District 1, which became District 9, to make it more compact and to keep it within Duval County.

44. Figure 10a shows District 6 and its surrounding districts in the FLSD2016 plan; Figure 10b shows the corresponding districts in the FLSD2022 plan.

45. In FLSD2016, the court took the same District 9 as in FLSD2012 and adjusted it to be more compact, becoming District 6 in 2016. In 2022 the Legislature, renumbering it to District 5, made the district more compact yet along the southern boundary by adjusting the southern border and the district's interface with the St. Johns River, and following Interstate 295, Interstate 10, and the First Coast Expressway (SR 23) for nearly all of the district's remaining boundary.



(a) FLSD2016 Plan



(b) FLSD2022 Plan

Figure 10: Historical Senate plans, Jacksonville region.

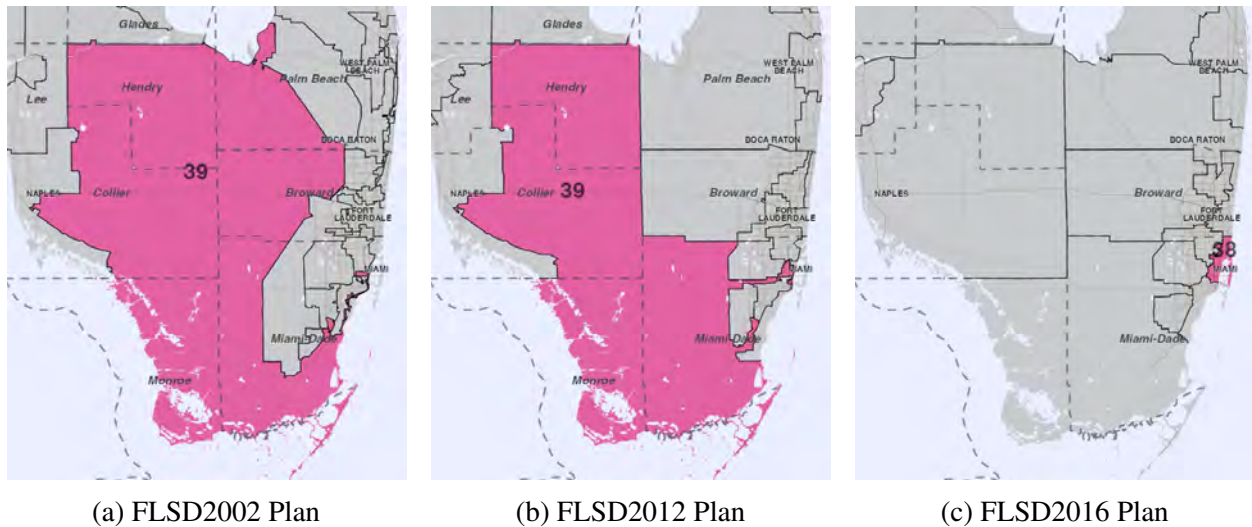


Figure 11: Historical Senate plans, South Florida.

### D.3. Historic Senate Districts including Miami-Dade County

46. Figure 11a shows District 39 (a district the Legislature recognized as protected for Black voters) and its surrounding districts in the FLSD2002 plan; Figure 11b shows the corresponding districts in the FLSD2012 plan, and Figure 11c shows the corresponding districts in the FLSD2016 plan.

47. In FLSD2002, District 39 stretched across 6 counties (Miami-Dade, Palm Beach, Hendry, Collier, Monroe, and an unpopulated portion of Broward) and connected areas on opposite sides of the Everglades. In FLSD2012, the Legislature adjusted the district so it contained 4 counties (Miami-Dade, Hendry, Collier, and Monroe). In FLSD2016, the district was significantly adjusted as part of the court-ordered map to be contained entirely within Miami-Dade county as a newly-numbered District 38.

### D.4. Historic Senate Districts in the Fort Lauderdale Area

48. Figure 12a shows District 29 (a district the Legislature recognized as protected for Black voters) and its surrounding districts in the FLSD2002 plan; Figure 12b shows the



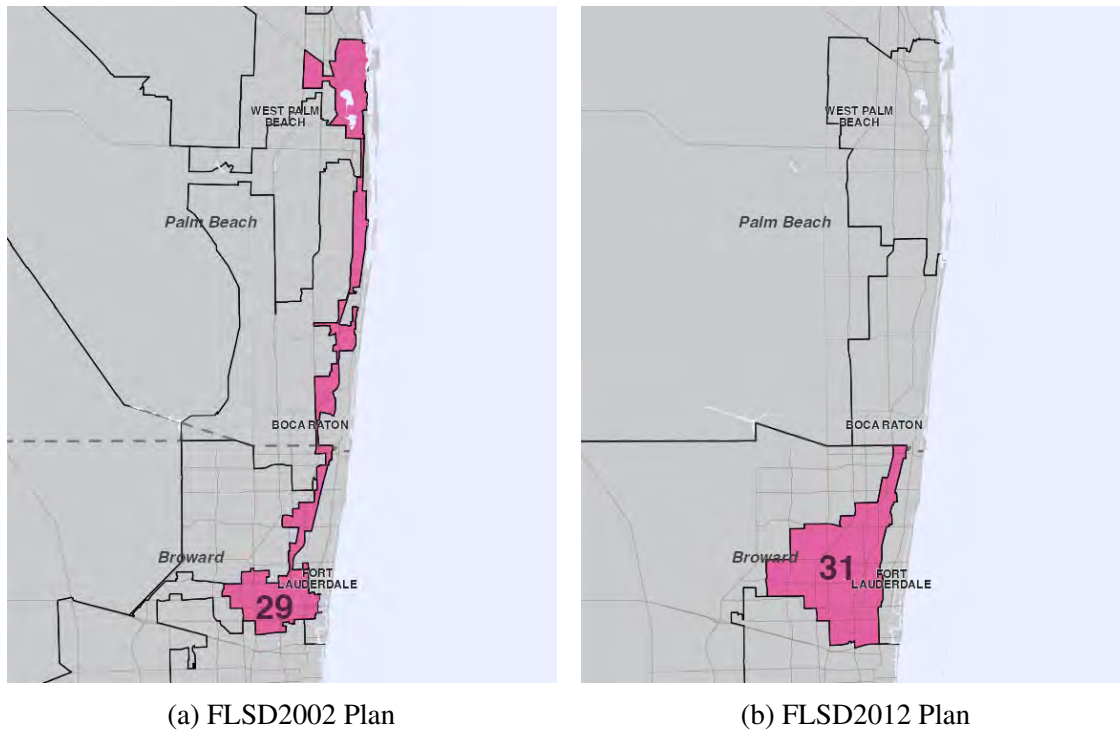


Figure 12: Historical Senate plans, Fort Lauderdale region.

corresponding districts in the FLSD2012 plan.

49. In FLSD2002, District 29 was highly noncompact and stretched across two counties (Broward and Palm Beach), connecting Black population centers in West Palm Beach and Fort Lauderdale. In FLSD2012, the court ordered the Legislature to adjust District 29, now numbered District 31, to be compact and be contained entirely within Broward County.

#### **D.5. Historic Congressional Districts in Broward and Palm Beach Counties**

50. Figure 13 shows changes in the Fort Lauderdale region across three rounds of congressional redistricting, involving plans FLCD2002, FLCD2012, FLCD2016 (adopted by court order), and FLCD2022. Figure 13a shows District 23 (a district the Legislature recognized as protected for Black voters) in the FLCD2002 plan; Figure 13b shows the corresponding districts in the FLCD2012 plan, Figure 13c shows the corresponding district in the FLCD2016 plan, and Figure 13d shows the corresponding district in the FLCD2022 plan.

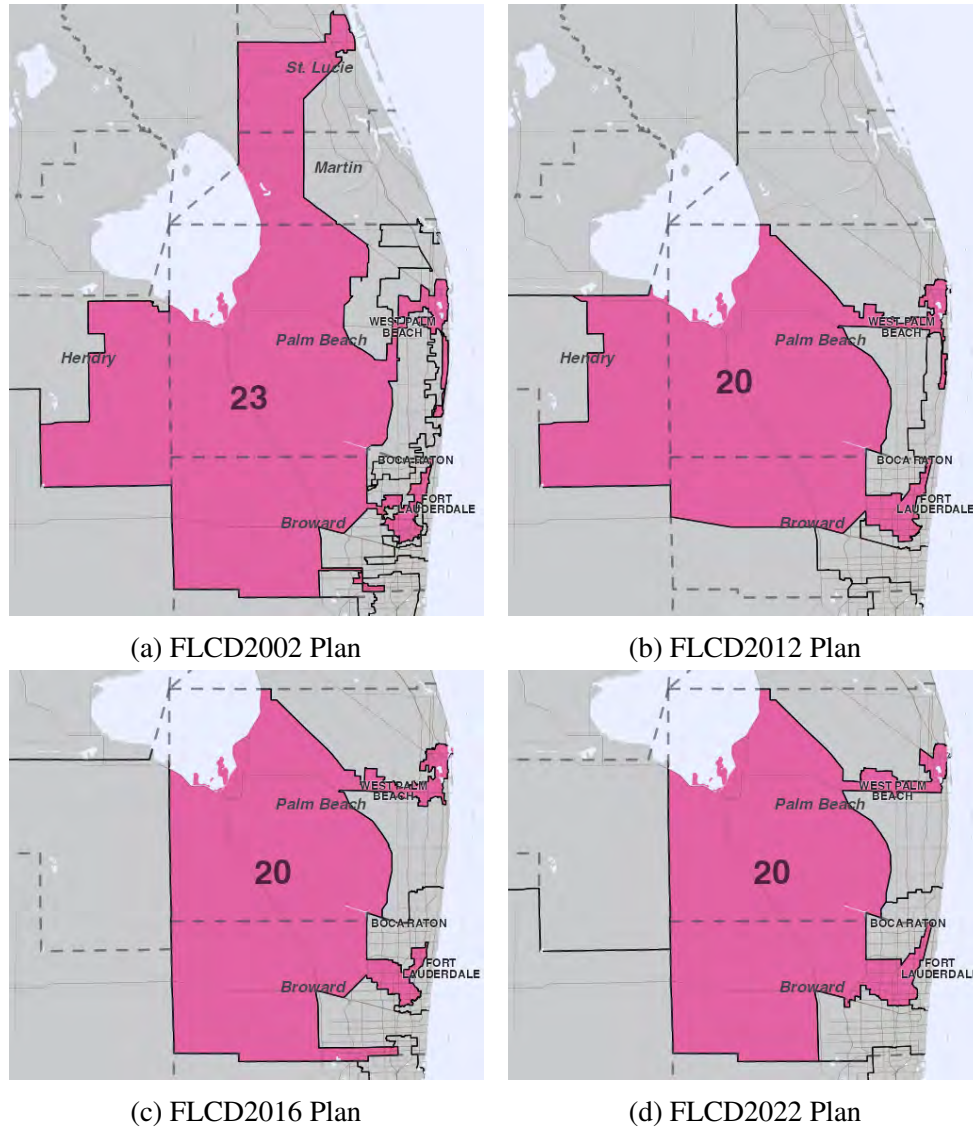


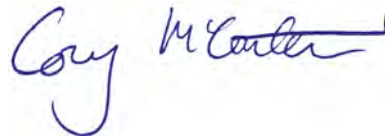
Figure 13: Historical congressional plans, Fort Lauderdale region.

51. In FLCD2002, District 23 covered five separate counties (Broward, Palm Beach, Hendry, Martin, and St. Lucie). In FLCD2012, the district was renumbered District 20 and the portions in St. Lucie and Martin counties were removed, so that District 20 covered three counties. In FLCD2016, the court adjusted District 20 to be contained within two counties by removing the portion within Hendry county. Finally, in FLCD2022, the Legislature adjusted District 20 to be more compact by removing an appendage at the southern end of the district.

**D.6. Summary**

52. All of these historical changes involved adjusting minority-protected districts to lie within fewer counties or to be contained wholly within a single county, and/or to be more geographically compact. Many of these changes came as part of court-ordered remedial plans. The changes from the enacted Senate plan to the three illustrative plans are all consistent with these historical adjustments.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct. Executed this 1st day of July, 2024.

A handwritten signature in blue ink, reading "Cory McCartan". The signature is fluid and cursive, with the first name "Cory" being more prominent and the last name "McCartan" following in a similar style.

Cory McCartan, Ph.D.

# **EXHIBIT A**

## **Curriculum Vitae**

# Cory McCartan

## Curriculum Vitae

June 2024

CONTACT INFORMATION	Center for Data Science, New York University 60 5th Ave New York, NY 10011	(425) 770-9244 corymccartan@nyu.edu
ACADEMIC EMPLOYMENT	<p><b>Pennsylvania State University</b> Assistant Professor of Statistics</p> <p><b>New York University</b> Center for Data Science Data Science Assistant Professor / Faculty Fellow</p>	<p>2024 –</p> <p>2023 – 2024</p>
EDUCATION	<p><b>Harvard University</b> Ph.D., Statistics, 2023. Committee: Kosuke Imai (chair), Xiao-Li Meng, Gary King. Dissertation: <i>Computational and Bayesian Methods for Geographic Data in the Social Sciences</i>. A.M., Statistics, 2021.</p> <p><b>Grinnell College</b> B.A., Mathematics, with honors.</p>	<p>2019 – 2023</p> <p>2015 – 2019</p>
PEER-REVIEWED PUBLICATIONS	<p>“Evaluating Bias and Noise Induced by the U.S. Census Bureau’s Privacy Protection Methods,” with Christopher T. Kenny, Tyler Simko, Shiro Kuriwaki, and Kosuke Imai (2024). <i>Science Advances</i> 10:18, ead12524.</p> <p>“Measuring and Modeling Neighborhoods,” with Jacob R. Brown and Kosuke Imai (2024). <i>American Political Science Review</i>, Online ahead of print.</p> <p>“Census Officials Must Constructively Engage with Independent Evaluations,” with Christopher T. Kenny, Tyler Simko, and Kosuke Imai (2024). <i>Proceedings of the National Academy of Sciences</i> 121:11, e2321196121.</p> <p>Letter to the editor re: Jarmin et al. (2023).</p> <p>“Making Differential Privacy Work for Census Data Users,” with Tyler Simko and Kosuke Imai (2023). <i>Harvard Data Science Review</i> 5:4.</p> <p>With response and rejoinder.</p> <p>“Sequential Monte Carlo for Sampling Balanced and Compact Redistricting Plans,” with Kosuke Imai (2023). <i>Annals of Applied Statistics</i> 17:4, 3300-3323.</p> <p>Covered by <i>The Washington Post</i>, <i>Quanta</i> magazine.</p>	



“Widespread Partisan Gerrymandering Mostly Cancels Nationally, but Reduces Electoral Competition,” with Christopher T. Kenny, Tyler Simko, Shiro Kuriwaki, and Kosuke Imai (2023). *Proceedings of the National Academy of Sciences* 120:25, e2217322120.

“Researchers Need Better Access to U.S. Census Data,” with Tyler Simko and Kosuke Imai (2023). *Science* 380:6648, 902-903.

“Recalibration of Predicted Probabilities Using the “Logit Shift”: Why Does it Work, and When Can it be Expected to Work Well?” with Evan T.R. Rosenman and Santiago Olivella (2023). *Political Analysis* 31:4, 651-661.

“Comment: the Essential Role of Policy Evaluation for the 2020 Census Disclosure Avoidance System,” with Christopher T. Kenny, Shiro Kuriwaki, Evan T.R. Rosenman, Tyler Simko, and Kosuke Imai (2023). *Harvard Data Science Review*, Special Issue 2.

Response to boyd and Sarathy (2022).

“Simulated Redistricting Plans for the Analysis and Evaluation of Redistricting in the United States,” with Christopher T. Kenny, Tyler Simko, George Garcia III, Kevin Wang, Melissa Wu, Shiro Kuriwaki, and Kosuke Imai (2022). *Nature: Scientific Data* 9:1, 689.

“The Use of Differential Privacy for Census Data and Its Impact on Redistricting: the Case of the 2020 U.S. Census,” with Christopher T. Kenny, Shiro Kuriwaki, Evan T.R. Rosenman, Tyler Simko, and Kosuke Imai (2021). *Science Advances* 7:41, eabk3283.

Originally a Public Comment to the Census Bureau (May 28, 2021).

Covered by *The Washington Post*, the *Associated Press*, the *San Francisco Chronicle*, *NC Policy Watch*, and others.

“Geodesic Interpolation on Sierpinski Gaskets,” with Caitlin Davis, Laura LeGare, and Luke Rogers (2021). *Journal of Fractal Geometry* 8:2, 117-152.

#### WORKING PAPERS

“Estimating Racial Disparities When Race is Not Observed,” with Robin Fisher, Jacob Goldin, Daniel E. Ho, and Kosuke Imai (2023). *NBER working paper*, Under Review.

“Individual and Differential Harm in Redistricting,” with Christopher T. Kenny (2022).

“Projective Averages for Summarizing Redistricting Ensembles” (2024). Under Review.

“Finding Pareto Efficient Redistricting Plans with Short Bursts” (2023).

#### OTHER WRITING

“Candy Cane Shortages and the Importance of Variation.” International Statistical Institute: *Statisticians React to the News* (December 21, 2021).

“Where Will the Rocket Land?” International Statistical Institute: *Statisticians React to the News* (May 12, 2021).

“Who’s the Most Electable Democrat? It Might be Warren or Buttigieg, Not Biden.” *The Washington Post* (October 23, 2019).

“I-405 Express Toll Lanes: Usage, Benefits, and Equity,” with Shirley Leung, C.J. Robinson, Kiana Roshan Zamir, Vaughn Iverson, and Mark Hallenbeck. Technical report for the

Washington State Department of Transportation (2019).

SOFTWARE	<b>redist:</b> Simulation Methods for Legislative Redistricting	
	<b>redistmetrics:</b> Redistricting Metrics	
	<b>birdie:</b> Bayesian Instrumental Regression for Disparity Estimation	
	<b>easycensus:</b> Quickly Find, Extract, and Marginalize U.S. Census Tables	
	<b>PL94171:</b> Tabulate P.L. 94-171 Redistricting Data Summary Files	
	<b>adjustr:</b> Stan Model Adjustments and Sensitivity Analyses using Importance Sampling	
	<b>causaltbl:</b> Tidy Causal Data Frames and Tools	
	<b>conformalbayes:</b> Jackknife(+) Predictive Intervals for Bayesian Models	
	<b>alarmdata:</b> Download, Merge, and Process Redistricting Data	
	<b>blockpop:</b> Estimate Census Block Populations for 2020	
	<b>ggredist:</b> Scales, Geometries, and Extensions of ggplot2 for Election Mapping	
	<b>tinytiger:</b> Lightweight Interface to TIGER/Line Shapefiles	
	<b>wacolors:</b> Colorblind-Friendly Palettes from Washington State	
	<b>nbdmodel:</b> Neighborhood Modeling and Analysis	
PRESENTATIONS	<b>American Causal Inference Conference</b> , Annual Meeting, Poster: 2024.	
	<b>Math and Democracy Seminar</b> , New York University, Invited Talk: 2024.	
	<b>ACM Conference in Equity and Access in Algorithms, Mechanisms, and Optimization</b> , Annual Meeting, Paper: 2023.	
	<b>Department of Political Science, MIT</b> , Political Methodology Speaker Series, Invited Talk: 2023.	
	<b>Society for Political Methodology</b> , Annual Meeting, Paper: 2023, 2022; Poster: 2022, 2021.	
	<b>Institute for Quantitative Social Science</b> , Harvard University, Applied Statistics Workshop, Paper: 2023, 2022, 2021, 2020.	
	<b>Joint Statistical Meetings</b> , Invited Paper Panel: 2022, 2021.	
	<b>American Association for Public Opinion Research</b> , Annual Meeting, Poster: 2022.	
TEACHING	<b>Penn State University</b>	
	STAT 597: Missing Data (special topic short course)	Fall 2024
	STAT 440: Computational Statistics	Fall 2024
	<b>New York University</b>	
	DS-UA 111: Data Science for Everyone	Spring 2024

**Harvard University**

STAT 117: Introduction to Biostatistics (Teaching Fellow) Spring 2021

STAT 221: Monte Carlo Methods & Other Computational  
Tools for Statistical Learning (Teaching Fellow) Fall 2020**Grinnell College**

MAT 215: Linear Algebra (Peer Mentor) Fall 2017 and Spring 2019

MAT 310: Statistical Modeling (Peer Mentor) Fall 2018

Grinnell College Math Lab 2018 – 2019

**HONORS AND  
AWARDS***Best Statistical Software Award*, for developing statistical software that makes a significant research contribution; awarded to the redist software package by the Society for Political Methodology, 2022.*Certificate of Distinction in Teaching*, awarded on the basis of student feedback by the Derek Bok Center for Teaching and Learning, 2021.*Pamela Ferguson Endowed Prize*, awarded to up to two senior students by the Grinnell College Department of Mathematics, 2018.**SERVICE**Reviewer: *Proceedings of the National Academy of Sciences*, *Journal of the American Statistical Association*, *Annals of Applied Statistics*, *Quarterly Journal of Political Science*, *Harvard Data Science Review*, *Multiscale Modeling and Simulation*, *Discrete Applied Mathematics*, *Election Law Journal*, *Sloan Foundation*.

Discussant: 2024 Midwest Political Science Association Annual Conference

Harvard Statistics Graduate Council 2020 – 2023

Organized Ph.D. student retreat and research “lightning talks,” 2020 and 2021.

First-year Ph.D. Student Mentor 2020 – 2023

Harvard Graduate Students Union – UAW Local 5118 2019 – 2021

Elected member, Bargaining Committee, 2020–2021 and 2021–2024 contracts.

Interim chair, Finance and Benefits Committee, 2020.

**OTHER EXPERIENCE****NAACP Legal Defense Fund** 2024Expert Witness, *McClure et al. v. Jefferson County Commission* (U.S. District Court for the Northern District of Alabama, Case 2:23-cv-00443). Testified by deposition.Expert Witness, *Callais et al. v. Landry* (U.S. District Court for the Western District of Louisiana, Case 3:24-cv-00122). Testified by deposition and at trial.**American Civil Liberties Union**

2021 – 2024

Expert Witness, *GRACE, Inc. et al. v. City of Miami* (U.S. District Court for the Southern District of Florida, Case 1:22-cv-24066). Testified by deposition and at trial.

Expert Witness, *Nairne et al. v. Ardoin* (U.S. District Court for the Middle District of Louisiana, Case 3:22-cv-00178). Testified by deposition and at trial.

Consultant (with Prof. Kosuke Imai), *League of Women Voters of Ohio v. Ohio Redistricting Commission* (Ohio Supreme Court, Case 2021-1193), *League of Women Voters of Ohio v. Ohio Redistricting Commission* (Ohio Supreme Court, Case 2021-1449).

**Data for Progress**

2022

Consultant, Midterm election modeling

**University of Washington eScience Institute**

Summer 2019

Data Science for Social Good Fellow

**Union of Grinnell Student Dining Workers**

2016 – 2019

Founder, President (2016–17), and Advisor to the Executive Board (2018–19)

**University of Connecticut**

Summer 2018

REU Participant, Department of Mathematics

**Fred Hutchinson Cancer Research Center**

Summer 2017

Lead Intern, Department of Biostatistics

**Cray, Inc. (now HPE)**

Summer 2015

Intern, Chapel language testing

## **EXHIBIT B**

### **Demographic Reports for Illustrative Plans**



Enacted Plan: Demographics

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D1	539,263	425,129	302,734	64,925	1,504	22,701	33,265	24,205	66,429
	2.50%	78.84%	71.21%	15.27%	0.35%	5.34%	7.82%	5.69%	15.63%
D2	538,769	427,245	320,663	46,676	1,534	28,893	29,479	30,427	48,210
	2.50%	79.30%	75.05%	10.92%	0.36%	6.76%	6.90%	7.12%	11.28%
D3	541,142	437,027	266,964	117,678	2,210	28,626	21,549	30,836	119,888
	2.51%	80.76%	61.09%	26.93%	0.51%	6.55%	4.93%	7.06%	27.43%
D4	542,508	434,081	298,014	55,786	2,974	36,892	40,415	39,866	58,760
	2.52%	80.01%	68.65%	12.85%	0.69%	8.50%	9.31%	9.18%	13.54%
D5	543,411	419,708	177,567	170,244	4,441	39,314	28,142	43,755	174,685
	2.52%	77.24%	42.31%	40.56%	1.06%	9.37%	6.71%	10.43%	41.62%
D6	538,821	425,131	298,978	59,824	2,427	34,945	28,957	37,372	62,251
	2.50%	78.90%	70.33%	14.07%	0.57%	8.22%	6.81%	8.79%	14.64%
D7	541,606	432,446	341,529	32,182	1,585	32,357	24,793	33,942	33,767
	2.51%	79.85%	78.98%	7.44%	0.37%	7.48%	5.73%	7.85%	7.81%
D8	543,176	446,999	317,447	47,683	3,641	55,398	22,830	59,039	51,324
	2.52%	82.29%	71.02%	10.67%	0.81%	12.39%	5.11%	13.21%	11.48%
D9	536,986	438,273	299,187	57,761	2,940	51,358	27,027	54,298	60,701
	2.49%	81.62%	68.26%	13.18%	0.67%	11.72%	6.17%	12.39%	13.85%
D10	535,435	423,987	255,401	47,691	5,429	80,022	35,444	85,451	53,120
	2.49%	79.19%	60.24%	11.25%	1.28%	18.87%	8.36%	20.15%	12.53%
D11	538,539	461,615	383,756	20,580	1,969	35,834	19,476	37,803	22,549
	2.50%	85.72%	83.13%	4.46%	0.43%	7.76%	4.22%	8.19%	4.88%
D12	536,474	421,893	237,490	62,345	5,722	96,769	19,567	102,491	68,067
	2.49%	78.64%	56.29%	14.78%	1.36%	22.94%	4.64%	24.29%	16.13%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D13	536,634	426,144	283,211	38,949	3,215	63,816	36,953	67,031	42,164
	2.49%	79.41%	66.46%	9.14%	0.75%	14.98%	8.67%	15.73%	9.89%
D14	535,992	429,795	219,461	33,420	7,053	133,125	36,736	140,178	40,473
	2.49%	80.19%	51.06%	7.78%	1.64%	30.97%	8.55%	32.62%	9.42%
D15	534,207	407,725	126,217	145,145	7,656	95,692	33,015	103,348	152,801
	2.48%	76.32%	30.96%	35.60%	1.88%	23.47%	8.10%	25.35%	37.48%
D16	535,448	420,545	170,706	132,167	7,472	84,137	26,063	91,609	139,639
	2.49%	78.54%	40.59%	31.43%	1.78%	20.01%	6.20%	21.78%	33.20%
D17	533,788	427,713	185,882	40,571	9,880	152,780	38,600	162,660	50,451
	2.48%	80.13%	43.46%	9.49%	2.31%	35.72%	9.02%	38.03%	11.80%
D18	542,722	460,442	353,127	27,280	2,201	42,457	35,377	44,658	29,481
	2.52%	84.84%	76.69%	5.92%	0.48%	9.22%	7.68%	9.70%	6.40%
D19	537,497	440,944	325,753	41,587	2,861	41,891	28,852	44,752	44,448
	2.50%	82.04%	73.88%	9.43%	0.65%	9.50%	6.54%	10.15%	10.08%
D20	535,067	423,758	284,208	43,087	3,417	69,559	23,487	72,976	46,504
	2.48%	79.20%	67.07%	10.17%	0.81%	16.41%	5.54%	17.22%	10.97%
D21	535,205	443,414	350,646	20,872	2,256	44,784	24,856	47,040	23,128
	2.48%	82.85%	79.08%	4.71%	0.51%	10.10%	5.61%	10.61%	5.22%
D22	533,476	457,296	373,825	18,453	1,338	42,519	21,161	43,857	19,791
	2.48%	85.72%	81.75%	4.04%	0.29%	9.30%	4.63%	9.59%	4.33%
D23	536,137	412,257	246,532	44,342	4,693	83,581	33,109	88,274	49,035
	2.49%	76.89%	59.80%	10.76%	1.14%	20.27%	8.03%	21.41%	11.89%
D24	543,535	426,669	168,420	101,603	5,477	132,009	19,160	137,486	107,080
	2.52%	78.50%	39.47%	23.81%	1.28%	30.94%	4.49%	32.22%	25.10%
D25	533,312	411,271	123,441	39,938	12,570	203,591	31,731	216,161	52,508
	2.48%	77.12%	30.01%	9.71%	3.06%	49.50%	7.72%	52.56%	12.77%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D26	540,142	450,997	291,676	68,653	2,672	62,854	25,142	65,526	71,325
	2.51%	83.50%	64.67%	15.22%	0.59%	13.94%	5.57%	14.53%	15.81%
D27	534,545	434,101	309,545	36,857	2,417	67,199	18,083	69,616	39,274
	2.48%	81.21%	71.31%	8.49%	0.56%	15.48%	4.17%	16.04%	9.05%
D28	537,495	438,888	275,904	31,279	2,432	114,282	14,991	116,714	33,711
	2.50%	81.65%	62.86%	7.13%	0.55%	26.04%	3.42%	26.59%	7.68%
D29	535,749	439,428	297,075	56,182	2,421	65,508	18,242	67,929	58,603
	2.49%	82.02%	67.60%	12.79%	0.55%	14.91%	4.15%	15.46%	13.34%
D30	539,428	424,951	199,068	85,979	4,485	92,462	42,957	96,947	90,464
	2.50%	78.78%	46.84%	20.23%	1.06%	21.76%	10.11%	22.81%	21.29%
D31	540,900	439,436	302,871	45,841	2,596	65,824	22,304	68,420	48,437
	2.51%	81.24%	68.92%	10.43%	0.59%	14.98%	5.08%	15.57%	11.02%
D32	542,051	429,267	116,723	191,379	6,726	92,544	21,895	99,270	198,105
	2.52%	79.19%	27.19%	44.58%	1.57%	21.56%	5.10%	23.13%	46.15%
D33	538,875	452,580	329,767	25,720	2,599	75,159	19,335	77,758	28,319
	2.50%	83.99%	72.86%	5.68%	0.57%	16.61%	4.27%	17.18%	6.26%
D34	533,571	419,631	50,081	197,467	12,651	146,659	12,773	159,310	210,118
	2.48%	78.65%	11.93%	47.06%	3.01%	34.95%	3.04%	37.96%	50.07%
D35	542,250	420,434	114,873	79,401	7,995	182,298	35,867	190,293	87,396
	2.52%	77.54%	27.32%	18.89%	1.90%	43.36%	8.53%	45.26%	20.79%
D36	540,685	457,302	66,320	16,824	11,663	347,296	15,199	358,959	28,487
	2.51%	84.58%	14.50%	3.68%	2.55%	75.94%	3.32%	78.49%	6.23%
D37	542,618	451,875	230,159	62,574	5,758	128,844	24,540	134,602	68,332
	2.52%	83.28%	50.93%	13.85%	1.27%	28.51%	5.43%	29.79%	15.12%
D38	543,674	429,766	79,107	48,254	7,649	277,655	17,101	285,304	55,903
	2.52%	79.05%	18.41%	11.23%	1.78%	64.61%	3.98%	66.39%	13.01%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D39	534,522	435,487	21,158	14,098	9,415	383,092	7,724	392,507	23,513
	2.48%	81.47%	4.86%	3.24%	2.16%	87.97%	1.77%	90.13%	5.40%
D40	542,532	433,582	81,214	29,110	6,556	303,459	13,243	310,015	35,666
	2.52%	79.92%	18.73%	6.71%	1.51%	69.99%	3.05%	71.50%	8.23%
TOTALS	21,538,187	17,339,232	9,476,700	2,500,407	194,500	4,138,185	1,029,440	4,332,685	2,694,907

Plan A: Demographics

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population	All Black Voting Age Population
D1	539,263	425,129	302,734	64,925	1,504	22,701	33,265	24,205	66,429
	2.50%	78.84%	71.21%	15.27%	0.35%	5.34%	7.82%	5.69%	15.63%
D2	538,769	427,245	320,663	46,676	1,534	28,893	29,479	30,427	48,210
	2.50%	79.30%	75.05%	10.92%	0.36%	6.76%	6.90%	7.12%	11.28%
D3	541,142	437,027	266,964	117,678	2,210	28,626	21,549	30,836	119,888
	2.51%	80.76%	61.09%	26.93%	0.51%	6.55%	4.93%	7.06%	27.43%
D4	542,508	434,081	298,014	55,786	2,974	36,892	40,415	39,866	58,760
	2.52%	80.01%	68.65%	12.85%	0.69%	8.50%	9.31%	9.18%	13.54%
D5	543,411	419,708	177,567	170,244	4,441	39,314	28,142	43,755	174,685
	2.52%	77.24%	42.31%	40.56%	1.06%	9.37%	6.71%	10.43%	41.62%
D6	538,821	425,131	298,978	59,824	2,427	34,945	28,957	37,372	62,251
	2.50%	78.90%	70.33%	14.07%	0.57%	8.22%	6.81%	8.79%	14.64%
D7	541,606	432,446	341,529	32,182	1,585	32,357	24,793	33,942	33,767
	2.51%	79.85%	78.98%	7.44%	0.37%	7.48%	5.73%	7.85%	7.81%
D8	543,176	446,999	317,447	47,683	3,641	55,398	22,830	59,039	51,324
	2.52%	82.29%	71.02%	10.67%	0.81%	12.39%	5.11%	13.21%	11.48%
D9	536,986	438,273	299,187	57,761	2,940	51,358	27,027	54,298	60,701
	2.49%	81.62%	68.26%	13.18%	0.67%	11.72%	6.17%	12.39%	13.85%
D10	535,435	423,987	255,401	47,691	5,429	80,022	35,444	85,451	53,120
	2.49%	79.19%	60.24%	11.25%	1.28%	18.87%	8.36%	20.15%	12.53%
D11	538,539	461,615	383,756	20,580	1,969	35,834	19,476	37,803	22,549
	2.50%	85.72%	83.13%	4.46%	0.43%	7.76%	4.22%	8.19%	4.88%
D12	536,474	421,893	237,490	62,345	5,722	96,769	19,567	102,491	68,067
	2.49%	78.64%	56.29%	14.78%	1.36%	22.94%	4.64%	24.29%	16.13%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D13	536,634	426,144	283,211	38,949	3,215	63,816	36,953	67,031	42,164
	2.49%	79.41%	66.46%	9.14%	0.75%	14.98%	8.67%	15.73%	9.89%
D14	535,992	429,795	219,461	33,420	7,053	133,125	36,736	140,178	40,473
	2.49%	80.19%	51.06%	7.78%	1.64%	30.97%	8.55%	32.62%	9.42%
D15	534,207	407,725	126,217	145,145	7,656	95,692	33,015	103,348	152,801
	2.48%	76.32%	30.96%	35.60%	1.88%	23.47%	8.10%	25.35%	37.48%
D16	536,874	410,683	155,637	117,582	8,954	99,881	28,629	108,835	126,536
	2.49%	76.50%	37.90%	28.63%	2.18%	24.32%	6.97%	26.50%	30.81%
D17	533,788	427,713	185,882	40,571	9,880	152,780	38,600	162,660	50,451
	2.48%	80.13%	43.46%	9.49%	2.31%	35.72%	9.02%	38.03%	11.80%
D18	539,076	456,260	327,300	55,263	2,378	37,667	33,652	40,045	57,641
	2.50%	84.64%	71.74%	12.11%	0.52%	8.26%	7.38%	8.78%	12.63%
D19	537,497	440,944	325,753	41,587	2,861	41,891	28,852	44,752	44,448
	2.50%	82.04%	73.88%	9.43%	0.65%	9.50%	6.54%	10.15%	10.08%
D20	534,059	427,337	298,335	35,075	2,825	67,926	23,176	70,751	37,900
	2.48%	80.02%	69.81%	8.21%	0.66%	15.90%	5.42%	16.56%	8.87%
D21	535,450	448,606	351,171	25,063	2,217	44,783	25,372	47,000	27,280
	2.49%	83.78%	78.28%	5.59%	0.49%	9.98%	5.66%	10.48%	6.08%
D22	533,476	457,296	373,825	18,453	1,338	42,519	21,161	43,857	19,791
	2.48%	85.72%	81.75%	4.04%	0.29%	9.30%	4.63%	9.59%	4.33%
D23	539,120	417,530	272,776	34,765	3,665	74,261	32,063	77,926	38,430
	2.50%	77.45%	65.33%	8.33%	0.88%	17.79%	7.68%	18.66%	9.20%
D24	543,535	426,669	168,420	101,603	5,477	132,009	19,160	137,486	107,080
	2.52%	78.50%	39.47%	23.81%	1.28%	30.94%	4.49%	32.22%	25.10%
D25	533,312	411,271	123,441	39,938	12,570	203,591	31,731	216,161	52,508
	2.48%	77.12%	30.01%	9.71%	3.06%	49.50%	7.72%	52.56%	12.77%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D26	540,142	450,997	291,676	68,653	2,672	62,854	25,142	65,526	71,325
	2.51%	83.50%	64.67%	15.22%	0.59%	13.94%	5.57%	14.53%	15.81%
D27	534,545	434,101	309,545	36,857	2,417	67,199	18,083	69,616	39,274
	2.48%	81.21%	71.31%	8.49%	0.56%	15.48%	4.17%	16.04%	9.05%
D28	537,495	438,888	275,904	31,279	2,432	114,282	14,991	116,714	33,711
	2.50%	81.65%	62.86%	7.13%	0.55%	26.04%	3.42%	26.59%	7.68%
D29	535,749	439,428	297,075	56,182	2,421	65,508	18,242	67,929	58,603
	2.49%	82.02%	67.60%	12.79%	0.55%	14.91%	4.15%	15.46%	13.34%
D30	539,428	424,951	199,068	85,979	4,485	92,462	42,957	96,947	90,464
	2.50%	78.78%	46.84%	20.23%	1.06%	21.76%	10.11%	22.81%	21.29%
D31	540,900	439,436	302,871	45,841	2,596	65,824	22,304	68,420	48,437
	2.51%	81.24%	68.92%	10.43%	0.59%	14.98%	5.08%	15.57%	11.02%
D32	542,051	429,267	116,723	191,379	6,726	92,544	21,895	99,270	198,105
	2.52%	79.19%	27.19%	44.58%	1.57%	21.56%	5.10%	23.13%	46.15%
D33	538,875	452,580	329,767	25,720	2,599	75,159	19,335	77,758	28,319
	2.50%	83.99%	72.86%	5.68%	0.57%	16.61%	4.27%	17.18%	6.26%
D34	533,571	419,631	50,081	197,467	12,651	146,659	12,773	159,310	210,118
	2.48%	78.65%	11.93%	47.06%	3.01%	34.95%	3.04%	37.96%	50.07%
D35	542,250	420,434	114,873	79,401	7,995	182,298	35,867	190,293	87,396
	2.52%	77.54%	27.32%	18.89%	1.90%	43.36%	8.53%	45.26%	20.79%
D36	540,685	457,302	66,320	16,824	11,663	347,296	15,199	358,959	28,487
	2.51%	84.58%	14.50%	3.68%	2.55%	75.94%	3.32%	78.49%	6.23%
D37	542,618	451,875	230,159	62,574	5,758	128,844	24,540	134,602	68,332
	2.52%	83.28%	50.93%	13.85%	1.27%	28.51%	5.43%	29.79%	15.12%
D38	543,674	429,766	79,107	48,254	7,649	277,655	17,101	285,304	55,903
	2.52%	79.05%	18.41%	11.23%	1.78%	64.61%	3.98%	66.39%	13.01%



District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D39	534,522	435,487	21,158	14,098	9,415	383,092	7,724	392,507	23,513
	2.48%	81.47%	4.86%	3.24%	2.16%	87.97%	1.77%	90.13%	5.40%
D40	542,532	433,582	81,214	29,110	6,556	303,459	13,243	310,015	35,666
	2.52%	79.92%	18.73%	6.71%	1.51%	69.99%	3.05%	71.50%	8.23%
TOTALS	21,538,187	17,339,232	9,476,700	2,500,407	194,500	4,138,185	1,029,440	4,332,685	2,694,907

Plan B: Demographics

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D1	539,263	425,129	302,734	64,925	1,504	22,701	33,265	24,205	66,429
	2.50%	78.84%	71.21%	15.27%	0.35%	5.34%	7.82%	5.69%	15.63%
D2	538,769	427,245	320,663	46,676	1,534	28,893	29,479	30,427	48,210
	2.50%	79.30%	75.05%	10.92%	0.36%	6.76%	6.90%	7.12%	11.28%
D3	541,142	437,027	266,964	117,678	2,210	28,626	21,549	30,836	119,888
	2.51%	80.76%	61.09%	26.93%	0.51%	6.55%	4.93%	7.06%	27.43%
D4	542,508	434,081	298,014	55,786	2,974	36,892	40,415	39,866	58,760
	2.52%	80.01%	68.65%	12.85%	0.69%	8.50%	9.31%	9.18%	13.54%
D5	543,411	419,708	177,567	170,244	4,441	39,314	28,142	43,755	174,685
	2.52%	77.24%	42.31%	40.56%	1.06%	9.37%	6.71%	10.43%	41.62%
D6	538,821	425,131	298,978	59,824	2,427	34,945	28,957	37,372	62,251
	2.50%	78.90%	70.33%	14.07%	0.57%	8.22%	6.81%	8.79%	14.64%
D7	541,606	432,446	341,529	32,182	1,585	32,357	24,793	33,942	33,767
	2.51%	79.85%	78.98%	7.44%	0.37%	7.48%	5.73%	7.85%	7.81%
D8	543,176	446,999	317,447	47,683	3,641	55,398	22,830	59,039	51,324
	2.52%	82.29%	71.02%	10.67%	0.81%	12.39%	5.11%	13.21%	11.48%
D9	536,986	438,273	299,187	57,761	2,940	51,358	27,027	54,298	60,701
	2.49%	81.62%	68.26%	13.18%	0.67%	11.72%	6.17%	12.39%	13.85%
D10	535,435	423,987	255,401	47,691	5,429	80,022	35,444	85,451	53,120
	2.49%	79.19%	60.24%	11.25%	1.28%	18.87%	8.36%	20.15%	12.53%
D11	538,539	461,615	383,756	20,580	1,969	35,834	19,476	37,803	22,549
	2.50%	85.72%	83.13%	4.46%	0.43%	7.76%	4.22%	8.19%	4.88%
D12	536,474	421,893	237,490	62,345	5,722	96,769	19,567	102,491	68,067
	2.49%	78.64%	56.29%	14.78%	1.36%	22.94%	4.64%	24.29%	16.13%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D13	536,634	426,144	283,211	38,949	3,215	63,816	36,953	67,031	42,164
	2.49%	79.41%	66.46%	9.14%	0.75%	14.98%	8.67%	15.73%	9.89%
D14	535,992	429,795	219,461	33,420	7,053	133,125	36,736	140,178	40,473
	2.49%	80.19%	51.06%	7.78%	1.64%	30.97%	8.55%	32.62%	9.42%
D15	534,207	407,725	126,217	145,145	7,656	95,692	33,015	103,348	152,801
	2.48%	76.32%	30.96%	35.60%	1.88%	23.47%	8.10%	25.35%	37.48%
D16	535,129	409,252	154,643	117,311	8,912	99,733	28,653	108,645	126,223
	2.48%	76.48%	37.79%	28.66%	2.18%	24.37%	7.00%	26.55%	30.84%
D17	533,788	427,713	185,882	40,571	9,880	152,780	38,600	162,660	50,451
	2.48%	80.13%	43.46%	9.49%	2.31%	35.72%	9.02%	38.03%	11.80%
D18	539,076	456,260	327,300	55,263	2,378	37,667	33,652	40,045	57,641
	2.50%	84.64%	71.74%	12.11%	0.52%	8.26%	7.38%	8.78%	12.63%
D19	537,497	440,944	325,753	41,587	2,861	41,891	28,852	44,752	44,448
	2.50%	82.04%	73.88%	9.43%	0.65%	9.50%	6.54%	10.15%	10.08%
D20	537,250	429,732	299,566	35,399	2,894	68,632	23,241	71,526	38,293
	2.49%	79.99%	69.71%	8.24%	0.67%	15.97%	5.41%	16.64%	8.91%
D21	537,835	450,137	352,168	25,231	2,239	45,049	25,450	47,288	27,470
	2.50%	83.69%	78.24%	5.61%	0.50%	10.01%	5.65%	10.51%	6.10%
D22	533,476	457,296	373,825	18,453	1,338	42,519	21,161	43,857	19,791
	2.48%	85.72%	81.75%	4.04%	0.29%	9.30%	4.63%	9.59%	4.33%
D23	535,289	415,035	271,542	34,544	3,616	73,437	31,896	77,053	38,160
	2.49%	77.53%	65.43%	8.32%	0.87%	17.69%	7.69%	18.57%	9.19%
D24	543,535	426,669	168,420	101,603	5,477	132,009	19,160	137,486	107,080
	2.52%	78.50%	39.47%	23.81%	1.28%	30.94%	4.49%	32.22%	25.10%
D25	533,312	411,271	123,441	39,938	12,570	203,591	31,731	216,161	52,508
	2.48%	77.12%	30.01%	9.71%	3.06%	49.50%	7.72%	52.56%	12.77%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D26	540,142	450,997	291,676	68,653	2,672	62,854	25,142	65,526	71,325
	2.51%	83.50%	64.67%	15.22%	0.59%	13.94%	5.57%	14.53%	15.81%
D27	534,545	434,101	309,545	36,857	2,417	67,199	18,083	69,616	39,274
	2.48%	81.21%	71.31%	8.49%	0.56%	15.48%	4.17%	16.04%	9.05%
D28	537,495	438,888	275,904	31,279	2,432	114,282	14,991	116,714	33,711
	2.50%	81.65%	62.86%	7.13%	0.55%	26.04%	3.42%	26.59%	7.68%
D29	535,749	439,428	297,075	56,182	2,421	65,508	18,242	67,929	58,603
	2.49%	82.02%	67.60%	12.79%	0.55%	14.91%	4.15%	15.46%	13.34%
D30	539,428	424,951	199,068	85,979	4,485	92,462	42,957	96,947	90,464
	2.50%	78.78%	46.84%	20.23%	1.06%	21.76%	10.11%	22.81%	21.29%
D31	540,900	439,436	302,871	45,841	2,596	65,824	22,304	68,420	48,437
	2.51%	81.24%	68.92%	10.43%	0.59%	14.98%	5.08%	15.57%	11.02%
D32	542,051	429,267	116,723	191,379	6,726	92,544	21,895	99,270	198,105
	2.52%	79.19%	27.19%	44.58%	1.57%	21.56%	5.10%	23.13%	46.15%
D33	538,875	452,580	329,767	25,720	2,599	75,159	19,335	77,758	28,319
	2.50%	83.99%	72.86%	5.68%	0.57%	16.61%	4.27%	17.18%	6.26%
D34	533,571	419,631	50,081	197,467	12,651	146,659	12,773	159,310	210,118
	2.48%	78.65%	11.93%	47.06%	3.01%	34.95%	3.04%	37.96%	50.07%
D35	542,250	420,434	114,873	79,401	7,995	182,298	35,867	190,293	87,396
	2.52%	77.54%	27.32%	18.89%	1.90%	43.36%	8.53%	45.26%	20.79%
D36	540,685	457,302	66,320	16,824	11,663	347,296	15,199	358,959	28,487
	2.51%	84.58%	14.50%	3.68%	2.55%	75.94%	3.32%	78.49%	6.23%
D37	542,618	451,875	230,159	62,574	5,758	128,844	24,540	134,602	68,332
	2.52%	83.28%	50.93%	13.85%	1.27%	28.51%	5.43%	29.79%	15.12%
D38	543,674	429,766	79,107	48,254	7,649	277,655	17,101	285,304	55,903
	2.52%	79.05%	18.41%	11.23%	1.78%	64.61%	3.98%	66.39%	13.01%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D39	534,522	435,487	21,158	14,098	9,415	383,092	7,724	392,507	23,513
	2.48%	81.47%	4.86%	3.24%	2.16%	87.97%	1.77%	90.13%	5.40%
D40	542,532	433,582	81,214	29,110	6,556	303,459	13,243	310,015	35,666
	2.52%	79.92%	18.73%	6.71%	1.51%	69.99%	3.05%	71.50%	8.23%
TOTALS	21,538,187	17,339,232	9,476,700	2,500,407	194,500	4,138,185	1,029,440	4,332,685	2,694,907

Plan C: Demographics

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D1	539,263	425,129	302,734	64,925	1,504	22,701	33,265	24,205	66,429
	2.50%	78.84%	71.21%	15.27%	0.35%	5.34%	7.82%	5.69%	15.63%
D2	538,769	427,245	320,663	46,676	1,534	28,893	29,479	30,427	48,210
	2.50%	79.30%	75.05%	10.92%	0.36%	6.76%	6.90%	7.12%	11.28%
D3	541,142	437,027	266,964	117,678	2,210	28,626	21,549	30,836	119,888
	2.51%	80.76%	61.09%	26.93%	0.51%	6.55%	4.93%	7.06%	27.43%
D4	542,508	434,081	298,014	55,786	2,974	36,892	40,415	39,866	58,760
	2.52%	80.01%	68.65%	12.85%	0.69%	8.50%	9.31%	9.18%	13.54%
D5	543,411	419,708	177,567	170,244	4,441	39,314	28,142	43,755	174,685
	2.52%	77.24%	42.31%	40.56%	1.06%	9.37%	6.71%	10.43%	41.62%
D6	538,821	425,131	298,978	59,824	2,427	34,945	28,957	37,372	62,251
	2.50%	78.90%	70.33%	14.07%	0.57%	8.22%	6.81%	8.79%	14.64%
D7	541,606	432,446	341,529	32,182	1,585	32,357	24,793	33,942	33,767
	2.51%	79.85%	78.98%	7.44%	0.37%	7.48%	5.73%	7.85%	7.81%
D8	543,176	446,999	317,447	47,683	3,641	55,398	22,830	59,039	51,324
	2.52%	82.29%	71.02%	10.67%	0.81%	12.39%	5.11%	13.21%	11.48%
D9	536,986	438,273	299,187	57,761	2,940	51,358	27,027	54,298	60,701
	2.49%	81.62%	68.26%	13.18%	0.67%	11.72%	6.17%	12.39%	13.85%
D10	535,435	423,987	255,401	47,691	5,429	80,022	35,444	85,451	53,120
	2.49%	79.19%	60.24%	11.25%	1.28%	18.87%	8.36%	20.15%	12.53%
D11	538,539	461,615	383,756	20,580	1,969	35,834	19,476	37,803	22,549
	2.50%	85.72%	83.13%	4.46%	0.43%	7.76%	4.22%	8.19%	4.88%
D12	536,474	421,893	237,490	62,345	5,722	96,769	19,567	102,491	68,067
	2.49%	78.64%	56.29%	14.78%	1.36%	22.94%	4.64%	24.29%	16.13%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D13	536,634	426,144	283,211	38,949	3,215	63,816	36,953	67,031	42,164
	2.49%	79.41%	66.46%	9.14%	0.75%	14.98%	8.67%	15.73%	9.89%
D14	535,992	429,795	219,461	33,420	7,053	133,125	36,736	140,178	40,473
	2.49%	80.19%	51.06%	7.78%	1.64%	30.97%	8.55%	32.62%	9.42%
D15	534,207	407,725	126,217	145,145	7,656	95,692	33,015	103,348	152,801
	2.48%	76.32%	30.96%	35.60%	1.88%	23.47%	8.10%	25.35%	37.48%
D16	538,875	414,716	163,622	115,635	8,878	97,317	29,264	106,195	124,513
	2.50%	76.96%	39.45%	27.88%	2.14%	23.47%	7.06%	25.61%	30.02%
D17	533,788	427,713	185,882	40,571	9,880	152,780	38,600	162,660	50,451
	2.48%	80.13%	43.46%	9.49%	2.31%	35.72%	9.02%	38.03%	11.80%
D18	539,076	456,260	327,300	55,263	2,378	37,667	33,652	40,045	57,641
	2.50%	84.64%	71.74%	12.11%	0.52%	8.26%	7.38%	8.78%	12.63%
D19	537,497	440,944	325,753	41,587	2,861	41,891	28,852	44,752	44,448
	2.50%	82.04%	73.88%	9.43%	0.65%	9.50%	6.54%	10.15%	10.08%
D20	533,504	424,268	290,587	37,075	2,928	71,048	22,630	73,976	40,003
	2.48%	79.52%	68.49%	8.74%	0.69%	16.75%	5.33%	17.44%	9.43%
D21	537,835	450,137	352,168	25,231	2,239	45,049	25,450	47,288	27,470
	2.50%	83.69%	78.24%	5.61%	0.50%	10.01%	5.65%	10.51%	6.10%
D22	533,476	457,296	373,825	18,453	1,338	42,519	21,161	43,857	19,791
	2.48%	85.72%	81.75%	4.04%	0.29%	9.30%	4.63%	9.59%	4.33%
D23	535,289	415,035	271,542	34,544	3,616	73,437	31,896	77,053	38,160
	2.49%	77.53%	65.43%	8.32%	0.87%	17.69%	7.69%	18.57%	9.19%
D24	543,535	426,669	168,420	101,603	5,477	132,009	19,160	137,486	107,080
	2.52%	78.50%	39.47%	23.81%	1.28%	30.94%	4.49%	32.22%	25.10%
D25	533,312	411,271	123,441	39,938	12,570	203,591	31,731	216,161	52,508
	2.48%	77.12%	30.01%	9.71%	3.06%	49.50%	7.72%	52.56%	12.77%



District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D26	540,142	450,997	291,676	68,653	2,672	62,854	25,142	65,526	71,325
	2.51%	83.50%	64.67%	15.22%	0.59%	13.94%	5.57%	14.53%	15.81%
D27	534,545	434,101	309,545	36,857	2,417	67,199	18,083	69,616	39,274
	2.48%	81.21%	71.31%	8.49%	0.56%	15.48%	4.17%	16.04%	9.05%
D28	537,495	438,888	275,904	31,279	2,432	114,282	14,991	116,714	33,711
	2.50%	81.65%	62.86%	7.13%	0.55%	26.04%	3.42%	26.59%	7.68%
D29	535,749	439,428	297,075	56,182	2,421	65,508	18,242	67,929	58,603
	2.49%	82.02%	67.60%	12.79%	0.55%	14.91%	4.15%	15.46%	13.34%
D30	539,428	424,951	199,068	85,979	4,485	92,462	42,957	96,947	90,464
	2.50%	78.78%	46.84%	20.23%	1.06%	21.76%	10.11%	22.81%	21.29%
D31	540,900	439,436	302,871	45,841	2,596	65,824	22,304	68,420	48,437
	2.51%	81.24%	68.92%	10.43%	0.59%	14.98%	5.08%	15.57%	11.02%
D32	542,051	429,267	116,723	191,379	6,726	92,544	21,895	99,270	198,105
	2.52%	79.19%	27.19%	44.58%	1.57%	21.56%	5.10%	23.13%	46.15%
D33	538,875	452,580	329,767	25,720	2,599	75,159	19,335	77,758	28,319
	2.50%	83.99%	72.86%	5.68%	0.57%	16.61%	4.27%	17.18%	6.26%
D34	533,571	419,631	50,081	197,467	12,651	146,659	12,773	159,310	210,118
	2.48%	78.65%	11.93%	47.06%	3.01%	34.95%	3.04%	37.96%	50.07%
D35	542,250	420,434	114,873	79,401	7,995	182,298	35,867	190,293	87,396
	2.52%	77.54%	27.32%	18.89%	1.90%	43.36%	8.53%	45.26%	20.79%
D36	540,685	457,302	66,320	16,824	11,663	347,296	15,199	358,959	28,487
	2.51%	84.58%	14.50%	3.68%	2.55%	75.94%	3.32%	78.49%	6.23%
D37	542,618	451,875	230,159	62,574	5,758	128,844	24,540	134,602	68,332
	2.52%	83.28%	50.93%	13.85%	1.27%	28.51%	5.43%	29.79%	15.12%
D38	543,674	429,766	79,107	48,254	7,649	277,655	17,101	285,304	55,903
	2.52%	79.05%	18.41%	11.23%	1.78%	64.61%	3.98%	66.39%	13.01%

District No.	Total Population	Total Voting Age Population	Single-Race Non-Hispanic White Voting Age Population	Non-Hispanic Black Voting Age Population	Hispanic Black Voting Age Population	Hispanic not Black Voting Age Population	Other Voting Age Population	All Hispanic Voting Age Population of any race	All Black Voting Age Population
D39	534,522	435,487	21,158	14,098	9,415	383,092	7,724	392,507	23,513
	2.48%	81.47%	4.86%	3.24%	2.16%	87.97%	1.77%	90.13%	5.40%
D40	542,532	433,582	81,214	29,110	6,556	303,459	13,243	310,015	35,666
	2.52%	79.92%	18.73%	6.71%	1.51%	69.99%	3.05%	71.50%	8.23%
TOTALS	21,538,187	17,339,232	9,476,700	2,500,407	194,500	4,138,185	1,029,440	4,332,685	2,694,907

# **EXHIBIT C**

## **Compactness Reports for Illustrative Plans**

Enacted Plan: Compactness

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
Unassigned	0	0	0	0	0	0
D1	2691.99	296.6	0.42	0.81	0.38	0
D2	6412.59	422.59	0.5	0.78	0.45	0
D3	10909.27	574.09	0.44	0.8	0.42	0
D4	1396.27	270.17	0.52	0.74	0.24	0
D5	248.11	68.79	0.6	0.87	0.66	0
D6	3433.34	334.82	0.5	0.83	0.38	0
D7	2533.17	281.98	0.49	0.79	0.4	0
D8	1486.08	230.57	0.37	0.83	0.35	0
D9	3728.37	327.28	0.44	0.89	0.44	0
D10	366.24	109.01	0.5	0.81	0.39	0
D11	2402.81	278.16	0.39	0.75	0.39	0
D12	999.4	208.28	0.32	0.78	0.29	0
D13	1290.38	225.59	0.36	0.72	0.32	0
D14	280.8	89.37	0.47	0.78	0.44	0
D15	288.09	88.82	0.45	0.82	0.46	0
D16	350.6	111.01	0.36	0.69	0.36	0
D17	489.02	112.07	0.52	0.94	0.49	0
D18	453.47	103.94	0.63	0.86	0.53	0
D19	1189.49	194.19	0.42	0.77	0.4	0
D20	1265.05	193.78	0.41	0.72	0.42	0
D21	655.35	113.77	0.55	0.89	0.64	0
D22	1142.7	146.54	0.49	0.92	0.67	0
D23	854	139.65	0.56	0.86	0.55	0
D24	196.77	62.56	0.53	0.91	0.63	0
D25	1577.77	232.85	0.43	0.84	0.37	0

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
D26	1319.56	176.02	0.45	0.88	0.54	0
D27	3426.57	365.04	0.4	0.6	0.32	0
D28	4026.5	325.63	0.48	0.83	0.48	0
D29	4203.31	307.33	0.49	0.83	0.56	0
D30	121.82	50.49	0.53	0.91	0.6	0
D31	1674.47	182.27	0.6	0.9	0.63	0
D32	88.47	47.93	0.59	0.88	0.48	0
D33	1091.73	141.78	0.46	0.94	0.68	0
D34	143.51	69.47	0.46	0.81	0.37	0
D35	955	135.99	0.54	0.94	0.65	0
D36	59.89	41.99	0.28	0.82	0.43	0
D37	185.95	86.97	0.29	0.79	0.31	0
D38	342.77	91.27	0.43	0.85	0.52	0
D39	169.57	58.3	0.58	0.9	0.63	0
D40	6953.01	636.98	0.22	0.54	0.22	0

Plan A: Compactness

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
Unassigned	0	0	0	0	0	0
D1	2691.99	296.6	0.42	0.81	0.38	0
D2	6412.59	422.59	0.5	0.78	0.45	0
D3	10909.27	574.09	0.44	0.8	0.42	0
D4	1396.27	270.17	0.52	0.74	0.24	0
D5	248.11	68.79	0.6	0.87	0.66	0
D6	3433.34	334.82	0.5	0.83	0.38	0
D7	2533.17	281.98	0.49	0.79	0.4	0
D8	1486.08	230.57	0.37	0.83	0.35	0
D9	3728.37	327.28	0.44	0.89	0.44	0
D10	366.24	109.01	0.5	0.81	0.39	0
D11	2402.81	278.16	0.39	0.75	0.39	0
D12	999.4	208.28	0.32	0.78	0.29	0
D13	1290.38	225.59	0.36	0.72	0.32	0
D14	280.8	89.37	0.47	0.78	0.44	0
D15	288.09	88.82	0.45	0.82	0.46	0
D16	219.62	101.95	0.32	0.7	0.27	0
D17	489.02	112.07	0.52	0.94	0.49	0
D18	437.05	92.4	0.62	0.89	0.64	0
D19	1189.49	194.19	0.42	0.77	0.4	0
D20	1379.93	229.69	0.45	0.75	0.33	0
D21	648.36	118.08	0.59	0.91	0.58	0
D22	1142.7	146.54	0.49	0.92	0.67	0
D23	893.5	170.76	0.46	0.79	0.39	0
D24	196.77	62.56	0.53	0.91	0.63	0
D25	1577.77	232.85	0.43	0.84	0.37	0

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
D26	1319.56	176.02	0.45	0.88	0.54	0
D27	3426.57	365.04	0.4	0.6	0.32	0
D28	4026.5	325.63	0.48	0.83	0.48	0
D29	4203.31	307.33	0.49	0.83	0.56	0
D30	121.82	50.49	0.53	0.91	0.6	0
D31	1674.47	182.27	0.6	0.9	0.63	0
D32	88.47	47.93	0.59	0.88	0.48	0
D33	1091.73	141.78	0.46	0.94	0.68	0
D34	143.51	69.47	0.46	0.81	0.37	0
D35	955	135.99	0.54	0.94	0.65	0
D36	59.89	41.99	0.28	0.82	0.43	0
D37	185.95	86.97	0.29	0.79	0.31	0
D38	342.77	91.27	0.43	0.85	0.52	0
D39	169.57	58.3	0.58	0.9	0.63	0
D40	6953.01	636.98	0.22	0.54	0.22	0



Plan B: Compactness

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
Unassigned	0	0	0	0	0	0
D1	2691.99	296.6	0.42	0.81	0.38	0
D2	6412.59	422.59	0.5	0.78	0.45	0
D3	10909.27	574.09	0.44	0.8	0.42	0
D4	1396.27	270.17	0.52	0.74	0.24	0
D5	248.11	68.79	0.6	0.87	0.66	0
D6	3433.34	334.82	0.5	0.83	0.38	0
D7	2533.17	281.98	0.49	0.79	0.4	0
D8	1486.08	230.57	0.37	0.83	0.35	0
D9	3728.37	327.28	0.44	0.89	0.44	0
D10	366.24	109.01	0.5	0.81	0.39	0
D11	2402.81	278.16	0.39	0.75	0.39	0
D12	999.4	208.28	0.32	0.78	0.29	0
D13	1290.38	225.59	0.36	0.72	0.32	0
D14	280.8	89.37	0.47	0.78	0.44	0
D15	288.09	88.82	0.45	0.82	0.46	0
D16	218.15	92.8	0.35	0.74	0.32	0
D17	489.02	112.07	0.52	0.94	0.49	0
D18	437.51	92.89	0.62	0.89	0.64	0
D19	1189.49	194.19	0.42	0.77	0.4	0
D20	1377.08	228.48	0.44	0.74	0.33	0
D21	642.27	115.11	0.59	0.91	0.61	0
D22	1142.7	146.54	0.49	0.92	0.67	0
D23	903.46	163.43	0.44	0.8	0.43	0
D24	196.77	62.56	0.53	0.91	0.63	0
D25	1577.77	232.85	0.43	0.84	0.37	0

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
D26	1319.56	176.02	0.45	0.88	0.54	0
D27	3426.57	365.04	0.4	0.6	0.32	0
D28	4026.5	325.63	0.48	0.83	0.48	0
D29	4203.31	307.33	0.49	0.83	0.56	0
D30	121.82	50.49	0.53	0.91	0.6	0
D31	1674.47	182.27	0.6	0.9	0.63	0
D32	88.47	47.93	0.59	0.88	0.48	0
D33	1091.73	141.78	0.46	0.94	0.68	0
D34	143.51	69.47	0.46	0.81	0.37	0
D35	955	135.99	0.54	0.94	0.65	0
D36	59.89	41.99	0.28	0.82	0.43	0
D37	185.95	86.97	0.29	0.79	0.31	0
D38	342.77	91.27	0.43	0.85	0.52	0
D39	169.57	58.3	0.58	0.9	0.63	0
D40	6953.01	636.98	0.22	0.54	0.22	0

Plan C: Compactness

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
Unassigned	0	0	0	0	0	0
D1	2691.99	296.6	0.42	0.81	0.38	0
D2	6412.59	422.59	0.5	0.78	0.45	0
D3	10909.27	574.09	0.44	0.8	0.42	0
D4	1396.27	270.17	0.52	0.74	0.24	0
D5	248.11	68.79	0.6	0.87	0.66	0
D6	3433.34	334.82	0.5	0.83	0.38	0
D7	2533.17	281.98	0.49	0.79	0.4	0
D8	1486.08	230.57	0.37	0.83	0.35	0
D9	3728.37	327.28	0.44	0.89	0.44	0
D10	366.24	109.01	0.5	0.81	0.39	0
D11	2402.81	278.16	0.39	0.75	0.39	0
D12	999.4	208.28	0.32	0.78	0.29	0
D13	1290.38	225.59	0.36	0.72	0.32	0
D14	280.8	89.37	0.47	0.78	0.44	0
D15	288.09	88.82	0.45	0.82	0.46	0
D16	266.6	94.78	0.42	0.74	0.37	0
D17	489.02	112.07	0.52	0.94	0.49	0
D18	437.51	92.89	0.62	0.89	0.64	0
D19	1189.49	194.19	0.42	0.77	0.4	0
D20	1328.62	201.87	0.43	0.72	0.41	0
D21	642.27	115.11	0.59	0.91	0.61	0
D22	1142.7	146.54	0.49	0.92	0.67	0
D23	903.46	163.43	0.44	0.8	0.43	0
D24	196.77	62.56	0.53	0.91	0.63	0
D25	1577.77	232.85	0.43	0.84	0.37	0

District	Polygon Area (sq. mi)	Perimeter (mi)	Reock	Area/Convex Hull	Polsby Popper	Holes
D26	1319.56	176.02	0.45	0.88	0.54	0
D27	3426.57	365.04	0.4	0.6	0.32	0
D28	4026.5	325.63	0.48	0.83	0.48	0
D29	4203.31	307.33	0.49	0.83	0.56	0
D30	121.82	50.49	0.53	0.91	0.6	0
D31	1674.47	182.27	0.6	0.9	0.63	0
D32	88.47	47.93	0.59	0.88	0.48	0
D33	1091.73	141.78	0.46	0.94	0.68	0
D34	143.51	69.47	0.46	0.81	0.37	0
D35	955	135.99	0.54	0.94	0.65	0
D36	59.89	41.99	0.28	0.82	0.43	0
D37	185.95	86.97	0.29	0.79	0.31	0
D38	342.77	91.27	0.43	0.85	0.52	0
D39	169.57	58.3	0.58	0.9	0.63	0
D40	6953.01	636.98	0.22	0.54	0.22	0

# **EXHIBIT D**

## **Boundary Reports for Illustrative Plans**

Enacted Plan: Boundary Report

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
1	4	82	9	55	0	0
2	3	87	6	61	0	0
3	2	100	0	58	0	0
4	28	77	21	45	0	0
5	14	14	80	10	0	0
6	14	87	13	20	0	0
7	15	85	12	53	0	0
8	12	62	22	64	6	0
9	7	87	13	45	0	0
10	20	83	7	57	0	2
11	9	88	11	48	0	0
12	6	70	27	24	1	2
13	12	89	10	34	0	2
14	45	48	19	41	1	7
15	15	53	27	25	6	6
16	19	6	39	31	1	18
17	12	74	7	27	5	7
18	24	52	16	71	0	8
19	4	77	9	52	7	0
20	1	53	33	33	0	9
21	12	45	28	54	0	1
22	19	73	24	46	0	2
23	5	58	46	3	0	7
24	22	30	33	46	0	14
25	5	89	9	29	0	2
26	11	48	30	24	0	8

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
27	10	73	19	21	1	4
28	2	89	6	43	0	3
29	2	92	2	31	4	1
30	52	7	39	14	0	16
31	8	47	31	48	6	5
32	59	0	41	0	3	3
33	5	71	29	60	0	0
34	24	37	38	47	0	4
35	20	76	16	0	0	1
36	12	0	64	27	1	9
37	26	42	39	44	2	0
38	13	17	18	51	15	6
39	30	17	72	4	0	5
40	1	88	5	80	2	0



Plan A: Boundary Report

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
1	4	82	9	55	0	0
2	3	87	6	61	0	0
3	2	100	0	58	0	0
4	28	77	21	45	0	0
5	14	14	80	10	0	0
6	14	87	13	20	0	0
7	15	85	12	53	0	0
8	12	62	22	64	6	0
9	7	87	13	45	0	0
10	20	83	7	57	0	2
11	9	88	11	48	0	0
12	6	70	27	24	1	2
13	12	89	10	34	0	2
14	45	48	19	41	1	7
15	15	53	27	25	6	6
16	10	0	29	24	1	42
17	12	74	7	27	5	7
18	30	67	11	87	0	2
19	4	77	9	52	7	0
20	11	49	27	38	2	14
21	11	48	12	64	0	13
22	19	73	24	46	0	2
23	4	53	34	5	3	17
24	22	30	33	46	0	14
25	5	89	9	29	0	2
26	11	48	30	24	0	8

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
27	10	73	19	21	1	4
28	2	89	6	43	0	3
29	2	92	2	31	4	1
30	52	7	39	14	0	16
31	8	47	31	48	6	5
32	59	0	41	0	3	3
33	5	71	29	60	0	0
34	24	37	38	47	0	4
35	20	76	16	0	0	1
36	12	0	64	27	1	9
37	26	42	39	44	2	0
38	13	17	18	51	15	6
39	30	17	72	4	0	5
40	1	88	5	80	2	0

Plan B: Boundary Report

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
1	4	82	9	55	0	0
2	3	87	6	61	0	0
3	2	100	0	58	0	0
4	28	77	21	45	0	0
5	14	14	80	10	0	0
6	14	87	13	20	0	0
7	15	85	12	53	0	0
8	12	62	22	64	6	0
9	7	87	13	45	0	0
10	20	83	7	57	0	2
11	9	88	11	48	0	0
12	6	70	27	24	1	2
13	12	89	10	34	0	2
14	45	48	19	41	1	7
15	15	53	27	25	6	6
16	11	0	32	22	1	41
17	12	74	7	27	5	7
18	30	66	11	86	0	3
19	4	77	9	52	7	0
20	11	50	26	38	2	15
21	12	47	10	68	0	10
22	19	73	24	46	0	2
23	4	54	36	6	2	12
24	22	30	33	46	0	14
25	5	89	9	29	0	2
26	11	48	30	24	0	8

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
27	10	73	19	21	1	4
28	2	89	6	43	0	3
29	2	92	2	31	4	1
30	52	7	39	14	0	16
31	8	47	31	48	6	5
32	59	0	41	0	3	3
33	5	71	29	60	0	0
34	24	37	38	47	0	4
35	20	76	16	0	0	1
36	12	0	64	27	1	9
37	26	42	39	44	2	0
38	13	17	18	51	15	6
39	30	17	72	4	0	5
40	1	88	5	80	2	0

Plan C: Boundary Report

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
1	4	82	9	55	0	0
2	3	87	6	61	0	0
3	2	100	0	58	0	0
4	28	77	21	45	0	0
5	14	14	80	10	0	0
6	14	87	13	20	0	0
7	15	85	12	53	0	0
8	12	62	22	64	6	0
9	7	87	13	45	0	0
10	20	83	7	57	0	2
11	9	88	11	48	0	0
12	6	70	27	24	1	2
13	12	89	10	34	0	2
14	45	48	19	41	1	7
15	15	53	27	25	6	6
16	26	8	16	35	1	44
17	12	74	7	27	5	7
18	30	66	11	86	0	3
19	4	77	9	52	7	0
20	5	53	23	36	2	18
21	12	47	10	68	0	10
22	19	73	24	46	0	2
23	4	54	36	6	2	12
24	22	30	33	46	0	14
25	5	89	9	29	0	2
26	11	48	30	24	0	8

District	City	County	Road	Water	Rail	Non
	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Boundaries(%)	Geo/Pol
						Boundaries(%)
27	10	73	19	21	1	4
28	2	89	6	43	0	3
29	2	92	2	31	4	1
30	52	7	39	14	0	16
31	8	47	31	48	6	5
32	59	0	41	0	3	3
33	5	71	29	60	0	0
34	24	37	38	47	0	4
35	20	76	16	0	0	1
36	12	0	64	27	1	9
37	26	42	39	44	2	0
38	13	17	18	51	15	6
39	30	17	72	4	0	5
40	1	88	5	80	2	0