EXHIBIT 16

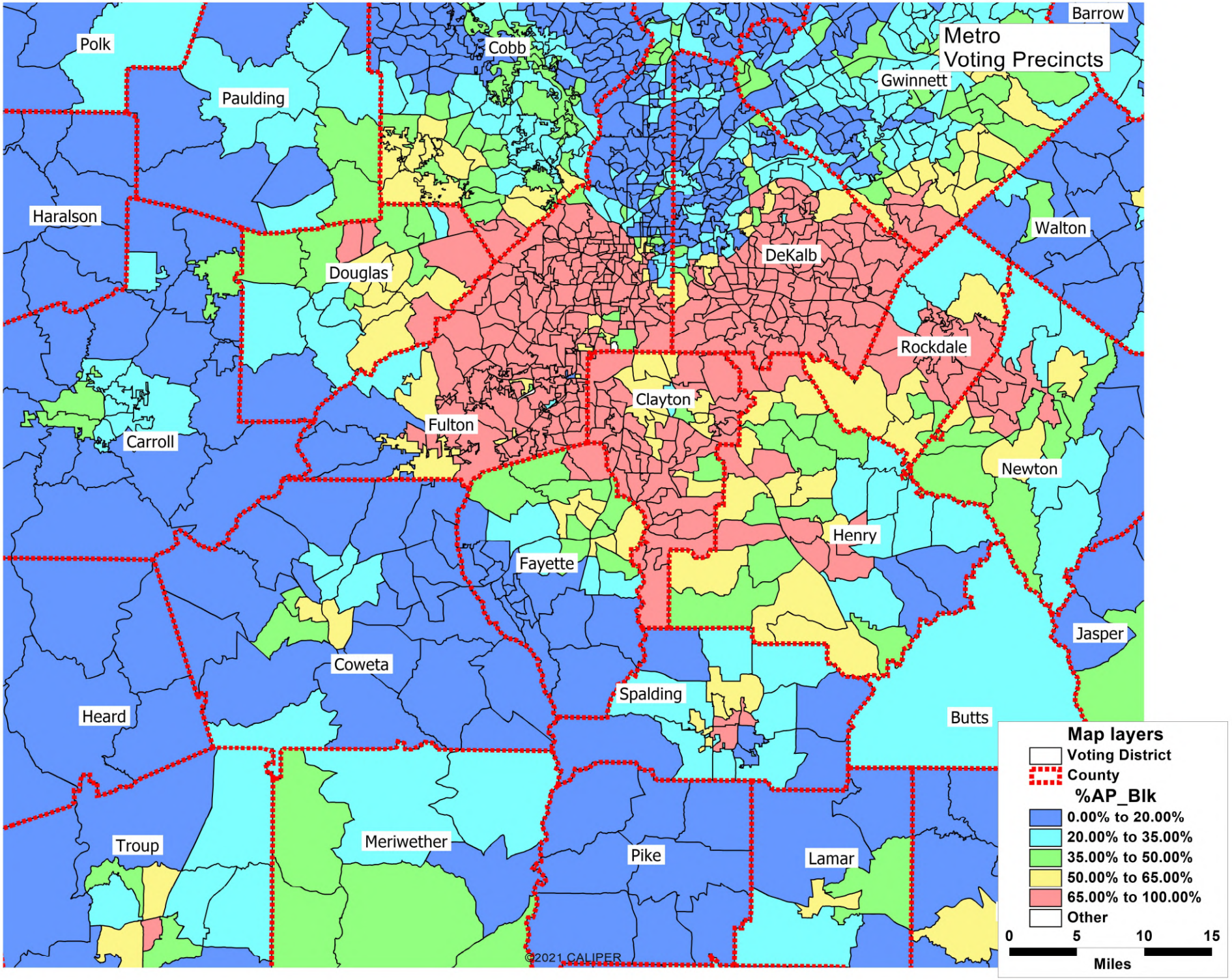

Metro
Voting Precincts
Barrow
Polk
Cobb
Gwinnett
Paulding
Haralson
Walton
DeKalb
Douglas
Rockdale
Clayton
Fulton
Carroll
Newton
Henry
Fayette
Jasper
Coweta
Spalding
Heard
Butts
Troup
Meriwether
Pike
Lamar
©2021 CALIPER
Map layers
Voting District
County
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0 5 10 15
Miles

EXHIBIT 17

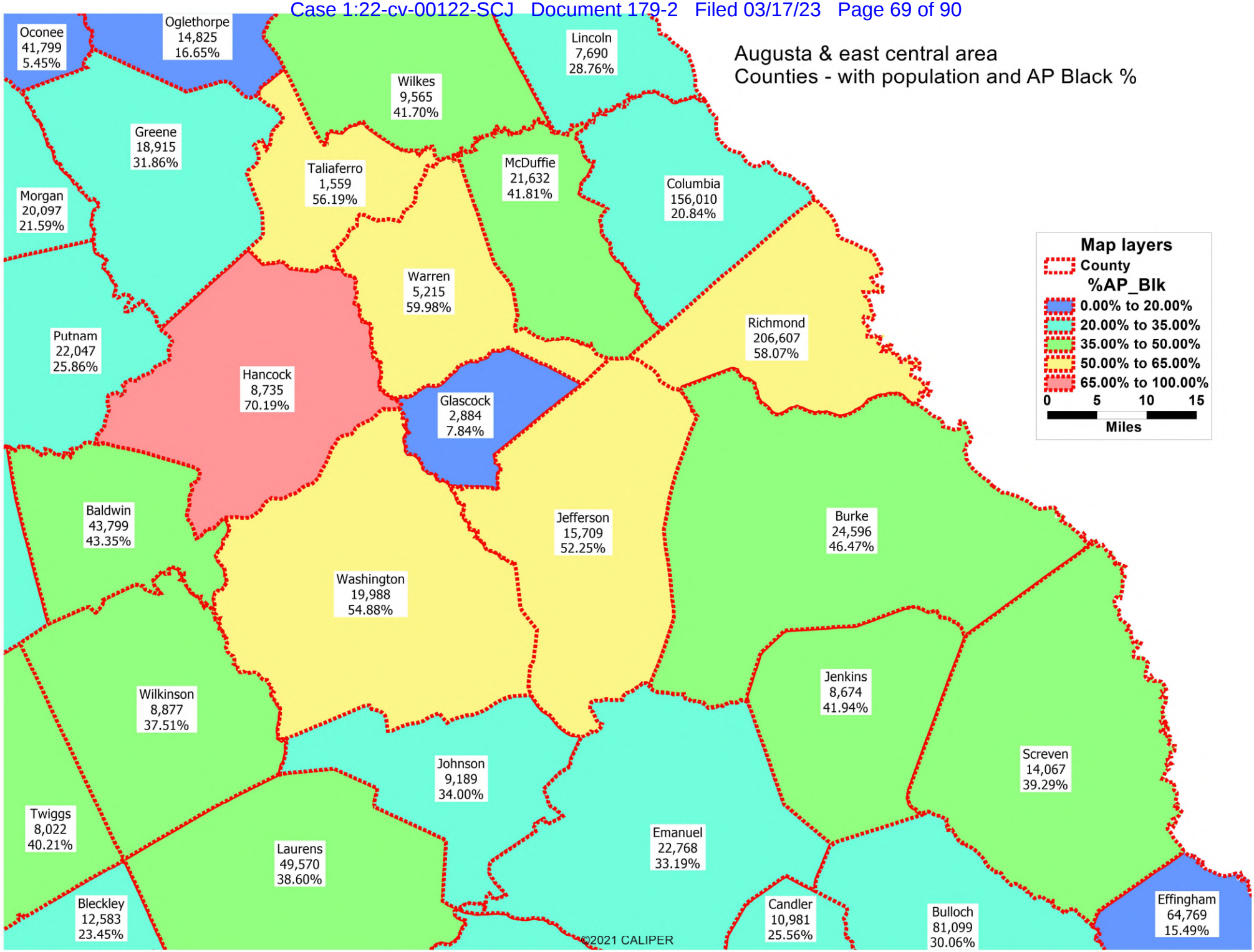

Augusta & east central area
Counties - with population and AP Black %
Oconee
41,799
5.45%
Oglethorpe
14,825
16.65%
Lincoln
7,690
28.76%
Wilkes
9,565
41.70%
Greene
18,915
31.86%
Taliaferro
1,559
56.19%
McDuffie
21,632
41.81%
Columbia
156,010
20.84%
Morgan
20,097
21.59%
Warren
5,215
59.98%
Richmond
206,607
58.07%
Putnam
22,047
25.86%
Hancock
8,735
70.19%
Glascock
2,884
7.84%
Baldwin
43,799
43.35%
Jefferson
15,709
52.25%
Burke
24,596
46.47%
Washington
19,988
54.88%
Jenkins
8,674
41.94%
Wilkinson
8,877
37.51%
Screven
14,067
39.29%
Johnson
9,189
34.00%
Twiggs
8,022
40.21%
Emanuel
22,768
33.19%
Laurens
49,570
38.60%
Bleckley
12,583
23.45%
Candler
10,981
25.56%
Bulloch
81,099
30.06%
Effingham
64,769
15.49%
©2021 CALIPER
Map layers
County
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0 5 10 15
Miles

EXHIBIT 18

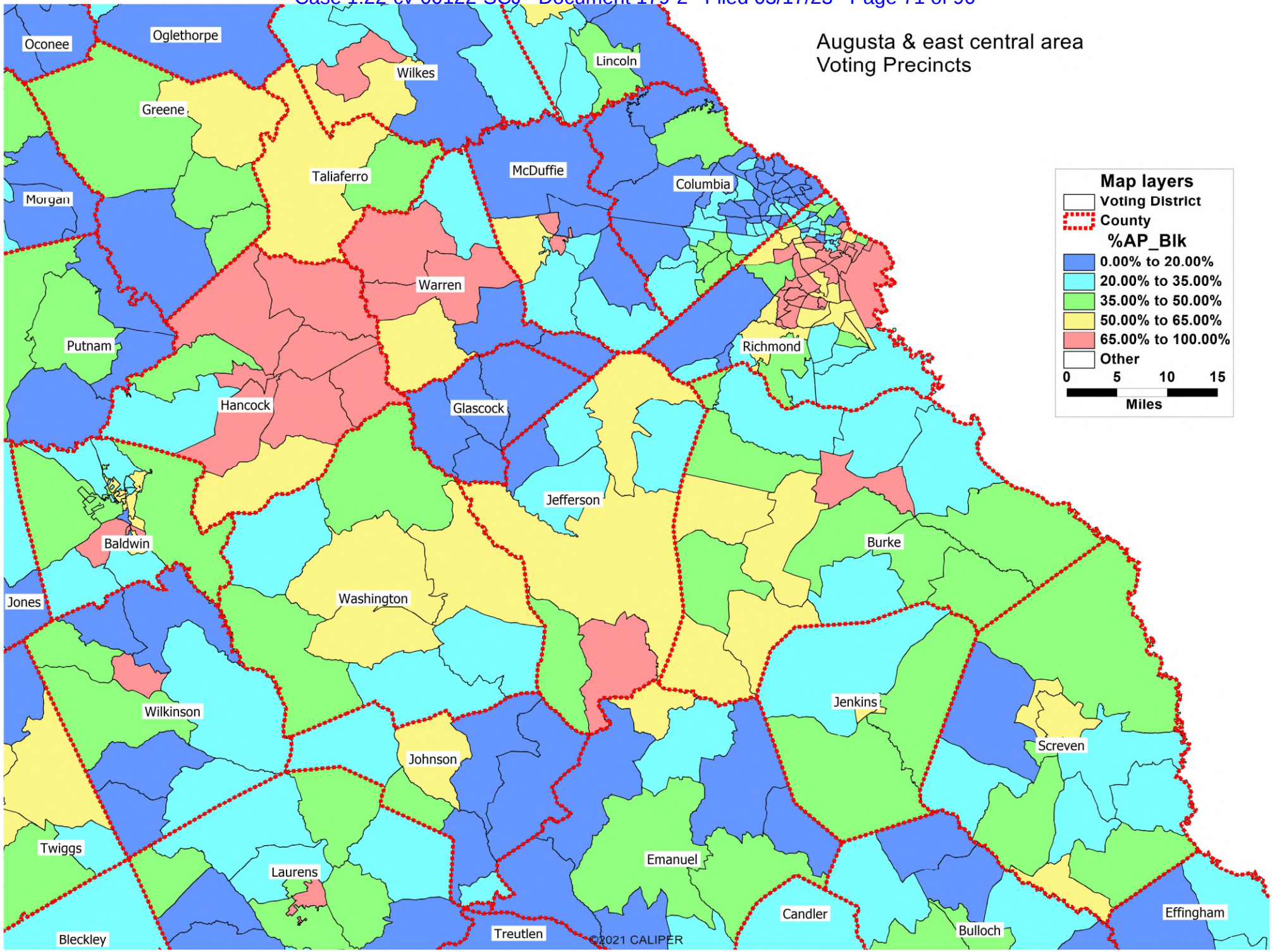

Augusta & east central area
Voting Precincts
Map layers
Voting District
County
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0 5 10 15
Miles
Oconee
Oglethorpe
Wilkes
Lincoln
Greene
Taliaferro
McDuffie
Columbia
Morgan
Warren
Putnam
Richmond
Hancock
Glascock
Jefferson
Baldwin
Burke
Jones
Washington
Wilkinson
Jenkins
Screven
Johnson
Twiggs
Emanuel
Laurens
Candler
Effingham
Bulloch
Bleckley
Treutlen
©2021 CALIPER

EXHIBIT 19

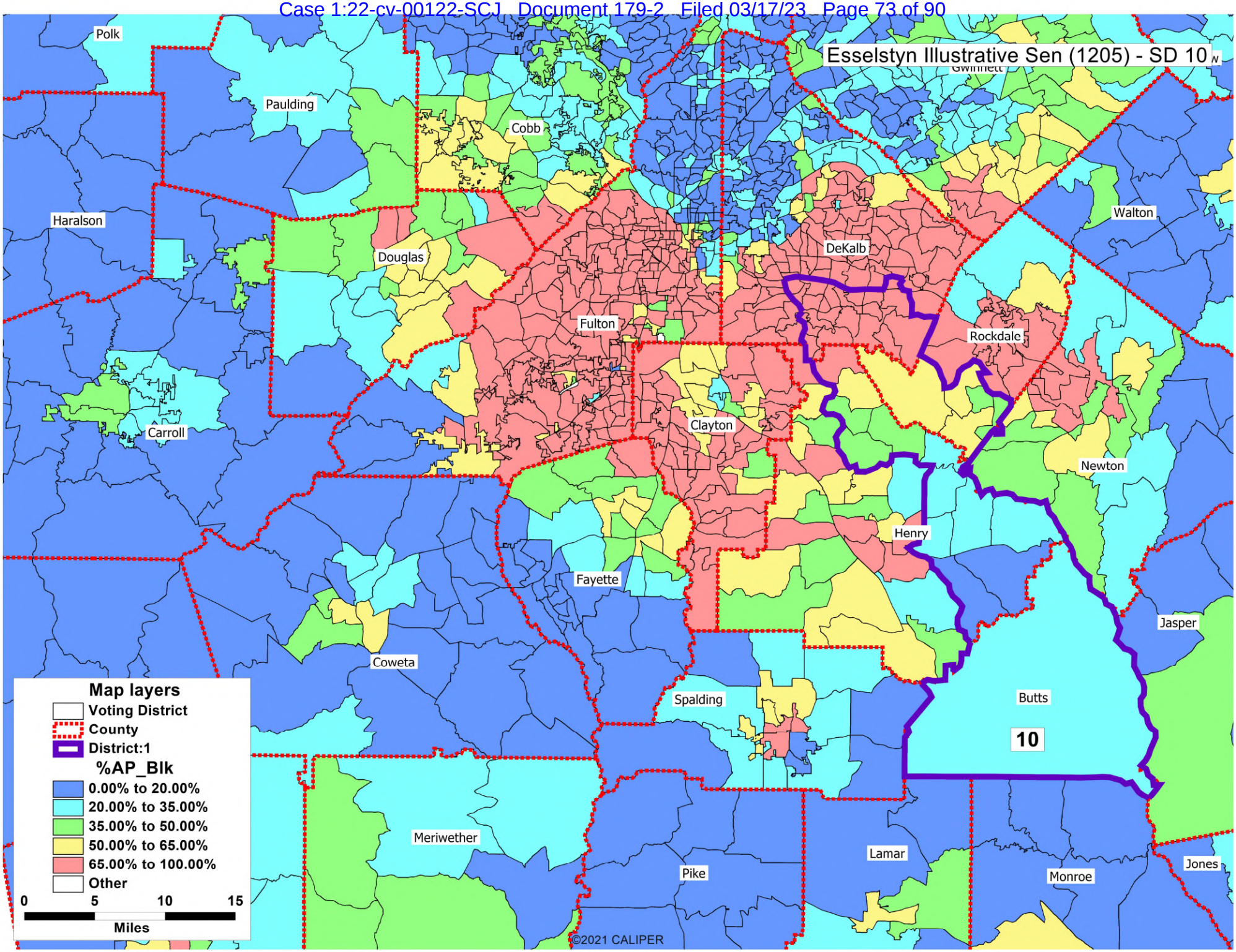

Esselstyn Illustrative Sen (1205) - SD 10
N
Polk
Paulding
Cobb
Gwinnett
Haralson
Douglas
Fulton
DeKalb
Walton
Rockdale
Carroll
Clayton
Newton
Henry
Fayette
Jasper
Coweta
Spalding
Butts
10
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
District:1
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 20

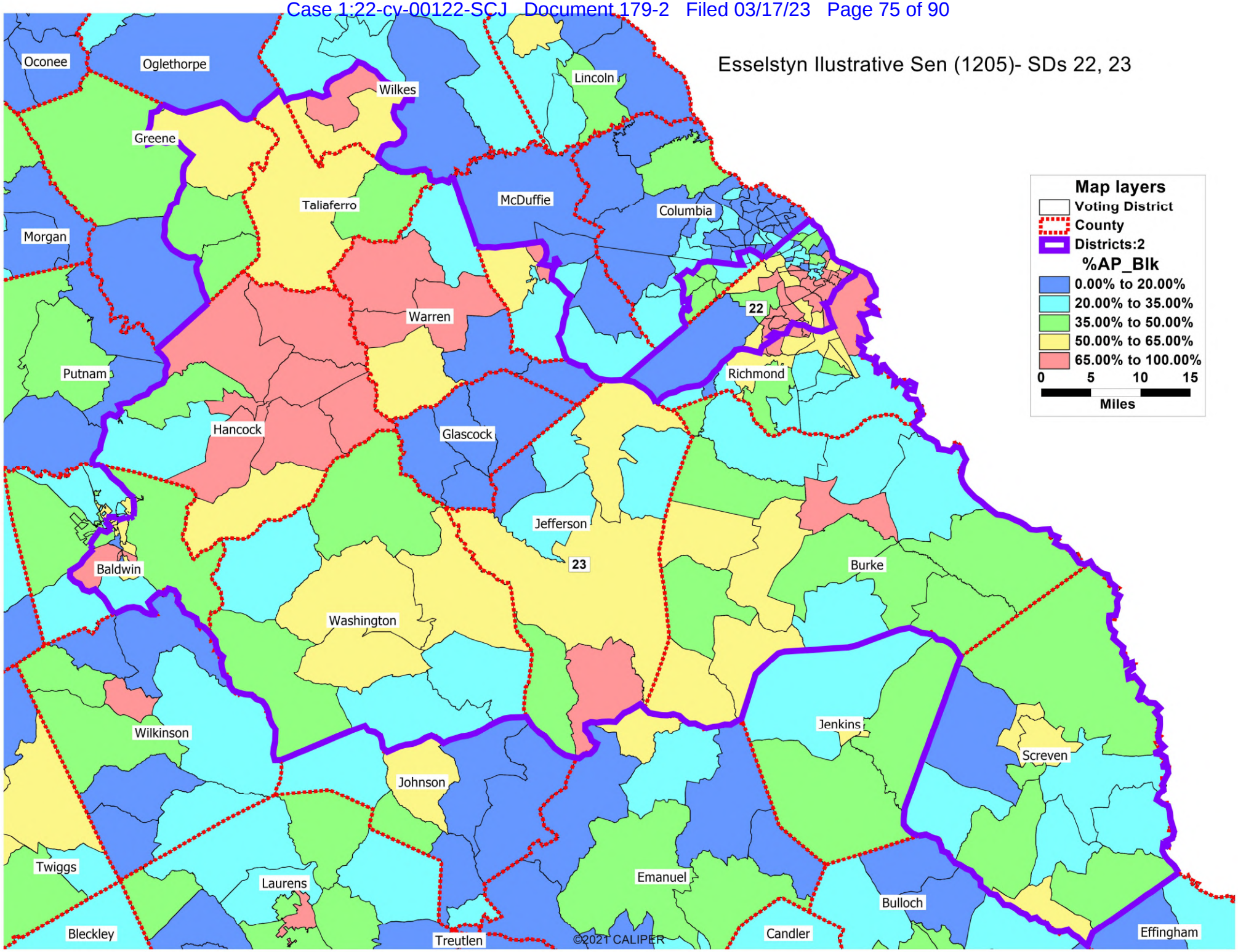

Esselstyn Ilustrative Sen (1205)- SDs 22, 23
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0 5 10 15
Miles
Oconee
Oglethorpe
Wilkes
Lincoln
Greene
Taliaferro
McDuffie
Columbia
Morgan
Warren
22
Putnam
Richmond
Hancock
Glascock
Jefferson
23
Baldwin
Burke
Washington
Wilkinson
Jenkins
Screven
Johnson
Twiggs
Laurens
Emanuel
Bulloch
Bleckley
Treutlen
Candler
Effingham
©2021 CALIPER

EXHIBIT 21

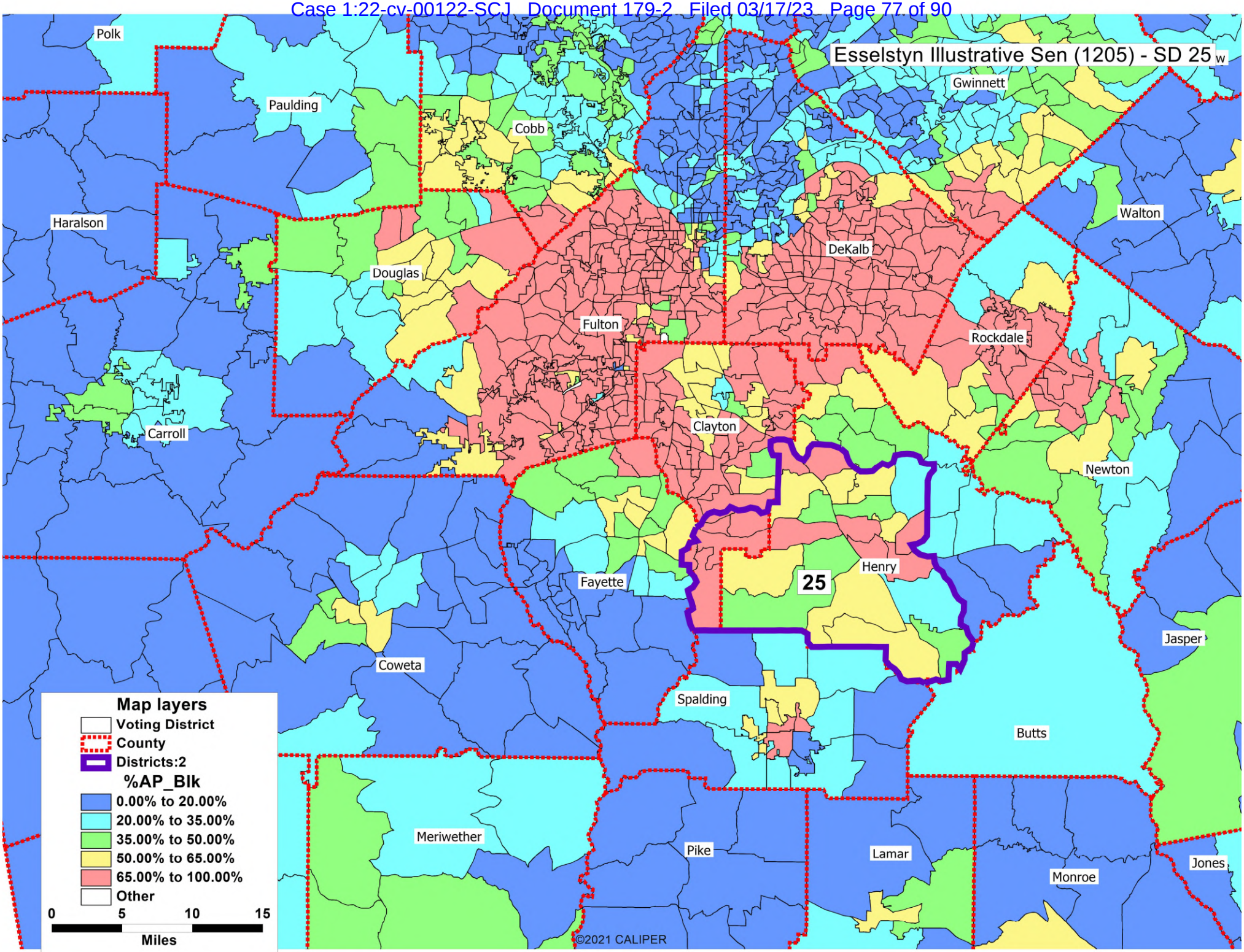

Esselstyn Illustrative Sen (1205) - SD 25
Polk
Paulding
Cobb
Gwinnett
Haralson
Douglas
Fulton
DeKalb
Walton
Rockdale
Carroll
Clayton
Newton
Fayette
Henry
25
Jasper
Coweta
Spalding
Butts
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 22

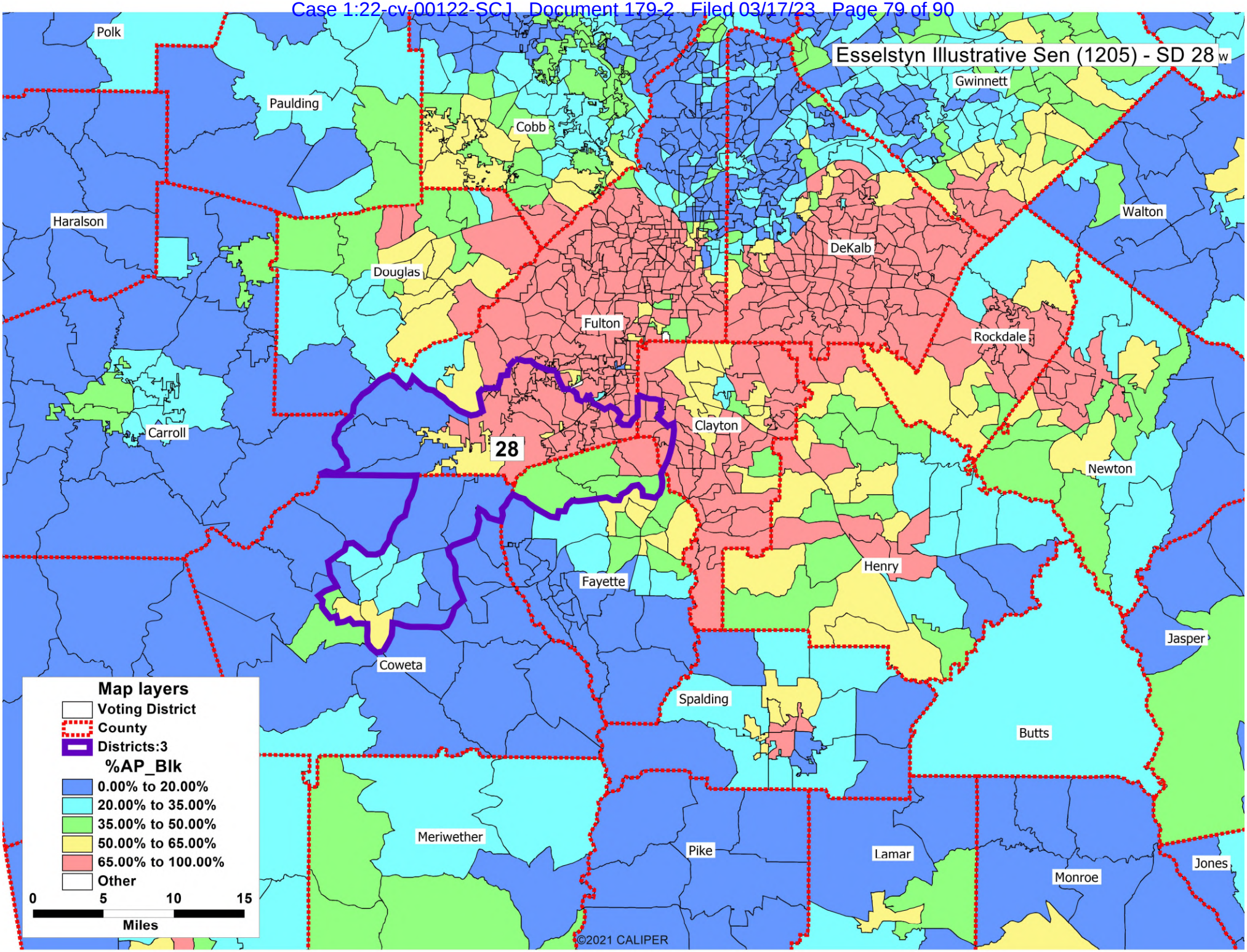

Esselstyn Illustrative Sen (1205) - SD 28
Polk
Paulding
Cobb
Gwinnett
Haralson
Douglas
Fulton
DeKalb
Walton
Rockdale
Carroll
28
Clayton
Newton
Fayette
Henry
Coweta
Spalding
Jasper
Butts
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
Districts:3
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 23

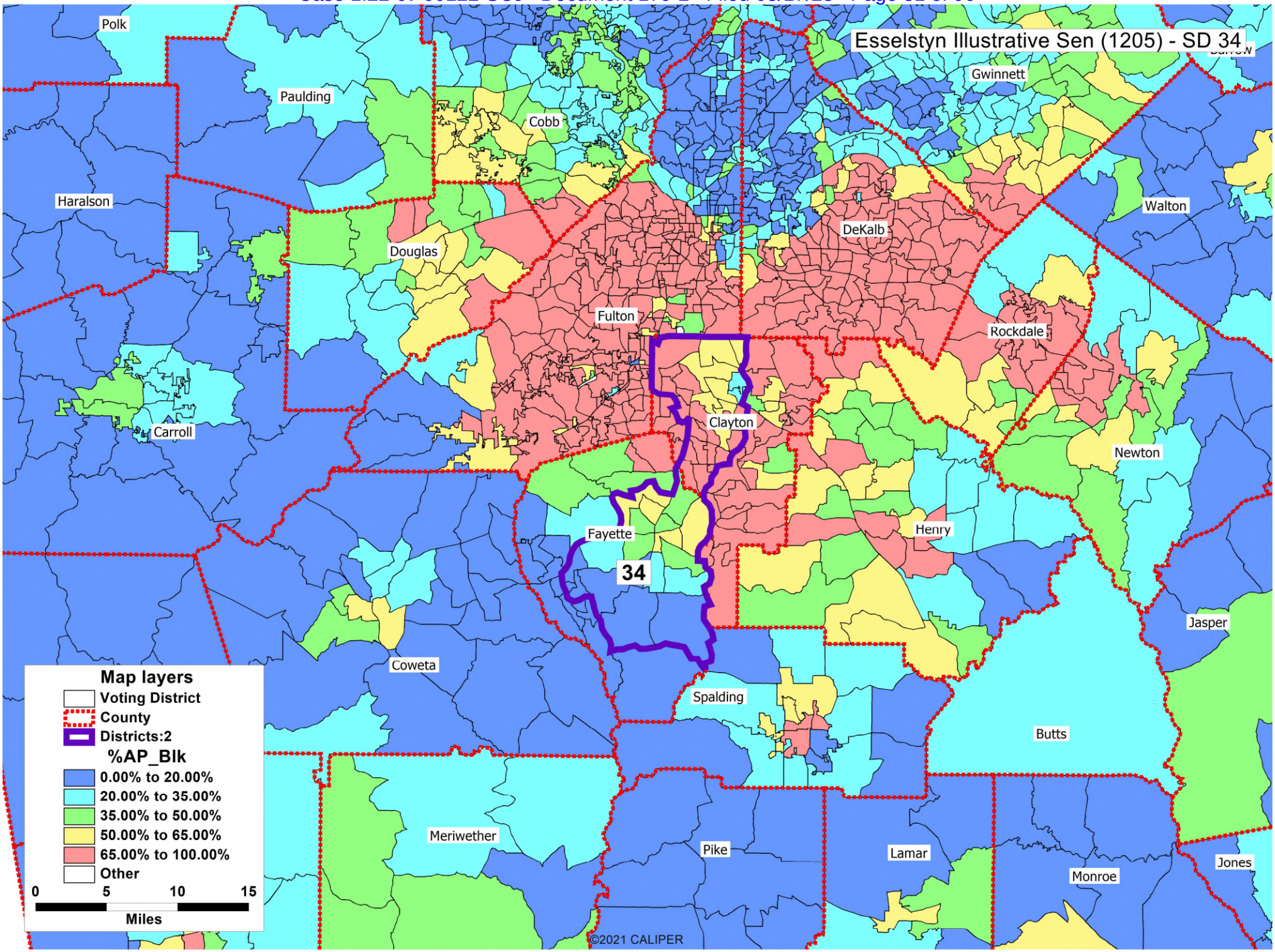

Esselstyn Illustrative Sen (1205) - SD 34
Polk
Paulding
Cobb
Gwinnett
Haralson
Douglas
DeKalb
Walton
Fulton
Rockdale
Carroll
Clayton
Newton
Fayette
Henry
34
Jasper
Coweta
Spalding
Butts
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0 5 10 15
Miles
©2021 CALIPER

EXHIBIT 24

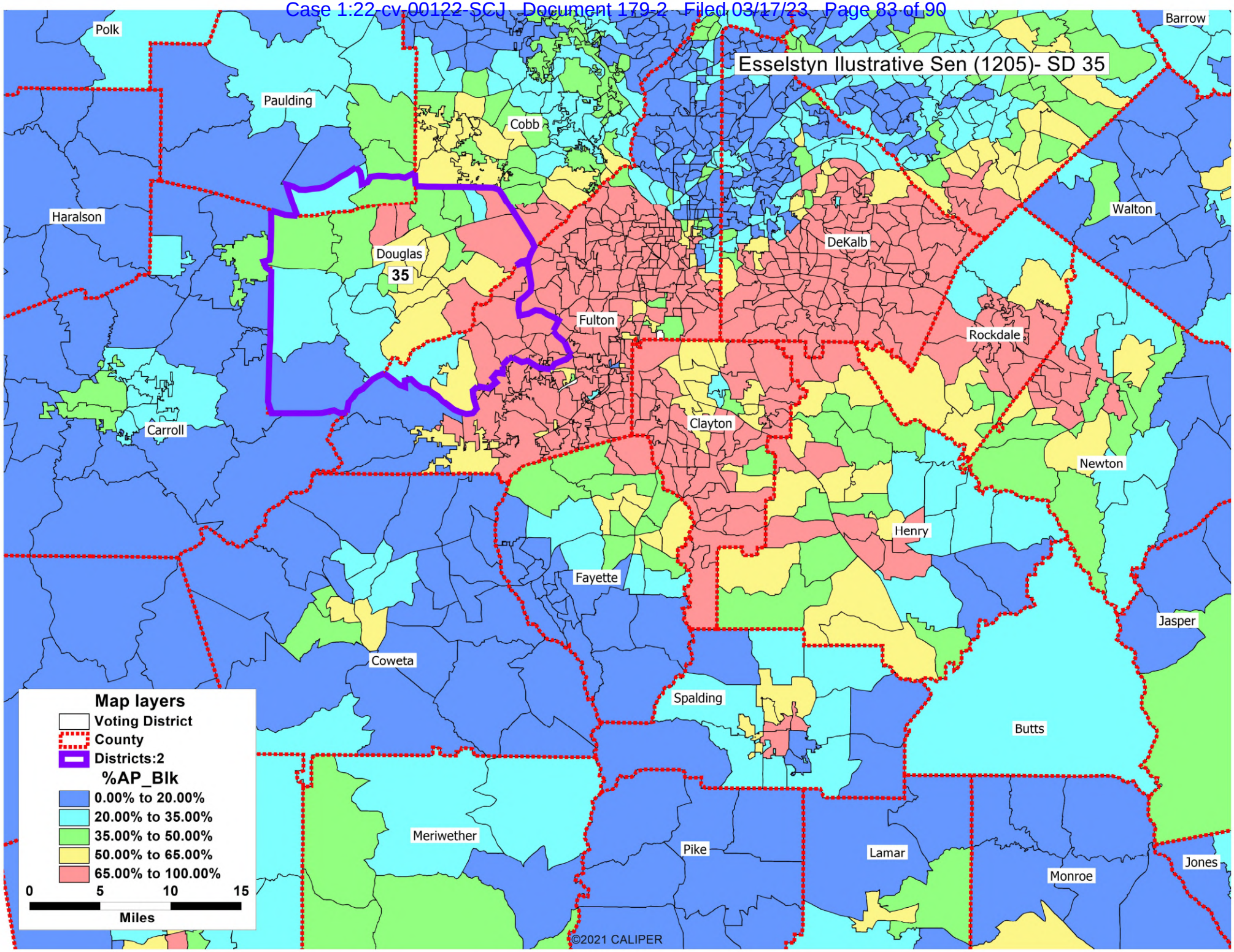

Esselstyn Ilustrative Sen (1205)- SD 35
Polk
Barrow
Paulding
Cobb
Haralson
Walton
Douglas
35
DeKalb
Fulton
Rockdale
Carroll
Clayton
Newton
Henry
Fayette
Jasper
Coweta
Spalding
Butts
Meriwether
Pike
Lamar
Jones
Monroe
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 25

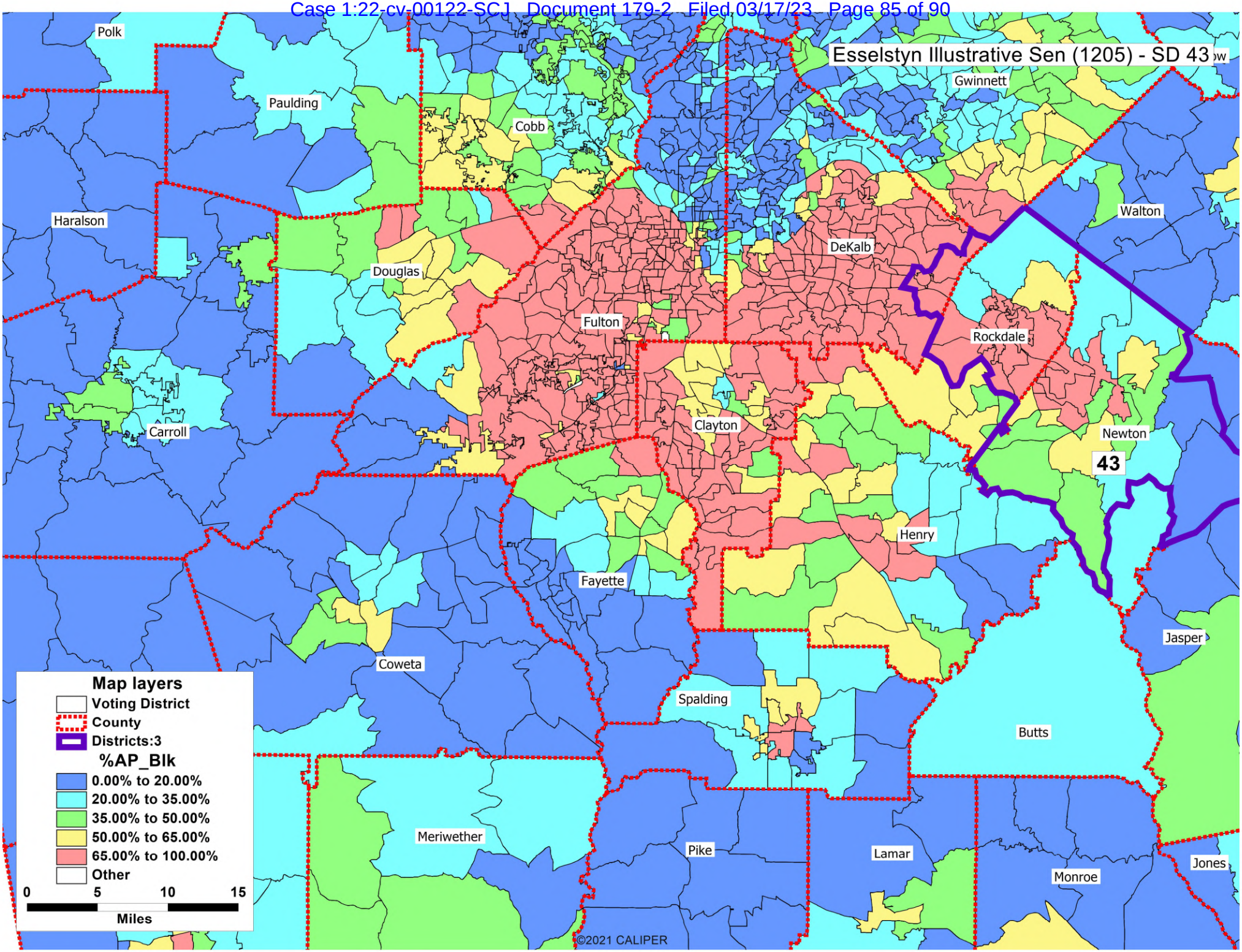

Esselstyn Illustrative Sen (1205) - SD 43
Polk
Paulding
Cobb
Gwinnett
Haralson
Douglas
Fulton
DeKalb
Walton
Rockdale
Carroll
Clayton
Newton
43
Henry
Fayette
Jasper
Coweta
Spalding
Butts
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
Districts:3
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 26

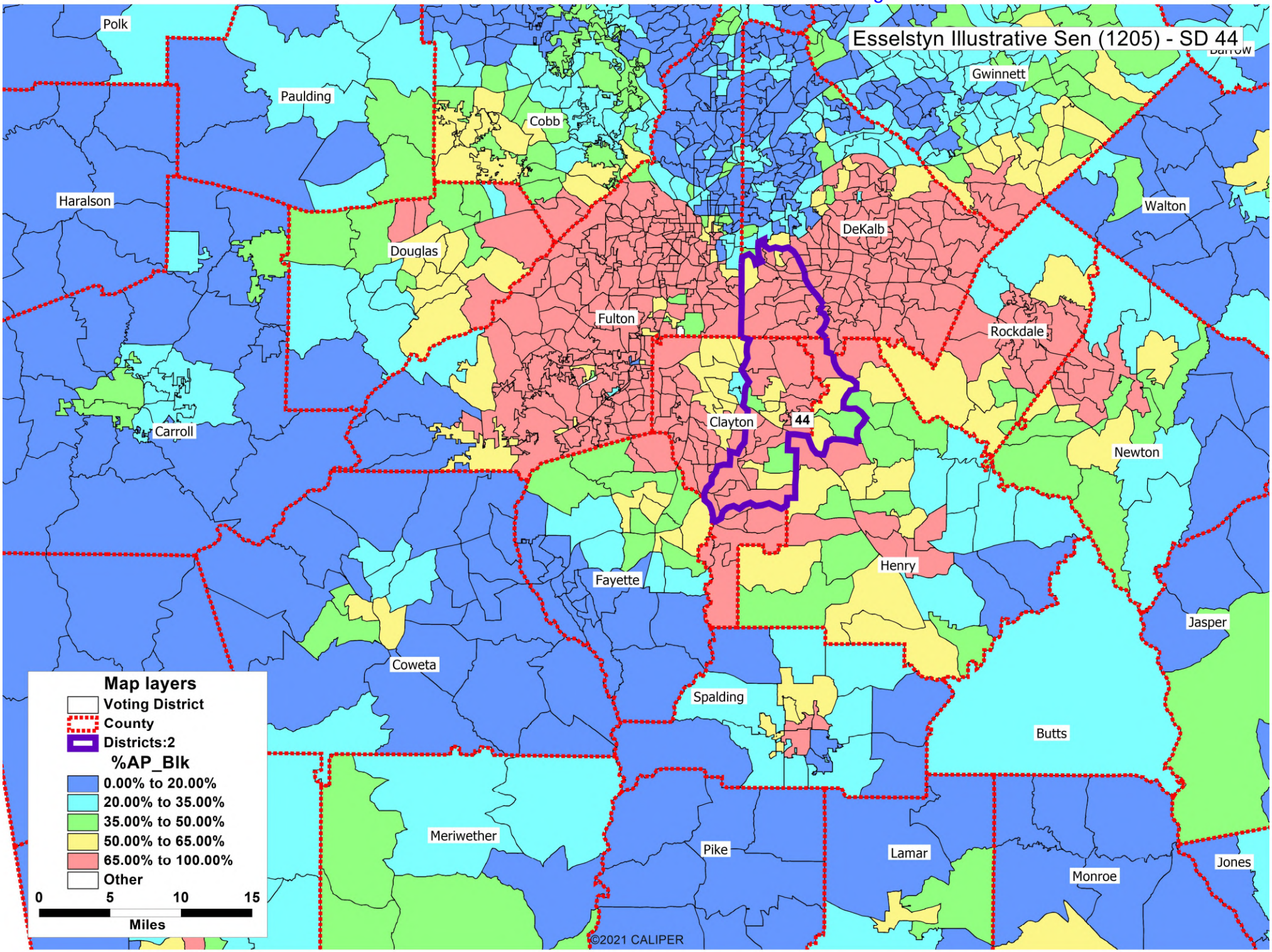

Esselstyn Illustrative Sen (1205) - SD 44
Polk
Paulding
Cobb
Gwinnett
Haralson
Douglas
DeKalb
Walton
Fulton
Rockdale
Carroll
Clayton
44
Newton
Henry
Fayette
Jasper
Coweta
Spalding
Butts
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 27

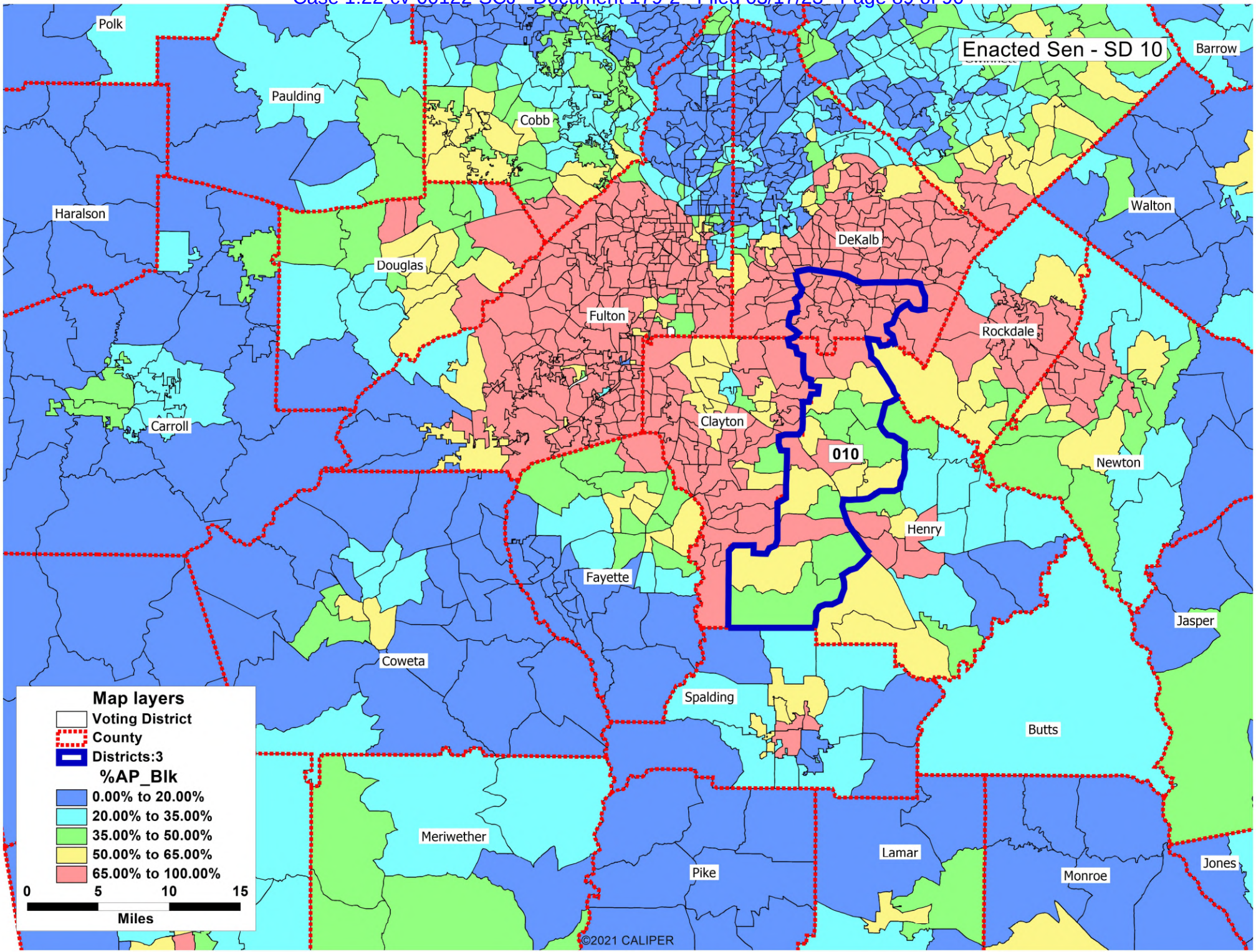

Enacted Sen - SD 10
Polk
Paulding
Cobb
Barrow
Haralson
Douglas
Fulton
DeKalb
Walton
Rockdale
Carroll
Clayton
010
Newton
Henry
Fayette
Jasper
Coweta
Spalding
Butts
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
Districts:3
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 28

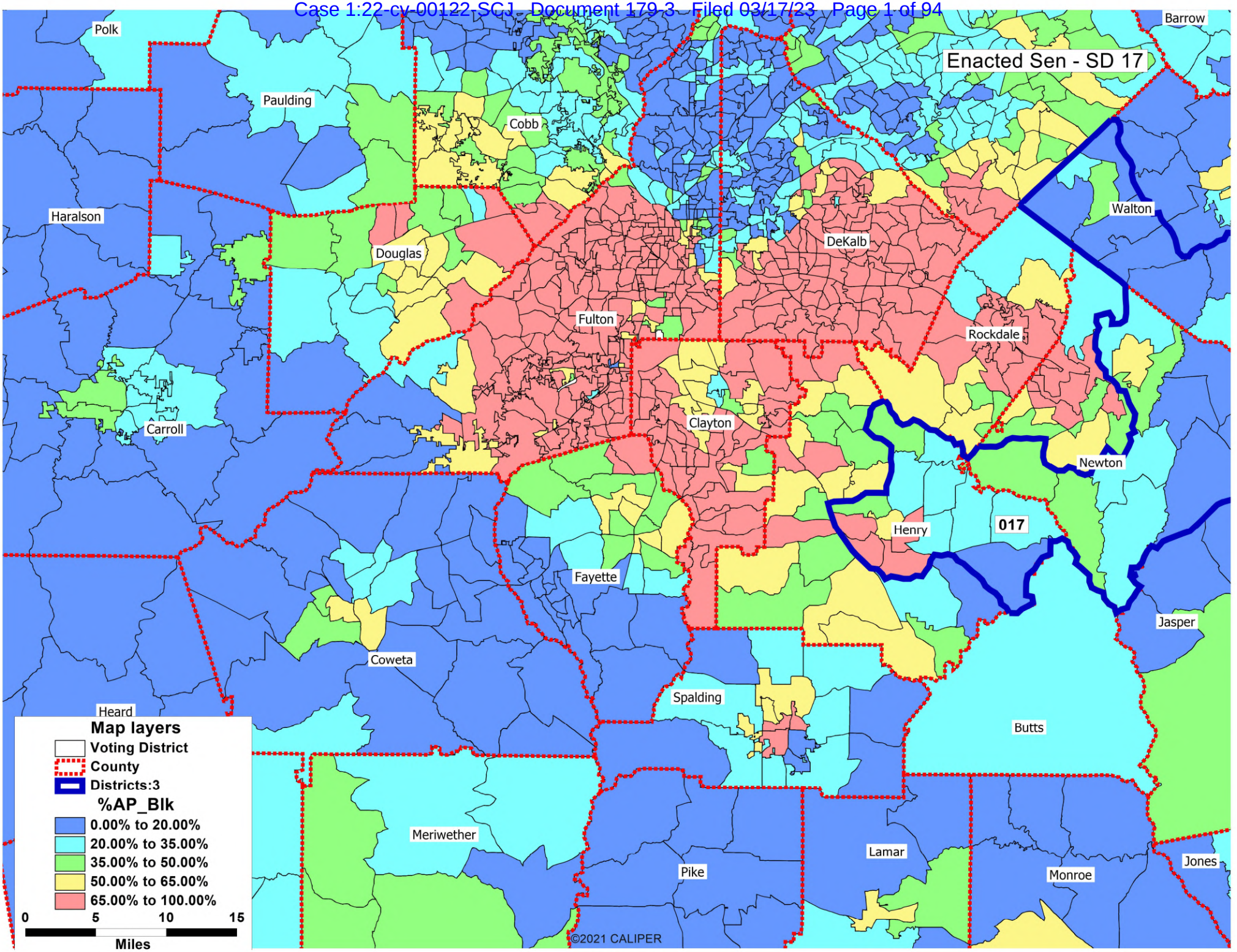

Enacted Sen - SD 17
Polk
Barrow
Paulding
Cobb
Haralson
Walton
Douglas
DeKalb
Fulton
Rockdale
Carroll
Clayton
Newton
Henry
017
Fayette
Jasper
Coweta
Spalding
Heard
Butts
Meriwether
Lamar
Pike
Monroe
Jones
Map layers
Voting District
County
Districts:3
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 29

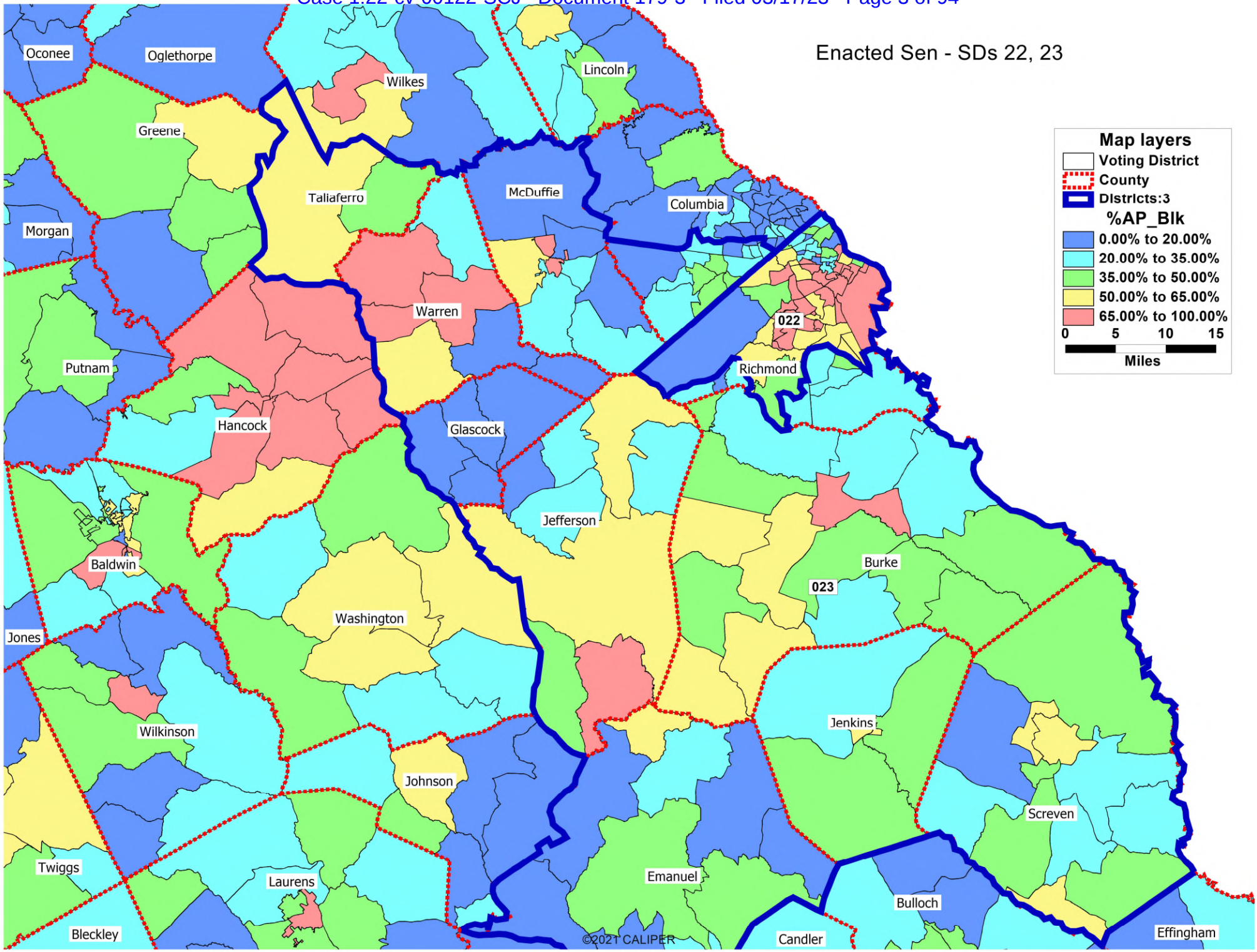

Enacted Sen - SDs 22, 23
Map layers
Voting District
County
Districts:3
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0 5 10 15
Miles
Oconee
Oglethorpe
Wilkes
Lincoln
Greene
Taliaferro
McDuffie
Columbia
Morgan
Warren
022
Putnam
Richmond
Hancock
Glascock
Jefferson
Baldwin
Burke
023
Washington
Jones
Wilkinson
Jenkins
Johnson
Screven
Twiggs
Laurens
Emanuel
Bulloch
Bleckley
Candler
Effingham
©2021 CALIPER

EXHIBIT 30

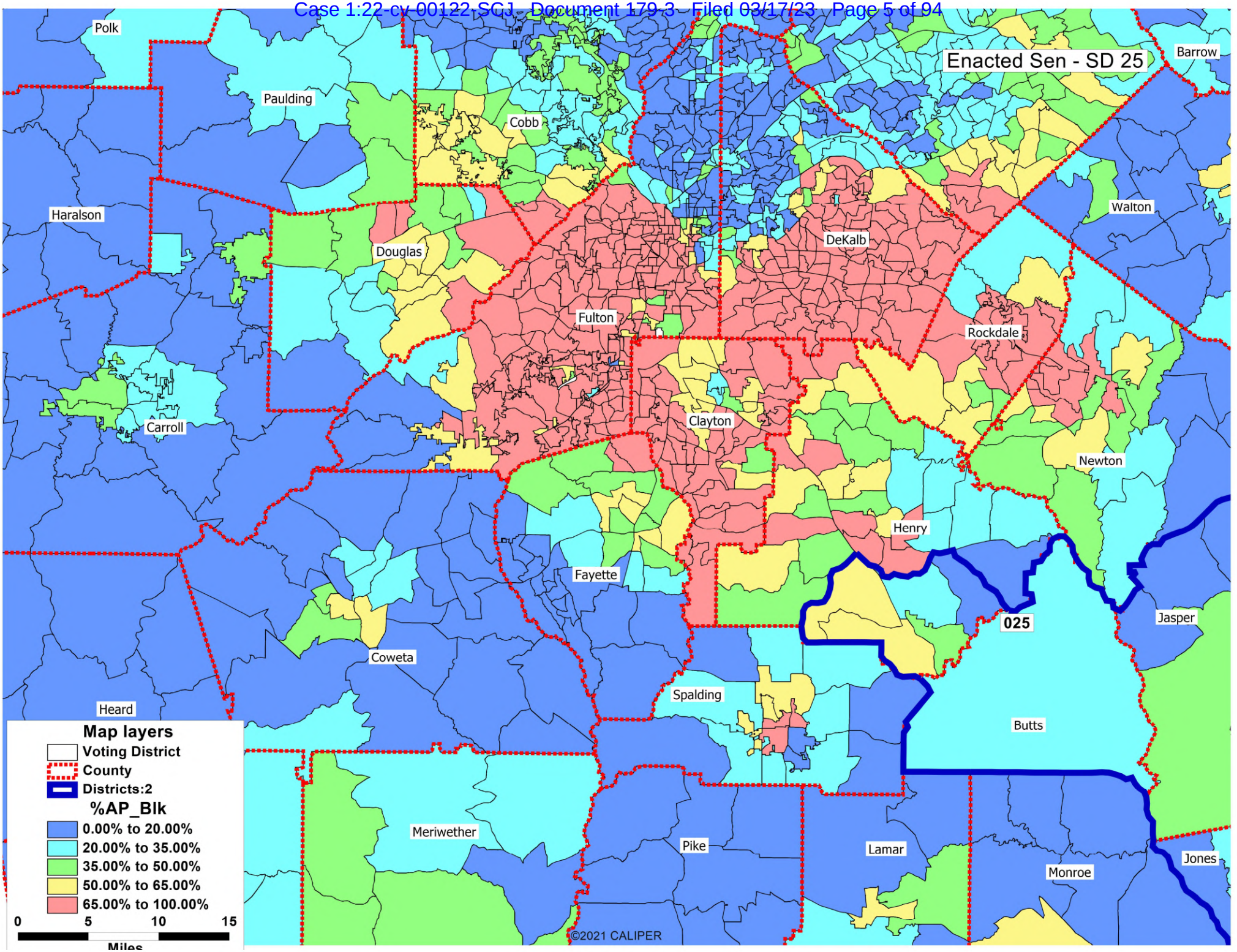

Enacted Sen - SD 25
Polk
Paulding
Cobb
Barrow
Haralson
Douglas
DeKalb
Walton
Fulton
Rockdale
Carroll
Clayton
Newton
Henry
Fayette
025
Jasper
Coweta
Spalding
Heard
Butts
Meriwether
Pike
Lamar
Monroe
Jones
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 31

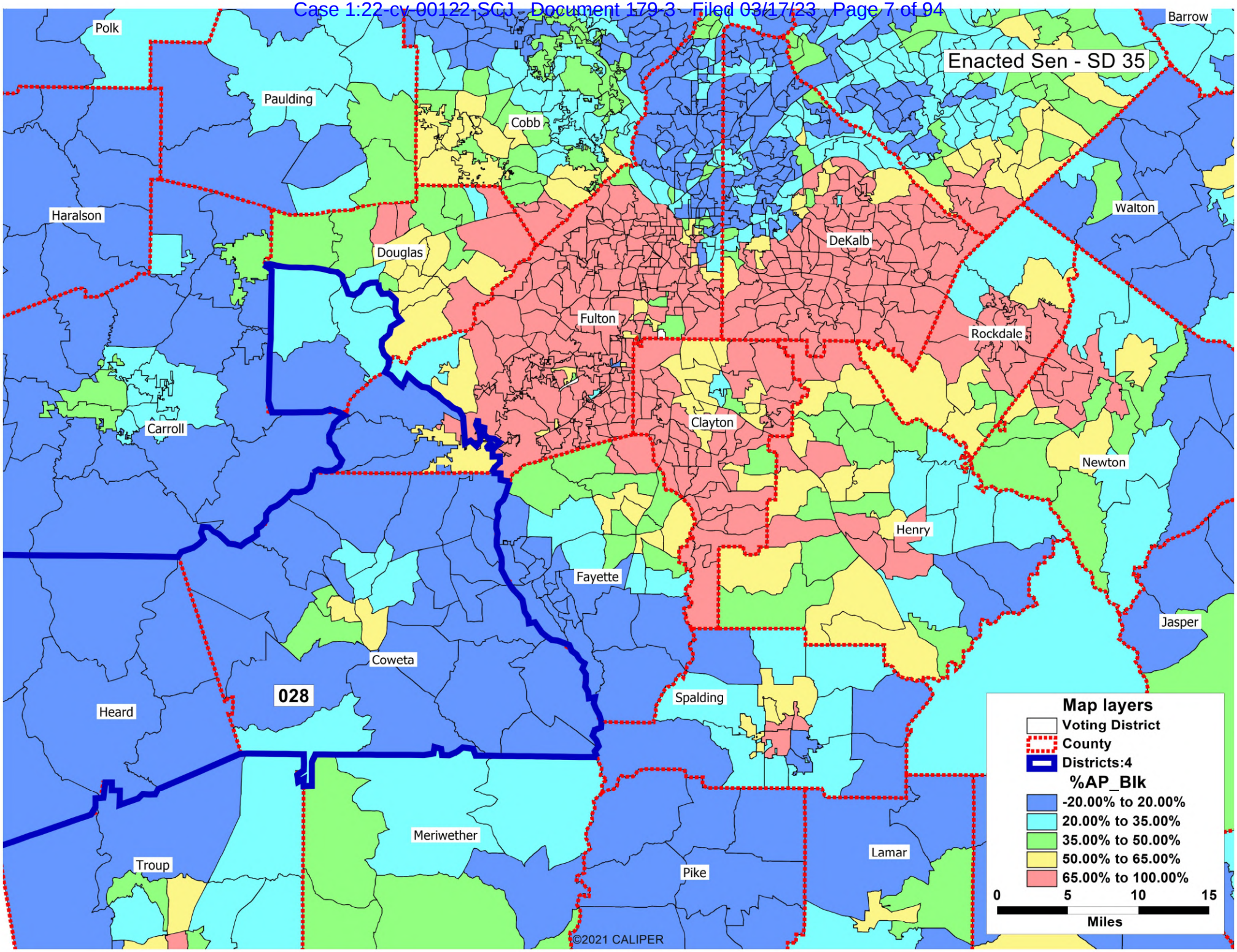

Enacted Sen - SD 35
Polk
Barrow
Paulding
Cobb
Haralson
Walton
Douglas
DeKalb
Fulton
Rockdale
Carroll
Clayton
Newton
Henry
Fayette
Jasper
Coweta
028
Heard
Spalding
Meriwether
Troup
Pike
Lamar
Map layers
Voting District
County
Districts:4
%AP_Blk
-20.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 32

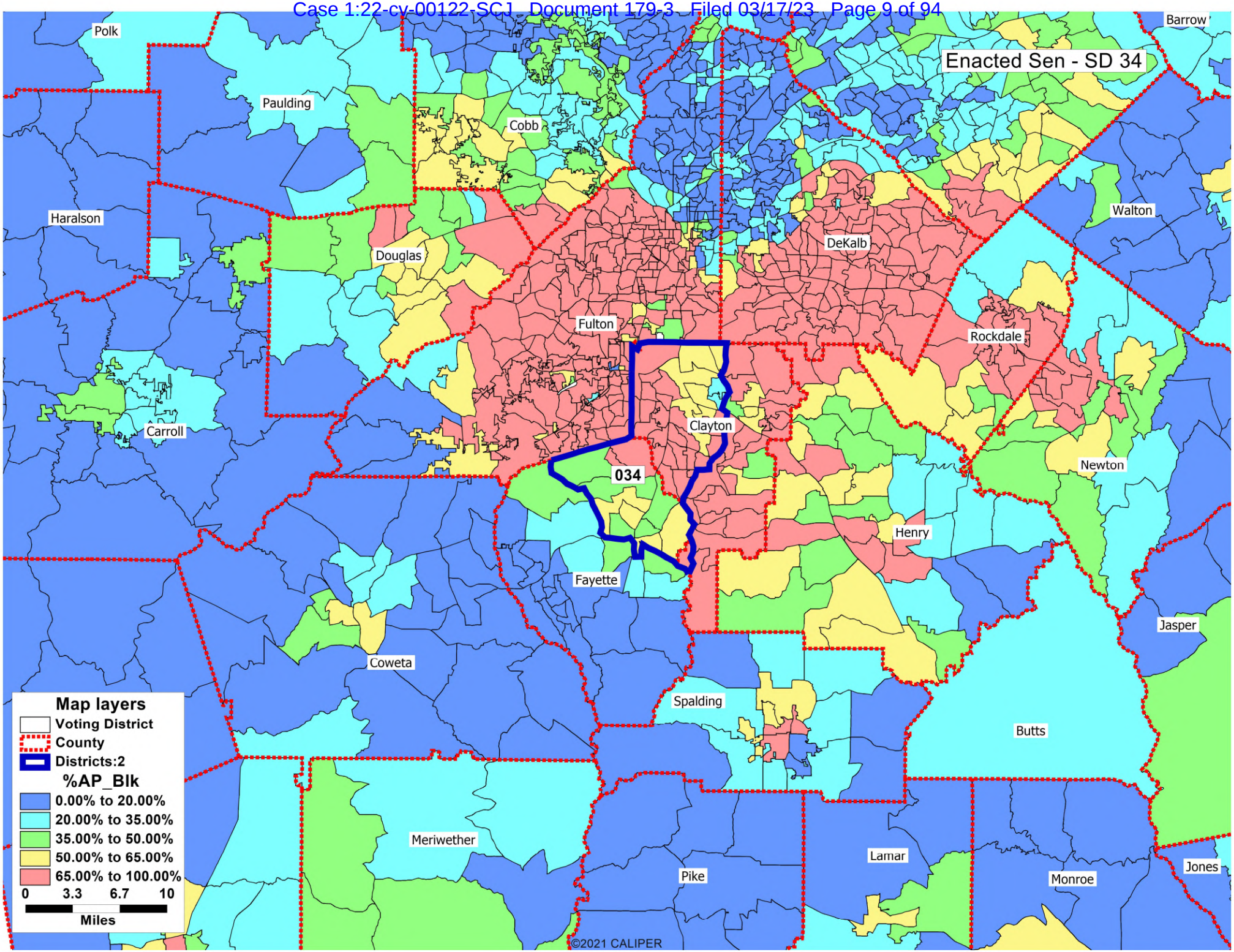

Enacted Sen - SD 34
Polk
Barrow
Paulding
Cobb
Haralson
Walton
Douglas
DeKalb
Fulton
Rockdale
Carroll
Clayton
034
Newton
Henry
Fayette
Jasper
Coweta
Spalding
Butts
Meriwether
Lamar
Pike
Monroe
Jones
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0 3.3 6.7 10
Miles
©2021 CALIPER

EXHIBIT 33

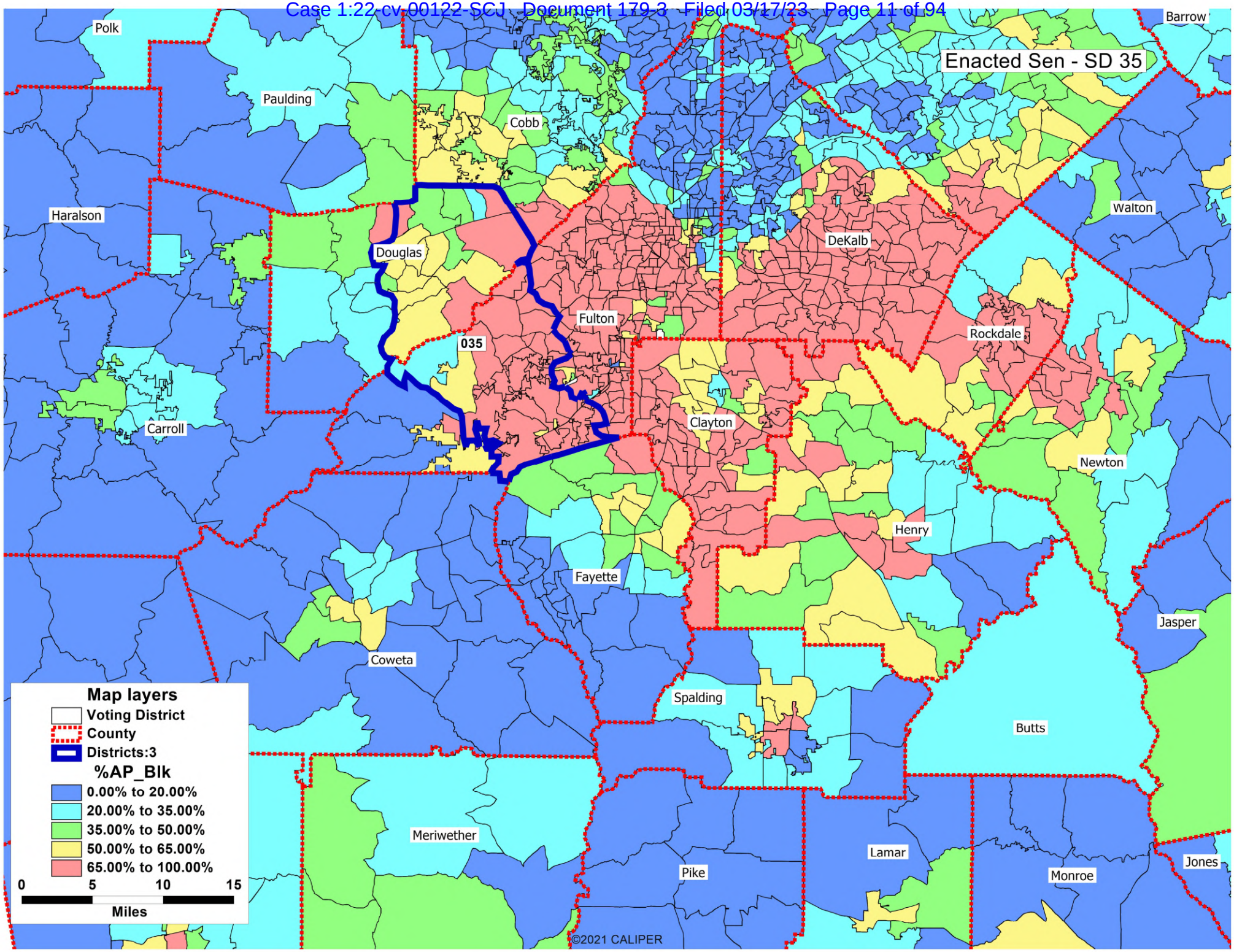

Enacted Sen - SD 35
Polk
Barrow
Paulding
Cobb
Haralson
Walton
Douglas
DeKalb
Fulton
035
Rockdale
Carroll
Clayton
Newton
Henry
Fayette
Jasper
Coweta
Spalding
Butts
Meriwether
Lamar
Jones
Pike
Monroe
Map layers
Voting District
County
Districts:3
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0 5 10 15
Miles
©2021 CALIPER

EXHIBIT 34

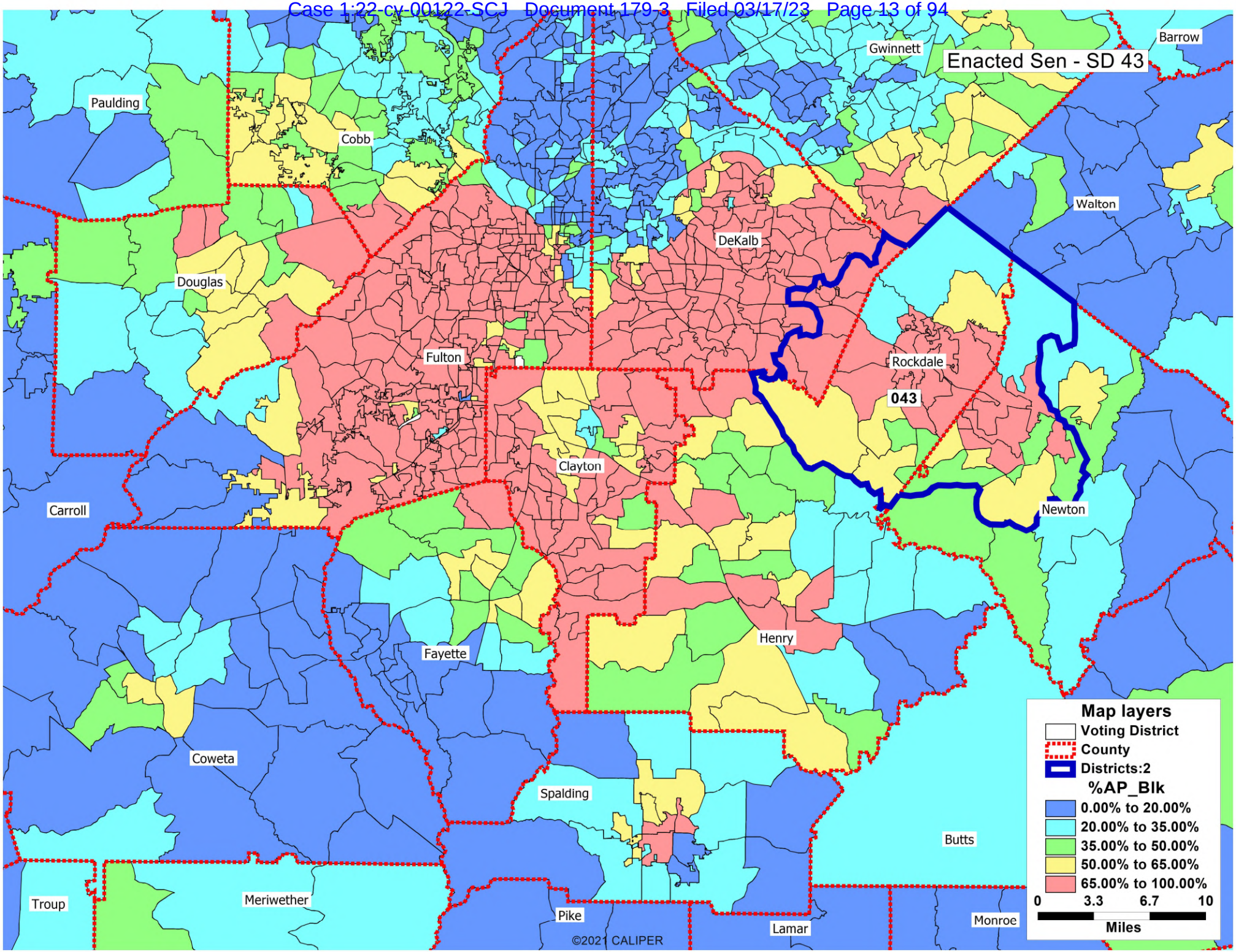

Enacted Sen - SD 43
Barrow
Gwinnett
Paulding
Cobb
Walton
DeKalb
Douglas
Fulton
Rockdale
043
Clayton
Carroll
Newton
Henry
Fayette
Coweta
Spalding
Butts
Troup
Meriwether
Pike
Lamar
Monroe
©2021 CALIPER
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0 3.3 6.7 10
Miles

EXHIBIT 35

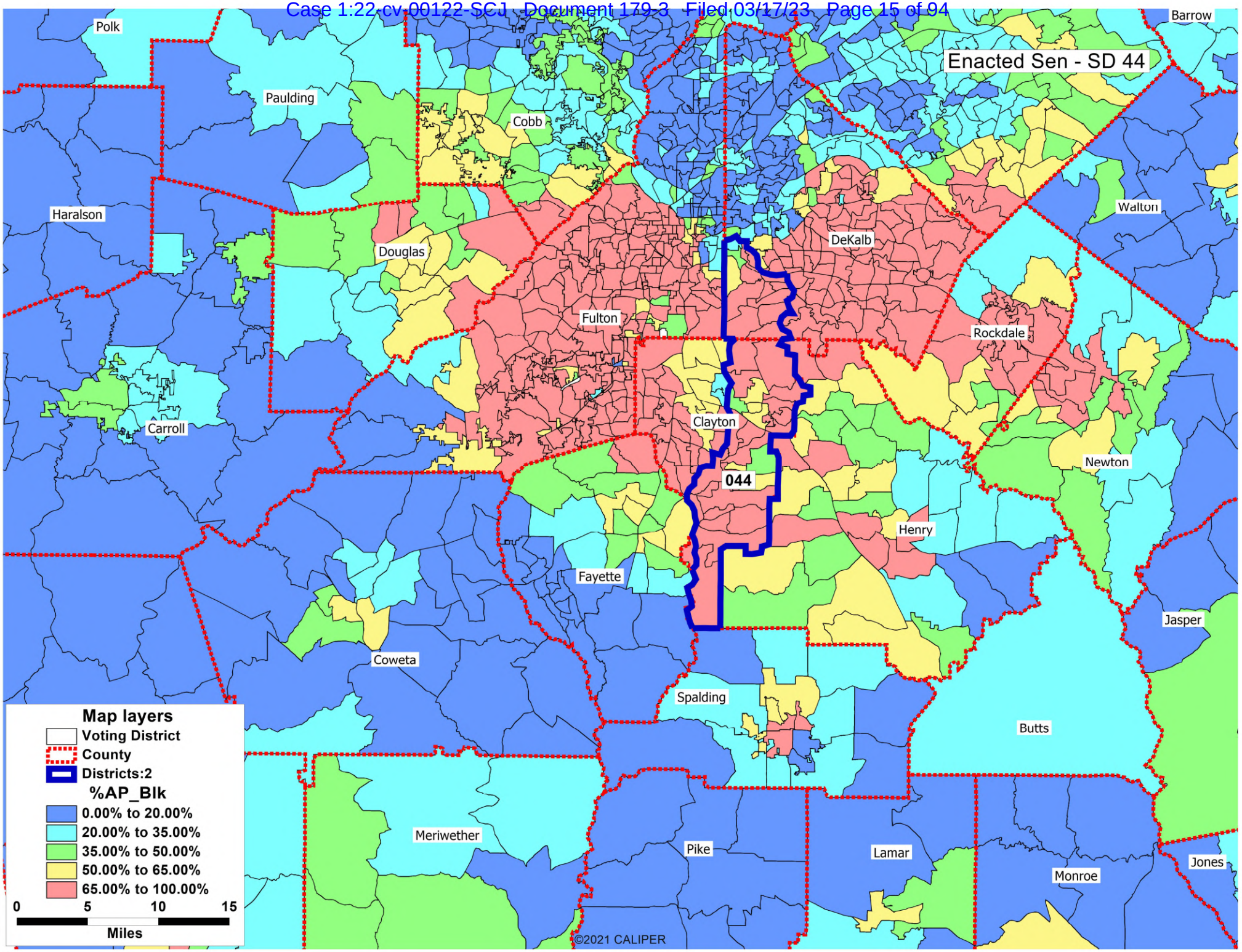

Enacted Sen - SD 44
Polk
Barrow
Paulding
Cobb
Haralson
Walton
Douglas
DeKalb
Fulton
Rockdale
Carroll
Clayton
Newton
044
Henry
Fayette
Jasper
Coweta
Spalding
Butts
Meriwether
Pike
Lamar
Jones
Monroe
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
0
5
10
15
Miles
©2021 CALIPER

EXHIBIT 36

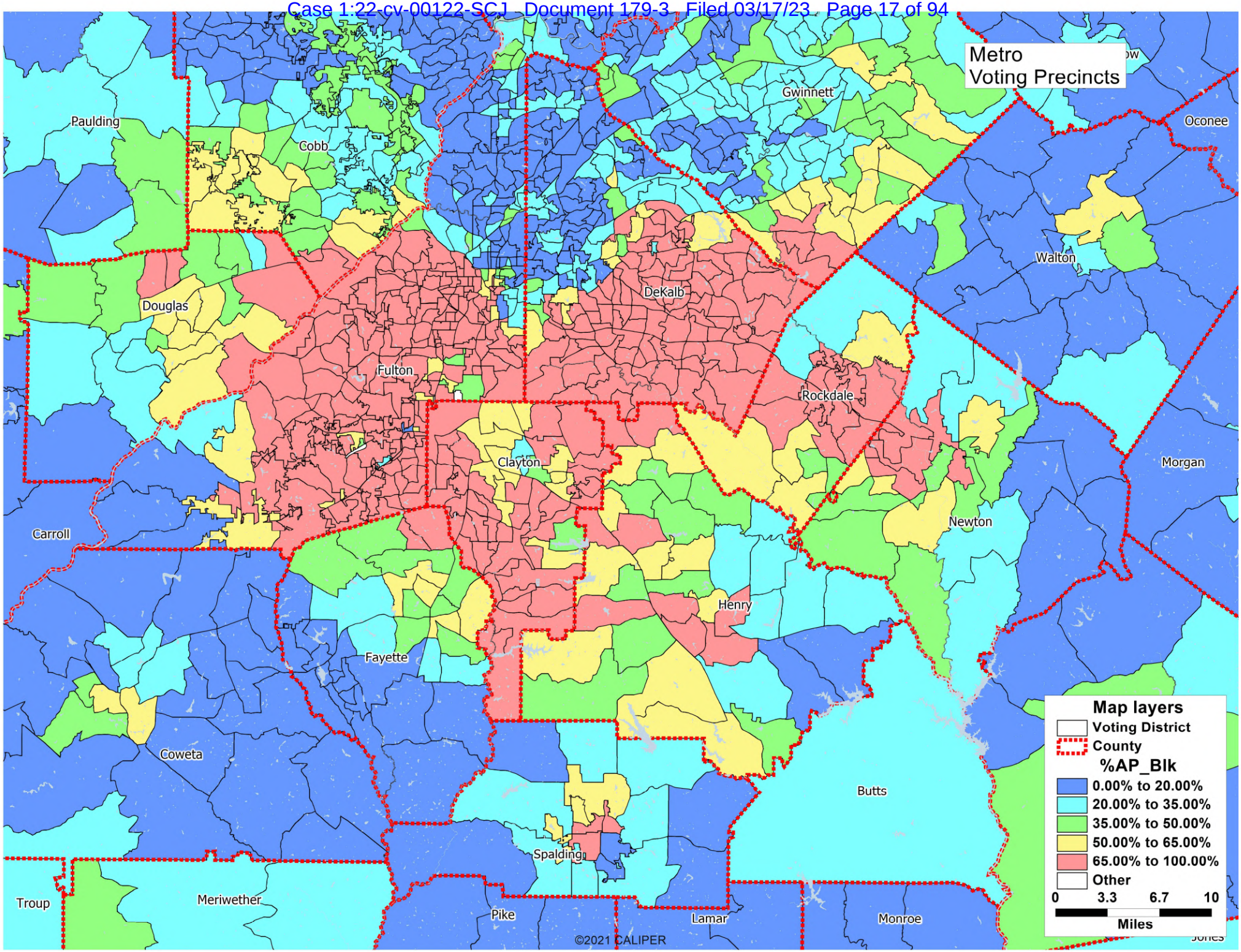
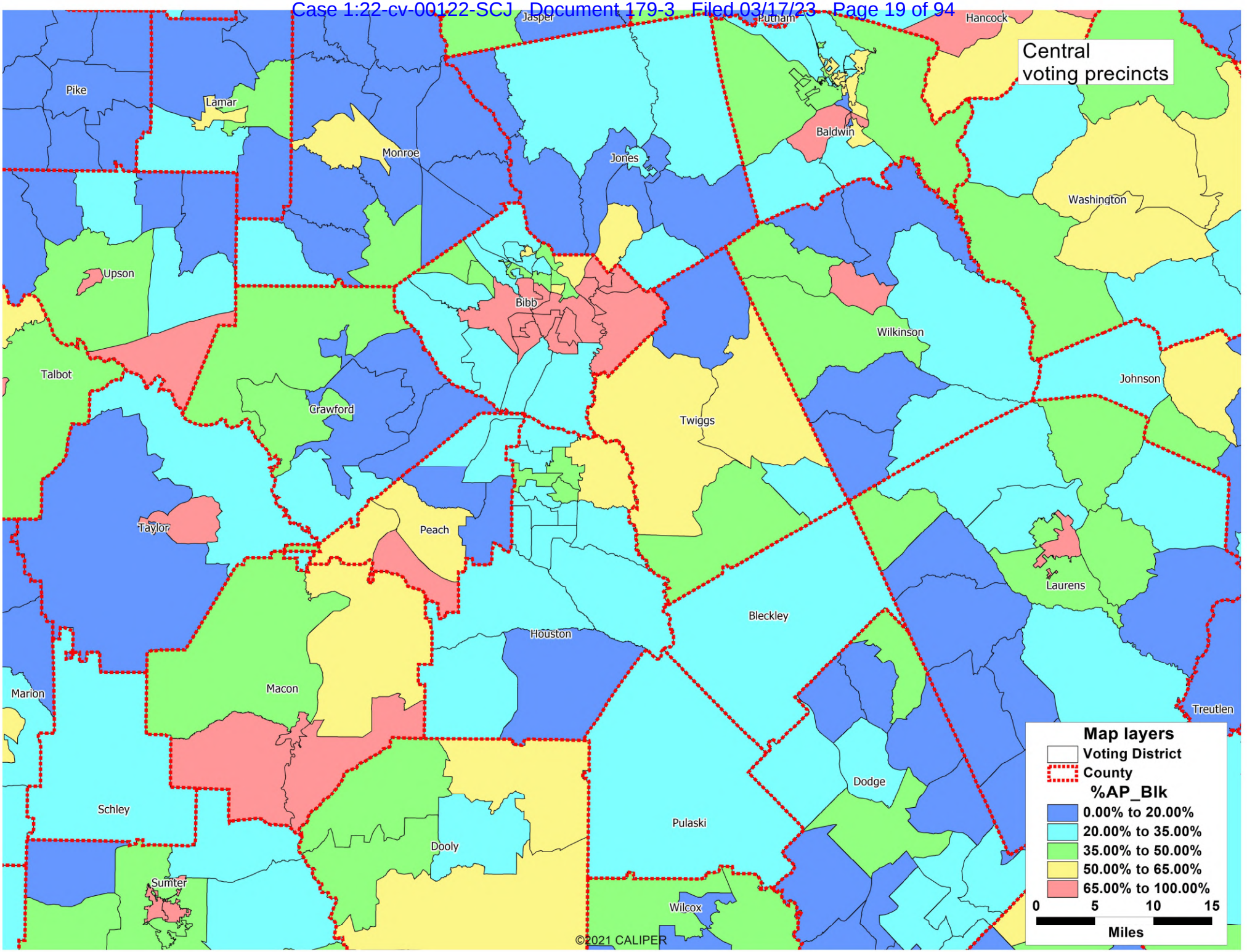

Metro
Voting Precincts
Paulding
Cobb
Gwinnett
Oconee
Walton
Douglas
DeKalb
Fulton
Rockdale
Clayton
Morgan
Carroll
Newton
Henry
Fayette
Coweta
Butts
Spalding
Troup
Meriwether
Pike
Lamar
Monroe
©2021 CALIPER
Map layers
Voting District
County
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
35.00% to 50.00%
50.00% to 65.00%
65.00% to 100.00%
Other
0 3.3 6.7 10
Miles

EXHIBIT 37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Putnam
Hancock
Pike
Lamar
Monroe
Jones
Baldwin
Washington
Upson
Bibb
Wilkinson
Talbot
Crawford
Twiggs
Johnson
Taylor
Peach
Laurens
Bleckley
Houston
Marion
Macon
Treutlen
Dodge
Schley
Pulaski
Dooly
Sumter
Wilcox
©2021 CALIPER
Map layers
Voting District
County
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0.00% to 20.00%
20.00% to 35.00%
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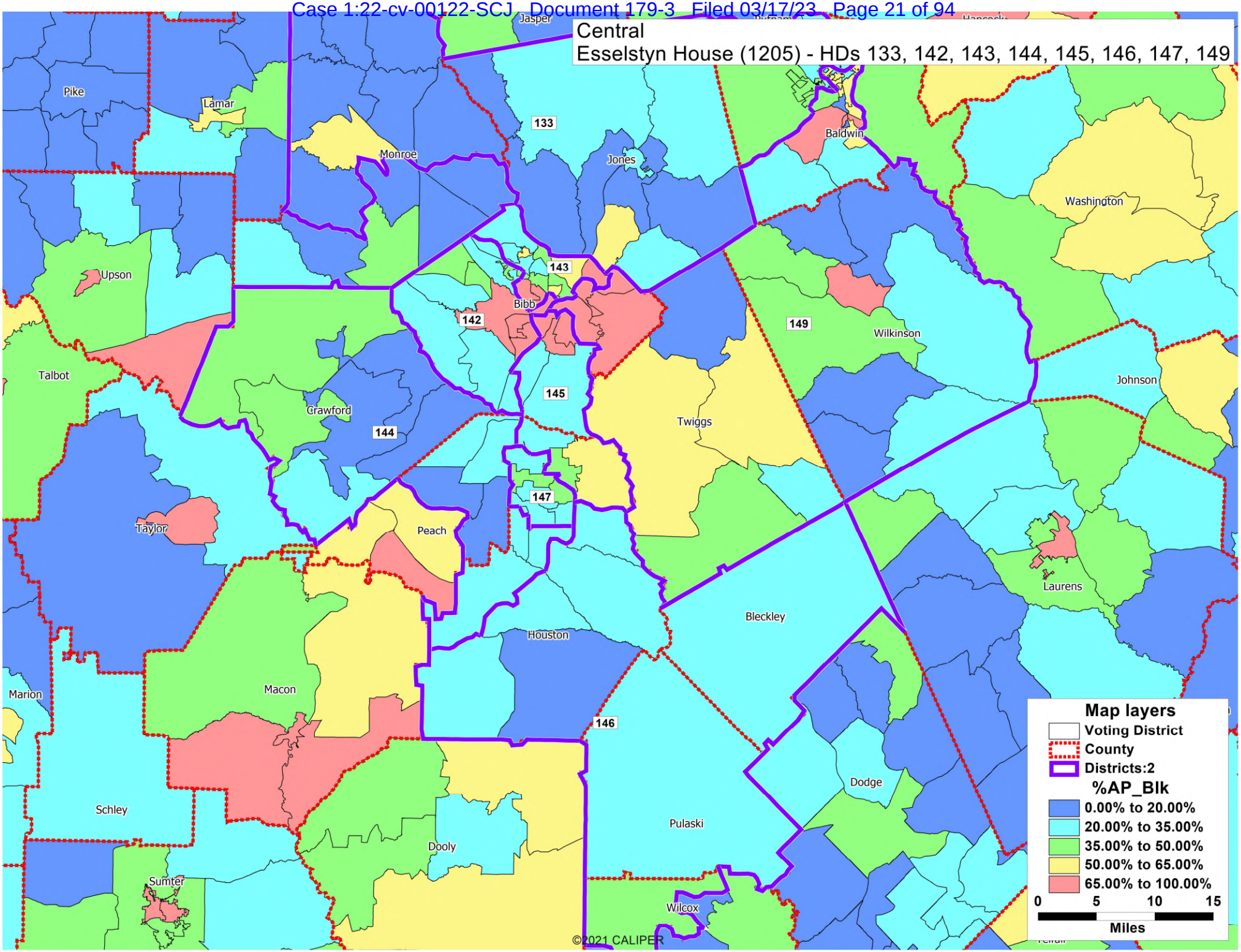
EXHIBIT 38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Esselstyn House (1205) - HDs 133, 142, 143, 144, 145, 146, 147, 149
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Lamar
Monroe
Jasper
Jones
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Washington
Upson
Bibb
Wilkinson
Talbot
Crawford
Twiggs
Johnson
Taylor
Peach
Laurens
Bleckley
Houston
Marion
Macon
Schley
Dodge
Pulaski
Dooly
Sumter
Wilcox
133
142
143
144
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Map layers
Voting District
County
Districts:2
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20.00% to 35.00%
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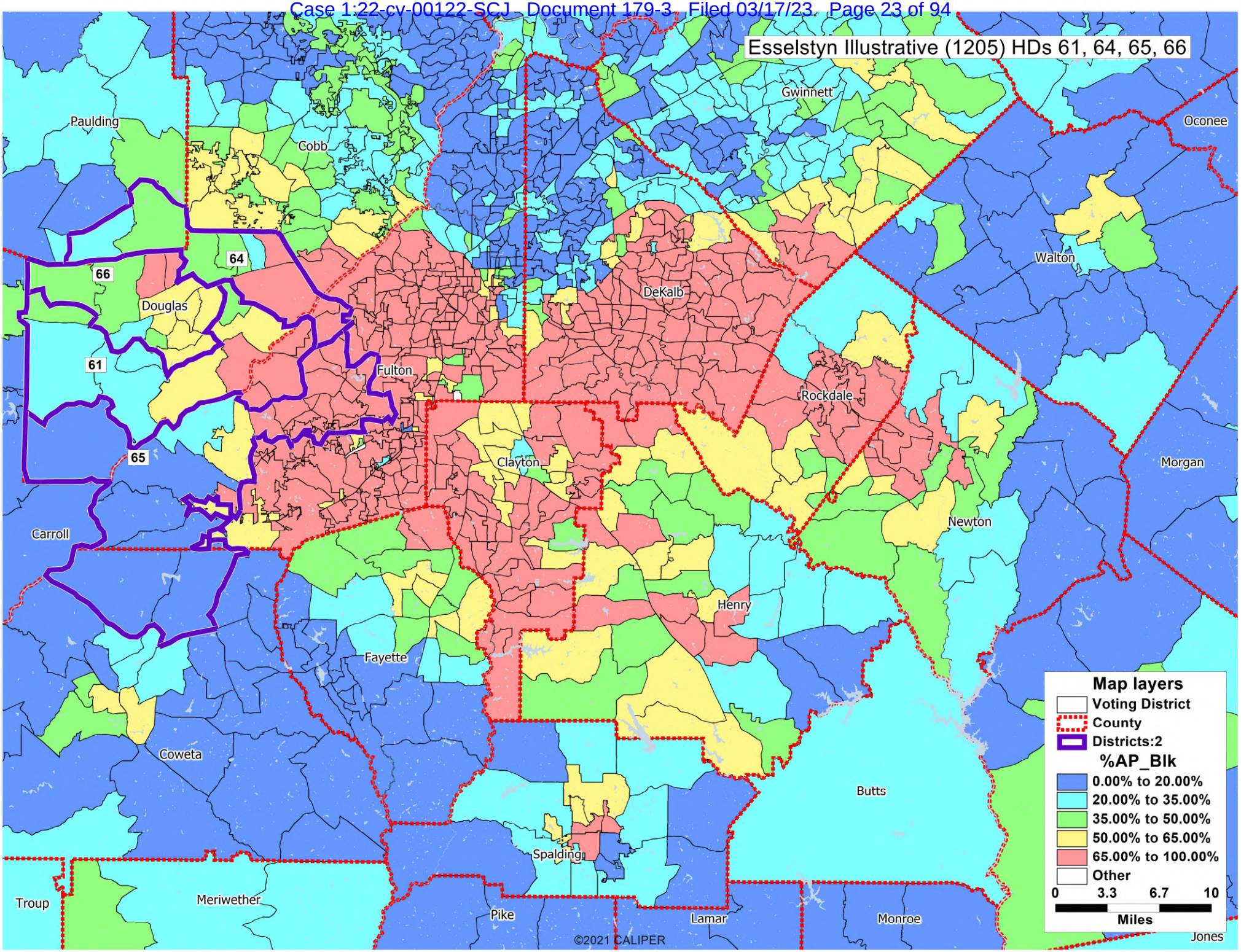
Miles
©2021 CALIPER

EXHIBIT 39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Morgan
Carroll
Newton
Henry
Fayette
Coweta
Butts
Spalding
Troup
Meriwether
Pike
Lamar
Monroe
Jones
66
64
61
65
©2021 CALIPER
Map layers
Voting District
County
Districts:2
%AP_Blk
0.00% to 20.00%
20.00% to 35.00%
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Other
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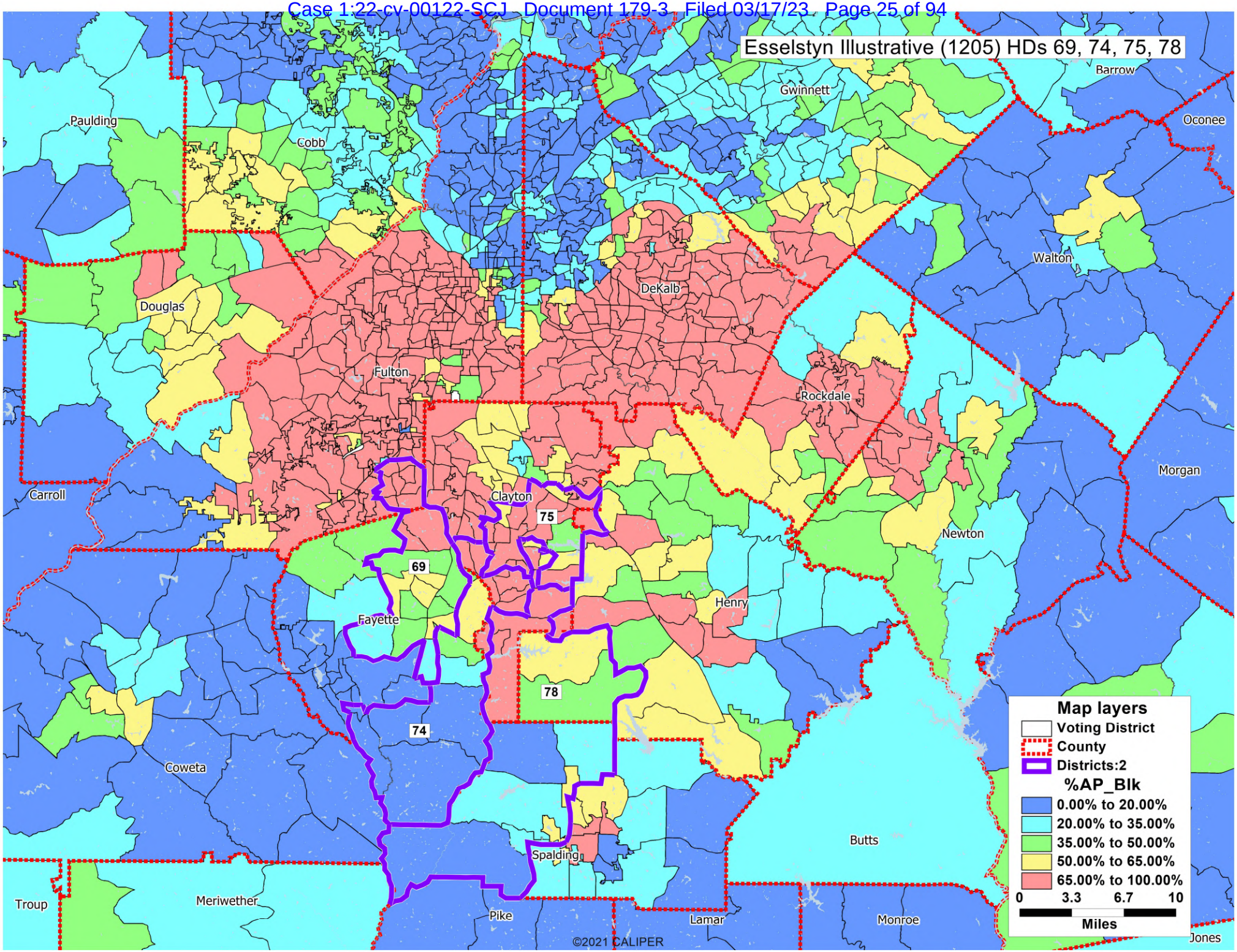
Miles

EXHIBIT 40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Barrow
Gwinnett
Paulding
Cobb
Oconee
Walton
DeKalb
Douglas
Fulton
Rockdale
Morgan
Carroll
Clayton
75
Newton
69
Henry
Fayette
78
74
Coweta
Butts
Spalding
Troup
Meriwether
Pike
Lamar
Monroe
Jones
©2021 CALIPER
Map layers
Voting District
County
Districts:2
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0.00% to 20.00%
20.00% to 35.00%
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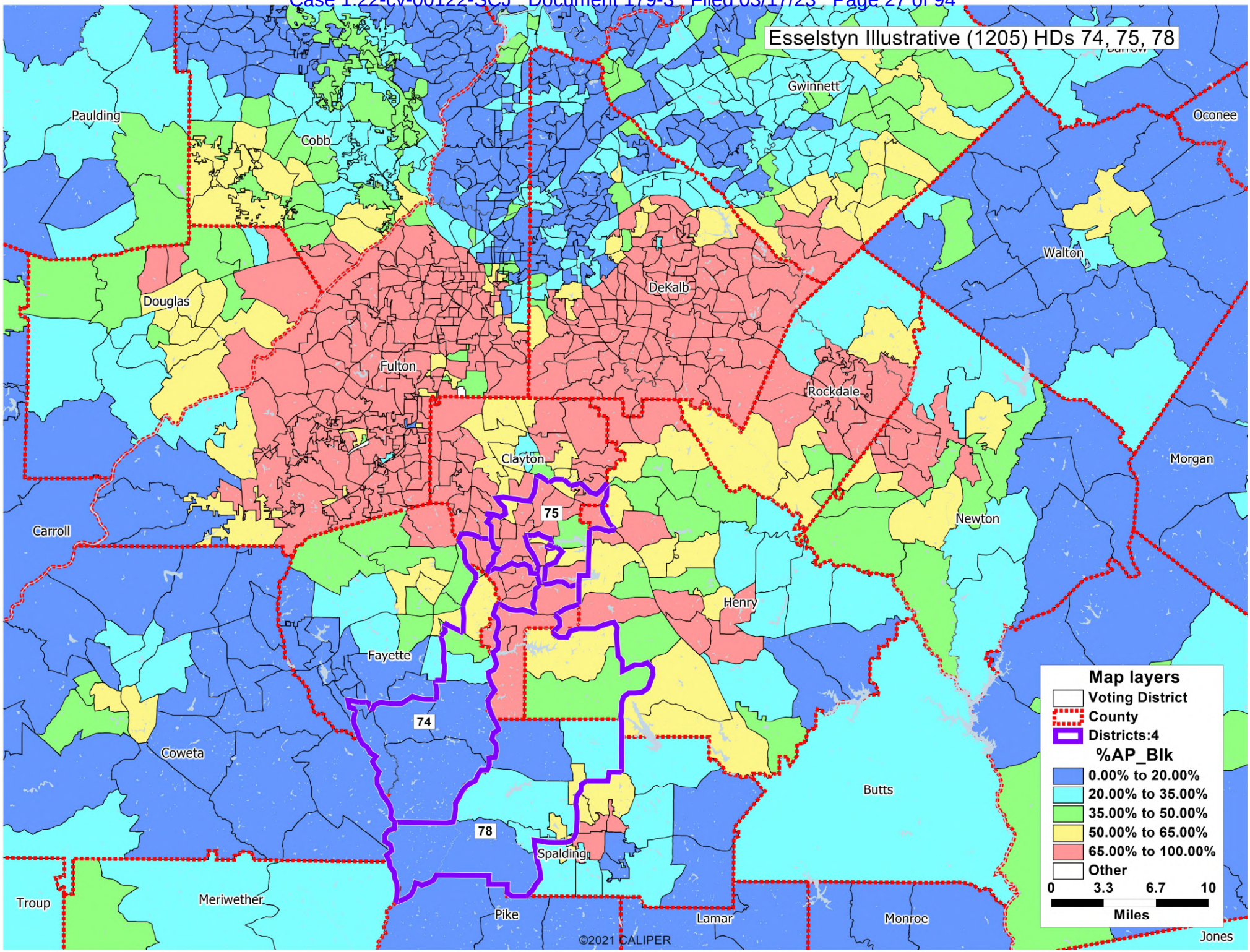
65.00% to 100.00%
0 3.3 6.7 10
Miles

EXHIBIT 41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Gwinnett
Oconee
Walton
Douglas
DeKalb
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Rockdale
Clayton
Morgan
Carroll
75
Newton
Henry
Fayette
74
Coweta
Butts
78
Spalding
Troup
Meriwether
Pike
Lamar
Monroe
Jones
©2021 CALIPER
Map layers
Voting District
County
Districts:4
%AP_Blk
0.00% to 20.00%
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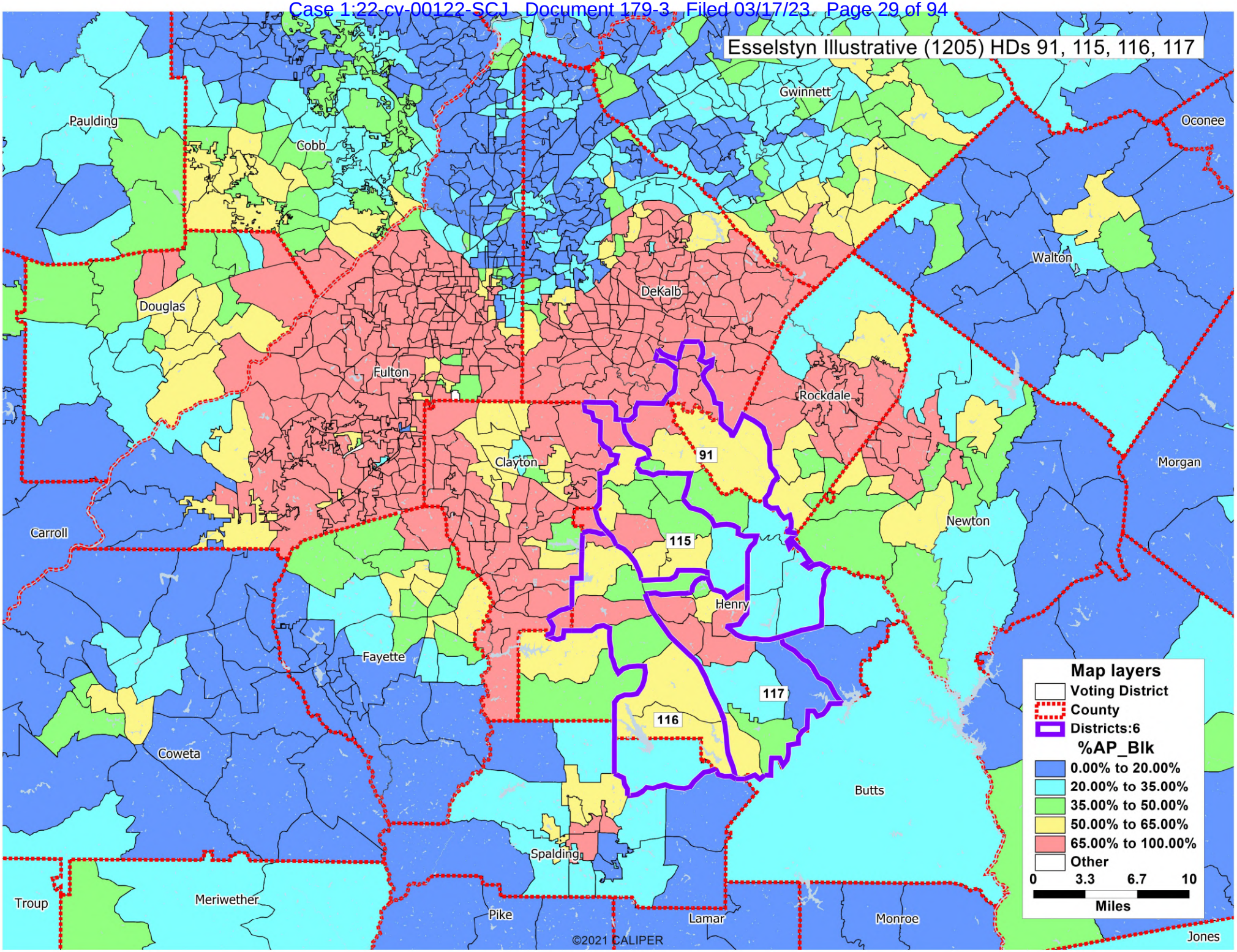
Other
0 3.3 6.7 10
Miles

EXHIBIT 42


Esselstyn Illustrative (1205) HDs 91, 115, 116, 117
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Cobb
Gwinnett
Oconee
Walton
Douglas
DeKalb
Fulton
Rockdale
91
Clayton
Morgan
Carroll
115
Newton
Henry
Fayette
117
116
Coweta
Butts
Spalding
Troup
Meriwether
Pike
Lamar
Monroe
Jones
©2021 CALIPER
Map layers
Voting District
County
Districts:6
%AP_Blk
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Other
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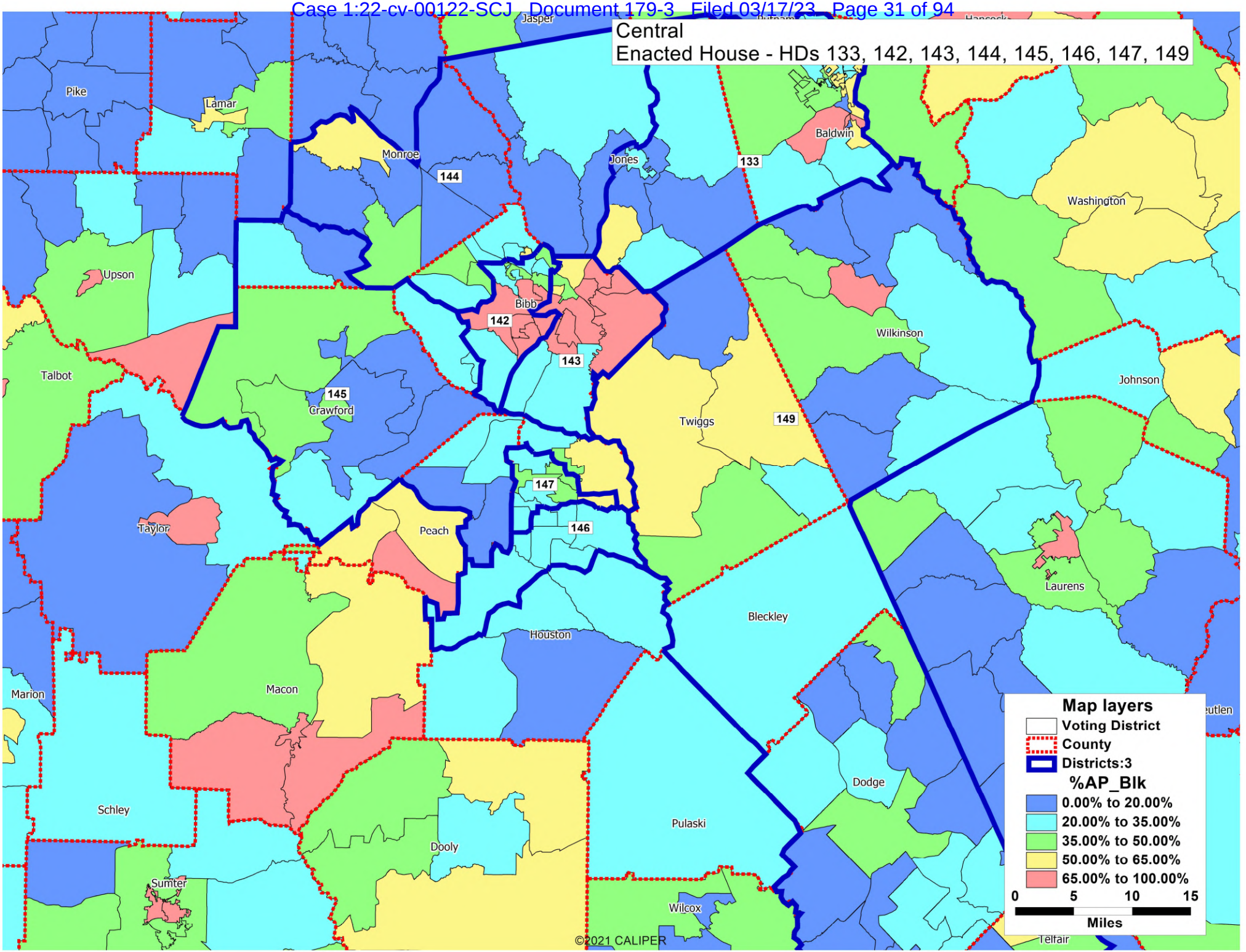
Miles

EXHIBIT 43


Central
Enacted House - HDs 133, 142, 143, 144, 145, 146, 147, 149
Jasper
Pike
Lamar
Monroe
144
Jones
133
Baldwin
Washington
Upson
Bibb
142
143
Wilkinson
Talbot
145
Crawford
Twiggs
149
Johnson
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Taylor
Peach
146
Laurens
Bleckley
Houston
Marion
Macon
Dodge
Schley
Pulaski
Dooly
Sumter
Wilcox
Telfair
©2021 CALIPER
Map layers
Voting District
County
Districts:3
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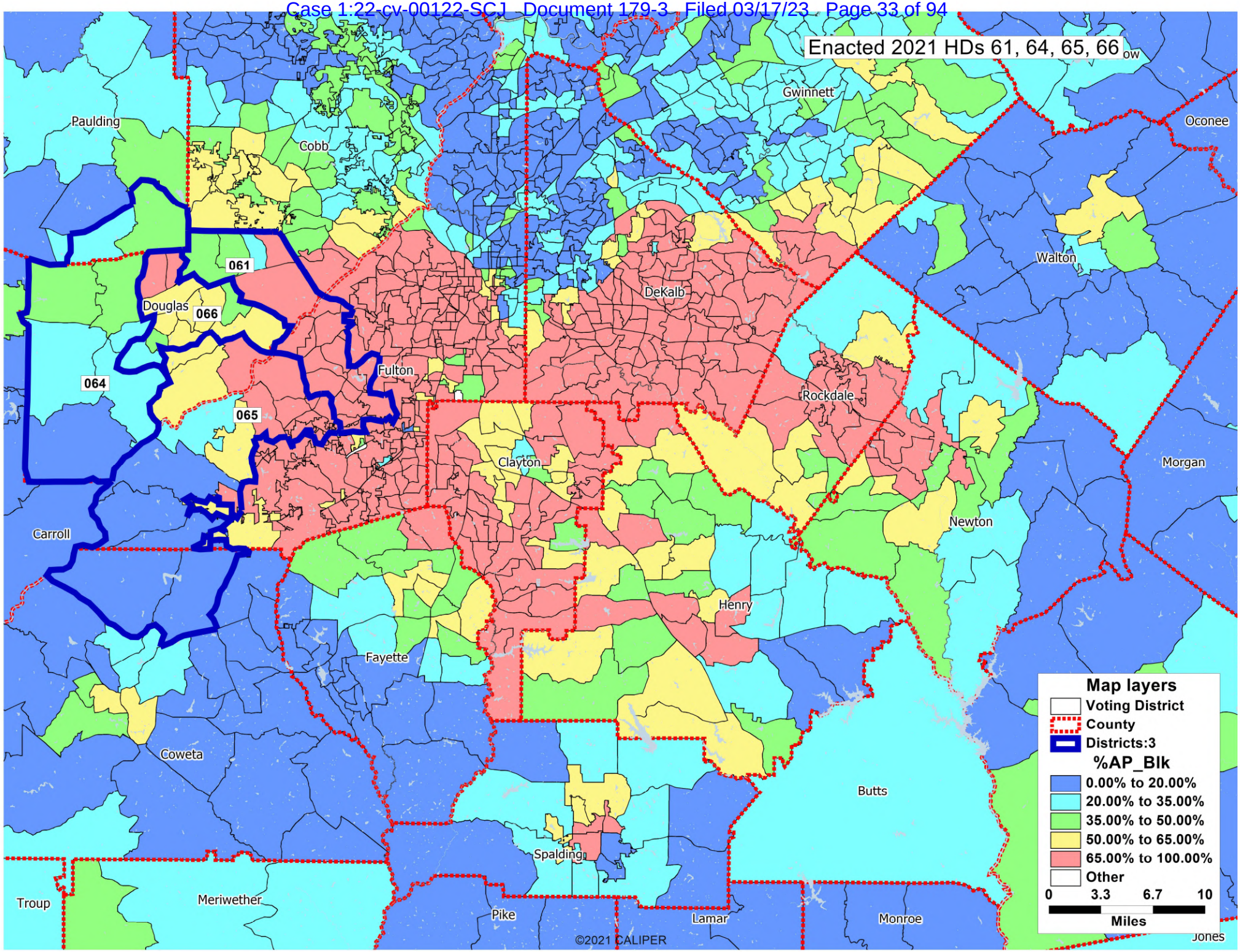
EXHIBIT 44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Paulding
Cobb
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Oconee
Walton
DeKalb
Douglas
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066
064
065
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Rockdale
Clayton
Morgan
Carroll
Newton
Henry
Fayette
Coweta
Butts
Spalding
Troup
Meriwether
Pike
Lamar
Monroe
Jones
©2021 CALIPER
Map layers
Voting District
County
Districts:3
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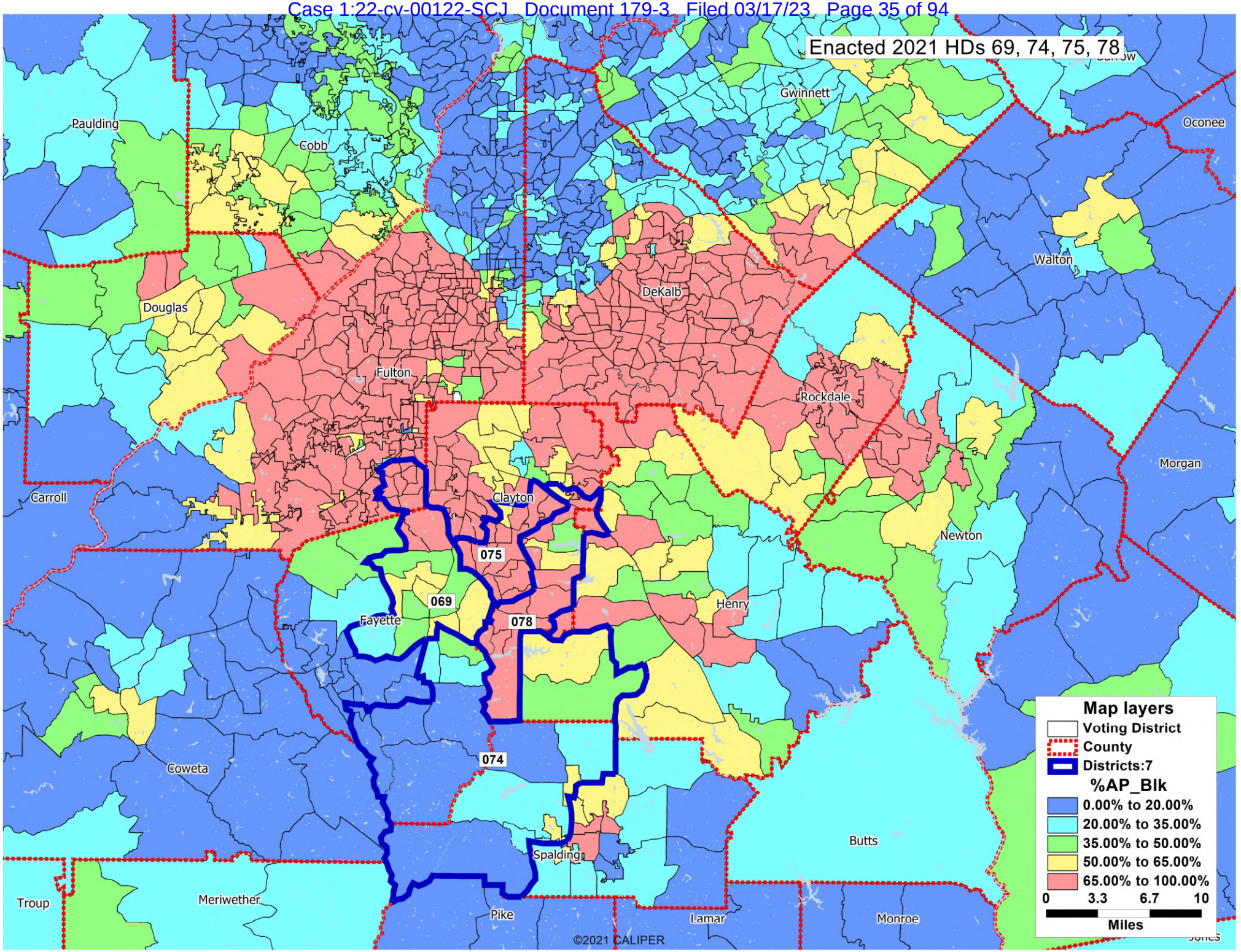
EXHIBIT 45


Enacted 2021 HDs 69, 74, 75, 78
Paulding
Cobb
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Rockdale
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Clayton
075
Newton
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Henry
Fayette
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074
Coweta
Butts
Spalding
Troup
Meriwether
Pike
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©2021 CALIPER
Map layers
Voting District
County
Districts:7
%AP_Blk
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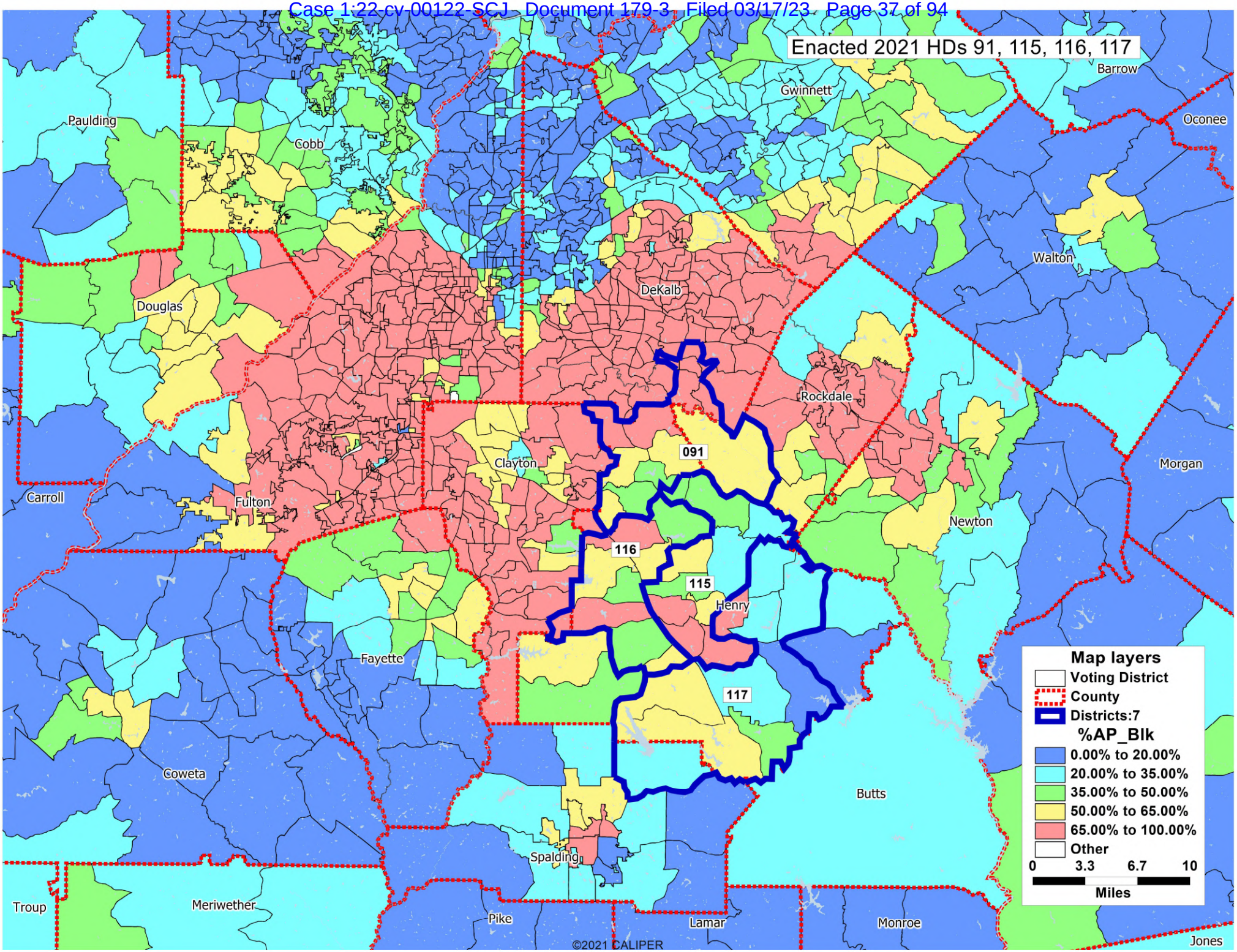
Miles

EXHIBIT 46


Enacted 2021 HDs 91, 115, 116, 117
Barrow
Gwinnett
Paulding
Cobb
Oconee
Walton
DeKalb
Douglas
Rockdale
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Morgan
Carroll
Fulton
Newton
116
115
Henry
Fayette
117
Coweta
Butts
Spalding
Troup
Meriwether
Pike
Lamar
Monroe
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©2021 CALIPER
Map layers
Voting District
County
Districts:7
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Other
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Miles

EXHIBIT 1

Exhibit
0011

Expert Report of Blakeman B. Esselstyn

I. INTRODUCTION

A. Qualifications

1. My name is Blakeman B. Esselstyn. I am the founder and principal of a consultancy called Mapfigure Consulting, which provides expert services in the areas of redistricting, demographics, and geographic information systems (GIS). For more specific information about the qualifications and credentials in the paragraphs below, please see my Curriculum Vitae, provided as **Attachment A**.

2. I have previously served as a consulting expert in two redistricting cases, and as a testifying expert in three cases related to other topics.

3. I have developed 15 redistricting plans that have been enacted for use in elections by jurisdictions at various levels of government.

4. I earned a bachelor's degree in Geology & Geophysics and International Studies from Yale University and a master's degree in Computer and Information Technology from the University of Pennsylvania. I have professional certifications both as a Geographic Information Systems Professional (GISP) and as a member of the American Institute of Certified Planners (AICP).

5. I have taught graduate-level semester courses in Geographic Information Systems (GIS) and have presented on redistricting at conferences at Harvard University, Duke University, the University of North Carolina at Chapel Hill, the University of Texas, and several other universities. I have also presented at events organized by the

National Conference of State Legislatures (NCSL), the Urban and Regional Information Systems Association (URISA), and the American Planning Association (APA).

6. In addition to speaking engagements, my work and opinions related to redistricting have often been cited in media outlets, and some of my related writings have been published or cited in national publications. Again, for details, please see **Attachment A**.

7. I am being compensated at a rate of $325 per hour. No part of my compensation is dependent upon the conclusions that I reach or the opinions that I offer.

B. About this report

8. Plaintiffs' counsel has asked me to determine whether there are areas in the State of Georgia where the Black population is "sufficiently large and geographically compact"[1] to enable the creation of additional majority-Black legislative districts relative to the number of such districts provided in the enacted State Senate and State House of Representatives redistricting plans from 2021.

9. The Georgia General Assembly has two chambers, each with distinct redistricting plans that I will consider individually. Following a demographic overview of the state that will be relevant for both chambers, the report will provide separate sections addressing each chamber's districts: first the State Senate, then the House of Representatives. For each chamber, I will briefly review the enacted plan, present an

[1] *Thornburg v. Gingles*, 478 U.S. 30, 50 (1986).

alternative illustrative plan, and supply some analysis of selected characteristics of the plans.

10. Unless otherwise specified, all map images in the report are ones that I created (though they may be maps showing redistricting plans I did not create).[2]

11. More detailed information about the sources of data, the software, and my methodology can be found in **Attachment B**.

C. Summary of conclusions

12. It is possible to create three additional majority-Black districts in the State Senate plan and five additional majority-Black districts in the State House plan while still adhering to other traditional redistricting principles.

II. Statewide Demographic Overview

A. Georgia and the 2020 Census

13. Georgia's population increased by more than one million people between the 2010 and 2020 censuses, from 9,687,653 to 10,711,908—an increase of approximately 10.6%.[3]

[2] Some maps deliberately do not show the State of Georgia in its entirety, as districts in large areas of the northern and southern parts of the state are unchanged in the illustrative plans. Focusing in on affected portions of the State's geography allows for more clarity and higher level of detail in the map figures.

[3] All demographic analysis is based on statistics obtained from the U.S. Census Bureau website, https://www.census.gov. For URLs of specific census resources used, please consult Attachment B.

14. According to the 2020 census, 33.0% of Georgia's population (essentially one-third) identified as "Black or African American alone or in combination."[4] The 2010–2020 population increase in this group outpaced the growth in the state as a whole, increasing by approximately 15.8%.

15. By contrast, the state's population identifying as White and neither Hispanic nor multi-racial *decreased* by 1.0% between 2010 and 2020. This non-Hispanic White population still constitutes a majority of the state population, but only barely, at 50.1%. In 2010, this group constituted 55.9% of Georgia's population.

16. The *voting age* population identifying as Black increased 21.8% from 2010 to 2020. In 2020 this group (sometimes abbreviated as BVAP for the Black voting age population) made up 31.7% of the voting age population, an increase from 29.7% in 2010. The non-Hispanic single-race White voting age population, however, has decreased from 59.0% of the voting age population to 52.8%.

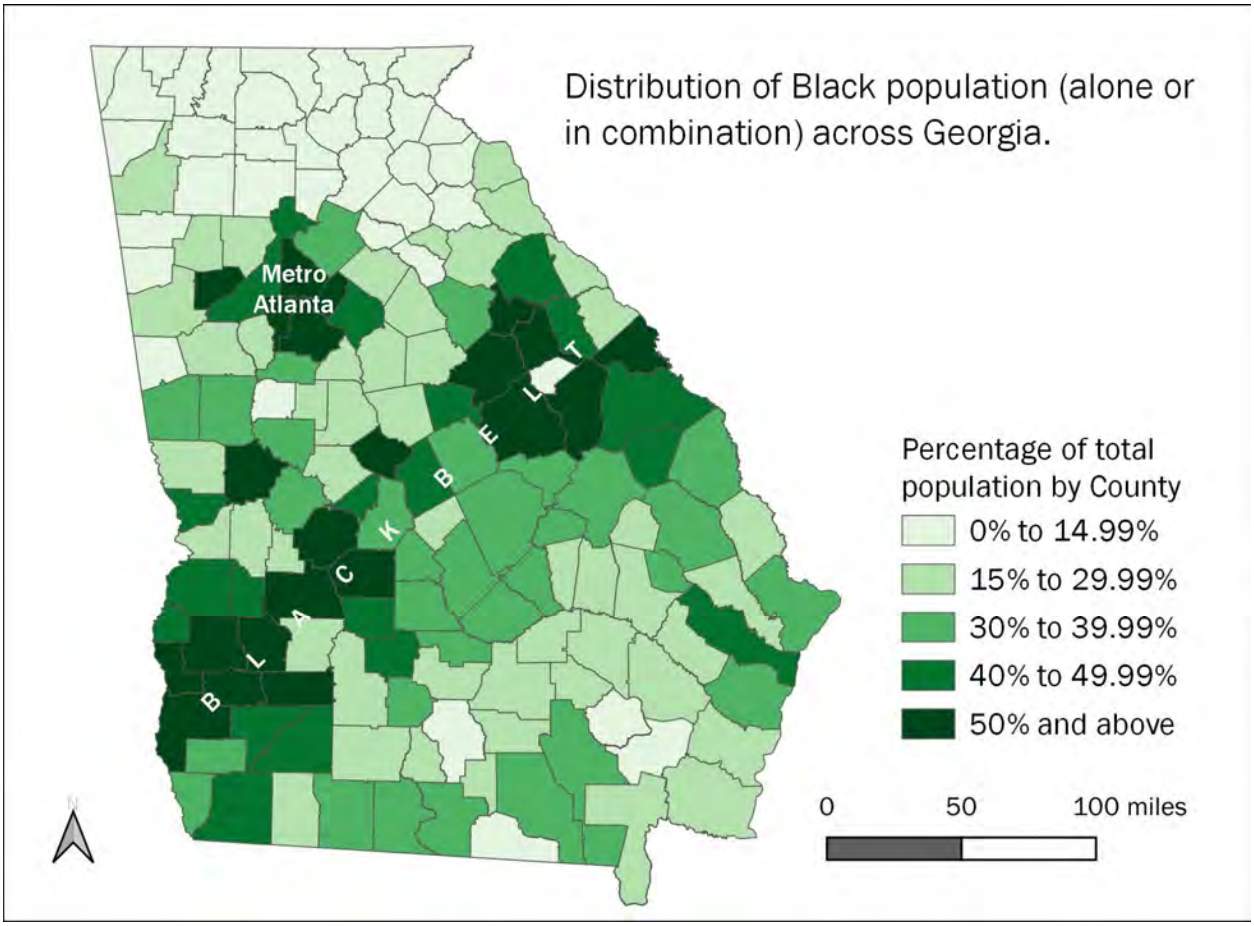
B. Geographic distribution of the Black population

17. Just about half of Georgia's Black population lives in six of the state's 159 counties, all of which are in the Metro Atlanta region. These six counties are, in order of decreasing Black population, Fulton, DeKalb, Gwinnett, Cobb, Clayton, and Henry.

[4] The Census Bureau classification "Black or African American alone or in combination," sometimes stated as "any part Black," will be the measure of the Black population that I use most frequently in this report. Unless otherwise stated, in the text that follows, "Black" can be taken to indicate "alone or in combination." This measure includes Black residents who also identify as Hispanic. In the understanding of this author, the "alone or in combination" designation is the appropriate measure for most Voting Rights Act Section 2 considerations.

18. The counties in Georgia where the percentage of Black residents generally tends to be highest can be grouped into two main categories: the aforementioned Metro Atlanta region and the so-called "Black Belt" of Georgia. Though some accounts say the origin of the term "Black Belt" in the American South stems from descriptions of the soil, modern classifications of which counties are in this region can hinge on the percentage of the population that is Black.[5] In Georgia, this belt of mostly rural counties constitutes a wide band from the southwest corner of the state to the central part of the South Carolina border near Richmond County. See Figure 1.

Figure 1: Statewide map showing percentages of Black population across counties



[5] See, e.g., *Southeastern Geographer* article at https://www.jstor.org/stable/26225503

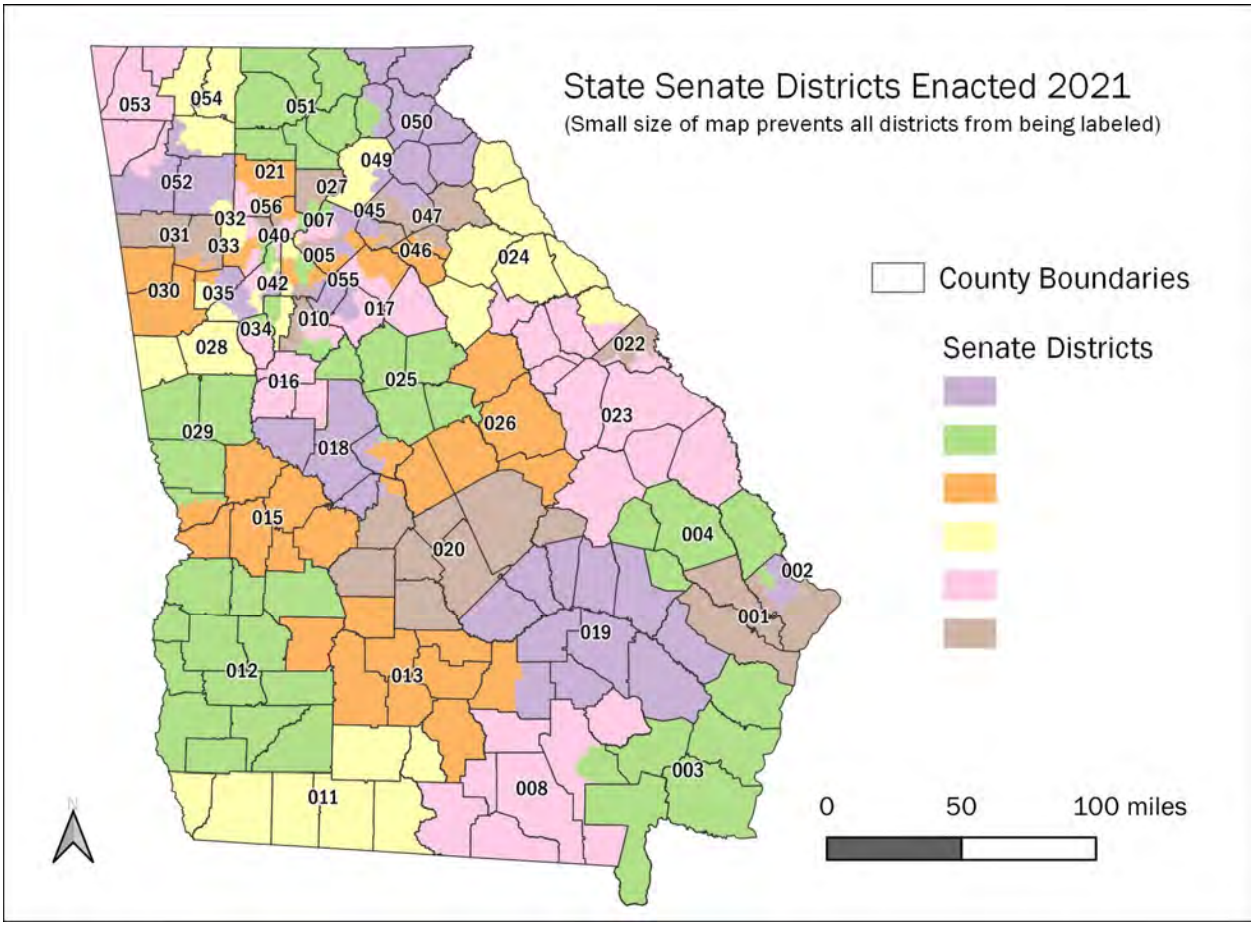
19. For a table showing demographic statistics from the 2020 census for Georgia's counties, please see **Attachment C**.

III. Georgia State Senate redistricting plan

A. Review of enacted State Senate plan

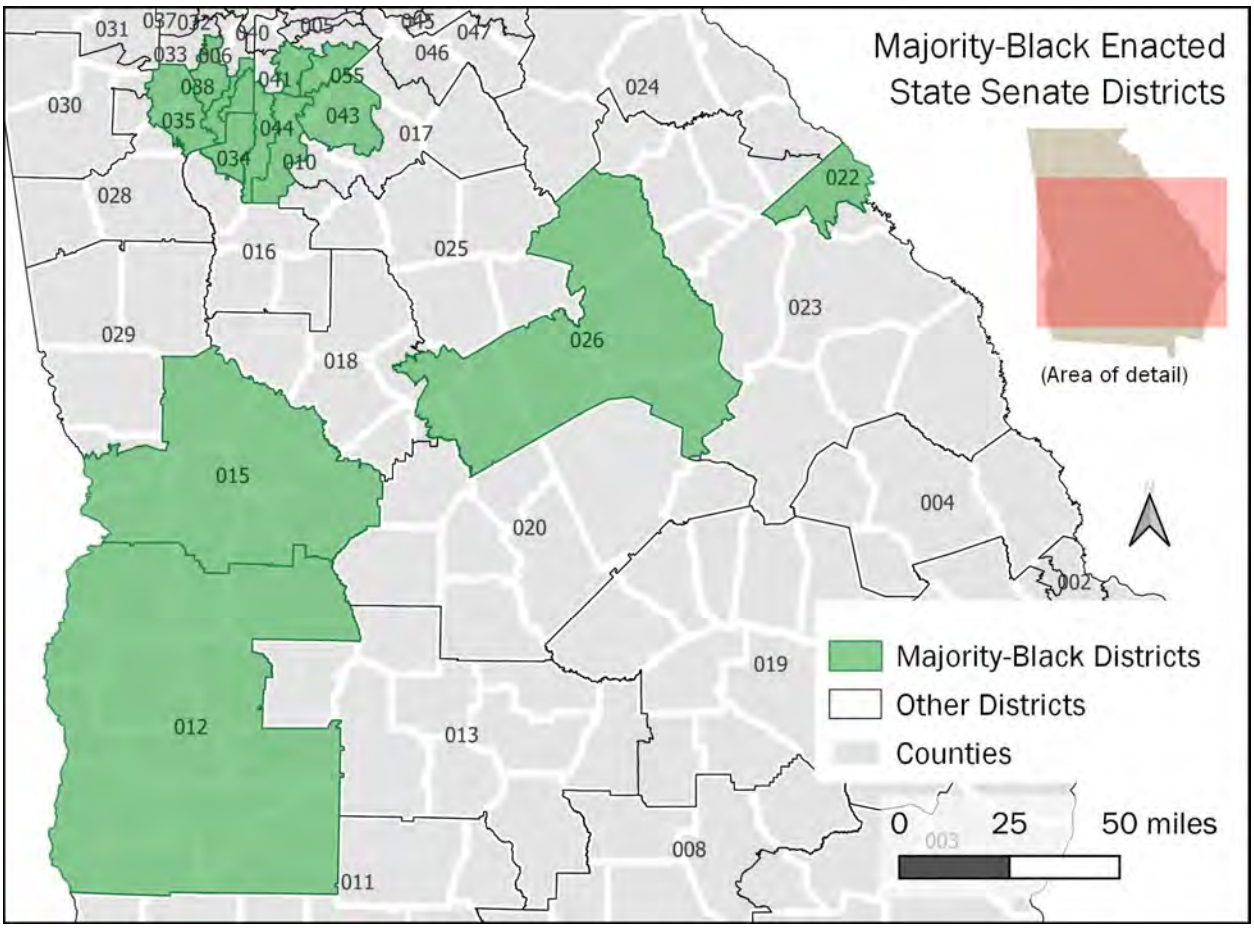
20. On December 30, 2021, Georgia Governor Brian Kemp signed new State Senate districts into law. With districts for 56 senators in this enacted plan, each district is designed to have a population near 191,284, or one-fifty-sixth of Georgia's total population. See Figure 2.

Figure 2: Map of all districts in enacted State Senate plan



21. Of the 56 districts in the enacted plan, 14 are majority-Black.[6] Ten of those are in the Metro Atlanta area and four are in the Black Belt. These districts are highlighted in Figure 3 below.

Figure 3: Map indicating majority-Black districts in enacted State Senate plan



22. For more maps and statistics related to the enacted State Senate districts, please see **Attachment D**.

[6] Per convention in Section 2 cases, "majority-Black" is taken to indicate that the district's *voting age* population that identifies as Black (alone or in combination) constitutes more than 50% of the district's voting age population.

B. Illustrative State Senate plan

23. The illustrative plan that I created, like the enacted plan, has 56 districts, all designed to have populations near 191,284. Because the illustrative plan used the enacted plan as a starting point, many of the districts are the same. In fact, just 22 of the districts were modified, leaving the other 34 unchanged.

24. The illustrative plan includes three additional majority-Black State Senate districts compared to the enacted plan, for a total of 17. Specifically, Senate Districts 23, 25, and 28 are not majority-Black in the enacted plan but are majority-Black in the illustrative plan. See Figure 4 and Table 1.

Figure 4: Map of majority-Black districts in the illustrative State Senate plan.

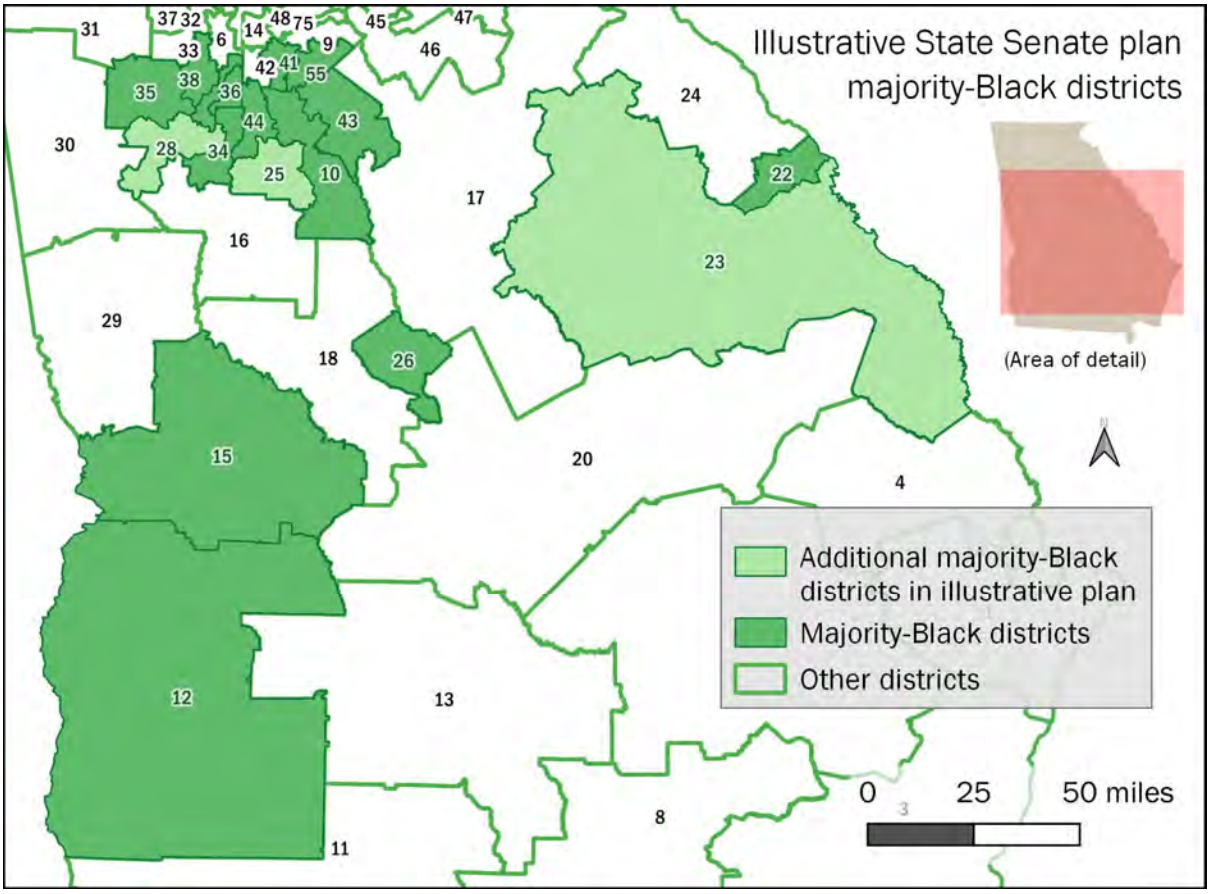


Table 1: Illustrative Senate plan majority-Black districts with BVAP percentages

District	BVAP%	District	BVAP%	District	BVAP%
10	61.10%	26	52.84%	39	60.21%
12	57.97%	28	57.28%	41	62.61%
15	54.00%	34	60.19%	43	58.52%
22	50.84%	35	54.05%	44	71.52%
23	50.43%	36	51.34%	55	65.97%
25	58.93%	38	66.36%		

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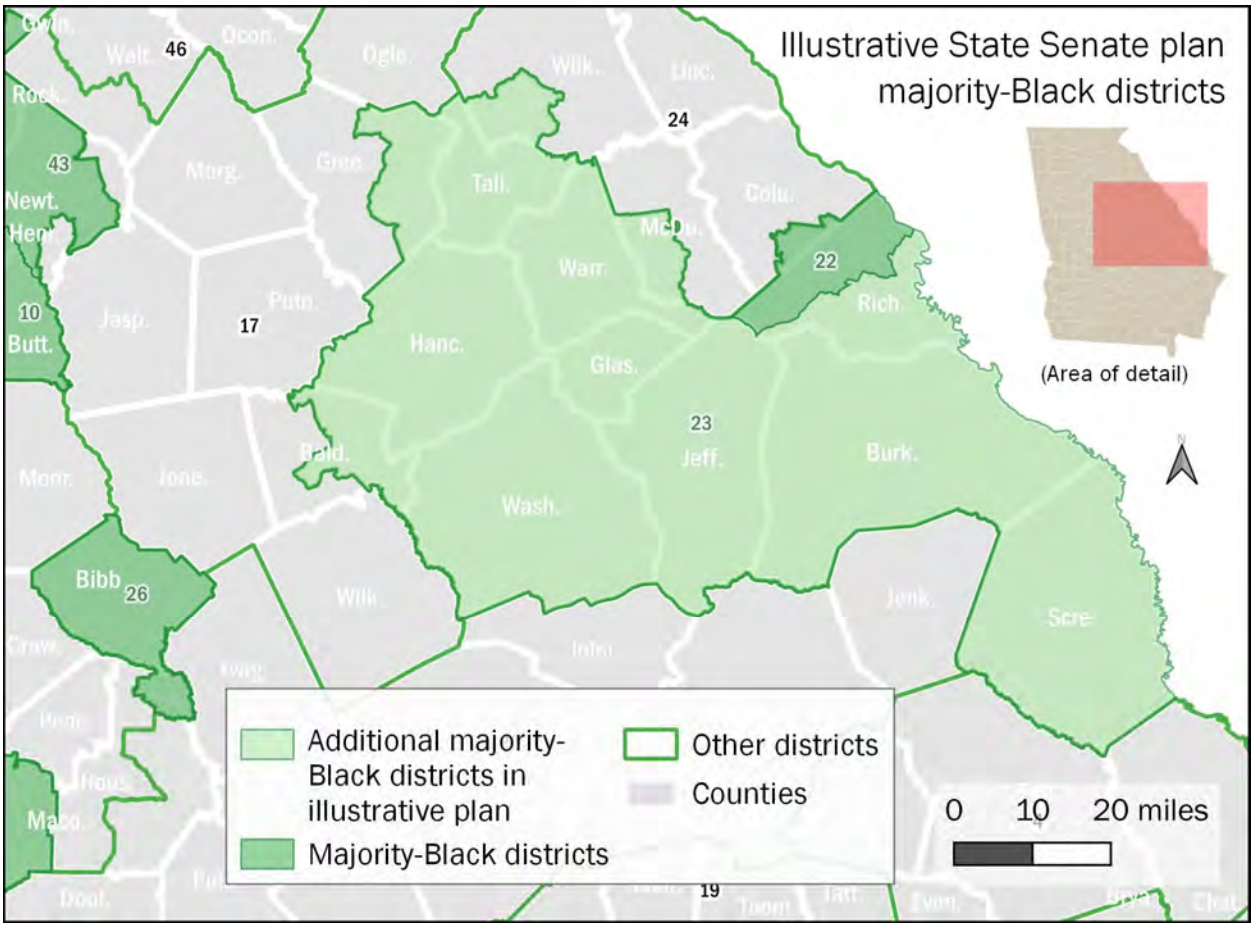
25. The additional majority-Black State Senate district in the eastern Black Belt area (District 23) includes all of Burke, Glascock, Hancock, Jefferson, Screven, Taliaferro, Warren, and Washington Counties and parts of Baldwin, Greene, McDuffie, Richmond, and Wilkes. See Figure 5.[7]

Figure 5: Map of eastern Black Belt region of illustrative plan with majority-Black State Senate districts indicated.



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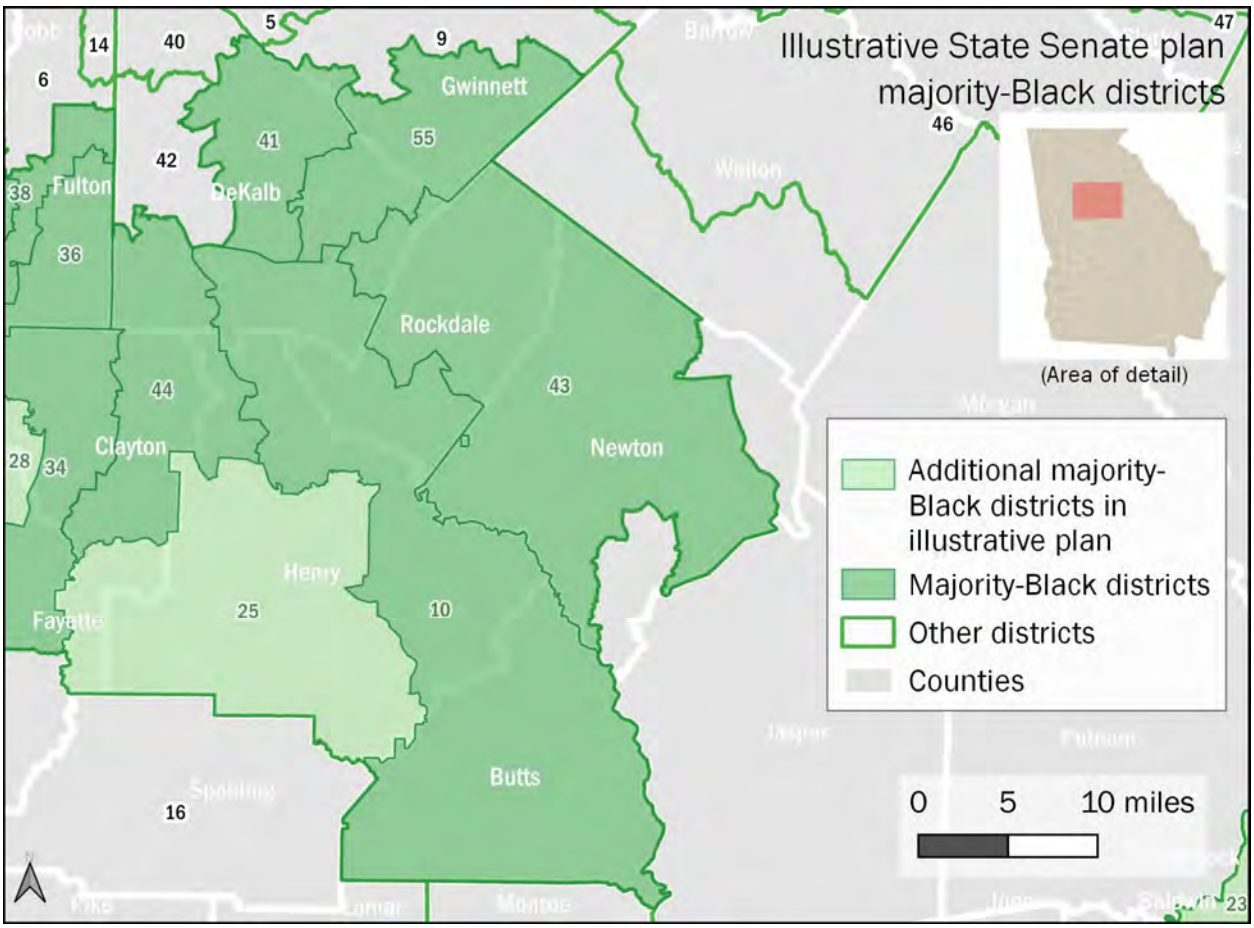
[7] Incidentally, in the illustrative plan, Bibb County is no longer divided; all of Bibb County is in the same district, and it is a majority-Black district (District 26).

26. The additional majority-Black State Senate district in the southeastern Metro Atlanta area (District 25) is composed of portions of Fayette and Henry Counties. See Figure 6.

Figure 6: Map of eastern Metro Atlanta area of illustrative plan with majority-Black State Senate districts indicated.



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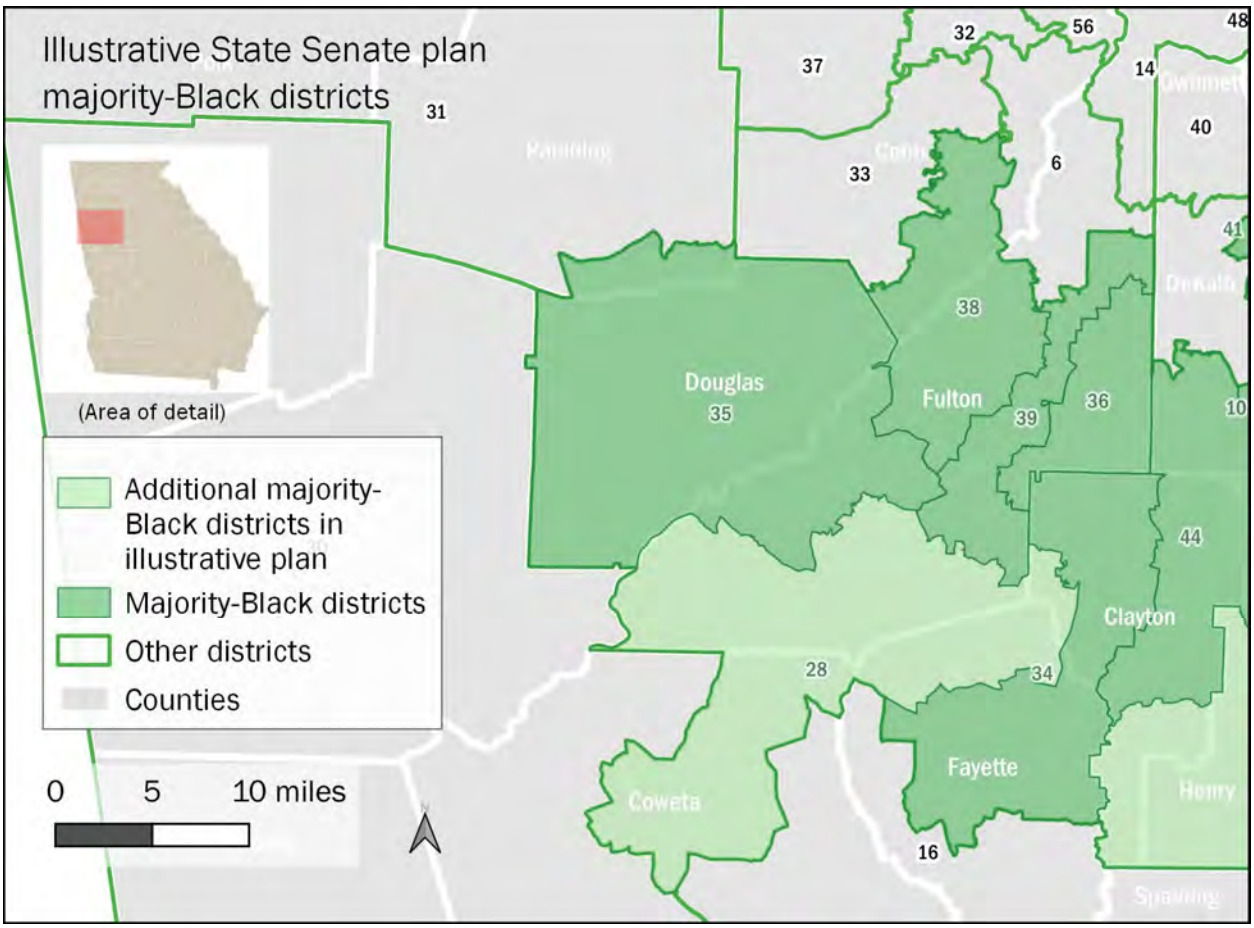
27. The additional majority-Black State Senate district in the southwestern Metro Atlanta area (District 28) is composed of portions of Clayton, Coweta, Fayette, and Fulton Counties. See Figure 7.[8]

Figure 7: Map of western Metro Atlanta area of illustrative plan with majority-Black State Senate districts indicated.



28. For more demographic statistics related to the illustrative State Senate districts, please see **Attachment E**.

[8] Incidentally, the illustrative map also includes all of Douglas County in one majority-Black State Senate district, rather than dividing it between two districts as it is in the enacted plan.

C. Comparative characteristics

29. In undertaking the creation of a new redistricting plan for the State Senate, the Senate Reapportionment Committee adopted the "2021-2022 Senate Reapportionment Committee Guidelines," a full copy of which is appended to this report as **Attachment F**. Within this document is a section called "GENERAL PRINCIPLES FOR DRAFTING PLANS," which contains a list of principles. The illustrative plan was drawn to comply with and balance these principles. The level of adherence for most of the principles can be viewed as a yes/no (e.g., "All plans adopted by the Committee will comply with the United States and Georgia Constitutions"), but for three of the principles where quantitative analysis can help illustrate adherence, an explanation and some summary statistics are provided below.

30. The guidelines provide that "[e]ach legislative district of the General Assembly should be drawn to achieve a total population that is substantially equal as practicable, considering the principles listed below." Noting that adherence to other principles can be in tension with population equality, both the enacted plan and the illustrative plan get substantially closer to population equality than the permissible threshold of ±5%. In both plans, most district populations are within ±1% of the ideal, and a small minority are within between ± 1 and 2%. None has a deviation of more than 2%. For the enacted plan, the relative average deviation is 0.53%, and for the illustrative plan the relative average deviation is 0.68%.

31. One of the guidelines states that "[c]ompactness" "should [be] consider[ed]." Numerous measures exist for quantifying compactness of districts, and a selection of

some of the most commonly used measures in redistricting are shown in Table 2 below—both for the enacted plan and the illustrative plan. One can see that the average compactness measures for the plans are almost identical, if not identical. An explanation of the five compactness metrics is provided as **Attachment G**.

Table 2: Compactness measures for enacted and illustrative State Senate plans.

	Reock (average)	Schwartzberg (average)	Polsby-Popper (average)	Area/Convex Hull (average)	Number of Cut Edges
Enacted	0.42	1.75	0.29	0.76	11,005
Illustrative	0.41	1.76	0.29	0.75	10,998

32. Another guideline states that "[t]he boundaries of counties and precincts" "should [be] consider[ed]." In redistricting in the United States, consideration of such boundaries is generally taken to mean that counties and precincts should be kept intact to the extent possible (i.e., not split among multiple districts). While the Reapportionment Committee's language regarding this guideline is not explicit, the table below (Table 3) provides numbers of counties and VTDs (the Census "Voting District" used by redistricting software as a proxy for precincts) split in both the enacted and illustrative State Senate plans.

Table 3: Political subdivision splits for enacted and illustrative State Senate Plans

	Intact Counties	Split Counties	Split VTDs
Enacted	130	29	47
Illustrative	125	34	49

33. While the creation of three additional majority-Black State Senate districts involved the division of additional counties and VTDs, the differences are marginal.

34. For more detailed statistics and reports on the above characteristics, please see **Attachment H**.

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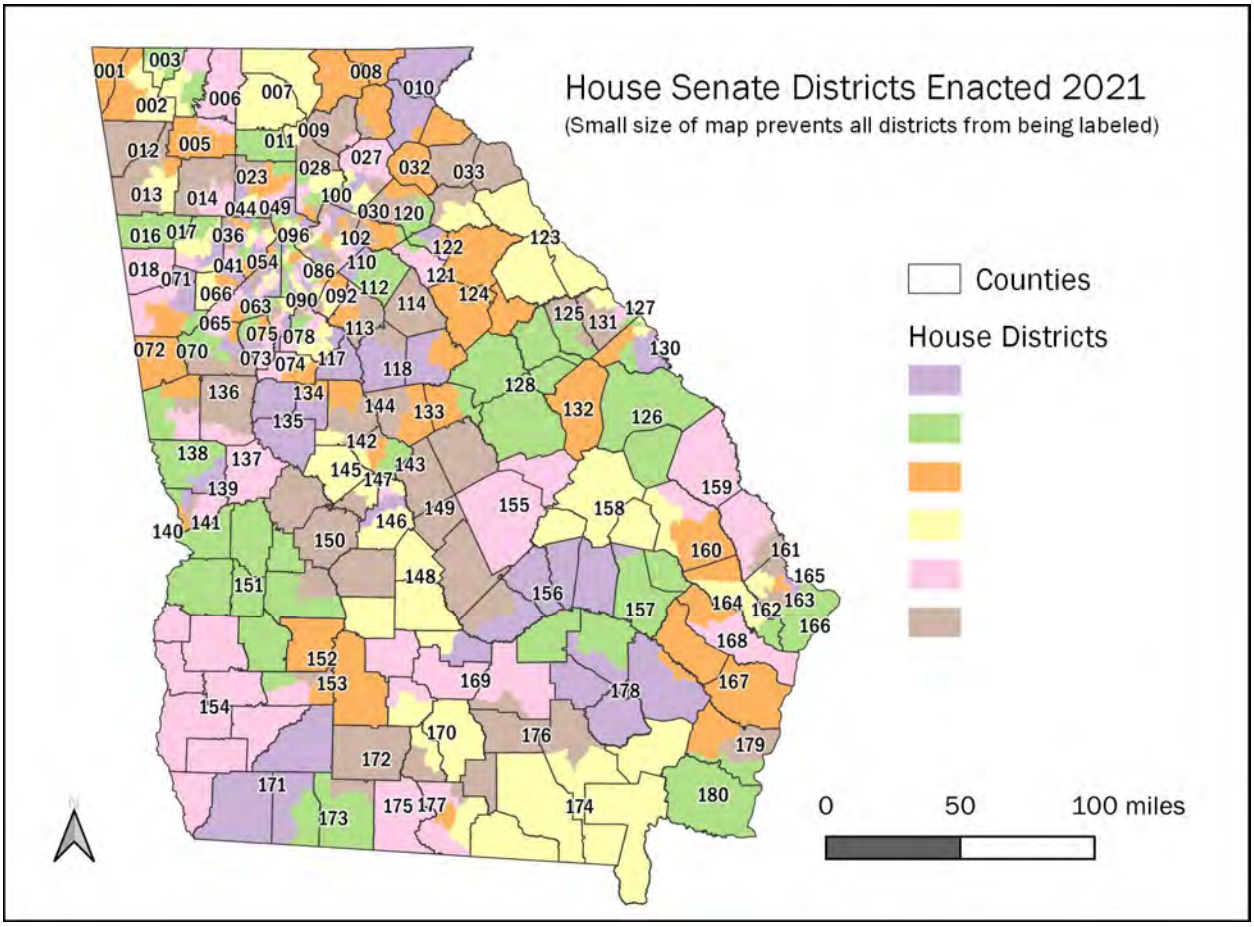
IV. Georgia House redistricting plan

A. Review of enacted House plan

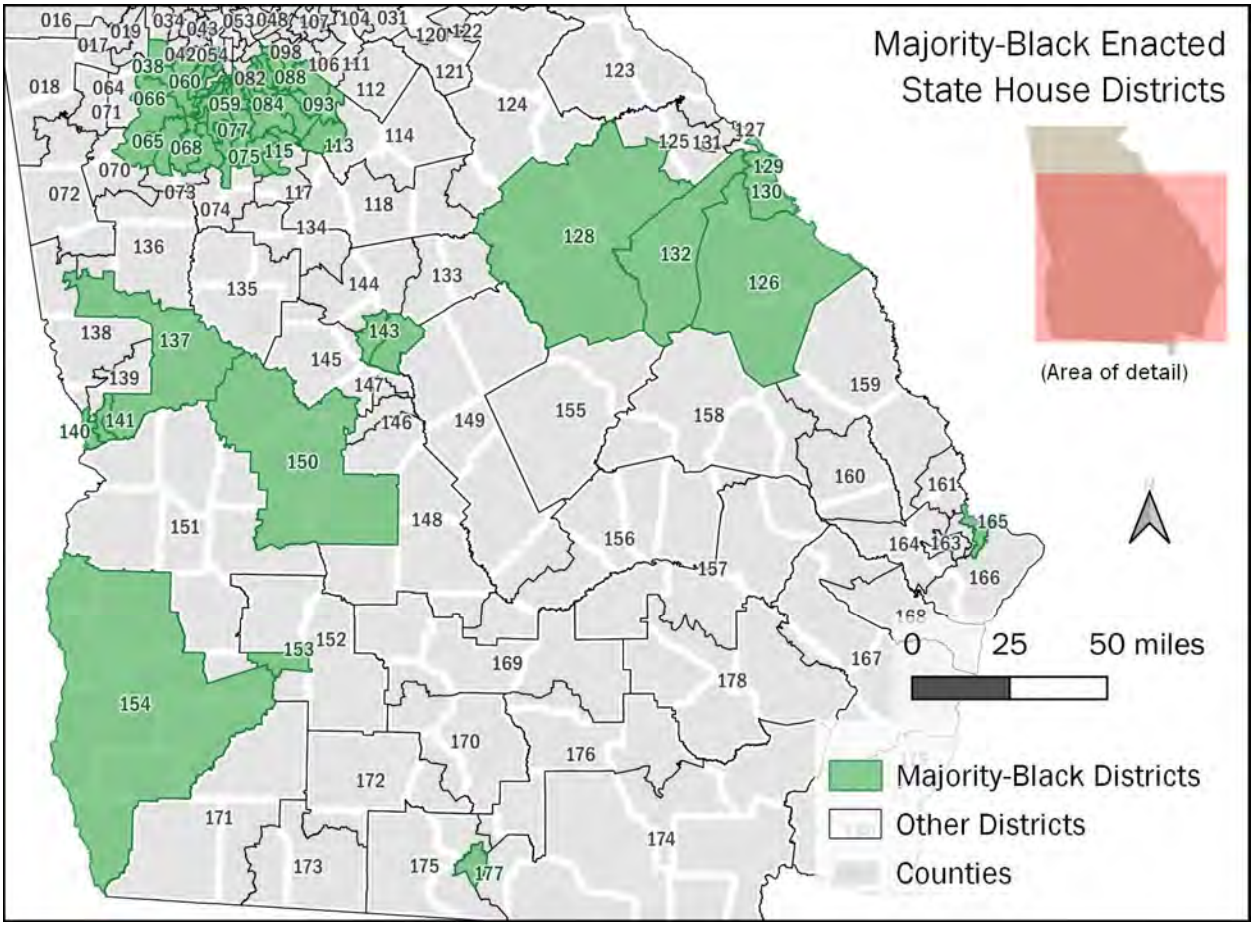
35. On December 30, 2021, Governor Kemp signed new House of Representatives districts into law. With districts for 180 Representatives in this enacted plan, each district is designed to have a population near 59,511, or one-one-hundred-eightieth of Georgia's total population. See Figure 8.

Figure 8: Map of all districts in enacted House plan



36. Of the 180 districts in the enacted plan, 49 are majority-Black. Thirty-four of those are in the Metro Atlanta area, 13 are in the Black Belt, and two small districts are within Chatham (anchored in Savannah) and Lowndes Counties (anchored in Valdosta) in the southeastern part of the state. These districts are highlighted in Figure 9 below.

Figure 9: Map indicating majority-Black districts in enacted House plan



37. For more maps and statistics related to the enacted House districts, please see **Attachment I**.

B. Illustrative House plan

38. The illustrative plan that I created, like the enacted plan, has 180 districts, all designed to have populations near 59,511. Because the illustrative plan used the enacted plan as a starting point, many of the districts are the same. In fact, just 26 of the districts were modified, leaving the other 154 unchanged.

39. The illustrative plan includes five additional majority-Black House districts compared to the enacted plan, for a total of 54. Specifically, House Districts 64, 74, 117, 145, and 149 are not majority-Black in the enacted plan but are majority-Black in the illustrative plan. See Figure 10 and Table 4.

Figure 10: Map of majority-Black districts in the illustrative House plan.

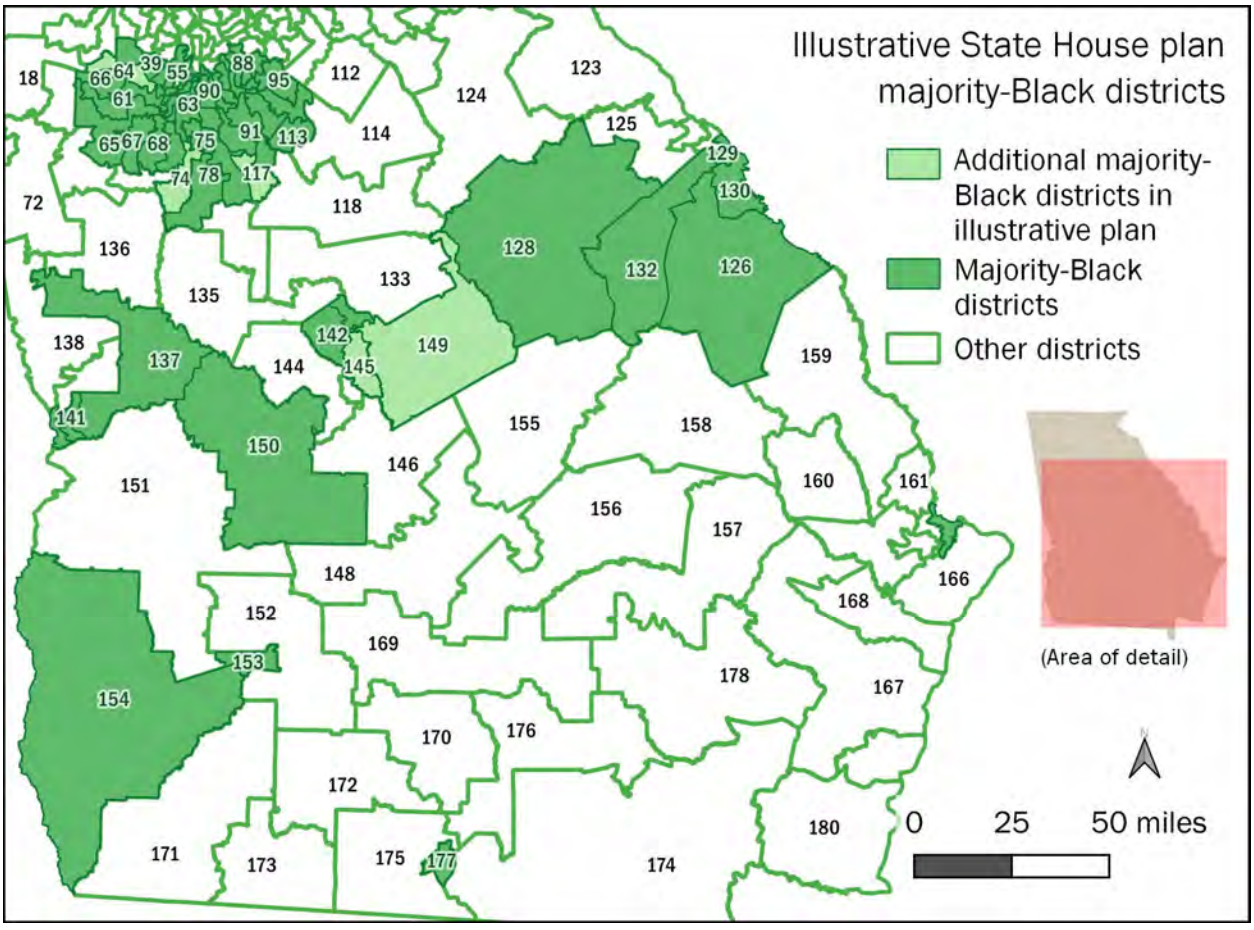


Table 4: Illustrative House plan majority-Black districts with BVAP percentages

District	BVAP%	District	BVAP%	District	BVAP%	District	BVAP%
38	54.23%	69	62.73%	91	60.01%	137	52.13%
39	55.29%	74	53.94%	92	68.79%	140	57.63%
55	55.38%	75	66.89%	93	65.36%	141	57.46%
58	63.04%	76	67.23%	94	69.04%	142	50.14%
59	70.09%	77	76.13%	95	67.15%	143	50.64%
60	63.88%	78	51.03%	113	59.53%	145	50.38%
61	64.87%	79	71.59%	115	53.77%	149	50.02%
62	72.26%	84	73.66%	116	51.95%	150	53.56%
63	69.33%	85	62.71%	117	51.56%	153	67.95%
64	50.24%	86	75.05%	126	54.47%	154	54.82%
65	55.32%	87	73.08%	128	50.40%	165	50.33%
66	50.64%	88	63.35%	129	54.87%	177	53.88%
67	58.92%	89	62.54%	130	59.91%		
68	55.75%	90	58.49%	132	52.34%		

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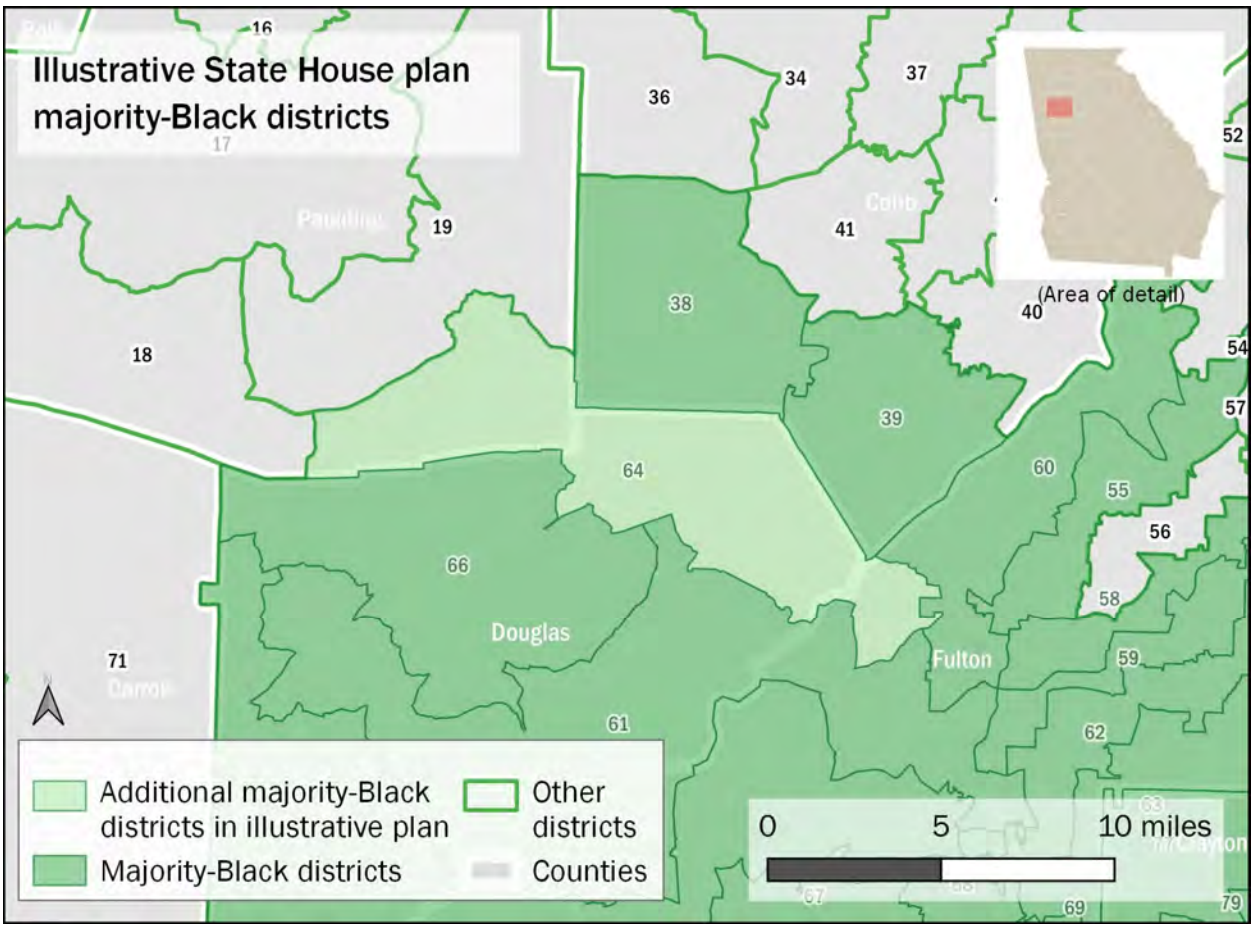
40. The additional majority-Black House district in the western Metro Atlanta area (District 64) is composed of portions of Douglas, Fulton, and Paulding Counties. See Figure 11.

Figure 11: Map of western Metro Atlanta area of illustrative plan with majority-Black House districts indicated.



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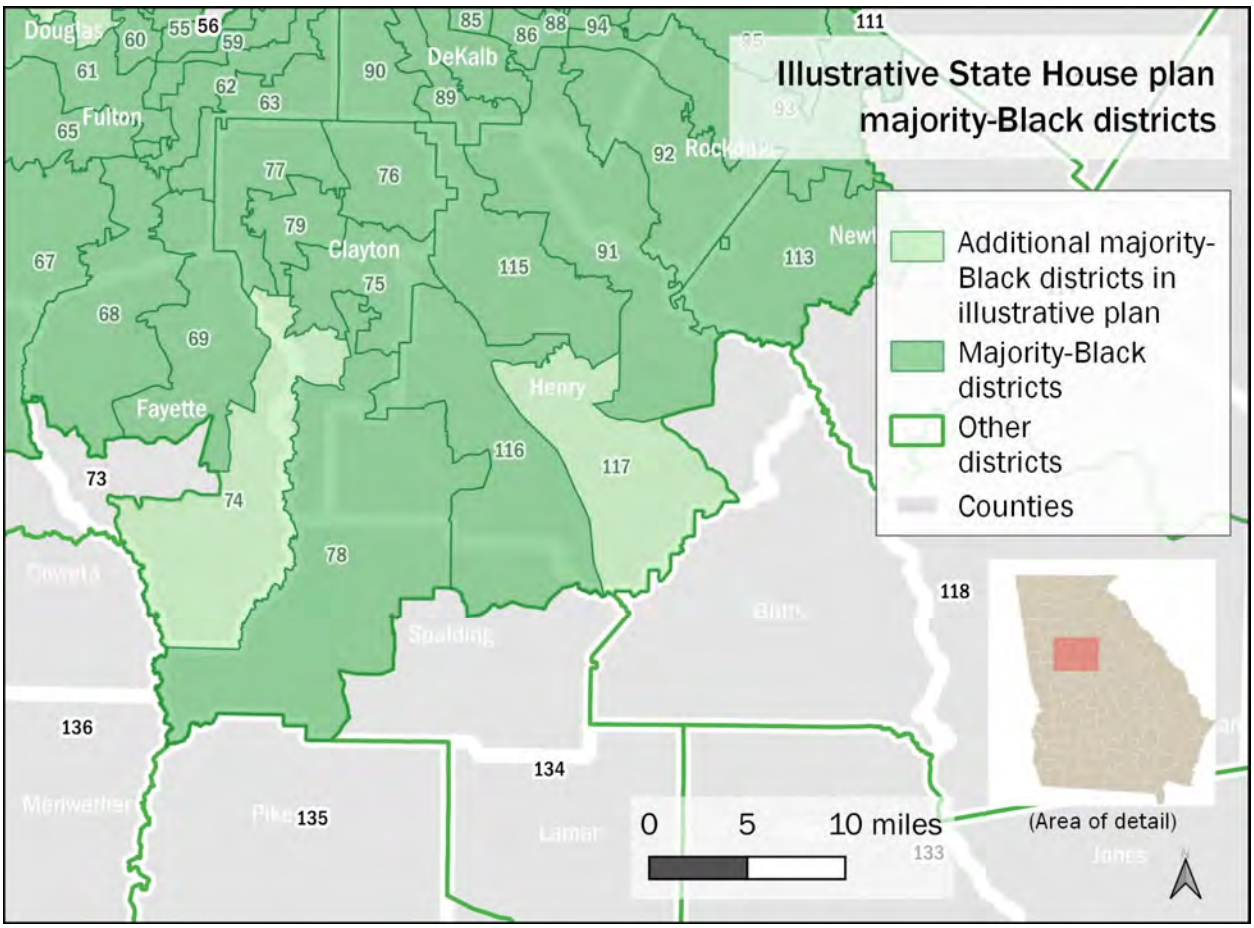
41. The additional majority-Black House districts in the southern Metro Atlanta area (Districts 74 and 117) are built from portions of Clayton, Fayette, and Henry Counties. See Figure 12.

Figure 12: Map of southern Metro Atlanta area of illustrative plan with majority-Black House districts indicated.



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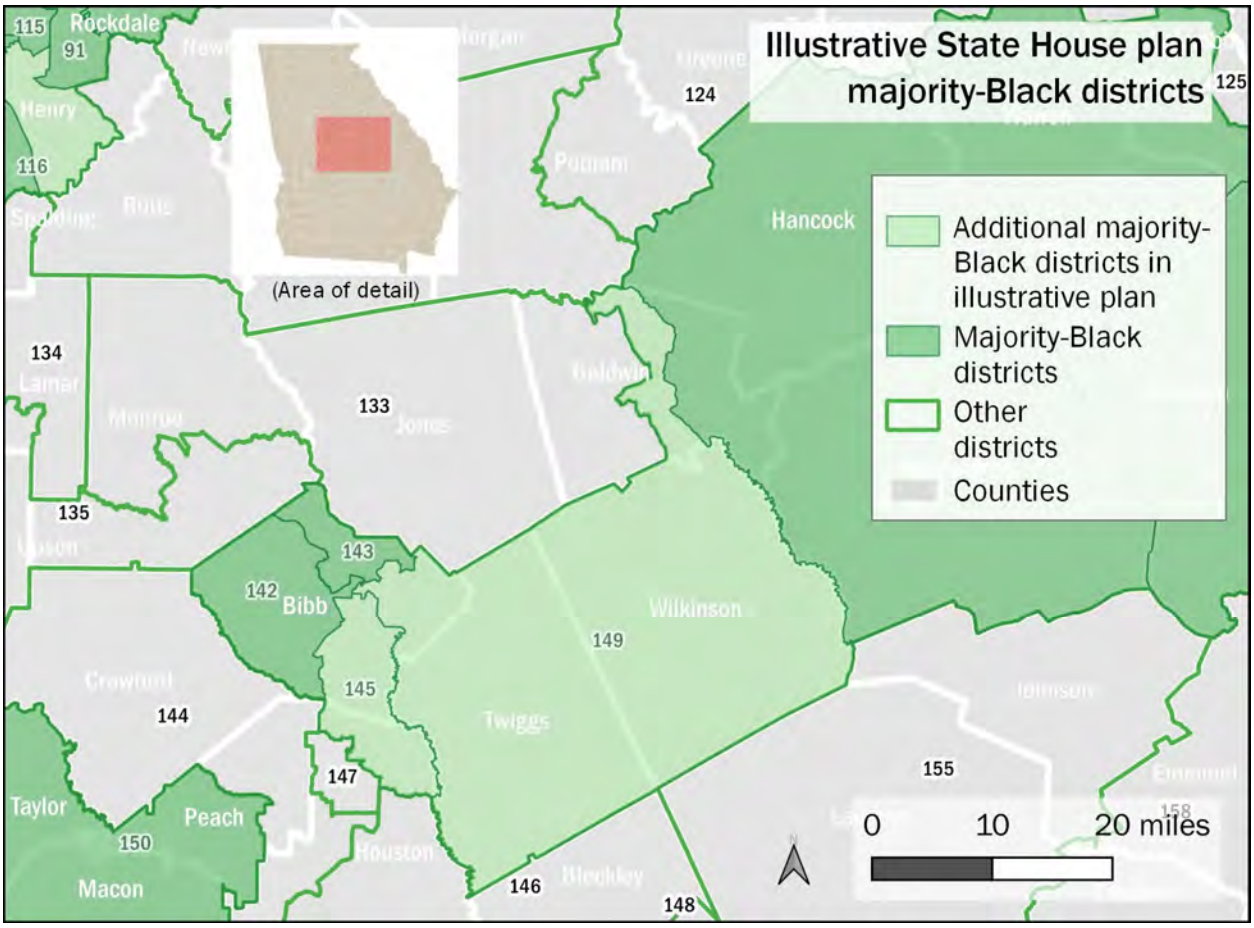
42. The two additional majority-Black House districts in the central Black Belt area (Districts 145 and 149) are built from portions of Baldwin, Bibb, and Houston Counties, as well as all of Twiggs and Wilkinson Counties. Instead of dividing Bibb County into four districts, of which three are only partially in Bibb County, as in the enacted plan, in the illustrative plan, two of the districts (Districts 142 and 143) are wholly contained in Bibb County, and only two (Districts 145 and 149) extend outside the county. See Figure 13.

Figure 13: Map of central Black Belt region of illustrative plan with majority-Black House districts indicated.



43. For more demographic statistics related to the illustrative State Senate districts, please see **Attachment J**.

C. Comparative characteristics

44. In undertaking the creation of a new redistricting plan for the House, the House Reapportionment Committee adopted the "2021-2022 House Reapportionment Committee Guidelines," a full copy of which is appended to this report as **Attachment K**. Within this document is a section called "GENERAL PRINCIPLES FOR DRAFTING PLANS," which contains a list of principles. The illustrative plan was drawn to comply with and balance these principles. As with the Senate Committee's principles discussed above, three of the principles can be quantitatively analyzed to help illustrate adherence. As with the State Senate illustrative plan, some explanatory notes and summary statistics are provided below.

45. The guidelines provide that "[e]ach legislative district of the General Assembly should be drawn to achieve a total population that is substantially equal as practicable, considering the principles listed below." As with the Senate plan, both the enacted plan and the illustrative plan get substantially closer to population equality than the permissible threshold of ±5%. In both plans, most district populations are within ±1% of the ideal, and a small minority are within between ± 1 and 2%. None has a deviation of more than 2%. For the enacted plan, the relative average deviation is 0.61%, and for the illustrative plan the relative average deviation is 0.64%.

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46. One of the guidelines states that "[c]ompactness" "should [be] consider[ed]." A selection of some of the most commonly used measures of compactness are shown in Table 5 below—both for the enacted plan and the illustrative plan. One can see that the average compactness measures for the plans are almost identical, if not identical.

Table 5: Compactness measures for enacted and illustrative House plans.

	Reock (average)	Schwartzberg (average)	Polsby-Popper (average)	Area/Convex Hull (average)	Number of Cut Edges
Enacted	0.39	1.80	0.28	0.72	22,020
Illustrative	0.39	1.82	0.28	0.72	22,475

47. Another guideline states that "[t]he boundaries of counties and precincts" "should [be] consider[ed]." The table below (Table 6) provides numbers of counties and VTDs (akin to precincts) split in both the enacted and illustrative House plans.

Table 6: Political subdivision splits for enacted and illustrative House plans.

	Intact Counties	Split Counties	Split VTDs
Enacted	90	69	185
Illustrative	89	70	192

48. While the creation of five additional majority-Black House districts involved the division of one additional county and a handful of VTDs, the differences are marginal.

49. For more detailed statistics and reports on the above characteristics, please see **Attachment L**.

V. Conclusion

50. This report has demonstrated that it is possible to create three additional majority-Black districts in the Georgia State Senate plan and five additional majority-Black districts in the Georgia House of Representatives plan while still adhering to other traditional redistricting principles.

51. I reserve the right to supplement this report in consideration of additional facts, testimony, or materials that may come to light.

Executed on January 13, 2022.

Blakeman B. Esselstyn

EXHIBIT 1

Supplemental Expert Report of Blakeman B. Esselstyn

I. Introduction

1. My name is Blakeman B. Esselstyn. I am serving as an expert on redistricting and demographics for the Plaintiffs. I provided a report related to the State of Georgia's legislative redistricting plans on January 13, 2022 ("initial report").

2. This supplemental report is in reply to items presented by John B. Morgan in a declaration filed in this case on January 18, 2022 ("Morgan report").

3. After its introductory explanations (¶¶ 1–8), the Morgan report primarily makes assertions about five separate elements related to redistricting plans for the Georgia State Senate and House—with a specific focus on the illustrative plans for each chamber that I offered and discussed in my initial report. In brief, those five elements are: 1) the number of majority-Black districts; 2) the pairing of incumbents; 3) the extent of differences between the enacted plans and the illustrative plans; 4) the number of political subdivisions divided; and 5) compactness. I will address Mr. Morgan's assertions and characterizations element by element in the section that follows.

II. Response to Morgan report

A. Number of majority-Black districts

4. In paragraphs 9 through 13 of his report, Mr. Morgan discusses the number of majority-Black districts in various plans. Notably, the final columns in Charts 1 and 2 demonstrate the reduction of the number of "packed" districts with BVAP percentages over 65% in the illustrative plans. One reason that the enacted plans have fewer

majority-Black districts than the illustrative plans is that more Black voters were unnecessarily concentrated into certain Metro Atlanta districts in the enacted plans. By unpacking these districts, the illustrative plans contain fewer packed districts—and, consequently, additional majority-Black districts.

5. At no point have I considered or examined the "Democratic proposed" plans discussed by Mr. Morgan in paragraphs 9 through 13, so I have no opinion as to the accuracy of his claims regarding those.

B. Pairing of incumbents

6. In paragraphs 14 through 18 of his report, Mr. Morgan discusses incumbents. In preparing my initial report, I was not able to find a publicly available authoritative listing of incumbent home addresses and plans for future candidacy, so I did not have a means to examine this topic. Mr. Morgan does not cite a source for his "database" of incumbent information other than that he "was given" it (¶ 6), so I was not able to review his specific claims, and as such am not able to corroborate or challenge them.

7. If provided authoritative information regarding incumbent home addresses, I can incorporate that information and make adjustments to the illustrative plans.

C. Extent of differences between enacted and illustrative plans

8. Mr. Morgan's paragraph 19 discusses the extent of differences between the enacted plans and my illustrative plans. The numbers of modified districts in the concluding sentences of the paragraph match the numbers that I supplied in my own report (¶¶ 23, 38). Mr. Morgan, however, does not point out the numbers of districts

that remain *unchanged*, which constitute significant majorities in both the State Senate and House plans.

9. One of the guiding principles in the creation of my illustrative plans was to keep changes to a minimum while adhering to other neutral criteria. Modifying one district necessarily requires changes to districts adjacent to the original modification, and harmonizing those changes with traditional redistricting criteria (such as population equality and intactness of counties) often inescapably results in cascading changes to other surrounding districts. While the illustrative plans are—intentionally—a departure from the enacted plans, most of the plans' districts remain intact. In the case of the illustrative House plan, for example, 86% of the districts are unchanged from the enacted House plan.

D. Political subdivision splits

10. Mr. Morgan devotes three short paragraphs to the splitting of political subdivisions, specifically counties and precincts/VTDs. The basic thrust of his assertions is that my illustrative plans split slightly more political subdivisions than do the enacted plans—again, something I acknowledged in my initial report (¶¶ 33, 48). As discussed in the paragraph above, minimizing the number of such splits was a significant consideration being weighed against other criteria. And ultimately, the numbers of additional splits in both illustrative plans are marginal.

11. Further, the number of county splits in the State Senate and House illustrative plans are lower than the number of such splits in the corresponding plans

that have been used in recent elections (i.e., the State Senate plan adopted in 2014, and the House plan adopted in 2015). See **Table 1** below:

Table 1: Number of split counties in various plans. [1]

	Illustrative	Adopted 2014/2015
State Senate	34	38
House	70	73

E. Compactness

12. Notably, Mr. Morgan's report demonstrates that the lion's share of the additional majority-Black districts in the illustrative plans outperform their precursors in the enacted plans according to the Polsby-Popper compactness measure (see Chart 5). Senate District 25 and House District 149 perform better according to that measure *and* the Reock measure. Further, illustrative Senate District 25 outscores its counterpart in the enacted plan on both the Schwartzberg and Area/Convex Hull measures.[2] In addition, illustrative House Districts 117, 145, and 149 all outscore their counterparts on the Schwartzberg and Area/Convex Hull measures.[3]

13. In my initial report, I included five measures of compactness that rely on different fundamental measurements, to show that the average scores of the enacted and illustrative plans were similar—or even identical—across the board. As numerous academics have pointed out, these metrics often differ on how they score compactness.[4] This variability of scoring explains why my initial report included five measures.

[1] Sources for 2014 and 2015 plan statistics: https://www.legis.ga.gov/api/document/docs/default-source/reapportionment-document-library/senate14-county.pdf?sfvrsn=e8061e5c_2 and https://www.legis.ga.gov/api/document/docs/default-source/reapportionment-document-library/counties-by-house-districts.pdf?sfvrsn=b7c39a42_2.

[2] See Attachment H to my initial report.

[3] See Attachment L to my initial report.

[4] See, e.g., https://gking.harvard.edu/files/gking/files/ajps.12603.pdf.

14. As I discussed in sections C and D above, priorities like compactness have to be pursued in conjunction with other priorities such as preservation of communities of interest and keeping precincts intact. House District 149 in the illustrative House plan provides a good example of honoring multiple principles. House District 149 in the enacted House plan is an elongated district that spans more than 80 miles north to south along a bending string of four counties, plus about half of a fifth. The corresponding district in the illustrative plan, which is centered on Twiggs and Wilkinson Counties, is, by contrast, closer to rectangular in shape, stretching about 50 miles north to south and about 40 miles east to west. (As noted above, it outscores the enacted version in both of the compactness tests noted by Mr. Morgan, as well as the two other district-specific measures in my initial report.) Further, the district generally follows the orientation of the Georgia Fall Line geological feature, which brings with it shared economic, historic, and ecological similarities.[5] Macon and Milledgeville, parts of which are in illustrative House District 149, are both characterized as "Fall Line Cities."[6] See **Figure 1** for a visual comparison of the two districts.

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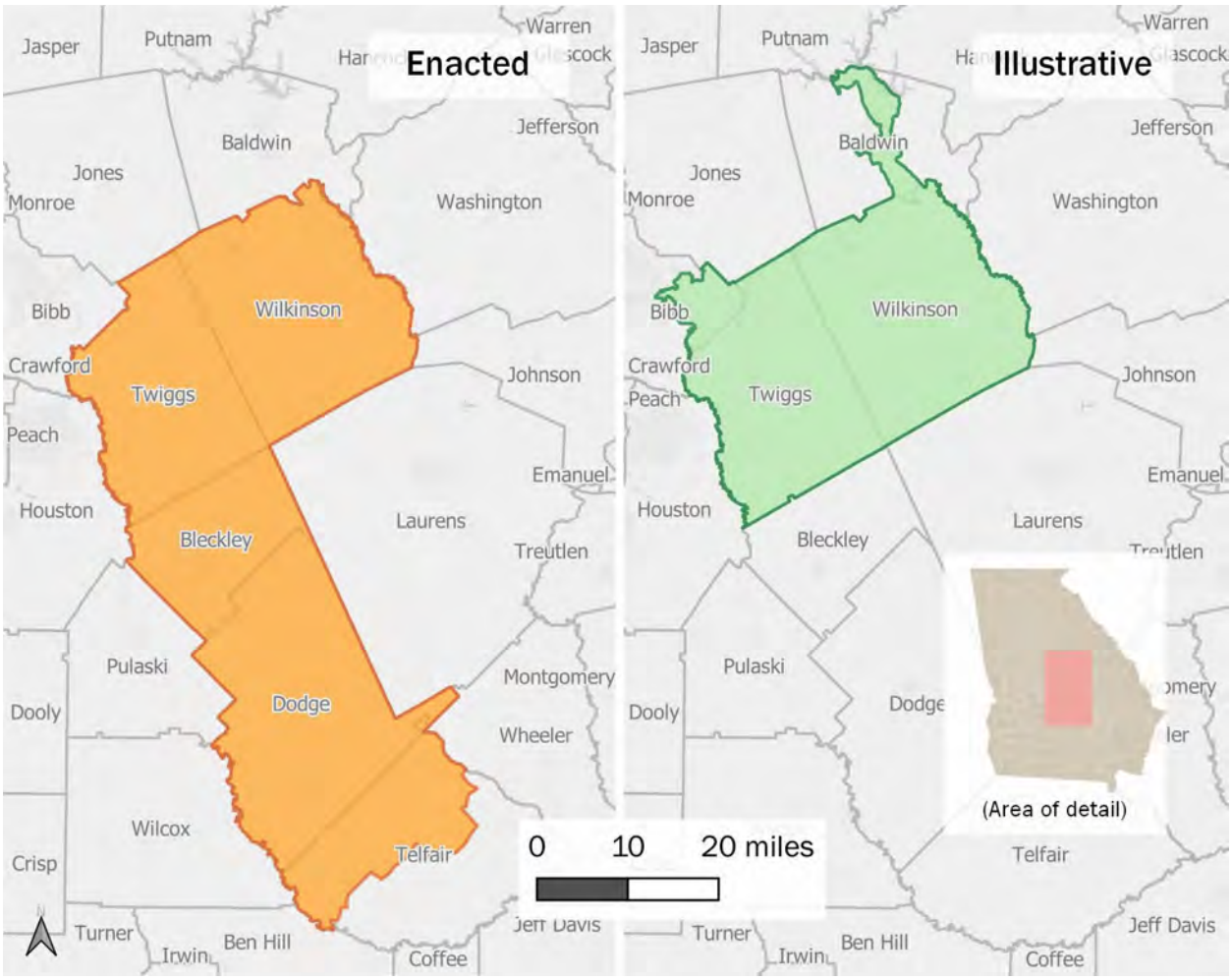
[5] See, e.g., https://www.georgiaencyclopedia.org/articles/geography-environment/fall-line/ and http://southres.com/uptowncolumbusdams/thefallline.php.

[6] See "Fall Line Cities" map at https://www.gpb.org/blogs/education-matters/2017/02/06/new-virtual-field-trip-physical-features-of-georgia and the southres.com article in the preceding footnote.

Figure 1: Comparison of enacted and illustrative House District 149



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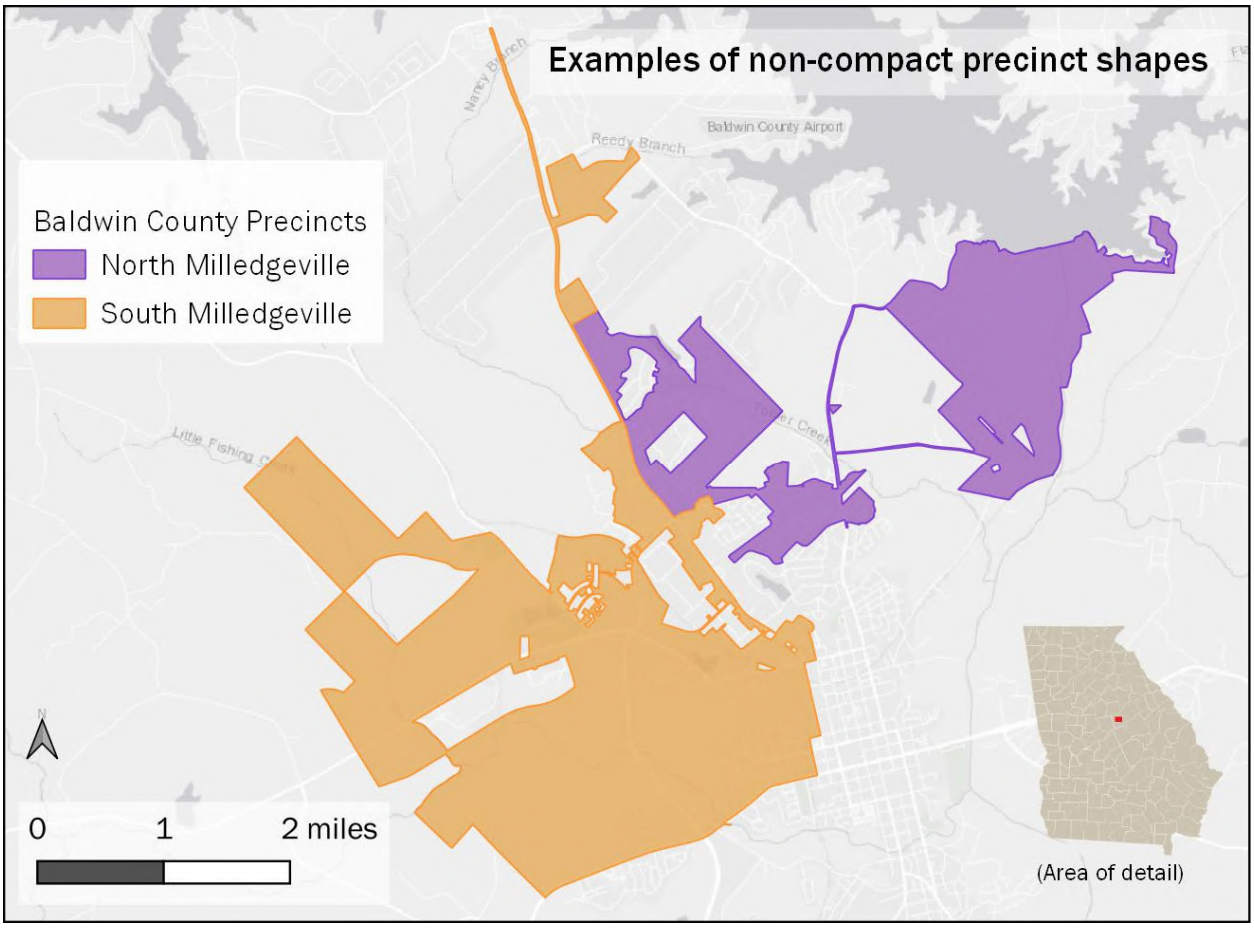
15. Baldwin County, at the northeastern corner of House District 149, also provides a helpful example of how compactness can coincide with consideration of VTDs (precincts). **Figure 2** below shows examples of two of the highly irregular precinct shapes in the central part of that county—each shape is a single precinct. Striving to preserve the intactness of such precincts while also attempting to keep a district boundary smooth presents a challenge, and sometimes the best possible result requires either the division of precincts or a less compact area of a district.

Figure 2: Map of two individual precinct shapes in Baldwin County.



16. Similar analysis of district compactness and cohesion can be used to compare Senate District 23 in the enacted plan versus the illustrative plan. As Mr.

Morgan points out (see Chart 5), illustrative Senate District 23 scores better on the Polsby-Popper measure than enacted Senate District 23, and my initial report (in Attachment H) notes that they score identically (1.93) on the Schwartzberg measure.

17. I reserve the right to supplement this report in consideration of additional facts, testimony, or materials that may come to light.

Executed on January 20, 2022.

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Blakeman B. Esselstyn

Second Supplemental Expert Report of Blakeman B. Esselstyn

1. My name is Blakeman B. Esselstyn. I am serving as an expert on redistricting and demographics for the Plaintiffs. I provided a report ("initial report") related to the State of Georgia's legislative redistricting plans on January 13, 2022, as well as a supplemental report on January 20, 2022, in reply to items presented by John B. Morgan in a declaration filed in this case on January 18, 2022.

2. This second supplemental report aims to provide additional information related to the testimony I gave on February 8, 2022, during the Court's preliminary injunction hearing.

3. In my testimony, I indicated that 49 of Georgia's 2,698 VTDs are divided in the illustrative State Senate plan (within all districts, not just those modified from the enacted plan), referencing Table 3 in my initial report. **Figure 1** shows which counties those VTD splits are in. Just 18 of the State's 159 counties account for all of the splits.

Figure 1: VTD splits in illustrative State Senate plan by County

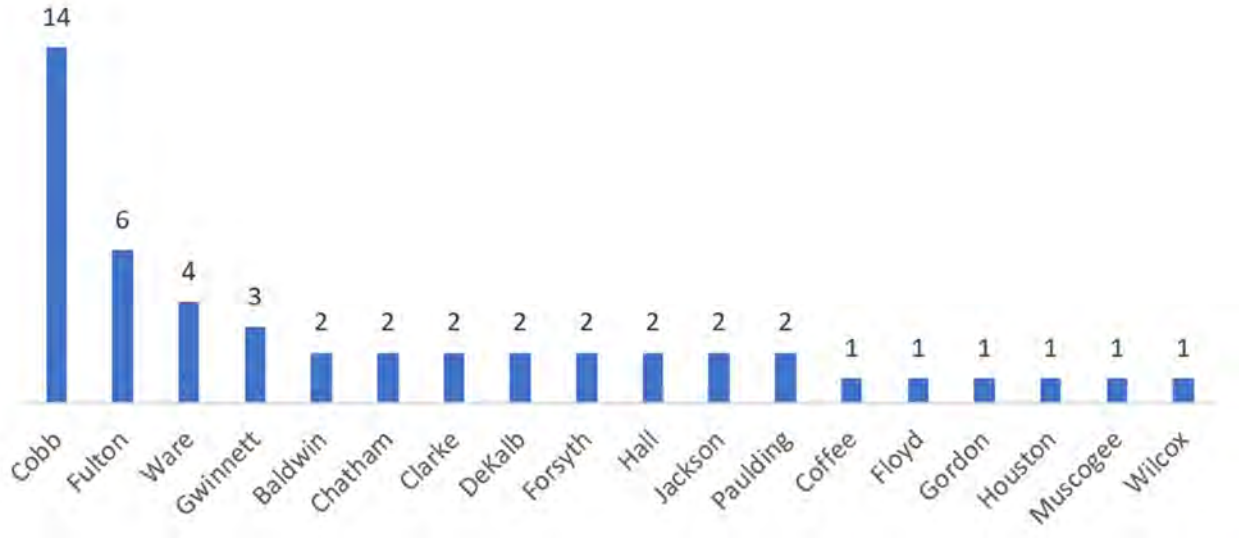
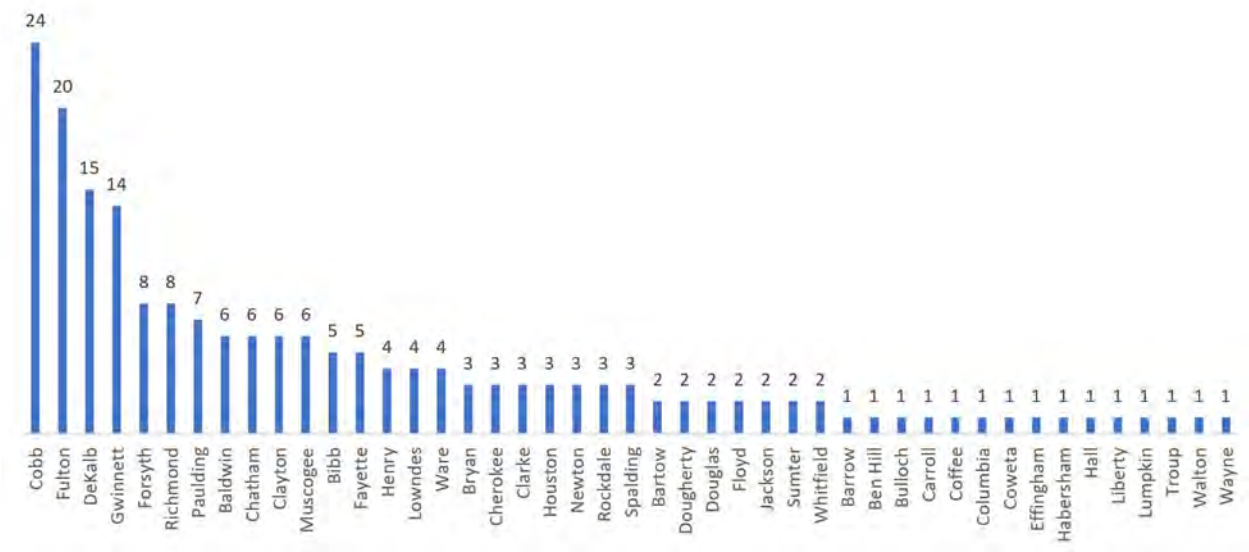


Exhibit 0013

4. My testimony also noted that 192 out of Georgia's 2,698 VTDs are divided in the illustrative House plan (again, within all districts, not just those departing from the enacted plan), referencing Table 6 in my initial report. **Figure 2** shows which counties those VTD splits are in. Just 45 of the State's 159 counties account for all of the splits.

Figure 2: VTD splits in illustrative State House plan by County



5. Another related item mentioned in my testimony was the number of districts in each of the illustrative plans that are changed relative to the enacted plans, as well as those that are unchanged (as discussed in¶¶ 23 and 38 of my initial report). **Figure 3** below shows the geographic locations of those 22 changed and 34 unchanged districts in the illustrative State Senate plan, and **Figure 4** below provides the comparable map for the 26 changed and 154 unchanged districts in the illustrative House plan.

Figure 3: Changed and unchanged districts in illustrative State Senate plan

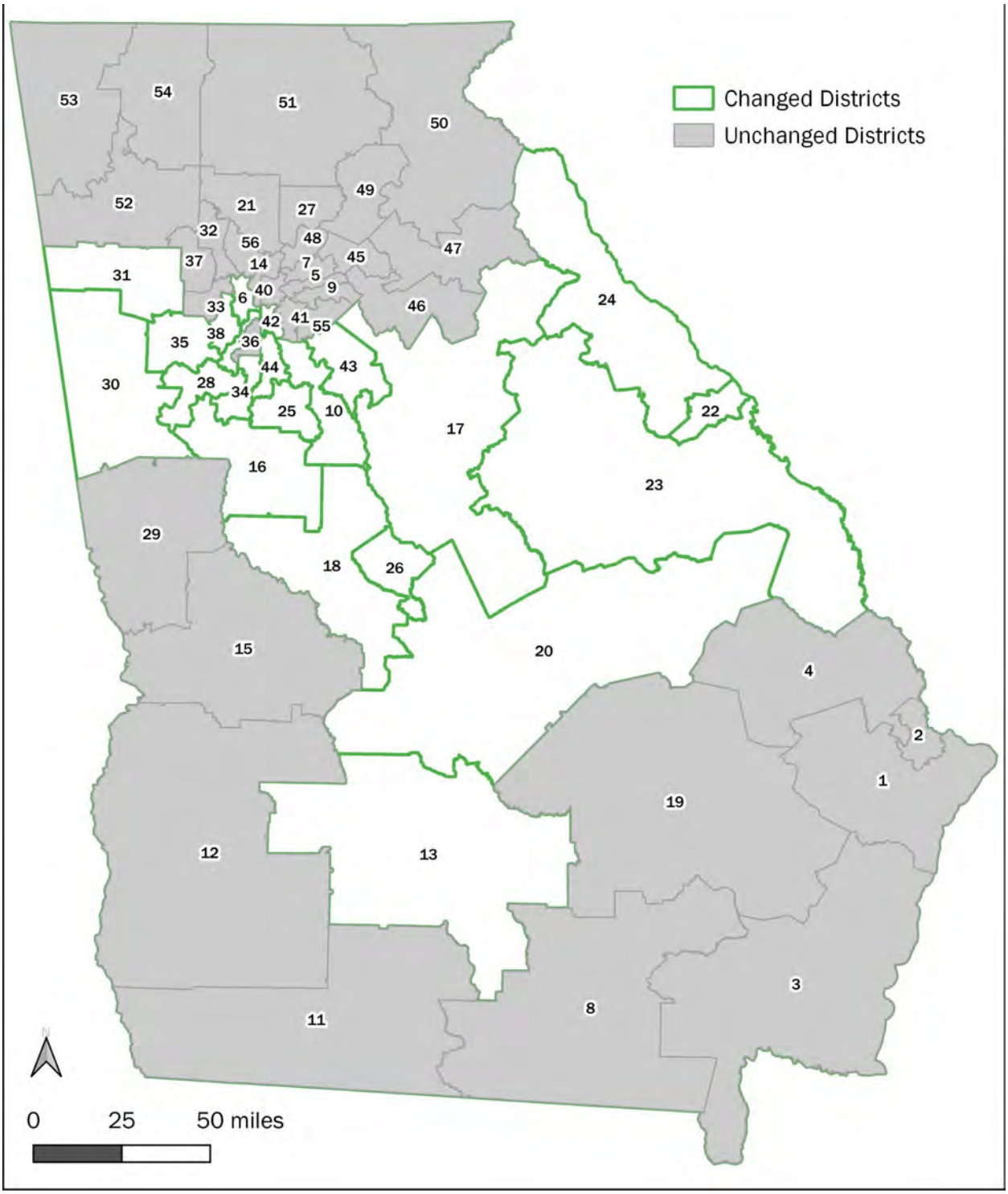
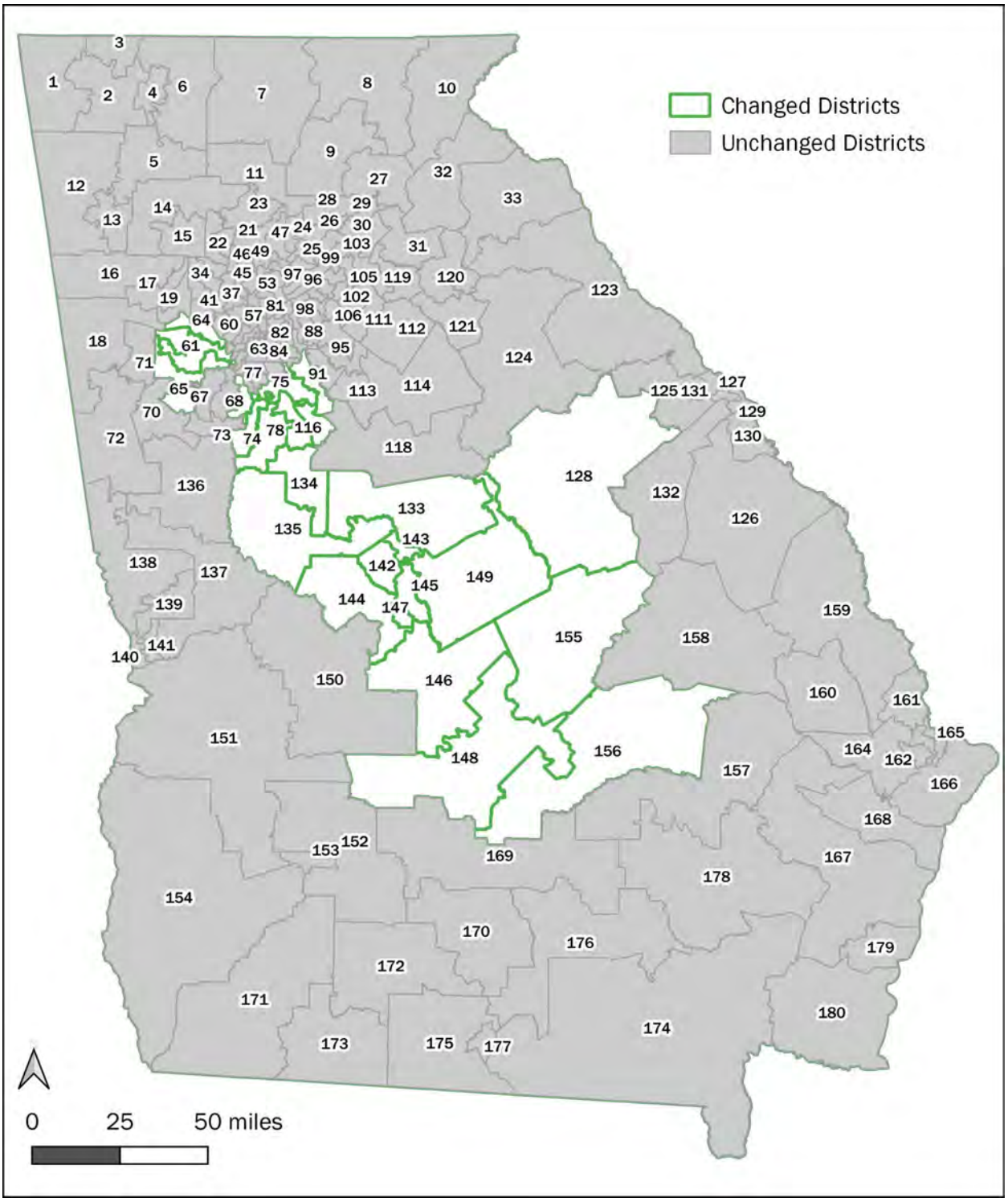


Figure 4: Changed and unchanged districts in illustrative House plan



6. I reserve the right to supplement this report in consideration of additional facts, testimony, or materials that may come to light.

Executed on February 9, 2022.

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Blakeman B. Esselstyn

Rebuttal Report of Blakeman B. Esselstyn

I. INTRODUCTION

1. My name is Blakeman B. Esselstyn, and I am the founder and principal of a consultancy called Mapfigure Consulting. I submitted an expert report on December 5th, 2022, which includes information about my qualifications.

2. I was asked by counsel to review the Expert Report of John B. Morgan (dated December 5th, 2022) and provide my analysis and conclusions. In addition to the report, I received block assignment files for the two Georgia redistricting plans Morgan created, as well as files to allow for the mapping of incumbent locations. Details about the data I used, the methodology of the analysis, and other tools used in making the graphics in this report are provided in **Attachment A**.

3. My conclusions can be summarized as follows: Morgan purports to have established a causal relationship between racial considerations and district compactness, but the basic arithmetic he uses isn't sufficient to properly demonstrate correlation, let alone causation. Further, his report contains profound weaknesses in the premises of his analysis, methodological missteps, internal inconsistencies, discrepancies in data reporting, conspicuous omissions, and thus, in the end, entirely unjustified conclusions.

II. FINDINGS

4. Morgan's approach both fails to use appropriate statistical methods and in fact uses methods that are explicitly discouraged in statistics education. I found numerous missteps and shortcomings in his analysis, each of which I will address below.

A. False equivalence and flawed comparisons

5. "At the heart of quantitative reasoning is a single question: *Compared to what?*"[1] Virtually the entirety of Morgan's analysis sections consists of comparing pairs of things: namely plans, regions, and districts, one each from his illustrative plan and the enacted plan, one chamber at a time. This type of pairing should involve equivalent entities, so that the comparisons are "apples to apples," but his paired items differ in substantive ways, undermining from the outset the validity of his analysis.

i. Compared plans aren't "cut from the same cloth"

6. The origin and drawing process for the enacted plans and the Morgan illustrative plans are fundamentally different. Often illustrative plans (such as the ones in my PI report submitted for this case) use a previously enacted plan as a starting point, but Morgan's plans do not. His plans, created from a blank slate, ignore, among other things, continuity (which Morgan himself describes in his report as a "traditional redistricting factor" in paragraph 19) and one of the General Assembly's adopted principles: "avoid[ing] the unnecessary pairing of incumbents."

[1] Edward Tufte, *Envisioning Information*, Graphics Press, Cheshire, CT, 1990, p. 67.

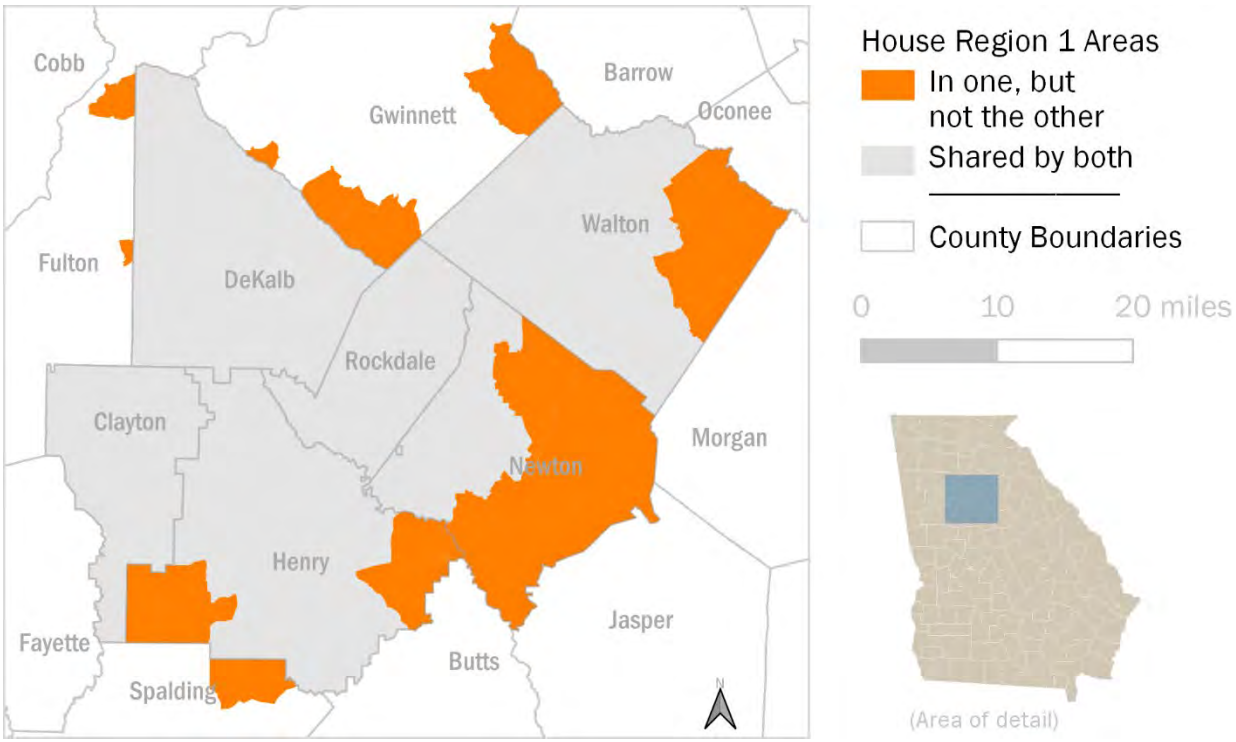
7. I can attest from personal experience that avoiding the pairing of incumbents presents an enormously significant constraint when designing redistricting plans. By ignoring it, Morgan created House and Senate plans that pair, respectively, *3.7 and 4.3 times as many* incumbents as the enacted plans.[2] Such plans would be highly unlikely to pass muster in the General Assembly given that they would pit 39% of the sitting legislators against each other.

ii. Compared regions and districts do not correspond

8. Morgan provides essentially no written statewide analysis of the plans (just some numbers with no interpretation) and devotes his analysis paragraphs to "region analysis." One might expect the pairs of regions he compares to have matching shapes, but he opts instead for what he calls "roughly similar geography"— and upon inspection the regions turn out to be surprisingly different. There are many areas that are in Morgan's illustrative region but not the enacted region, or vice versa. See the areas shaded in orange in Figure 1 below. Thus when Morgan refers to the singular "region 1" (e.g., in paragraph 30) it's not even clear to me what that consists of.

[2] Interestingly, the numbers Morgan provides for incumbents paired by the enacted plans differ significantly from those given in Charts 3 and 4 of his declaration of January 18th, 2022 for this matter.

Figure 1: Map showing differences in "region 1" for Morgan House illustrative and enacted plans



9. In the House region 1 analysis, the area (orange) which doesn't have a corresponding area in the other plan amounts to *more than a third* of the shared area (gray). Maps showing similarly large discrepancies for the other region pairs are provided in **Attachment B**; supporting statistics are provided in **Attachment C**.

10. Morgan's two versions of House region 1 don't even have the same number of districts, so one has almost 61,000 more people than the other. The Black voting age population of the two Senate region versions, meanwhile, differs by 52,794 persons.

11. Though Morgan says he numbered his illustrative plan to be similar to the enacted plan, several of the districts included in one region don't have a matching district in the other.[3]

12. Morgan calls out pairs of districts he deems "comparable" to compare in more detail. Though he chose the labeling so that similarly placed districts would be similarly numbered, two of his four pairs involve districts with mismatched numbers. In paragraph 44, he compares his illustrative District 055, wholly in DeKalb County, with enacted District 010, 79% of whose area is in Henry County. Such pairings raise more questions than they do answers.

13. Perhaps most notably, the Senate analysis region Morgan defines as the "metro region" in the Atlanta area conspicuously fails to align with any of the various defined regions called "Metro Atlanta." In fact, neither his Senate metro region nor either of his House regions encompass Gwinnett or Cobb Counties, the state's second and third most populous counties. See, e.g., his Map on p. 38.[4] These counties also have the 3rd and 4th highest Black voting age populations of all the counties in the state.

14. With the regions and districts differing so much in their shape, composition, and demographics, the comparison of their summary statistics has too much roughness in it to be acceptable for rigorous quantitative inquiry.

[3] All of the following districts have no match. Chart 3: 114; Chart 4: 094 and 111. Chart 6: 038 and 134; Chart 7: 025 and 070; Chart 10: 048; Chart 11: 038.

[4] The final two maps in Morgan's report are not identified with a number.

B. The majority of the analysis is on a (small) minority of the data

15. For each chamber, Morgan devotes only six lines of narrative text and one table in the analysis sections to the *statewide* plans; the entire remainder of his analysis sections are "Region Analysis." But he gives no reason why he chooses to limit his analysis to just 7% of Georgia's counties for the House and 6% for the Senate,[5] or why he didn't choose different areas for House and Senate to include more Georgia geography.[6] And out of a total of 236 House and Senate districts, his more detailed comparison looks at only 4 (or 2%). Students of statistics learn early on that a small sample size is a big red flag if the research purports to extrapolate findings to a larger area or population.

C. Not a representative sample

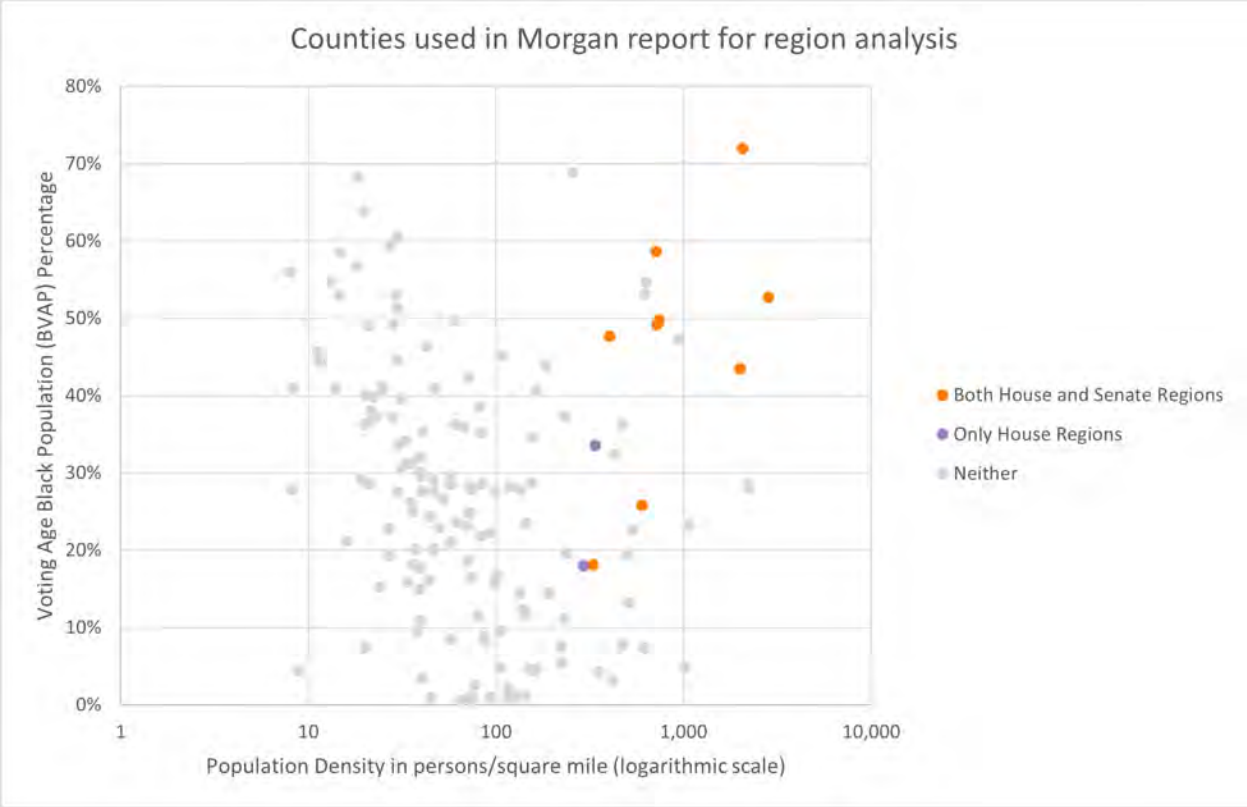
16. The counties chosen for analysis tend to be outliers when compared to all of Georgia's counties in terms of the racial makeup and density of their population (see Figure 2 below with BVAP and persons per square mile). For a report that purports to draw conclusions about how consideration of race and compactness might be related, Morgan focuses his analysis on custom-designed regions that disproportionately include the state's most densely populated counties with the highest percentage of Black people. Interestingly, though Morgan says the plans were drawn in a "race-blind" way, the districts he chooses to call out for focused analysis are all from the two counties (DeKalb

[5] These numbers are based on his identification of counties in paragraphs 28 and 42. Note that paragraph 42 does not mention Heard County, though mapping shows it is fully in both versions of his Senate metro region. The 6% figure is accurate whether Heard County is included or not.

[6] Admittedly, the regions represent a higher percentage of the state total if you consider the number of districts in them instead of the number of counties (29% or 30% for House depending on how you quantify his differing regions, and 27% in the Senate), but see the subsequent section for shortcomings of the sample of districts.

and Fulton) that are closest to the top right corner of Figure 2 below, i.e. the most densely populated and the most Black.

Figure 2: Scatterplot of all Georgia counties by BVAP and population density, with Morgan's "region analysis" counties highlighted.[7]



D. Cherry-picking

17. Cherry-picking is "[c]hoosing to make selective choices among competing evidence, so as to emphasize those results that support a given position, while ignoring or dismissing any findings that do not support it."[8] For this reason, it is "a hallmark of

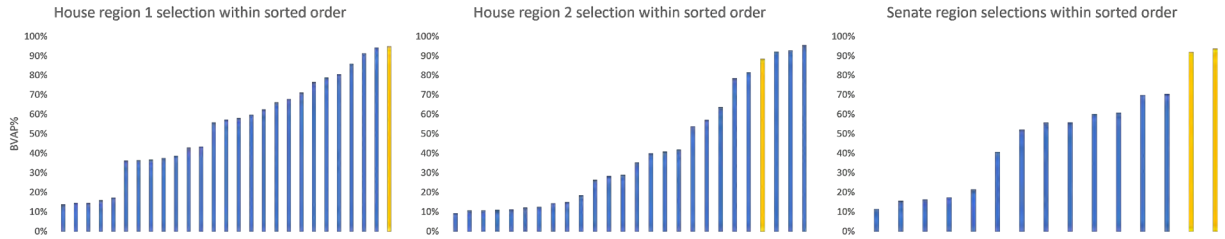
[7] Again, these are based on his identification of counties in paragraphs 28 and 42.

[8] Richard Somerville, PhD, Advance Written Testimony submitted to the US House of Representatives Committee on Energy and Commerce Subcommittee on Energy and Power, March 8, 2011, p. 46. At https://www.govinfo.gov/content/pkg/CHRG-112hhrg66704/pdf/CHRG-112hhrg66704.pdf

poor science or pseudo-science."[9] Morgan's report includes multiple examples of selective data exposition which would be hard to explain away as anything other than cherry-picking.

18. Morgan offers no explanation for why he chooses certain districts to write more about in support of his theorized connection between compactness and race, but looking at them next to all of the options he could have chosen leaves little doubt that there was an agenda. See in Figure 3 below how Morgan's choices from his illustrative plans compared to their peer districts when it comes to the BVAP numbers. Note that in every case, the districts pulled out for attention come from the far right of the chart, i.e., having the highest percentage of voting age Black people.

Figure 3: Bar charts showing each of Morgan's illustrative region's districts sorted by BVAP, highlighting districts chosen for detailed analysis



19. In Figure 4 below, a parallel pattern emerges. From all the districts he could have chosen to call out from the three regions in the enacted plans, he chose to call out the ones with the lowest compactness scores. By pairing illustrative districts having relatively high Black percentages with enacted districts with relatively low compactness scores, he got comparisons that most seem to bolster his argument.[10]

[9] Id.

[10] Looking at the sorted compactness scores for Morgan's illustrative districts, or the sorted BVAP numbers for the enacted districts turns out not to be instructive, since by choosing an illustrative district from the top of the BVAP ranking and an enacted district from the bottom of the compactness ranking,

Figure 4: Bar charts showing each of the enacted region's districts sorted by compactness scores, highlighting districts chosen for detailed analysis

E. Correlation, causation, and confounding

20. Even if one were to disregard the statistical failings described above, Morgan's argument still falls apart under scrutiny.

21. Note his language about cause and effect. He may not always use the words "cause" (often opting instead for "lead to," "yield,", "impacted," "[a measurement] "is lowered by" [a separate action]," etc.) or "effect" (more often using "impact"), but implied causation is sprinkled throughout the report. However, causation is not the same as correlation, and proving causation requires more than calculating averages and comparing a handful of pairs of examples. As a classic example, ice cream sales and shark attacks may both increase at the same times during the summer, but that doesn't mean that ice cream sales cause shark attacks.[11]

Morgan is all but guaranteed to have a pair where his illustrative district has higher BVAP *and* higher compactness than the enacted district.

[11] See, e.g., Hastie, Trevor, et al. *An Introduction to Statistical Learning: With Applications in R*. Springer US, 2021. Pp. 74-75.

22. Morgan's analysis disregards other confounding factors. Three different times during his report, Morgan does concede that "there may be many causes" of district compactness scores (i.e., other than racial considerations), but he fails to elaborate about what those might be, which further weakens the credibility of his analysis. He acknowledges that his plans differ from the enacted plans not only based on their treatment of race, but also incumbency and continuity, however he fails to dig into any data on any factors other than race.[12]

23. One could conceivably fail to demonstrate a causative effect between factors but still at least be able to show correlation between them. Morgan doesn't even do that; his fundamental point has a fundamental problem.

24. For example, in paragraph 34, Morgan states, "Looking at the individual district data in region 2, the House Enacted plan has more majority black districts and they are less compact than the districts in the House Illustrative Plan." In the following sentence, he goes on to express an opinion on a causal relationship as if correlation had been established by the previous sentence, but it hasn't. Further, for every one of his chosen examples, I could choose a counterexample that would suggest an opposite conclusion—or an ambiguous conclusion: what if the Reock compactness score is higher and the Polsby-Popper score is lower (or vice versa)? His attempt at deductive reasoning falls flat.

[12] Other possible influences include how communities of interest and public comment were taken into account. Morgan does not mention having reviewed any public comment.

III. CONCLUSION

25. Essentially, Morgan's report describes how he conducted a sort of experiment, followed by "analysis" sections, followed by the conclusions he draws from his observations. But what he calls analysis is not so much analysis of a potential causal relationship but rather a litany of observations and claims, many of which are unsubstantiated. His hand-waving observations fall so short of real statistical investigation as to be devoid of significance.

26. While he shows the ability to assemble basic tables, calculate totals, percentages, and averages, and to decide which numbers are greater or less than each other, if this report had been submitted as an assignment in an introductory statistics course, I believe that it would get a failing grade.

27. The very premise of his experiment is suspect, the experimental design is unsound, the data reporting raises concerns, the methodology of the analysis fails to employ appropriate statistical practices, and hence any conclusions drawn from it are spurious. In short, the report can't be taken seriously as meaningful analysis.

28. I reserve the right to supplement this report in consideration of additional facts, testimony, or materials that may come to light.

Executed on January 23, 2023.

Blakeman B. Esselstyn

Attachment A:

Software, data sources, and methodology

1. The primary tool that I used for my analysis was Maptitude for Redistricting. More information about this software and the data that I have loaded into it can be found in Attachment B to my expert report submitted on December 5th, 2022. For creating the maps in Figure 1 and Attachment B (of this report), I used software called QGIS, also described in the aforementioned attachment to my previous expert report. The charts in Figures 2, 3, and 4 were created using Microsoft Excel.

2. The additional data considered for this rebuttal report included the block assignment files for the two Georgia redistricting plans Morgan created, as well as files to allow for the mapping of incumbent locations. These were provided by counsel.

3. After reading Morgan's report, I loaded the files mentioned in the previous paragraph into Maptitude for Redistricting. I then examined the plans and their sub-components and performed calculations to better understand their attributes.

4. For comparison of the geographic area and demographics of the district subsets identified by Morgan for his "region analysis," I used the following process in Maptitude for Redistricting for each chamber's plans:

- With the illustrative plan open, I selected from the "Districts" layer the districts Morgan identified as being in each illustrative region and retained that selection of districts as a separate named set.
- I ensured that the Area field was visible in the District dataview (as well as the relevant demographic fields).
- I used the "Compute Statistics" tool to get summary area and demographic statistics for each set (i.e., region).
- For each illustrative region, I exported the selection set as a CDF file.
- (I also exported them as shapefiles for mapping in QGIS, where I used a "union" operation to distinguish between shared and unshared portions.)
- I then opened the enacted plan and repeated the five steps above.
- I then imported the CDF file(s) of the region(s) from the illustrative plan.

- I created a dataview from the “Census Block” layer and ensured that the Area field and relevant demographic fields were visible in that dataview.
- I used the “Select by Location” tool to select the census blocks in each region and retained those as separate named selection sets.
- I then used the "Combine Selection" tool to select, e.g., the blocks in both the illustrative and enacted regions, or in one region but not both, and retained those selections as named selection sets.
- With the “Compute Statistics” tool I was then able to get summary statistics for the selection sets.
- Summary statistics were collected for comparison and can be seen in Attachment C.

5. For calculating the area statistics related to a sub-geography of enacted Senate District 010, I followed a similar process to the above, using the “Select by Location” tool and “Combine Selection” tool to select blocks in both SD 010 and Henry County, and the “Compute Statistics” tool on the resulting subset.

6. For Black voting age populations of Cobb and Gwinnett Counties (and other Georgia counties), I used the Any Part Black Voting Age Population numbers from the Census Bureau’s PL 94-171 data, available in the Counties layer in Maptitude for Redistricting.

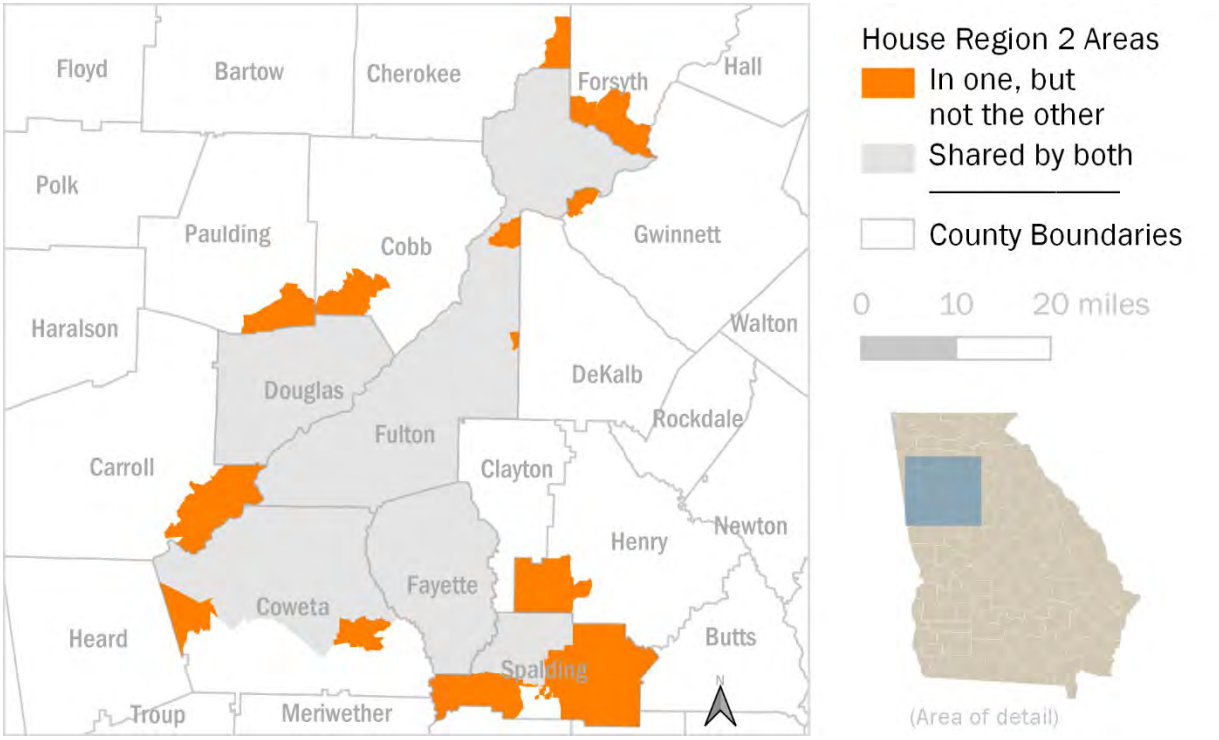
7. The same Counties layer dataview, with Area and relevant demographic fields visible, allowed me to export a spreadsheet to Excel, which I then used to generate the scatterplot of APBVAP percentage and population density.

8. For the sorted bar charts of districts’ BVAPs and density scores, I used the numbers provided in Charts 3, 4, 6, 7, 10, and 11 of Morgan’s report.

Attachment B:

Supplemental Maps

Figure B-1: Map showing differences in "region 2" for House illustrative and enacted plans



(Attachment continues on following page)

Figure B-2: Map showing differences in "metro region" for Senate illustrative and enacted plans

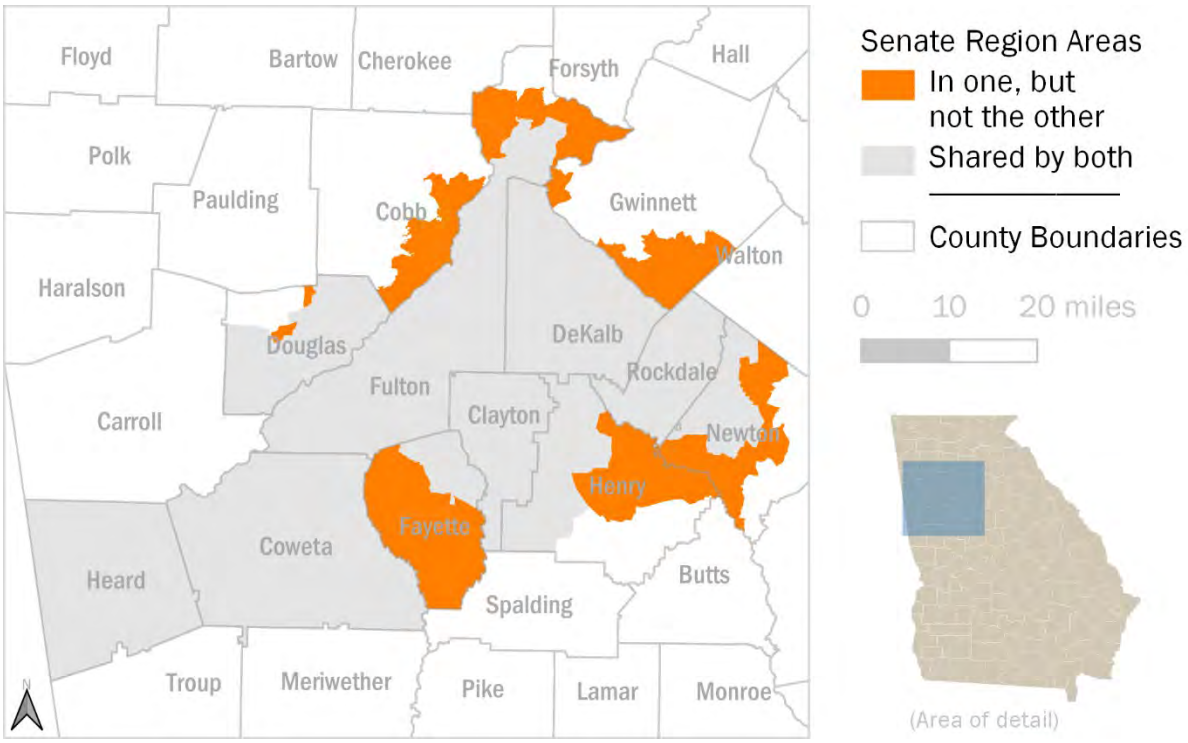


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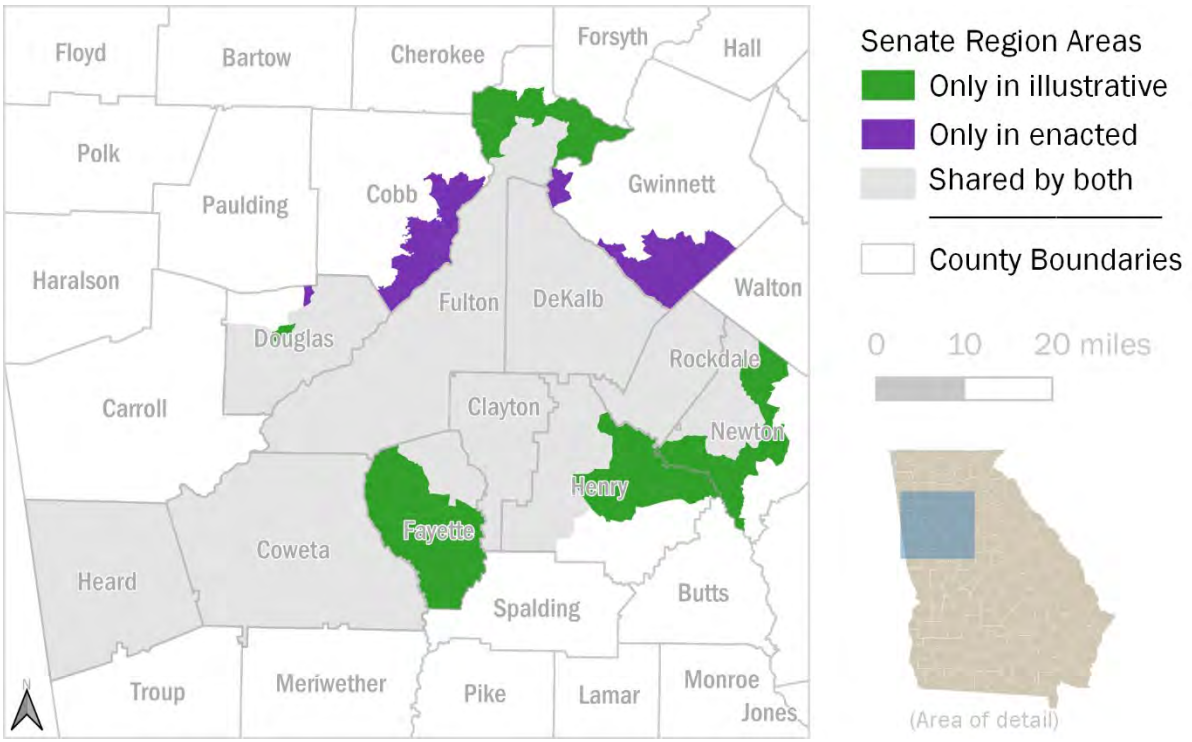
Figure B-3: Map showing differences in "metro region" for Senate illustrative and enacted plans—with plan origin identified



Attachment C:

Supporting Statistics

Districts	Count	Total Population	AP Black 18+ Population	Area (sq. miles)
House total	180			59,457.06
House illustrative region 1	27	1,610,605	658,763	1,410.90
House illustrative region 2	26	1,543,700	494,757	1,370.90
House enacted region 1	28	1,671,533	681,726	1,323.42
House enacted region 2	26	1,543,313	476,470	1,435.72
Region 1 both versions		1,531,363		1,157.01
Region 1 either version		1,750,775		1,577.31
Region 1 one but not other		219,412		420.30
Region 2 both versions		1,417,389		1,223.43
Region 2 either version		1,669,624		1,583.20
Region 2 one but not other		252,235		359.77
Senate total	56			59,457.06
Senate illustrative region	15	2,873,756	1,082,599	2,560.16
Senate enacted region	15	2,873,125	1,135,393	2,289.23
Senate both versions		2,510,542		2,140.09
Senate either version		3,236,339		2,709.30
Senate one but not other		725,797		569.21
Total Area of Senate enacted District 10				169.20
Area of above inside Henry County				133.94