DESCRIPTION OF SOFTWARE, DATA, AND CRITERIA

The Supreme Court's Order of March 13, 2012, directed that the Petition, "specify the software used to create the plan, the data and criteria used in drafting the plan, the source of the data used in drafting the plan, and any other relevant information." The following description was provided to the Attorney General by the Senate's professional staff:

SOFTWARE USED BY SENATE TO CREATE SENATE PLANS

1. In July 2007, the Florida Senate began development of the next generation of redistricting software. Providing broad public access was foremost among system requirements, and professional staff determined that the best and most affordable technology for maximizing public participation would be an open source web application.

2. During development, in November 2010, new standards for the Legislature to follow for drawing congressional and legislative districts were added to the State Constitution. District Builder's custom interface and features were designed and deployed specifically to facilitate building districts in accordance with the new standards.

3. Users can assign or reassign entire territories to districts by clicking on counties, municipalities, or any of the other layers of census geography (places,

voting-tabulation districts ("VTDs"), tracts, block groups, or blocks). This feature facilitates drawing districts that utilize political boundaries, where feasible.

4. When new territory is assigned to a district, statistical profiles instantly are updated on the dashboard and separate statistics window, both of which are customizable and may include minority voting age population figures. Also, the interactive map supports the option of displaying data labels for District Builder's population attributes in any of the assignable layers of Census geography. For example, total population can be displayed on the interactive map for blocks to help with equalizing population. These features facilitate drawing districts that are as equal in population as practicable.

5. District Builder can display "value ramps" (choropleth maps) indicating concentrations of black and Hispanic populations. It also has a query tool (also known as "i-tool") for viewing the demographic details for any point on the map across the full range of Census layers. These features, together with data labels showing minority counts and percentages, facilitate drawing districts that preserve opportunities for racial and language minorities.

6. Unlike its predecessors, District Builder does not display partisan affiliations or election results on screen or in any reports.

7. Political boundaries (county and municipal lines), as well as major highways and waterways, appear in the interactive maps with distinctive

symbology. This feature facilitates drawing districts that utilize political and geographical boundaries, where feasible.

8. District Builder has scale bars and a "measure" tool to complement visualization and facilitate drawing districts that are contiguous and geometrically compact.

9. When plans are processed for posting on the Senate Redistricting website, among the downloads created are shapefiles that summarize geometric attributes of districts, including area, perimeter, chord (end-to-end length), the area of the perimeter circle, the area of the minimum bounding circle, and the area of the convex hull. Those attributes plug directly into the most commonly used ratios for measuring geometric compactness.

10. District Builder's features and capabilities are outlined in detail in the online Help manual. *See* https://db10.flsenate.gov/db1/help.

11. To use District Builder, individuals register for a free secure account. Registrants get password-protected system access and secure storage for personal plans. An internal server with the same version of the application and data is available for Senators and staff. A third instance of District Builder, also with the same version, was installed January 19, 2012, by Florida State Courts system administrators on an internal server they manage.

12. In November 2009, the Florida House of Representatives began

development of its own web-based redistricting software, MyDistrictBuilder™, which, like District Builder, is freely available to the public. The Florida Senate's District Builder and the Florida House of Representatives' MyDistrictBuilder™ online applications give Floridians two choices for accessing the redistricting programs, data, and plans that legislators and professional staff use to navigate interactive maps, explore population characteristics, and build districts.

13. Senate and House professional staff collaborated to ensure common, consistent geography and data in the two applications. In addition, Senate and House professional staff shared plans submitted to either chamber. Maps, statistics, and downloads for each submission were posted on both the Senate and House Redistricting websites, regardless of whether the plan was drawn using District Builder, MyDistrictBuilder™, or some other redistricting application.

DATA USED BY SENATE TO CREATE SENATE PLANS

14. Senate and House professional staff used their respective web applications as the interface for drafting plans. Both applications included: (1) 2010 Census Redistricting Data [P.L. 94-171 machine-readable data files] (U.S. Census Bureau); (2) 2010 TIGER/Line Shapefiles [machine-readable data files] (U.S. Census Bureau); and (3) Reference layers (e.g., road geography from the Florida Department of Transportation and features in Bing Maps).

15. In addition, professional staff consulted the following data in drafting

plans: (1) 2010 Census Summary File 1 Data [machine-readable data files] (U.S. Census Bureau); (2) 2006-2010 American Community Survey Data [machine-readable data files] (U.S. Census Bureau); (3) Public input (public testimony, public hearings, public redistricting plans submissions, public electronic and written communications); and (4) Bing Maps, Google Maps, Google Earth and Google Street View.

16. In both District Builder and MyDistrictBuilder™, county, then VTD, then block is the primary hierarchy of Census geography. For the 2010 Census, 484,481 blocks are nested within the 9,435 VTDs and 9,435 VTDs are nested within Florida's 67 counties.

17. VTDs are an official layer of Census geography submitted to the Census Bureau by supervisors of elections to facilitate efficient administration of elections after redistricting. A block is an area bounded on all sides by visible and/or invisible features shown on a map prepared by the U.S. Census Bureau. A block is the smallest geographic entity for which the Census Bureau tabulates decennial census data.

18. For all layers in the 2010 Census Redistricting Data, the Census Bureau enumerates total population in six independent categories of race, plus a seventh category for Hispanic or Latino. The Census Bureau also tabulates voting age population (18 years and older) for the same categories.

19. Using the methodology prescribed by the United States Department of Justice, *see* Guidance Concerning Redistricting Under Section 5 of the Voting Rights Act, 76 Fed. Reg. 7470, at 7472-73 (Feb. 9, 2011), professional staff aggregated the 252 permutations in the Census P.L. 94-171 data to a manageable number that preserves the detail required for compliance with and enforcement of the Voting Rights Act in legislative and congressional redistricting. In District Builder, counts of black population and black voting-age population include persons who self-identified as black or African-American alone or in combination with one or more other races. "NHB" (non-Hispanic black) is the population that self-identified as black and not Hispanic. "HB" is the population that self-identified as both black and Hispanic. "HxB" is the population that self-identified as Hispanic and not black. "SRW" is the population who self-identified as white alone, excluding Hispanic persons. "Oth" is the population that does not fall into one of the other four mutually exclusive categories.

20. For statistical reports prepared for committee meetings or the Petition Appendix, the HB population is "allocated alternatively to the Latino category and the minority race category." *Id.* at 7473. The total count of black persons includes the NHB plus HB populations, and the total count of Hispanic persons includes the HxB plus HB populations. As a result, Hispanic Black (HB) populations are counted in both totals. Numbers of HB persons in each district many other

demographic details are shown in "Tab B6 District Demographic Profiles." For assessing the combined population of blacks and Hispanics in a district that detailed breakout is required.

21. The dashboard and statistics window in District Builder can be customized to display the user's choice of population categories: (1) Total Population; (2) Deviation (count and percentage); (3) Total VAP (Voting Age Population, 18 and older; count and percentage); (4) Non-Hispanic White alone VAP (single-race white, count and percentage); (5) Non-Hispanic Black VAP (includes Black alone or in combination with other races; count and percentage); (6) Hispanic Black VAP (includes Black alone or in combination with other races; count and percentage); (7) Hispanic VAP other than Hispanic Black (excludes Hispanic Black VAP; count and percentage); (8) Other VAP (not single-race white nor black alone or in combination nor Hispanic; count and percentage).

22. District Builder includes features for viewing or copying districts from other redistricting plans. These features facilitate incorporating districts from other plans and then refining boundaries to better achieve the tier one and tier two constitutional standards.

DATA USED BY SENATE TO ANALYZE PLANS

23. Each of the sub-tabs under "Tab B - Map and Statistics Packages" in the Petition Appendix exhibit data used by professional staff to analyze senate plans.

Some of the reports come directly from standard reports that are published for all submitted plans on the Senate Redistricting website. Examples include: (1) "Tab B4 District by County Reports (Shares of Population)," (2) "Tab B5 District by Existing District (Shares of Population)," and (3) "Tab B6 District Demographic Profiles."

24. Other reports rearrange, recalculate, or reformat data posted on the Senate Redistricting website in spreadsheets formulated to facilitate comparative analyses of metrics. "Tab B1 Maps and Statistical Comparisons (11x17 Inches)" is an example. The first four pages of the 7-page report are maps of the newly created senate districts in SJR 2-B and of the three senate plans considered in the original 2012 apportionment case (the Benchmark senate districts, the invalidated districts in SJR 1176, and the Coalition alternative). Each 11x17-inch map shows the state with regional insets for South Florida, Jacksonville, Orlando, and Tampa Bay. All of the insets are at the same map scale. Significant water bodies (contiguous area greater than 5 acres) are depicted in transparent blue. Primary and secondary roads are depicted in transparent red. These are the geographical layers used by the Senate's boundary analysis described below. Districts are distinguished by color and are outlined in solid black. County boundaries are depicted with dashed lines. City lines are not depicted on these maps, though city names appear in the insets. What otherwise would be empty space off the Gulf Coast includes a table showing

district deviations and populations. Each map provides the District Explorer link that can be used interactively to view district boundaries and underlying demographics in much greater detail. The 35x42-inch statewide maps under "Tab C - Statewide Maps (35x42 Inches)" use similar symbology.

25. The fifth page shows district population deviations and minority voting age population percentages. Districts in the four plans are aligned side-by-side based on location (i.e., geography and population overlaps) rather than district numbers. For example, District 1 in SJR 2-B is aligned with District 4 in the Coalition plan, District 3 in SJR 1176, and District 4 in the Benchmark. Some alignments are less than ideal. A few are not even close. Professional staff was constrained by requirements to list each district in each plan one and only one time, and completing the puzzle involved judgment and compromise. Overall, however, the approach is useful for facilitating comparisons among plans.

26. Minority voting age population percentages on the fifth page are depicted with conditional formatting that emphasizes higher percentages of Black VAP with more intense reds and the higher percentages of Hispanic VAP with more intense blues. With minority districts, in particular, professional staff tried to align districts to facilitate comparisons across plans. Looking at maps in tandem with the comparative statistics is the best way to comprehend differences among plans.

27. The sixth page of "Tab B1 Maps and Statistical Comparisons (11x17 Inches)" shows summary results of boundary analyses and geometric compactness analyses conducted by professional staff. For each district and for the plan as a whole, the report shows the extent to which district boundaries utilize political or geographical features.

28. In the absence of an established quantitative method for gauging the extent to which district borders use political and geographic features, professional staff invented a set of quantitative metrics that in essence: (1) merges all of Florida's county and municipal boundaries in into a web of line segments; (2) extends that web to include primary and secondary roads[1] and significant bodies of water (contiguous areas greater than 5 acres within bays, rivers, or lakes); (3) determines the percentage of each district's total perimeter that is masked by the web of political boundaries only; and (4) determines the percentage of each

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[1] All geographic features used for the Senate's boundary analysis are from 2010 TIGER/Line shapefiles provided by the U.S. Census, and they are defined in the *2010 TIGER/Line Shapefiles Technical Documentation.* For example, page 5-59 states:

> The Primary and Secondary Roads shapefile contains all linear street features with MTFCC of 'S1100' and 'S1200' in the MAF/TIGER database. The shapefiles are provided at a State geographic extent and in linear elemental feature geometry. Secondary roads are main arteries, usually in the U.S. Highway, State Highway, or County Highway system. These roads have one or more lanes of traffic in each direction, may or may not be divided, and usually have at-grade intersections with many other roads and driveways. They often have both a local name and a route number.

district's total perimeter that is masked by the extended web of political or geographical boundaries. This boundary analysis does not purport to be a perfect test for compliance with legal standards, but the data and method are well suited as analytical tools for comparing the extent to which various districts and plans utilize political and geographical boundaries.

29. The geometric compactness measures calculated by professional staff use Census 2010 TIGER/Line geometry (a geographic coordinate system that in its native form is inappropriate for measuring distances) converted to NAD83 / Florida GDL Albers, which is an equal-area projection system that minimizes distortion in aerial calculations for the State of Florida. Other redistricting software packages use different projection schemes and produce different results.

30. The geometric compactness measures presented at committee meetings and on page six of the 11x17-inch report include: (1) perimeter, which is the total linear mileage of all vectors (line segments) that constitute the boundary of a district; (2) chord, which is the linear end-to-end mileage between the two most distant points on the a district's boundary; (3) convex hull score, which is the ratio of a district's area to the area of the minimum shape of a surrounding polygon with no reflex angles (greater than 180 degrees; the convex hull is sometimes described as the shape that results from fitting a rubber band around the border of a district); (4) Reock score, which is the ratio of a district's area to the area of the minimum

bounding circle; and (5) Polsby-Popper score, which is the ratio of a district's area to the area of the "perimeter circle," which is a circle that has a circumference equal to the perimeter of the district. The five measures can be used together to confirm visual impressions regarding geometric compactness.

31. The seventh page of "Tab B1 Maps and Statistical Comparisons (11x17 Inches)" compares how counties and cities are split or kept intact by districts in the various plans. For example, if a city is wholly contained in a single district, its contribution to the aggregate number of splits is zero. If a city is divided among two districts, its contribution to the aggregate number of splits is two. If a city is divided among three districts, its contribution to the aggregate number of splits is three, and so on.

32. One type of report in the Petition Appendix is unique in that it does not use data from the Senate Redistricting website or the U.S. Census. The reports in "Tab B2 MyDistrictBuilder Statistics for Functional Analysis," use data from the House of Representatives' MyDistrictBuilder™ online redistricting application. MyDistrictBuilder™ includes select voter registration and candidate percentages for statewide elections in 2006, 2008, and 2010. The House of Representatives obtained voter and election data from the Florida Department of State, Division of Elections, and from Florida's 67 supervisors of elections.

33. To conduct the required functional analyses during the Extraordinary

Apportionment Session, Senate professional staff used the following methodology: (1) Open a redistricting plan in MyDistrictBuilder™; (2) Select the "Census, ACS, Elections and DMV" option for "Customize Data Grid;" (3) Select "Save Data Grid" to save .csv export in local storage; (4) Paste contents of data grid into spreadsheet developed to facilitate consideration of factors the Supreme Court used for functional analyses; and (5) Analyze voter registration, turnout, and election results for individual districts using the method prescribed by the Supreme Court.

34. The first four pages of each plan's functional analysis report highlight key factors suggested by the Supreme Court's analysis of various districts. In this section, election results are recalculated to exclude minor candidates (i.e., votes for the two major candidates in each contest total to 100%). The fifth through eighth pages show MyDistrictBuilder™ data directly. The final two pages in "Tab B2 MyDistrictBuilder Statistics for Functional Analysis" provide a data description explaining the field names used in the MyDistrictBuilder™ grid and included in the Senate's functional analysis reports.

35. "Tab B3 ESRI Compactness Statistics" shows the geometric compactness measures produced by the ESRI Online Redistricting Application. Professional staff determined that distance and area calculations in the ESRI Online Redistricting Application use a WGS 84 Web Mercator Auxiliary Sphere (WMAS) coordinate system. Projection schemes of this general type are common

for web mapping applications, including Google Maps and Bing. The Senate uses NAD83 / Florida GDL Albers, which is optimized for calculating areas in Florida. The compactness measurements generated by different redistricting applications do not always match. Variations may arise because different projections are used to flatten the globe for calculating two-dimensional areas or because different algorithms are used to calculate the size of minimum bounding circles.

36. "Tab B4 District by County Reports (Shares of Population)" shows for various plans the relative share of the total district population comprised by each of its constituent counties (Share of District). It also shows the share of each county's population in the District (Share of County). This same analysis is performed for total population, voting age population (VAP), Black VAP, and Hispanic VAP.

37. "Tab B5 District by Existing District (Shares of Population)" shows for various plans the relative share of the total district population comprised by districts in the Benchmark senate plan (Share of Plan A). It also shows the share of each Benchmark district's population in the proposed new district (Share of B). This same analysis is performed for total population, voting age population (VAP), Black VAP, and Hispanic VAP.

38. "Tab B6 District Demographic Profiles" shows a host of demographic statistics from the Census Summary File 1 data. With the exception of counts for "Mexican," "Puerto Rican," "Cuban," and "Other Hispanic or Latino," which are

disaggregated from tract-level reports, U.S. Census reports all Summary File 1 data used for this report at the block level, and block totals are aggregated to the district level. With the Senate's District Explorer online application, similar reports are accessible for the multiple layers of census geography. Professional staff used District Builder and District Explorer in tandem.

39. "Tab B7 District VAP of Each Racial and Ethnic Group" includes reports that show district totals for each racial and ethnic group in the 2010 Census Redistricting Data [P.L. 94-171] supplied by the U.S. Census Bureau for: (1) SJR 2-B (Newly Created Senate Plan S016S9030), (2) the Coalition Alternative (Proposed Senate Plan SPUBS0176), (3) SJR 1176 (Invalid Senate Plan S000S9008), and (4) the Benchmark Senate Plan (FL2002_SEN).

CRITERIA USED IN DRAFTING THE PLANS

40. The following criteria were used in drafting the apportionment plan: (1) Article III, Sections 16 and 21 of the State Constitution; (2) The Florida Supreme Court's In re: Senate Joint Resolution of Legislative Apportionment 1176 opinion (March 9, 2012); (3) The Equal Protection Clause of the Florida and United States Constitutions; and (4) Sections 2 and 5 of the federal Voting Rights Act of 1965.

41. In drafting the apportionment plan, senate professional staff used voter-registration counts and election results only to conduct the functional analysis prescribed by the Court, and not to advantage or disadvantage any incumbent or

political party.