IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF SOUTH CAROLINA
CHARLESTON DIVISION

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THE SOUTH CAROLINA STATE CONFERENCE OF THE NAACP, *et al.* Plaintiffs,	: 3: 21-cv-03302-MGL-TJH-RMG : OCTOBER 14, 2022
v.	: VOLUME VIII
THOMAS C. ALEXANDER, *et al.*, Defendants.	: (PAGES 1913 - 2038)

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TRANSCRIPT OF BENCH TRIAL PROCEEDINGS
BEFORE THREE-JUDGE PANEL:
HONORABLE MARY GEIGER LEWIS, HONORABLE TOBY J. HEYTENS,
HONORABLE RICHARD M. GERGEL,
UNITED STATES DISTRICT COURT JUDGES

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Proceedings recorded by mechanical stenography, transcript produced by computer.

INDEX

PLAINTIFFS' WITNESSES

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PLAINTIFFS' EXHIBITS

SENATE DEFENDANTS' EXHIBITS

Exhibit	Description	Identified	Admitted
3	Senate Guidelines	1939, 1950 1983	

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(The following bench trial proceedings resumed on Friday, October 14th, 2022, at 9:00 a.m.)

JUDGE GERGEL: Good morning. Please be seated. Good morning, everybody.

Let me first address the issue of the data matter. I read some e-mails back and forth this morning at 5:30 in the morning. Great morning reading. Mr. Gore's e-mail I thought was very interesting. And what it revealed was y'all know a lot about data than I do, okay? And I met with Mr. Rainwater this morning in an effort to try to figure out where we are, because, I'm an agnostic about what we use. I just want it right. And I want the parties -- let me say this: Everything is sort of an estimate. We want to be as precise as we can, but we know using the censuses is in some ways an estimate. But what I don't want is someone reading an order saying, you got the numbers wrong.

So, here's what we're going to do. I've asked Mr. Rainwater and Mary Katherine to confer with your IT people, share the data, and in five days, if there is a dispute, you let me know the areas of dispute. And in five days, if you've got areas of agreement, tell us what those are. That's easy. If there are areas of disagreement, tell me what you think it should be, and we'll just have to make a ruling, okay? But we won't close the record, because we need the data. Because with all these voluminous records, 700, 800 exhibits, or

whatever, y'all didn't give us the data, and we need it. So, I would just ask all counsel to work with each other, and then in five days, if there is a dispute, tell me where the dispute is, or if there is not a dispute -- I understand there's just a question about some split VTDs, is where there's just a little bit of uncertainty. And hopefully, y'all can work that out. We don't care how you work it out, we just want you to work it out. And if you don't, you'll tell us why you disagree, we'll consult with the technical expert and we'll enter an order about what data to use, okay? Our clear preference -- clear preference -- is y'all work it out, okay? Y'all know it better than we do.

Okay. Let me talk a second about schedule from here out. This is going to get everybody's attention. We want proposed findings of fact and conclusions of law filed by November 3, 2022. And we want to have closing arguments on November 22nd, 2022, at 9:00 a.m. This is not a debate society. I won't put the clock on you, but I'll turn off your microphone at some point. You know, we know -- y'all have done just a great job of giving us the details, and we kind of know where the disputes are. I mean, we really do. And, you know, y'all just need to help us. The findings of fact and conclusions of law will kind of lay out clearly where y'all are and it will help refine our closing argument. And if the occasion arises after the findings of fact and there are

particular issues we want you to address, we'll let you know that, okay? But what we're trying to do is have an orderly end to this in a timely manner. And I think having the findings of fact and conclusions of law before argument makes so much sense.

Okay. Are there further matters to come before the Court for the plaintiff?

MR. CHANEY: Your Honor, just that the two exhibits that reflect the agreement between us and the House should be filed today.

JUDGE GERGEL: Good.

MR. CHANEY: I just wanted to flag for the Court that that would be coming in, because it would be after our last witness.

JUDGE GERGEL: Okay. We're not closing the -- that's great. We do need it. We need the designations. You said y'all were going to color-code it. Will you give us an original copy of that, or only digital copies?

MR. CHANEY: Whatever the Court would prefer, we can accommodate.

JUDGE GERGEL: Well, certainly the digital would be fine, but, you know, some of us are the age where we really like to read hard copy. And I'd say at least one for each chamber. So, three. If you get them to me, I'll get them distributed for you, if you'd like.

MR. CHANEY: Or we can send them directly.

JUDGE GERGEL: Just send them directly. But we need one set each. But the digital will be fine. Our law clerks will read the digital, and we'll read the hard copy, is the way it works. And we do need something to kind of direct us -- if there are particular areas you think are important, we want y'all to tell us that.

MR. CHANEY: And we'll do that, your Honor.

And just so the Court can look out for it, it's PX-138 and PX-216.

JUDGE GERGEL: What's the first one?

MR. CHANEY: PX-138.

JUDGE GERGEL: Yes.

MR. CHANEY: And then the second one is 216.

JUDGE GERGEL: And those are deposition designations?

MR. CHANEY: One is the designation of Mr. Brunell, and the other is a text message thread that you heard from Mr. Moore quite a bit about. I just wanted to flag that.

JUDGE GERGEL: Okay. How about the deposition designations? When's that coming?

MR. CHANEY: I think we should have the House color-coded digital copies before the Court today. We've got the counter designations from the Senate over the course of yesterday and this morning. And so, we should be able to both file the designations themselves today, and then the

transcripts with the color-coding will be a little bit delayed because I have to incorporate that information.

JUDGE GERGEL: That's fine.

MR. CHANEY: And then the two witnesses that the House ended up not calling, we're still working on sort of narrowing those designations.

JUDGE GERGEL: How many deposition designations do we have?

MR. CHANEY: I think something in the order of like 14, total. But, yes.

JUDGE GERGEL: I've got to tell you, it does mystify me a bit about all these deposition designations. I've got to be honest with you, if they were important enough, I would have thought you would have called them. And if you didn't call them, how important are they? I mean, really, I'm just kind of wondering about that.

MR. CHANEY: Sure. And I think at least as to some of them, the material parts are how they are inconsistent one to the next, to the next. And I think the Court would have had relatively little patience to ask the same questions of live witnesses over and over and over and over again on the order of the number of designations. But we can point to on the transcripts those inconsistencies among people who are presumably all in the same room. And so, I think it's important for the Court to see that in the record,

particularly when considering whether or not there was an intent to hide both from the public and this Court the true motives behind the map.

JUDGE GERGEL: Okay. That's what all these depositions are about, motive? About whether it's partisan motive or not?

MR. CHANEY: Not exclusively, no. But --

JUDGE GERGEL: Whatever.

MR. MOORE: Your Honor, in any event, we have worked hard to narrow these designations. We obviously still think that the plaintiffs' designations are excessive. And to the extent that we have -- like, the counter designations are sort of designed to counter them. I would ask that plaintiffs, if they send us the color-coded exhibits before they submit them to the Court, and then we're going to work with them on the designations. There is one deposition transcript where there are still competing designations, which we have performed redactions on to match this stipulation with respect to this one exhibit, this text chain. And I'm still reviewing that to make sure that it's appropriately redacted. But we'll get that to them today or over the weekend.

MR. CHANEY: The highlighted transcripts reflect only what the parties sent to each other. And so, those just hit the docket as a sealed set of exhibits. We didn't provide it to the House, because they just reflect what the House told us

with respect to counters, and what we told them with respect to designations. I'm not sure the utility of -- I mean, we can, in the future, provide the -- you know, let them see the transcripts first, but it just shows what the parties exchanged already.

MR. MOORE: We'll take a look at it. And if we have any issues, we'll make --

JUDGE GERGEL: Yeah, just object. But we have good filters. You know, this is not a jury.

Okay. Anything further from the plaintiff?

MR. CHANEY: Not from the plaintiff.

JUDGE GERGEL: From the defense?

MR. TRAYWICK: Briefly, your Honor.

The plaintiffs, just a few minutes ago, filed on the public docket PX-651. This was an exhibit shown to Senator Campsen during his cross-examination. They've filed a written motion to move to admit the exhibit instead of asking the Court here in the courtroom to do it. And in doing so --

JUDGE GERGEL: What is the exhibit?

MR. TRAYWICK: It was the draft of bullet points that Breeden John sent to himself. And Senator Campsen --

JUDGE GERGEL: Said he never saw it.

MR. TRAYWICK: Right. And so, they're saying that it's being offered to show the motive. But if no member of the General Assembly saw it -- and during his deposition,

Breeden testified that he sent it to himself so that he could go home and work on it. It was a working document. They're trying to --

JUDGE GERGEL: Is it different from the one Breeden John sent, ultimately?

MR. TRAYWICK: It was different. And --

Before you pop up, let me finish please.

What they're trying to use it for is to show that the numbers on core preservation are different. And so, that is being offered to try to show the truth of the matter asserted, not to show the motive of any member of the General Assembly, because it's a Senate judiciary staffer who was working on a document at 10:00 p.m. the night before the floor debate and made changes to it before it was ultimately circulated. So, that has no bearing on --

JUDGE GERGEL: Was the number wrong, right? Is it debated? What's going on?

MR. FREEDMAN: The numbers are certainly disputed, your Honor.

JUDGE GERGEL: Well, you know, rather than filing a motion with us, we're probably -- I hate to address it, but after the expert today, if you need to -- we need to see the document and just go ahead and rule on it so I don't have that hanging out there.

MR. TRAYWICK: Sure. And I would just say, instead

of bringing it up, they filed it on the public docket, and I'm pretty sure we had a confidential stamp on it. So, we have concerns with that. But it was just a little irregular from how we've been doing it.

JUDGE GERGEL: Well, I'm not too worried about it, myself. I just want to be able to address it, but I want to go ahead and get our expert up.

Are there other issues we need to address?

MR. MOORE: I just have one question, your Honor. And maybe it's a stupid question, but I'm assuming that with respect to the findings of fact and conclusions of law, you want the defendants to collaborate on that and you want one version from all of us, right?

JUDGE GERGEL: I think that would be very helpful. And it would probably have the inconsistent ones probably be more confusing than is worthwhile.

MR. MOORE: That was my thought. I just wanted to make sure that that was what the Court wanted.

JUDGE GERGEL: I mean, you know, I've tried to make the point many times that the plan appears to have been a Senate plan. And the House folks pretty much weren't involved in developing the Senate plan. They said that. And so, I thought, frankly, Mr. Moore, a lot of this House stuff was largely irrelevant because of that. But, you know, you were answering some things people were saying, so I get it --

MR. MOORE: Yes, sir.

JUDGE GERGEL: -- but I'm just saying to everybody, you know. And I would say, in your findings of fact, focus on the map, not so much on the back and forth and did this guy say this and that guy say that. That's not that elucidating. And I know that some of the stuff, irregularity reflects racial intent -- or can reflect racial intent. But, folks, focus on the maps. Focus on the maps. That's what we're looking at.

MR. MOORE: And I appreciate your Honor saying that. That's one of the reasons why we decided to cut those two witnesses yesterday. I think it was the appropriate thing to do. And we were responding to the Court's comments. You know, I have thought that a lot of this House stuff was irrelevant, too, but we felt like we had to address issues when they were raised.

JUDGE GERGEL: You never let relevance get in the way of a trial, right?

MR. MOORE: As Judge Thomas used to say: I'll accept service on that.

JUDGE GERGEL: Yes. Okay. Are we ready to proceed?

MR. CEPEDA DERIEUX: Yes, your Honor.

JUDGE GERGEL: Call your next witness.

MR. CEPEDA DERIEUX: Plaintiffs call Dr. Kosuke Imai.

KOSUKE IMAI, Ph.D., having first been called as a

witness, was duly sworn and testified as follows:

DIRECT EXAMINATION

BY MR. CEPEDA DERIEUX:

Q. Good morning, Dr. Imai. Could you please state your name for the record?

A. Kosuke Imai.

Q. And where do you work?

A. I work at the Harvard University.

Q. And, Dr. Imai, did you prepare a report in this case?

A. Yes, I did.

Q. Did you provide a CV as part of your work in this case?

A. Yes.

MR. CEPEDA DERIEUX: Your Honor, may I approach?

JUDGE GERGEL: You may. But we don't need -- I've reviewed the CV. It's previously been presented. We've addressed *Daubert* issues. What are you presenting Dr. Imai for?

MR. CEPEDA DERIEUX: Oh. Sure, your Honor. Plaintiffs offer Dr. Imai as an expert in political science statistics, computational social science --

JUDGE GERGEL: Hold on. Slow down.

MR. CEPEDA DERIEUX: Sure.

JUDGE GERGEL: Political science statistics --

MR. CEPEDA DERIEUX: Statistics.

JUDGE GERGEL: Okay.

MR. CEPEDA DERIEUX: Computational social science.

JUDGE GERGEL: Hold a second. Okay. Yes?

MR. CEPEDA DERIEUX: And causal inference research methods.

JUDGE GERGEL: Causal research inference methods?

MR. CEPEDA DERIEUX: Correct. Yes, your Honor.

JUDGE GERGEL: Okay. Beyond the *Daubert* motion -- filed in response to the *Daubert* motion, do the defendants have any other objections to Dr. Imai as an expert?

MR. GORE: No further objection, your Honor.

JUDGE GERGEL: Very good. Dr. Imai is recognized as an expert in political science statistics, computational social sciences, and causal research inference methods.

MR. CEPEDA DERIEUX: Sorry, your Honor. It's causal inference research methods.

JUDGE GERGEL: Causal inference research methods. Sorry to get that backwards.

MR. CEPEDA DERIEUX: Not sure that matters, but just wanted to --

JUDGE GERGEL: I'm not sure it doesn't either, but I want to get it right. It's kind of like the VTD splits.

MR. MATHIAS: And, your Honor, just for the record, no further objections from the House on that.

JUDGE GERGEL: Thank you. I was treating y'all as one. Sorry. Thank you, Mr. Mathias.

Okay. Please proceed.

MR. CEPEDA DERIEUX: Thank you, your Honor.

BY MR. CEPEDA DERIEUX:

Q. Okay, Dr. Imai. Let's discuss your work in this case. And your report is Plaintiff's Exhibit 32. If at any point you wish to have any pages displayed, please let me know, and we can do that?

A. Okay.

Q. So, Dr. Imai, could you explain to the Court the analyses you did in this matter?

MR. CEPEDA DERIEUX: And, Stephen, if we could put slide one up.

BY MR. CEPEDA DERIEUX:

Q. And, Dr. Imai, can we take these analyses one by one?

A. Yes. So, I conducted three simulations analyses in my report.

MR. GORE: Your Honor, I just need to raise the point, we were not provided these demonstratives before. This is the first time we're seeing this. Quick look, it looks okay to us, but I don't know what's behind this.

JUDGE GERGEL: Well, looks like a summary right out of the summary of opinions. But do you want to look at it for a minute?

MR. GORE: Do you have a hard copy or something we can look at?

MR. CEPEDA DERIEUX: I don't think I do.

MR. GORE: Okay. Well, if it's okay with the Court, we'll just watch the slides as they come by and if --

JUDGE GERGEL: And if you have an objection, raise it.

MR. GORE: Thank you.

MR. CEPEDA DERIEUX: There's two, so it'll be quick.

MR. GORE: Even I'll be able to see them then.

BY MR. CEPEDA DERIEUX:

Q. Dr. Imai, if you could, please explain your first analysis in this matter.

A. Yes. So, the first analysis is localized simulation analysis, where I generated 10,000 alternative ways of creating Districts 1 and 6.

Q. And what happened to the rest of the boundaries in the map?

A. Right. So, the other five districts are set to the same as those under the enacted plan. So, the only thing I generated are the district boundaries between Districts 1 and 6.

Q. Okay. And can I call this your "localized district analysis," for ease of reference?

A. Sure.

Q. Okay. And just very briefly, what did your localized district analysis find?

MR. CEPEDA DERIEUX: And, Stephen, if we could go to the next slide. And I guess I'll give defense a second to look at this.

MR. GORE: Thank you. No objection.

BY MR. CEPEDA DERIEUX:

Q. And, just briefly, what did your localized district analysis find?

A. Yes. So, my simulation is race-blind in the sense that I did not use race to generate the simulated districts, which means that race is not -- it's a race-neutral baseline. And compared to that, I find that the enacted plan is unusual in the way that the Charleston County is split, by placing a disproportionately large number of Black voters who live in Charleston County into District 6, and as a result, lowering the Black voting age population in District 1.

Q. Okay. So, can we go to your second analysis? And what was that analysis, Dr. Imai?

A. Yes. So, the second analysis is also race-blind in the sense that I did not use race as an input in my algorithm when generating simulated districts. Again, I'm focusing on Districts 1 and 6 while holding the other districts as exactly the same as under the enacted plan. And here, unlike the first simulation analysis, I'm focusing just on Charleston County. So, the way that -- I'm just generating alternative ways, 10,000 of them, ways of splitting Charleston County.

And the enacted plan splits Charleston County, so that's what I'm looking at. And I basically generated 10,000 race-blind boundaries within the Charleston County.

Q. Okay. And, in brief, what were your findings on this analysis?

A. So, my finding basically confirms the finding from the first analysis by showing that the enacted plan puts a large number of -- a disproportionately large number of Black voters who live in Charleston County into District 6, and, again, lowering the Black voting age population of District 1.

Q. Thank you. And you said you did three analyses. What was the third?

A. Right. So, the third analysis is a statewide simulation analysis. So, by statewide, what I mean is that it's not just simulating Districts 1 and 6, I'm simulating all seven districts at the same time. But this analysis is done to address the possibility of the enacted plan trying to be compliant with the Voting Rights Act. So, I made sure that all simulated plans have a District 6, which the Black voting age population proportion is between 45 and 50 percent, which is in the same range as the Black voting age population proportion of District 6 under the enacted plan.

Q. And may I call this your "statewide analysis" or your "statewide VRA compliance analysis"?

A. Sure.

Q. Thank you, Dr. Imai. Let's take a step back and work through some of the basics in what you just said. What are simulations?

A. So, simulation analysis is basically the idea that to evaluate the characteristics or biases of the enacted plan, you can basically compare the enacted plan with a large number of alternative plans that are compliant with a set of specified redistricting criteria. So, in this case, I'm interested in how the race played a role in drawing the district boundaries under the enacted plan.

Q. And how is your simulation analysis different from traditional redistricting analysis?

A. Right. So, for many decades, the traditional methods that compare the enacted plan of a particular state with some other plans from other states, or perhaps compare the enacted plan from the plans from the previous decades, the problem of these traditional comparisons is that you're comparing apples and oranges. States are different. You can't compare South Carolina with New York or Alabama. They're different in terms of population, they're different in terms of redistricting laws. And over time, comparison is also problematic. The laws can change, or the population can also change.

And so, the advantage of simulation analysis is we're using -- I'm using the same exact rules as the enacted plan uses and the same exact population data and be able to the

generate alternative -- a large number of an alternative set of plans that serves as a benchmark for comparison.

Q. What about political geography? Does it use the same political geography?

A. Yes. So, it uses same exact data. So, it's population figures, racial composition, and election data, if such data are used in some analyses.

Q. Is there anything your simulations are not intended to do?

A. So, this is a very important point I'd like to emphasize, is that simulation analysis is -- the whole purpose of that is to evaluate the characteristics of the enacted plan. It's not meant to be used for generating a plan that can be enacted and practiced. So, the whole purpose of this is an evaluation of the enacted plan.

Q. So, is the purpose of simulations to replicate a legislature's process for drawing a map?

A. No.

Q. All right. So, let's work through your methodology. What method did you use to generate the simulated plans in your report?

A. So, I used the algorithm that belongs to a broader family of so-called Monte Carlo methods.

Q. And, Dr. Imai, what is the Monte Carlo method?

A. So, the Monte Carlo method is -- the key characteristic

of the Monte Carlo method is its ability to obtain a representative sample of redistricting plans that comply with a set of redistricting criteria -- in this case, myself -- specified. And this is important because there is a large number of redistricting plans that could comply with a set of redistricting criteria. It actually exceeds the number of atoms in the universe. So, even with a powerful computer, you can never enumerate all of them. However, Monte Carlo methods allow you to obtain a representative sample from this population of all possible redistricting plans that are compliant with a set of rules. And it's almost -- it's very similar to the idea of, you know, surveying something where you only interview 1,000 people to figure out what the United States population is thinking, instead of interviewing every single person who lives in this country.

Q. And do you have experience using Monte Carlo method in redistricting simulations?

A. Yes. So, I was one of the very first researchers who used Monte Carlo methods for the purpose of evaluating redistricting plans. This was about 10 years ago. And I have developed several methods in this area as well as software packages that are widely used by researchers and other experts.

Q. How many Monte Carlo methods that can be use for redistricting simulations are there?

A. So, there are several of them. They can be divided into two types. One is called Markov Chain Monte Carlo. It's called MCMC, for short. And that's the first family. And then, the second type of Monte Carlo is called Sequential Monte Carlo, SMC methods. And SMC is the algorithm that I actually developed myself. And I've also developed some of the MCMC as well.

Q. And have both of these algorithms, or types of algorithms, been peer-reviewed in the use of redistricting simulations?

A. Yes. So, many of these algorithms have been written in papers that have been published in the peer-reviewed journals. The main SMC paper is still currently under review, but its applications have been published in a couple of different journals as well.

Q. The simulations you generated with your MCMC algorithm in this case, are they replicable?

A. Yes. So, this is one of the important things that I try to do in my own academic work as well as expert-witness work. I developed open-source software packages that implement these algorithms. So, open source means that the code is open so everyone can just see what the code looks like and its extent. And it's freely available, so anyone can download from the website and install on your personal computers. So, all my analyses, both my academic work, as well as my expert-witness

work, are based on this package that I've developed. It's been used by many other researchers and other experts and been downloaded more than, you know, 30,000 times. And so, everything I did in this case, as well as in other cases, are duplicable, using this software package.

Q. Thank you. And you said you developed SMC, but you used MCMC in this report. Why did you do that?

A. Right. So, the choice of the algorithms for any analysis is important, and it has to consider what type of an analysis one is doing. In this case, as I summarized earlier, my first two analyses focuses on Districts 1 and 6. So, there are two districts that I'm investigating. In those cases -- I'm not going to go into the detail, unless you'd like -- but SMC and MCMC are essentially the same, so there's very little difference between the two. So, I could have used either one of them.

The statewide analysis, however, is a little bit different. So, statewide analysis, as I explained earlier, is trying to keep the BVAP proportion of District 6 in between 45 and 50 percent. So, it's a very specific constraint about specific districts. And those types of constraints are much easily incorporated into MCMC methods. So, that's why I used the MCMC method for the statewide analysis. And, for the sake of consistency, I decided to use the same for the first two analyses, even though in those two analyses the two methods

are essentially the same.
Q. Okay. Let's talk about some of the materials or sources you used. Can you describe the sources you relied on to prepare your work in this case?
A. Yes. So, the sources that I relied on to develop constraints that would be used for the algorithms are the State House and the State Senate redistricting guidelines. I also used the software package that I developed. As I explained earlier, that's how you implement the algorithms that I used. And then I also used the data from the census, which includes shapefiles and population figures, population counts, racial information. And I also used the data on incumbency residency location.
Q. What about the enacted South Carolina congressional plan?
A. Oh, yes. So, the enacted plan is also used to evaluate its characteristics. I didn't use that to, you know, directly generate the alternative plans, but when you compare -- when you evaluate the enacted plan, you have to use that to compare with the simulated plans.
Q. And are these the type of material you usually use in your work?
A. Yes. So, this is a very typical data source I use. What's nice about it is that, you know, census data is all public. And the guidelines obviously are not public, but -- or, well, may be public. But I use them to inform the

constraints that I used for the algorithm.
Q. And are these materials you've used in other cases where you've appeared as an expert?
A. Yes.
Q. So, you mentioned you used the House and Senate guidelines.
MR. CEPEDA DERIEUX: I'm going to ask Stephen to please pull up Plaintiffs' Exhibit 175.
BY MR. CEPEDA DERIEUX:
Q. Dr. Imai, do you recognize this document?
A. Yes.
Q. What is this document?
A. This is the House guidelines.
Q. Did you rely on this document to prepare your findings in this case?
A. Yes, I did, to conduct the constraints.
Q. And we'll speak on that a little more later.
MR. CEPEDA DERIEUX: Stephen, I'll ask you to please pull up what I believe is Senate Exhibit 3.
BY MR. CEPEDA DERIEUX:
Q. Dr. Imai, do you recognize this document?
A. Yes.
Q. What is this?
A. This is the Senate guidelines.
Q. And did you rely on this document to make your findings?

A. Yes, I did.
Q. So, let's talk about how you used the House and Senate guidelines to set up the simulations that your algorithm ran. What did you understand the purpose of the House and Senate guidelines to be?
A. I understand that these guidelines are used when drawing the enacted plan.
Q. And so, let's focus on the House guidelines first. Dr. Imai, does this document list criteria to be used in redistricting in South Carolina?
A. Yes.
Q. And did you understand all the criteria listed in this document to be equally important?
A. No.
Q. And could you say more? What do you mean by that?
A. I think if you go to the next page, there's a section that's called the "priority of criteria." So, there, as written, the requirements given in sections one, two, three, and four should be given the priority.
Q. And just what are sections one, two, three, and four?
A. So one, two, three, and four are -- well, it's hidden there. But U.S. Constitution, federal law, state law and eco-population.
Q. Thank you. And what about the Senate guidelines, Senate Exhibit 3, does that document -- did you understand it to list

several criteria to be used in redistricting in South Carolina?
A. Yes.
Q. Did you understand that all criteria listed in that document were equally important?
A. No.
Q. Could you say more about that?
A. Yeah. So, on the Section 3, under the heading of "additional considerations," I said there are other criteria that should be given consideration where practical and appropriate. So, I take this to understand that these criteria that are listed as additional considerations are not given the priority, and the ones that are listed in the earlier sections -- the sections one and two -- are given the priority.
Q. Thank you. So, let's talk about how you implemented criteria in these guidelines in your algorithm. So, did your algorithm treat all constraints equally?
A. No.
Q. And say more about that. How were they treated differently?
A. So, in these type of algorithms, there are two types of constraints. The way to think about this is one is the hard constraints, and the other one are the soft constraints. And the hard constraints are constraints that every simulated plan

is satisfied. So, if you place it as a hard constraint, every simulated plan that I generate would satisfy that constraint.

The soft constraint is a little bit different. So, there, you're basically encouraging the algorithm to draw a certain type of district -- not, you know, strictly enforcing. So, depending on the strengths, there are certain type of redistricting plans that are more likely to be generated.

Q. All right. So, hard constraints and soft constraints. Easy enough. Let's take those in turn. What were the hard constraints in your simulation?

A. Right. So, there are three hard constraints in my localized simulation analysis as well as statewide analysis. The first one is the contiguity, which means that every simulated district that I generate is contiguous. I also have the population deviation constraint. And this one is set to the .1 percent. So, what that means is that every simulated district that I generate has the population within the range of .1 percent of the target population. So, here, the target population is the total population of South Carolina divided by seven, which is the total number of districts in this state. So, that's the second hard constraint.

The third hard constraint is the "avoidance of incumbency pairing." So, I made sure that no incumbent is paired with another incumbent in the same district in every simulated plan that I generated. For the statewide analysis, I have one

additional hard constraint, which is what I call the VRA constraint, where I make sure that every simulated plan has District 6, who's BVAP proportion is between 45 and 50 percent, which is the simulated range as the one under the enacted plan.

Q. Thank you. So, let's take those first three. You mentioned contiguity, population deviation, and no pairing of incumbents as hard constraints. Let's talk about contiguity first. Was the contiguity constraint a part of all three of your analyses?

A. Yes.

Q. Did it apply to all districts in your race-blind analysis?

A. Yes.

Q. Could you say more about that?

A. Yes. So, every district that I generate in those analyses are basically contiguous.

Q. And so, you explained that you focused on Districts 1 and 6; did I get that right?

A. Yes, that's right.

Q. So, what happens to the rest of the map as far as contiguity goes?

A. Right. So, the other five districts are, as I said, in these localized simulation analyses are held up exactly the same as the enacted plan, so they're also contiguous as well.

Q. Understood. And did your contiguity constraint apply to all seven districts in your statewide analysis?
A. Yes. So, I made sure that every district of every simulated plan is contiguous.
Q. Okay. And I'll ask you, Dr. Imai: Are you familiar with the concept of contiguity by water?
A. Yes.
Q. What is contiguity by water?
A. Yeah. So, that means that if the two geographical units are only connected through the water, you can view that as contiguous.
Q. And does your algorithm consider contiguity by water to be permissible?
A. Yes. I allow for contiguity by water.
Q. Are you familiar with point-to-point contiguity?
A. Yes.
Q. What is point-to-point contiguity?
A. So, it's two geographical units that are touching with one another just with a point, like this *(indicating)*, then you can view them as contiguous.
Q. And does your algorithm permit point-to-point contiguity?
A. No.
Q. Is that consistent with the House and Senate guidelines?
A. So, the House and Senate guidelines are actually in conflict on this regard. So, one of them says point-to-point

contiguity is allowed, and the other one says it shouldn't be allowed. So, I decided not to allow for this.

Q. Thank you. So, the second hard constraint you mentioned was population deviation. Let's talk a little more about this. What do you mean by population deviation?

A. Yes. So, the population deviation is basically looking at the population of each district. So, in my case, you know, in every simulated district, you can compute how many people live there. And population deviation is the difference between the population of each district and the target population, which is the perfectly equal population division within the state. So, again, the total number of people who live in the state, divided by the number of districts, which is seven.

Q. And where does this requirement come from?

A. Yeah. So, this requirement is listed in both House and Senate guidelines, the population equality.

Q. What about federal law?

A. Yes. That's also part of federal law.

Q. So, how important do you consider this population deviation to be, according to the guidelines?

A. So, this is a hard constraint, so every simulated plan satisfies this particular constraint.

Q. Thank you. And I believe I heard you say you chose a .1 percent deviation on your simulated districts. Why did

you choose .1 percent as a deviation?

A. Yes. So, this is a very important point, because often people ask about population deviation. In the guidelines -- essentially, the guidelines say it should be equal up to one percent. So, you should have a strict equality for population deviation.

My algorithm has a population deviation maximum of .1 percent, which is about a little bit over 700 people in the case of South Carolina. So, there is a difference. And, you know, many people ask why is that. But one needs to remember that purpose of simulation is an evaluation of an enacted plan. It's not to generate -- they're not letting the algorithm control the enacted plan.

So, in order to evaluate the enacted plan, we in academics use precincts as units. Precincts are the smallest units for which electoral results are available. And it's a much bigger unit than the census block, which is used as a building block for, you know, when you're drawing an enacted plan.

So, my simulation uses the precinct as a unit as well. And in South Carolina, the average size of a precinct is about a little bit above 2,000 people. When you're using a precinct as a unit, it's not possible to get down to one-person difference. It's just that the precinct is too big to get down to strict equality. But it is important to emphasize

this difference. So, in my simulation algorithm, the maximum deviation is a little bit over 700 people. But most simulated districts have a lot smaller differences -- a couple hundred, usually -- people differences. Those differences have absolutely no impact on the substantive conclusions that I draw from my simulation analysis. Because, as you'll see, the results of my simulation analysis is much -- rests on much bigger differences, not just a couple hundred people difference.

Q. And I think you touched on it, but I just want the record to be clear. For purposes of your simulations, do you consider a difference of plus minus one person, or plus minus .1 percent to be meaningful?

A. No, no.

Q. And why not?

A. Because, as I said, the evidence that I used to draw my conclusion of this simulation analysis does not rest on the tiny differences. And, in fact, I could take each simulated plans, each of the 10,000 simulated plans, and try to equalize the district by, you know, choosing a couple precincts by splitting into small blocks within it. But I didn't do that because doing so has no impact on the substantive conclusion I draw from this analysis.

Q. Thank you. And then the third hard constraint you mentioned was that you didn't pair an incumbent with another

incumbent; is that right?
A. That's correct.
Q. And did that constraint apply through all of your analyses?
A. Yes, all three analyses impose that constraint as a hard constraint.
Q. Thank you. So, I want to talk specifically about the constraints that are specific to the analyses you discussed. And first I'll talk about your localized district and the localized analysis that focuses on Charleston County; so, the first two. You said these were race-blind. Why didn't you use race data in those analyses?
A. Yes. So, the main goal of my analysis is to determine whether race played a significant role in drawing district plans based on the enacted plan. In the simulation analysis, in order to figure out whether race played a significant role, what you do is, basically you generate race-blind baseline by using algorithm, but without any racial input. So, by construction, the simulated plans have no race -- race played no role in generating the simulated plan. And what you can do is then compare the enacted plan with these race-blind simulated plans to see if they differ significantly in terms of racial composition. And that's exactly what I did.
Q. And I'll ask Stephen to please put up the Senate guidelines and focus on Roman 1.C.

And, Dr. Imai, if you could just read that paragraph to yourself, and I'll ask you a question in a second.

A. So, this is about avoidance of racial gerrymandering. "All plans must comply with the Fourteenth Amendment to the United States Constitution, as interpreted by the United States Supreme Court" --

Q. You can just read it to yourself.

A. Oh, okay. All right. I've read it. Sorry.

Q. So, what I want to ask you is: Could race predominate as a factor in any of the simulated plans your algorithm drew?

A. No. The reason is that I did not use race to generate simulated plans, so race played no role, let alone, the predominant role.

Q. Okay. What about partisan data? Did your localized analyses use any partisan data?

A. I did not use any partisan data either.

Q. And why is that?

A. The guideline doesn't give any specific instruction about how those partisanship data should be used.

Q. So, let's talk now about your statewide analysis. So, could you explain to me again the VRA constraint you used in that analysis?

A. Yes. So, the VRA constraint is an additional hard constraint. So, it's a hard constraint in addition to the three hard constraints that I used for the localized analysis.

And basically, every simulated plan will have District 6, whose BVAP, Black voting age population -- BVAP proportion -- between 45 and 50 percent.

Q. And why did you build that constraint into your statewide analysis?

A. Right. So, the goal of the statewide analysis is to see whether the findings of my localized simulation analysis hold up and can be explained by the possible consideration of compliance with the Voting Rights Act.

So, as the enacted plan has the District 6 BVAP proportion at about 47 percent, I basically generated a simulated plan that has a similar level of BVAP proportion for the same exact district, and then see what kind of alternative districting is possible under that constraint.

Q. So, I'll ask Stephen to please put Senate Exhibit 3 -- and, again, let's go to 1(c).

And just look at that for a second, Dr. Imai, to yourself, please.

A. Yes. I did.

Q. And I'll ask: From your perspective as an academic, what is an example of a compelling state interest that the use of race might serve in a redistricting plan?

A. Yes. So, compliance with the Voting Rights Act is one example of comparing state interests.

Q. Thank you. So, we've talked about, I think, all your

hard constraints. Let's focus on your soft constraints. And just if you could explain, what are soft constraints?

A. Right. So, soft constraints are basically the constraint that encourages the simulation algorithm to generate certain types of redistricting plans.

Q. And what encourages whether a certain redistricting plan will do what your soft constraints want it to do?

A. Yes. So, there is a parameter that the analyst -- in this case, myself -- specifies for each soft constraint. So, that parameter represents the strength of the constraint. So, the stronger the constraint is, the encouragement to the algorithm would be stronger.

Q. And what determines the strength of those parameters?

A. So, in my analysis, what I did was to use the enacted plan as a benchmark and determined the strength of the soft-constraint parameters. So, in my analysis, I used the enacted plan as a benchmark to determine the parameter values for each soft constraint.

Q. All right. And what specific soft constraints did you build into your analysis?

A. So, the first one is compactness. So, I set the -- I specify the parameters such that the simulated districts are at least as compact as the enacted districts on average.

Q. And any the others? What are the other soft constraints?

A. The other soft constraint is the number of split

counties. So, I set the parameter values so that the number of split counties in the simulated redistricting plans are no greater than those in the enacted plan, on average.

Q. Any others?

A. And I did the same thing for the municipality splits.

Q. So, when you say you did the same thing --

A. Yes. So, I made sure that the number of split municipalities is no greater than that of the enacted plan, on average.

Q. Okay. So, let's talk about compactness a little more.

MR. CEPEDA DERIEUX: Stephen, if you could go to paragraph 58 of Dr. Imai's report.

BY MR. CEPEDA DERIEUX:

Q. I just want to ask you, Dr. Imai: How did you measure the compactness of your simulated plans?

A. Yes. So, to measure compactness, I used two measures that are widely used in the academic literature. One is called Polsby-Popper Score, and the other one is called Fraction of Edges Kept.

Q. And what is Polsby-Popper?

A. Practically speaking, Polsby-Popper basically compares the district with the circle that has the same length of the perimeter, and essentially see if the district is close to a circle. So, the idea is that if the district is not compact, it may not be very close to the circle.

Q. And what are Fraction of Edges Kept?
A. The Fraction of Edges Kept is based on mathematical sort of idea of graphically -- I'm not going to go into the detail, but this measure is commonly used in academic literature. And also, actually, it's closely related to the way that these algorithms control the compactness.
MR. CEPEDA DERIEUX: And, Stephen, if you could please go to the House guidelines at page two and focus under Roman numeral IV, specifically that last paragraph.
BY MR. CEPEDA DERIEUX:
Q. Dr. Imai, that reads: "Compactness should be judged in part by the configuration of prior plans. Compactness should not be judged based upon any mathematical, statistical, or formula-based calculation or determination." Did I read that right?
A. Yes, you did.
Q. And are Polsby-Popper and Fraction of Edges Kept mathematical, statistical, or formula-based calculations?
A. They are mathematical, statistical, and formula-based calculations. And that's what I do.
Q. So, I'd like to ask: Does your algorithm in any way measure compactness by the configuration of prior plans?
A. So, to the extent that algorithms make sure that the districts that generate are, you know, as compact as those districts in the enacted plan, and to the extent the enacted

plan reflects the configuration of the prior plan, the simulated plan should be similar in terms of the compactness, as defined in this section.

Q. Okay. So, second soft constraint, how did you constrain the number of county boundaries in your simulations?

A. Oh, yeah. I also should mention that the algorithm -- you know, soft constraints in terms of the split counties and split municipalities. So, compactness is controlled in there as well by preserving those geographical units.

And for your question about split counties, essentially what I did was to make sure to choose the parameters such that the simulated plan, on average, have, you know, fewer number of split counties than the enacted plan.

Q. And you did that for both counties and municipalities?

A. That's correct. So, my simulation -- all simulations have those two constraints as soft constraints.

Q. Dr. Imai, what about core retention? Did you impose a constraint to consider the cores of existing districts?

A. Not directly.

Q. Could you say more about that, please?

A. Yes. So, first of all, if you consider my localized analysis, so that my first localized analysis focuses on Districts 1 and 6 and freezes the other five districts as the same as under the enacted plan. So, to the extent that the enacted plan has core preservation, my localized simulation

analysis follows exactly that in those five districts.

Now, in my second localized analysis, I further restricted such that the only thing that's changing -- the only thing that I'm generating is the boundary within Charleston County. Everything else, not just those five districts, but also the District 1 and 6 outside of Charleston County, is exactly the same as the enacted plan. So, to the extent that the enacted plan preserves the core, my simulation analysis also preserves the core.

Q. And, Dr. Imai, in reviewing the guidelines, did you see an objective definition of the cores of existing districts in there?

A. No, I did not see any sort of operationizable instruction about how cores should be either defined or preserved.

Q. And I'll ask: In your broader work, is retaining the cores of specific districts something you build into your simulations?

A. No. I never, in my expert-witness work -- not just in this case but in other cases that I've done, I did not incorporate the core retention constraint directly.

Q. And why is that?

A. So, the reason -- again, this is important because the goal of the simulation analysis is an evaluation of the enacted plan. And in particular, a racial gerrymandering case like this one, we're trying to isolate the lower rate spread

in determining the district boundaries under the enacted plan. So, in order to isolate the role race played in determining the enacted plan, I did not want to input directly any plan, whether it's a previous plan any other plan as a constraint. Because, if you do that, you would inherit -- the result simulated plans would, in fact, inherit all factors that went into this, say, previous plan, right, which may include race or some other related factors. And since I did not analyze the previous plan in this report -- my goal is to analyze the enacted plan -- I have no idea what factors went into the previous plan. Therefore, I focused on the constraints that are listed in the guidelines that are clearly operationalizable in the objective matters. So, things like population deviations, compactness, number of split counties and so on. And I used those as input as an effort to isolate the role race played beyond the set of traditional redistricting criteria. So, I did not use the core retention. That's a function of the previous plan.

Q. Thanks, Dr. Imai. So, let's talk about the conclusions of your analyses. And let's start with the first one, the localized Districts 1 and 6 simulation. Why did you choose to focus on District 1 and District 6?

A. Right. So, as you know, the largest change from the previous plan happened under the enacted plan, is Districts 1 and 6. The other five districts are largely kept the same as

those under the previous plan. So, naturally, one would focus on the district boundary that changed most.

Q. And why did you freeze the boundary for all the districts?

A. Right. So, in this analysis, I didn't want other districts to influence how the analysis of this particular district boundary, the boundary between Districts 1 and 6, is drawn. So, you know, it's sort of a hard test, right, because in the redistricting, everything could affect everything. But I'm saying suppose that five districts that I'm now focusing on, we're going to use exactly the same districts under the enacted plan and see whether or not race played a significant role in determining the district boundary between Districts 1 and 6.

Q. Thank you. And what does running these as a race-blind simulation allow you to see about the boundary between those two districts?

A. Right. So, the main goal is to determine whether race played a role. So, in order to isolate the role race played in the simulation analysis, what you do is you first generate a race-blind or a race-neutral baseline by generating a large number -- in this case, 10,000 -- alternative districts that comply with the traditional redistricting rules and then see if race played a role beyond those rules.

Q. Okay. So, I'm going to ask Stephen to pull up

Plaintiffs' Exhibit 33, which is Figure 1 in your report. And let's first focus on the left side of this figure.

And, Dr. Imai, if you could tell us what that shows.

A. Yes. So, the left map shows the distribution of Black voters in these two districts, District 1 and District 6. And I would like you to focus on, in the Charleston County area, where you see that enacted boundary, which is the black line -- the solid black line is the enacted boundaries -- places the city of Charleston and the city of North Charleston into District 6 while leaving the rest of Charleston County to District 1. The gray lines represent the county boundaries. So, again, the black line is the enacted boundary, and the gray line is the county boundary. And the colors represent the number of Black voters who live in each precinct. So, the darker the color is, more Black voters live there.

Q. Now, let's look at the right side of that figure. What does this second map show you?

A. Right. So, the right map shows where District 1 is likely to be located under the simulation. So, if you recall, I generated 10,000 alternative ways of creating Districts 1 and 6 while fixing the other districts to those districts on the enacted plan. The darker blue shows the -- the darker the color is, it means that each precinct is going to have a higher probability of belonging to District 1 under the enacted plan. So, again, I would like you to focus on the

area within Charleston County, where the enacted plan places -- yeah. So, you can see that the enacted plan, that's the black line, places the city of Charleston and the city of North Charleston into District 6. However, these areas actually under simulation belong to District 1. That's why they are dark blue. So, the dark blue area is most likely to belong to District 1.

Q. Thank you. And I'll ask Stephen to please bring up Plaintiffs' Exhibit 34, which is Figure 2 in your report.

What does this histogram tell us, Dr. Imai?

A. Yes. So, this histogram shows what I showed in the map, which is actually a statistical outlier, the patterns in the map that I just showed you in the blue map -- that I just showed you -- is a statistical outlier. So, here, what I'm showing is the BVAP proportion of District 1. So, under the enacted plan, which is the red vertical line, it's about 17 percent; however, on the simulated plan, it's such higher. Almost all the simulated plans have a BVAP proportion of more than 20 percent for District 1. And the reason why is, as I showed you, the city of Charleston and city of North Charleston tend to be part of District 1 under the simulated plan, even the enacted plan places those Black voters in District 6.

Q. So, taken together, what does this all tell you about the boundary between District 1 and District 6?

A. Right. So, this shows that the way the enacted plan drew the boundary between Districts 1 and 6 is highly unusual compared to the race-blind simulated plans, and is a statistical outlier. In fact, none of my 10,000 simulated plans places as low BVAP proportion in District 1 as the enacted plan. So, it's a clear statistical outlier.

Q. So, let's talk about the second set of simulations you ran, which just focused on the Charleston County split boundary. Why did you do this? Why did you only focus on Charleston County?

A. So, this is even a greater stress test on my finding, because the first analysis was already a stress test by fixing all other districts exactly the same as the enacted plan, and looking at Districts 1 and 6 and seeing how the boundary of those two districts are different. Here, I'm looking to see is it really the case that the way Charleston County is being split is unusual. So, my first analysis indicated it is unusual and it's a statistical outlier. But I'm going to zoom in farther within Charleston County and then see if the boundary within that county is actually also a statistical outlier, even after fixing the rest of the boundary between these two districts as exactly the same as the one used under the enacted plan.

Q. And what did that simulation tell you?

A. So, that second localized simulation analysis essentially

confirms the finding from the first localized analysis by showing that a disproportionately large number of Black voters who live in Charleston County is placed in the District 6 under the enacted plan when compared to the race-blind simulation plans, as a result, lowering the BVAP proportion of District 1.

Q. And I'll ask Stephen to put up Plaintiffs' Exhibit 35 which is Figure 3 in your report.

Dr. Imai, what does this histogram tell us?

A. Yes. So, this, again, shows numerically the enacted plan is a statistical outlier in the way that it draws the district boundary between Districts 1 and 6 within Charleston County. So, to show that, I look at the number of Black voters who live in Charleston County and are assigned to District 1 under the enacted plan and also under the simulated plan. And under the enacted plan, you see that less than 20,000 -- I don't remember the exact number -- let's see. Yeah, I don't recall the exact number. But, anyway, less than 20,000 voters are placed in District 1 to live in Charleston County, but under the simulated plans, it's much, much greater. And, in fact, less than one percent of my 10,000 simulated plans places fewer Black voters in District 1 when compared to the enacted plan.

Q. Dr. Imai, if you look at page 14 of your report, is the number that you were looking for in there?

A. Oh, yes. So -- yeah. Under the enacted plan, a little bit above 15,000 Black voters are in District 1; whereas, you know, on average under simulation, about 25,000 Black voters. So, this is just focusing on Charleston County and not changing any other district boundaries. So, just in terms of, you know, calibrating this number, that's what it shows.

Q. So, taking all of this together, what are your conclusions on the localized Charleston County simulations?

A. Yeah. So, second localized simulation analysis basically confirms what I found in the first simulation analysis, in that the way that the district boundary is drawn within Charleston County is highly unusual, compared to the race-blind simulated plans. And it is a statistical outlier in terms of placing a disproportionately large number of Black voters who live in Charleston County -- in particular, city of Charleston and city of North Charleston -- placing them in District 6 instead of District 1, which basically leads to low BVAP proportion of District 1 under the enacted plan.

Q. So, let's focus on the conclusions of your statewide simulation. And now that we've gone through your localized analyses, I'll ask you again: Why did you do the statewide simulation?

A. Right. So, the statewide analysis tries to put another stress test on the finding that I obtained in my localized simulation analysis. In the localized simulation analysis,

I'm focusing on just Districts 1 and 6. I'm not changing any other districts. What that means is that if the simulated plan places more Black voters in District 1 as opposed to District 6, that just automatically lowers the BVAP proportion of District 6, because you're moving people from one district to another. So, increasing District 1 will reduce District 6.

So, in fact, if you look at the localized simulation plan that I generated, we have -- I have more Black voters in District 1, as I showed you, but that means fewer Black voters are going to be placed in District 6. But it is possible that, under the enacted plan, District 6's BVAP proportion is much higher in order to comply with the Voting Rights Act. So, what I wanted to see is if I make sure that my simulated plans maintained the same level of BVAP proportion for District 6, do I still see the same pattern, and specifically, do I still see the way that the enacted plan splits Charleston County is unusual, relative to otherwise race-blind. So, the basis is used to maintain District 6's BVAP proportion at the same level as the enacted plan, but the rest of the districts are created without race as a factor.

Q. And with this statewide focus, did you focus on any other boundaries outside of District 1 and District 6?

A. Yes. So, I start with Districts 1 and 6, because that's where my whole analysis started. So, I start with the boundary between Districts 1 and 6, as before, but I also look

at Richland County and Sumter County, where, as you'll see, the enacted plan splits the Black community. So, I focused on those two counties, which basically is the district boundary between 2 and 6 as well as district boundary between 5 and 6.

Q. So, let's stay in Charleston for a second, which we've already talked about, but now you're looking at it within statewide simulations. What were your findings in Charleston County with the statewide simulations?

A. Yes. So, statewide simulation basically confirms, you know, usual findings from the localized simulation analysis in that the district boundary between Districts 1 and 6 is highly unusual compared to the statewide simulation analysis. And so, the compliance with the VRA cannot explain the role race played in drawing the district boundary. So, in other words, race played a role in determining the district boundary between Districts 1 and 6 beyond the purpose of traditional redistricting criteria as well as the compliance with the Voting Rights Act.

Q. So, I'll ask Stephen to focus on Plaintiffs' Exhibit 36, which is Figure 4 in your report.

Dr. Imai, what does this histogram tell us?

A. Yeah. So, this histogram is strikingly similar to the localized simulation analysis histogram I showed you, and it shows the enacted plan is a statistical -- clear statistical outlier in terms of the BVAP proportion of District 1. And as

I said earlier, the District 1 BVAP proportion in the enacted plan is about 17 percent in contrast, and the simulated plan, which accounts for the possible VRA compliance, keeping the District 6 at the same level of BVAP proportion as the enacted plan. So, you cannot reduce it. Even if you put that constraint, you see the clear difference between the simulated and the enacted plan in terms of BVAP proportion of District 1. So, this shows that the compliance with VRA cannot explain the fact that the enacted plan has an extremely low BVAP proportion of District 1 compared to the simulated plan.

Q. So, did this analysis in any way change your conclusions from the prior analyses that we've discuss?

A. No. Actually, it enforces it. It basically bolsters the finding that I obtained in my localized simulation analysis.

Q. And I'll briefly ask if Stephen can pull up Plaintiffs' Exhibit 37, which is Figure 5 in your report.

And, Dr. Imai, I think we've seen one of these before. But could you just tell us what this represents?

A. Yes. So, this is exactly the same figure I showed you earlier, the localized simulation analysis. So, here, we're looking at the statewide simulation analysis. And I'm, again, coloring each precinct based on the proportion of simulated plans where the precinct is placed in District 1. So, the darker the blue are, more likely to be part of District 1. And, again, I would like you to focus closely on the area of

city of Charleston and the city of North Charleston. So, that label, District 6 is located in that area. So, those areas have very dark blue, okay?

So, what that means is that those areas under the simulated plan are much more likely to belong to District 1, instead of being placed into District 6. So, in that sense, the district boundary of the enacted plan is highly unusual, and race played a significant role in there, beyond the redistricting criteria as well as possible compliance with the VRA.

Q. And I'll ask Stephen to go to Plaintiffs' Exhibit 38, which is Figure 6 in your report.

What does this histogram tell us?

A. Right. So, this even more clearly shows that the enacted plan is an extreme statistical outlier. So, as you can see, this is looking at the number of Black voters who live in Charleston County who are placed in District 1. Under the enacted plan, there was about 15,000 Black voters placed in District 1 -- so, that's the red vertical line -- where if you look at the histogram, which it presents the same number for the simulated plans, it's much, much greater. And you notice that there is a big spike all the way to the right. And the reason the big spike is there is that, in many simulations -- in fact, I think about 75 percent of 10,000 stimulations -- entire Charleston County is assigned to District 1 without

being split. Okay. So, this shows that the enacted plan is highly, highly unusual in terms of the way that it splits Charleston County, because most simulations -- in fact, it doesn't split at all. And even when it does, it places many more Black voters into District 1 by -- you know, indicated by little gray histograms between 20,000 and 60,000, when compared to the enacted plan. So, this clearly, again, shows that the enacted plan is a statistical outlier.

Q. Dr. Imai, we've heard testimony that the distribution of Black voters between Districts 1 and 6 in Charleston County must be a coincidence because legislators didn't look at race.

Does your analysis speak to whether such a coincidence is likely?

A. If it's a coincidence, it would be extremely astronomically small number, small probability. So, if you call that a coincidence, it is. But my statistical analysis shows it's highly unlikely.

Q. Thank you. So, you mentioned you focused on the district -- the boundary between Districts 6 and 2, right?

A. Yes. So, after I looked at Districts 1 and 6, which was motivated by the first localized analysis, I looked to see the other two places where the Black community is being split under the enacted plan.

Q. And did you use the same 10,000 simulated statewide maps that we've been discussing for Charleston County?

A. That's correct. So, there's only one set of 10,000 simulated plans for the statewide analysis. So, all I'm doing is comparing the enacted plan with the 10,000 simulated plans, first just looking at the Charleston County area and then next looking at Richland County.

Q. And I'll ask Stephen to pull up Plaintiffs' Exhibit 39, which is Figure 7 in your report.

And I'll ask you, Dr. Imai, what does your statewide analysis tell you about how the enacted plan treats Richland County?

A. Yes. So, the left map shows how the enacted plan deals with Richland County. And, again, the Black solid line represents the boundary of Districts 2 and 6, in this case, under the enacted plan. And the brown color represents the number of Black voters who live there. So, the darker the color is, the larger number of Black voters live there. And as you can clearly see, the enacted plan splits the Black community in two districts, Districts 2 and 6. There is a hook-shaped part of District 6 in Richland County that takes some Black voters, and the other part, the eastern part of the city of Columbia, is placed in District 2. So, essentially, by splitting Richland County, you know, the enacted plan splits the Black community into two districts. That's what the left graph shows -- left map shows. And, as before, the gray lines represent the county boundary.

Q. Okay. And what does the right map tell you?
A. So, the right map in this case is very similar to the map I showed you earlier. In this case, we're looking at Districts 2 and 6. So, it shows how often each precinct is placed to District 2, as opposed to District 6, in the simulations. And what you see is Richland County is almost entirely White, which means that none of these precincts will be likely to be placed in District 2, okay? And the only place there's a small probability that would be a part of District 2 would be the northwest corner of the county, where you can see the bright blue there. But, as you can see from the left map, not many Black voters live there. So, what this shows is that the simulated plans will keep the Black community of Richland County intact, not splitting into Districts 2 and 6.
Q. And if we could pull up Plaintiffs' Exhibit 40, which is Figure 8, what does this histogram tell us, particularly in relationship with what you just described?
A. Yes. So, basically, I first look at how often the entire Richland County would be assigned to District 6, okay? And if you look at the 10,000 simulated plans, I think about 40 percent of the simulated plan would not split Richland County and assigns the entire county to District 6. So, the enacted plan split into 2 and 6, but the simulated plan will keep them intact and assign the entire thing to District 6.

Now, about 24 percent of simulated plans do split Richland County in Districts 2 and 6, which is exactly what the enacted plan did. But this figure shows they do it very differently. As I showed in the map earlier, most of Richland County was in the white map --

Maybe, Stephen if you could go back to map, if that's possible.

MR. CEPEDA DERIEUX: Side by side. Oh, the previous map and the histogram.

THE WITNESS: The previous map.

BY MR. CEPEDA DERIEUX:

Q. And I'm sorry, Dr. Imai. I heard you say 24 percent. Did you mean --

A. Well, approximately 24 percent of the 10,000, which is 2388. But anyway, if you look at the map again, you know, most of Richland County wouldn't be assigned to District 2, and the only places that may be assigned with small probability would be this bright blue area, where when you look at the left map, you see that not many Black voters live there. And that's reflected in Figure 8.

So, under the simulated plan, District 2 takes a relatively large number of Black voters, because there's a hook shape, and then District 2 comes down, allowing the hook shape and basically grabs the Black voters who live there. However, the simulated plan won't do that, and, in fact,

assigned much fewer number of black voters to District 2. So, you can see in the histogram the vertical line, which is the enacted plan, is much, much higher than most of the simulated plans, which is assigned much smaller Black voters who live in Richland County to District 2. So, again, it's a statistical outlier.

Q. And taken together, what does your statewide simulation tell you about how the enacted plan treats Richland County?

A. Right. So, what this shows is that compliance with the VRA does not require -- it is not necessary to split a community of Black voters in Richland County in order to comply with the Voting Rights Act. In fact, it is possible, and actually a much more likely outcome to keep those voters intact and assign them to District 6.

Q. Okay. And Let's go to Sumter County. You said you also focused on Sumter County in your statewide analysis?

A. Yes. Because, as you see, the city of Sumter is another place where the Black community is split under the enacted plan.

Q. And what did you learn about how the enacted map treats Sumter County?

A. Right. So, again, the left map is the map of Sumter County. And here, we're looking at Districts 5 and 6. And as you can see, the black line is the district boundary, and it cuts through the middle of Sumter County. And the little dark

brown area, it's small, but that's the city of Sumter. And as you can see, the district boundary under the enacted plan cuts through that community, splits the city of Sumter in Districts 5 and 6. And, again, the gray lines represent the county boundary.

Q. And what does the right map tell you?

A. Right. So, the right map shows the proportion of simulated plans which assign each precinct of Sumter County to District 5. Now, remember from the left map that District 5 under the enacted plan takes the western part of Sumter County. In contrast, the simulated plan essentially doesn't assign any part of Sumter County to District 5. So, that's why it's almost all White, because most of the simulated plans don't assign this county to District 5.

Q. You say "most." Does that mean that some of the simulated plans assign Sumter County to District 5?

A. There is a table that I showed. If you can pull that out.

MR. CEPEDA DERIEUX: Stephen, if you could pull up Plaintiffs' Exhibit 42.

THE WITNESS: So, you can actually calculate how often simulated plans assign Sumter County to different districts. So, over 90 percent of simulated plans out of 10,000 simulated plans assign the entire Sumter County to the District 6; so, without splitting, okay? And there are some

cases they split. So, for example, 4.5 percent of the simulated plan is split into Sumter County into Districts 6 and 7, but not 5 and 6, as the enacted plan does. Only 1.2 percent of the simulated plan would split Sumter County in a way that the enacted plan did, which is to split into Districts 5 and 6.

So, again, the way that the enacted plan splits Sumter County is highly unusual, relative to the simulated plan, and this unusual pattern cannot be explained by compliance with the Voting Rights Act. In other words, to comply with the Voting Rights Act, it is not necessary to split Sumter County in the way that the enacted plan did.

Q. Thank you, Dr. Imai. And I'm just going to ask you to please recap your opinions.

MR. CEPEDA DERIEUX: And, Stephen, if you could bring up the second slide again.

BY MR. CEPEDA DERIEUX:

Q. And, Dr. Imai, can you tell us what you concluded from your report?

A. Sure. So, I've done a comprehensive set of simulation analyses to examine whether race played a role in determining the district boundaries in the enacted plan beyond the purpose of compliance with the traditional redistricting criteria. And I started with a localized analysis focusing on Districts 1 and 6 that are mainly located in Charleston County. And I

showed you that my simulation analysis basically establishes that the way that the enacted plan splits Charleston County is highly unusual relative to the race-blind simulation baseline. It's unusual because it places a large number of Black voters into District 1, especially those who live in District 6, especially those who live in the city of Charleston and city of North Charleston, which leads to the much lower BVAP proportion of District 1 in the enacted plan when compared to the race-blind simulation baseline.

And this finding is confirmed in my analysis where I freeze everything else, except the boundary within Charleston County, and then generated 10,000 race-blind alternative district boundaries in that county. And it still shows that the way the enacted plan splits the county is highly unusual. So, these analyses show that race played a significant role in determining district boundaries between Districts 1 and 6 in the enacted plan, beyond the purpose of complying with the traditional redistricting criteria.

Finally, the statewide analysis examined the possibility that the findings I had from the localized simulation analysis are due to the possible consideration of VRA compliance. And, there, what I showed is that VRA compliance, as well as the traditional redistricting criteria, cannot explain the patterns that I found -- unusual patterns that I found in the localized analysis. In fact, race played a significant role

beyond traditional redistricting criteria and the compliance with VRA. And this was found both in Charleston County as well as in Richland County and Sumter County, where the simulation shows that it is not necessary -- in fact, it is highly unusual -- to split the community of Black voters in those counties in order to satisfy the Voting Rights Act. So, that's my conclusion.

Q. And just to be clear, Dr. Imai, when you say VRA compliance, what you mean is a simulation that keeps the BVAP of District 6 between 45 and 50 percent, right?

A. That's right. So, basically, my statewide simulation analysis would ask the question of: What redistricting plan would have been possible if one wanted to keep the BVAP proportion of District 6 at the similar level as the enacted plan? And 10,000 simulated plans I generated basically represent that alternative. It is the plan. And I found that the way the enacted plan created the districts, these districts are highly unusual in terms of racial composition.

Q. Thank you, Dr. Imai.

MR. CEPEDA DERIEUX: I pass the witness.

JUDGE GERGEL: Very good. We're going to take our morning break.

(Recess.)

THE COURT: Please be seated.

Why am I not surprised that Mr. Gore is doing this

cross-examination? We've enjoyed you, Mr. Gore. Thank you very much for being here.

MR. GORE: I'm not sure which way to take that comment.

JUDGE GERGEL: I was always worried when the judge complimented me that I wasn't going to win. But I try to compliment everybody.

MR. GORE: Thank you, your Honor. It's been a privilege and pleasure to be in your court. So, thank you.

CROSS-EXAMINATION

BY MR. GORE:

Q. Dr. Imai, I'm John Gore, and I represent the Senate Defendants. I believe we met by Zoom before for your deposition; is that right?

A. Nice to meet you in person.

Q. Yeah. I agree. Thank you for being here today.

Now, when you were talking about your localized simulation plans with Mr. Cepeda, I believe you said race didn't predominate because those simulations didn't use race, correct?

A. That's correct.

Q. Okay. And you don't draw any conclusions about whether race predominated in the enacted plan, correct?

A. I say significant in a statistical sense.

Q. Yeah. But you don't use the word "predominant," right?

A. I don't use it in the legal sense because I'm not a lawyer.
Q. And you don't know one way or the other whether the General Assembly actually used race to draw the enacted plan, do you?
A. My analysis doesn't address, you know, like what intent the General Assembly had when drawing the enacted plan.
Q. And your analysis doesn't try to get in the mapmaker's head, right?
A. No. I can't.
Q. You're not trying to figure out why the mapmaker drew the map a certain way, correct?
A. No.
Q. And you're not looking at the intent of the map drawer or legislators; is that right?
A. That's correct.
Q. And so, you also don't draw any conclusions about whether the General Assembly intentionally discriminated, right?
A. No.
Q. And I believe you mentioned before there are two Monte Carlo methods for simulation analysis, correct?
A. That's correct. Speaking of those two types.
Q. So, if I refer to sequential Monte Carlo as SMC, does that work?
A. I developed that. SMC works, yes.

Q. And for Markov Chain Monte Carlo, is it ok if I refer to them as MCMC?
A. That's what we call them.
Q. Wonderful.
MR. GORE: Mr. Traywick, can you pull up the first tab on the screen here?
BY MR. GORE:
Dr. Imai, this is a paper of yours that I downloaded off the web. Do you recognize this paper?
A. I wrote that paper.
Q. You did write that paper. And this draft is dated June 14th of 2022, correct?
A. That's correct.
Q. And I believe you said earlier that there's an SMC paper currently under peer review; is that right?
A. This is the one that's currently under peer review.
Q. Thank you for confirming that. And in this paper you discuss SMC and MCMC methods, right?
A. That's correct.
Q. Okay. And you generally take the position that SMC is a superior method, correct?
A. I would like to say yes because I developed SMC, but it depends on the context.
Q. Okay.
MR. GORE: So, let's scroll down first, Mr. Traywick,

if we can, to page three of the article.

BY MR. GORE:

Q. And at the bottom here of this page, you include a critique of the MCMC method. So, I've highlighted it here. Do you mind reading that for the record?

A. Sure. "First, distribution that some of these algorithms sampled from are not made explicit are leaving open the possibility that the generated ensemble is systematically different from the true set of all valid plans. Second, even when the District 6 is known, MCMC algorithms used to sample from it may be prohibitively slow to mix and cannot be a representative sample."

Q. So, Dr. Imai, here, you're taking the position that MCMC algorithms in certain cases don't yield a representative sample, right?

A. In certain cases, yes.

Q. And in other cases they generate plans that are systematically different than the true set of all valid plans; isn't that right?

A. In other cases, yes.

Q. You, nonetheless, chose to use MCMC method in this case, correct?

A. That's correct.

Q. Let's go back to the first page of this article, if we might, in the abstract. And I've highlighted here a sentence

in the abstract. Can you see that, Dr. Imai?
A. Sure.
Q. Do you mind reading that into the record as well?
A. "For successful application, sampling methods must scale to large maps with many districts incorporated realistic legal constraints and accurately and efficiently sample from a selected target distribution."
Q. So, you agree, don't you, Dr. Imai, that to be instructive, simulation analysis has to incorporate realistic legal constraints, right?
A. It depends on the context and purpose. But, generally, yes.
Q. Generally, yes. But in this case, you didn't incorporate all the realistic legal constraints, did you?
A. I'm not sure why you say that.
Q. Well, we'll talk about that a little bit more in a minute.
A. Okay.
Q. But did you do anything to confirm that your simulation plans satisfied legal requirements?
A. So, I did my best to account for the explicit rules given in those guidelines, the State and House guidelines *(sic)*.
Q. But you didn't consider all the rules in the guidelines, correct?
A. Well, it depends on which rule you're talking about.

Q. Okay. We'll get into that more here in just a minute.

MR. GORE: Let's go to the next tab, if we could, Mr. Traywick.

BY MR. GORE:

Q. This is another of your articles: "The Essential Role of Empirical Validation in Legislative Redistricting Simulation." Did I read that correctly?

A. Yes.

Q. And one of your co-authors here is Ben Fifield?

A. That's correct.

Q. And who is Mr. Fifield?

A. He's my former student.

Q. Did you have any dealings with Mr. Fifield in connection with this case?

A. What do you mean by "dealings"?

Q. Was Mr. Fifield part of the ACLU data team?

A. Oh, I see. Yes. So, he was -- I don't think he is any longer, but he was part of the data team for ACLU.

Q. And as a member of the data team, Mr. Fifield compiled data and shared it with you, right?

A. I don't know exactly what he did, but he did send me the data. You know, he shared the data by e-mail links with -- you know, cc'd to counsel.

Q. So, you had some e-mail exchanges with Mr. Fifield about the data you received from the ACLU; is that right?

A. He did send me the data. I'm not sure -- well, we never had e-mail exchanges without counsel being cc'd about the data. And I don't recall if he ever -- you know, in those e-mails if he ever had written to each other. But I did receive the data from him -- the link to the data. But I don't know what role he played in preparing that data set.

Q. Let's move on the next page of this, if we can. We have a highlighted portion, I hope. Here in the left column.

Dr. Imai, will you also read this from this article you're co-author of?

A. Yeah. "And yet, if there exists no scientific evidence that these simulation methods can actually yield a representative sample of valid redistricting plans, we cannot rule out the possibility that the comparison of a particular plan against the sample plan yields misreading conclusions such as gerrymandering."

Q. So, when the simulation methods aren't scientifically validated, they can yield misleading conclusions, right?

A. That's correct.

Q. And so, what did you do to scientifically validate the data you received from the ACLU?

A. Oh, data, or the simulation methods?

Q. I'm asking you now about the data. You didn't do anything to validate that data, did you?

A. What do you mean by "validate"?

Q. Did you do anything to check whether the data was accurate?
A. I checked with a lot of sources to make sure -- other people who use the same source -- in this case, census data -- to make sure that the numbers, you know, add up. But, like, I didn't validate every single data point, if you mean by validation. By validation, if you mean that.
Q. Yeah. I do mean that. So, you didn't go through the data point by point to see if the data was accurate?
A. No, I didn't do that.
Q. Okay. So, Dr. Imai, I believe you testified earlier that you reviewed the House and Senate guidelines as part of your report, correct?
A. Yes.
MR. GORE: Mr. Traywick, can we go to the third tab, which is Dr. Imai's report. It's in evidence as Plaintiffs' Exhibit 32.
BY MR. GORE:
Q. Now, you reviewed the House and Senate guidelines, but you didn't actually control in your simulations for all the criteria in the guidelines, correct?
A. Like, which criteria are you talking about?
Q. Sure.
MR. GORE: Let's go two more over, if we can, Mr. Traywick, to Senate Exhibit 3. It may be the easiest way to

do this. Let's go the second page.
BY MR. GORE:
Q. And there, at 3b, "constituent consistency." So, let's start with one of these -- the second piece of that says: "Keeping's incumbents' residents in their districts with core constituents"; do you see that?
A. Yes, I do.
Q. And did you add a control to your algorithm for that, for keeping incumbents' residents with their core constituents?
A. Not directly.
Q. Not directly. And, in fact, you allow in your model for the districts to cover different geography than the enacted plan, correct?
A. Right. Because, otherwise, it wouldn't be different from the enacted plan.
Q. Right. So, even though each incumbent gets a district in your approach, the district they get might be different, correct?
A. Different from the enacted plan, yes.
Q. Yes. So, that's true by geography and by the voters in the district, correct?
A. That's correct.
Q. Okay. And, before, I think you discussed with Mr. Cepeda that you also didn't control for preserving the cores of existing districts; is that right?

A. Not directly.
Q. And if we go up and look at 3A, you didn't control for communities of interest, correct?
A. Not directly. However, some of the guidelines mention the counties and administrative boundaries. So, those are being controlled.
Q. Right. And those are separate parts of the guidelines, right? If we scroll down, that would be C or D or E here. And communities of interest are separately identified as criteria, correct?
A. Oh. But in the other guideline, I think it's part of the community of interest definition.
Q. I see. So, you're referring to the House guidelines because the Senate guidelines, there is a different criteria?
A. That's correct.
Q. Okay. And you didn't control for that criterion; is that right?
A. Not directly.
Q. And did you control for natural geographic boundaries and how that might affect how the plan is drawn?
A. What do you mean by "natural"?
Q. Rivers, water features, anything like that.
A. Not directly.
Q. And, here, if we look at 3E, one of the Senate criteria is minimizing divisions of voting precinct boundaries,

correct?
A. That's correct.
Q. And you didn't control for that either, did you?
A. Not directly. However, the simulation is based on precincts. So, all precincts, unless they are split by either municipalities or the enacted plan itself, are kept intact.
Q. But even though you drew by VTD, some of your simulation plans split VTDs, right?
A. Right. But only when they're split by municipalities or the enacted plan itself.
MR. GORE: Mr. Traywick, can you take us back to that third tab, Dr. Imai's report, take us down to page 27? And scroll up a little bit here -- right there. Figure 14.
BY MR. GORE:
Q. You have these histograms that compare the enacted plan VTD splits to your simulations, right? And you have three different simulations, Districts 1 and 6, Charleston County, and statewide; is that right?
A. That's correct.
Q. Okay. So, according to these histograms, the enacted plan performs better than most of the simulation plans on VTD splits, correct?
A. That's correct.
Q. And if we scroll down a little bit more, that's true in all three of the simulations, correct?

A. Yes. On average, yes.
Q. On average. And let's scroll down to paragraph F.
And this is called precinct splits of simulated districts. And paragraph 61, which is under Section F, do you mind reading that last sentence for us?
A. Yes. "This is, in part, due to the fact that many municipalities split VTDs, implying that there is often a direct tradeoff between municipality and precinct splits."
Q. So, you acknowledge that there are tradeoffs between municipality splits and VTD splits, correct?
A. That's right. In South Carolina, municipalities split local precincts.
Q. And, yet, you control for municipality splits but you didn't control for the tradeoff with VTD splits, correct?
A. That's correct.
Q. And you also used in that sentence both the term, VTD, and precincts; do you see that?
A. Yes.
Q. And are you using those interchangeably?
A. That's correct.
Q. Dr. Imai, you also didn't consider politics in your simulations, correct?
A. What do you mean by "politics"?
Q. Partisan performance of districts.
A. I did not use any election data.

Q. And so, you didn't consider how districts would perform for Republicans or Democrats, correct?
A. I did not analyze election data.
Q. And you also didn't conduct a racially polarized voting analysis, correct?
A. I was not asked to do that. I just wasn't asked to do that.
Q. And you didn't control for racially polarized voting in any way in your analysis, correct?
A. No.
Q. And so, you don't have an opinion as to whether what you observed is race rather than politics in the enacted plan, correct?
A. I have no opinion on what role the politics played in the enacted plan -- drawing the enacted plan.
Q. And the analysis in your report also doesn't contain any constraint for the benchmark plan, correct?
A. That's correct.
Q. But if the map drawer started with the benchmark plan, wouldn't the benchmark plan be a relevant constraint in the analysis?
A. So, my analysis doesn't try to emulate what the map drawer did.
Q. But what if the map drawer had started with the benchmark plan, wouldn't that affect the range of plans available to the

map drawer?
A. Might be. But, again, I don't analyze the process in which the map drawer drew the enacted plan.
Q. And it was possible to include a benchmark-related constraint in your model, right?
A. That's possible.
Q. And you could do that by population or geography, correct?
A. That's correct.
Q. Now, you actually did at some point run a simulation that included a benchmark-related constraint, correct?
A. At some point, the counsel asked me to do that.
Q. And you compared that simulation to the ensemble plan, correct?
A. What do you mean by "ensemble"?
Q. I'm sorry. The enacted plan. You compared your simulation to the enacted plan, which would have included the benchmark-related constraint?
A. At one point I think that happened, yes.
Q. And do you recall what the results of that simulation analysis was?
A. I don't recall the specifics.
Q. But you didn't include that in your report, correct?
A. Right, for the reason that I don't use, you know, any other plan in any of my expert reports. For the reason I

stated earlier.
Q. So, in your report, the only plan you compared to the simulations is the enacted plan, right?
A. That's correct.
Q. And you don't compare any other plans submitted by the public, correct?
A. No.
Q. So, you don't compare the Harpootlian Plan, correct?
A. No.
Q. Or the LWV plan, correct?
A. No.
Q. Or either the NAACP plans, correct?
A. No.
Q. So, before, when you were talking to Mr. Cepeda, I think you acknowledged that your plans are drawn to a 0.1 percent population deviation; is that right?
A. That's the maximum deviation that's allowed in my simulation.
Q. And you agree with me that that violates the Senate guidelines, correct?
A. I think consistent with the population deviation requirement in the Senate guidelines.
MR. GORE: Mr. Traywick, can you take us to page 10 of Dr. Imai's report?
BY MR. GORE:

Q. I want to understand how your model works a little bit better, if you'll indulge me for a minute.
A. Uh-huh.
Q. So, you impose constraints in the algorithm and you assign strengths to the constraints, correct?
A. That's correct.
Q. Okay.
A. For the soft constraints, you're talking about?
Q. Yes, the soft constraints. Because I understand the hard constraints are hard. It's a maximum strength?
A. Yes, there is a constraint on that.
Q. So, changing the strength of a constraint in a model will change the output and will result in a different set of simulated plans, correct?
A. That's correct.
Q. And that's true if we were to change the strength of two constraints, right?
A. That's correct.
Q. Or if we change the constraint of all the constraints, correct?
A. It made no change but it may change, yes.
Q. Okay. But your model did not attempt to approximate the strength that the General Assembly assigned to these criteria, right?
A. I'm not sure what you mean by "strength the General

Assembly assigned."
Q. Well, I think we just agreed that redistricting involves tradeoffs, correct?
A. Uh-huh -- yes.
Q. So, the General Assembly, when it makes that tradeoff, has to decide which criterion is more important to it, correct?
A. I don't know. I have no opinion on how the General Assembly drew the plan.
Q. And you, yourself, don't draw maps, correct?
A. I'm not a map drawer either.
Q. But certainly you assigned strengths to the model. And why did you do that?
A. Why did I do that?
Q. Yeah. Why do you assign strengths to the constraints?
A. Right. Because I wanted to make sure that the simulated plans are as compliant with the traditional redistricting criteria as the enacted plan in terms of those constraints that I was considering.
Q. Right. But you can't really judge whether the General Assembly would have assigned the same strengths to those constraints, correct?
A. My algorithm is publicly available, but I don't think they're using it. I hope not.
Q. And when you did the analysis, you weren't trying to

mimic what the map drawer had done, correct?
A. No.
Q. And you weren't trying to mimic how the General Assembly might have weighted particular factors, correct?
A. No. I'm just evaluating the characteristics of the plan.
MR. GORE: Mr. Traywick, if you could scroll up to the bottom of page nine, top of page 10.
BY MR. GORE:
Q. So, this is a list of your constraints; is that right? I think this is for the statewide simulation, correct?
A. Okay. Yes, that's right.
Q. And the only difference between the statewide and the local simulations for constraints is that the statewide simulation includes your Voting Rights Act constraint, correct?
A. That's correct. I mean, aside from the fact that the localized simulation focuses on two districts, and statewide does the whole state.
Q. Sure.
MR. GORE: Mr. Traywick, if you'll scroll down to the top of page 10.
BY MR. GORE:
Q. In this bullet point here at the top, you say the number of split counties is, on average, no greater than the corresponding number in the enacted plan, correct?

A. That's correct.
Q. And you're look at that average across the set of simulated plans; is that right?
A. That's right.
Q. So, some of the plans in the simulation have more split counties than the enacted plan; isn't that right?
A. May have more, yeah. That's correct.
Q. And the same would be true for the municipalities, right?
A. That's correct.
Q. Because those are simulation-wide averages, not plan-specific numbers, correct?
A. That's correct.
Q. And you didn't do anything to instruct the model to split only the same counties as the enacted plan, correct?
A. Well, in my localized analysis, you know, second localize analysis, it's focusing on Charleston County while fixing everything else to the same as the enacted. So, for that simulation, it's exactly the same.
Q. And for the statewide simulation, it's not though, correct?
A. Right. The statewide is not.
Q. And it's the same with municipalities, correct?
A. That's correct.
Q. Did you place any constraint on splitting counties of a particular size?

A. No.
Q. So, you didn't differentiate between big counties and small counties by population?
A. I didn't do that.
Q. And how about municipalities?
A. No.
Q. Now, you could have constrained the model to split the statewide simulation to split only the same counties that are split in the enacted plan, correct?
A. Right. But that's not how the guidelines are written.
Q. And you could have done the same thing with the municipalities, right?
A. Right. But that's not how the guidelines are written.

MR. GORE: Let's scroll down if we can, Mr. Traywick, to page 26 while we're talking about county splits. We're looking for Figure 12.

BY MR. GORE:

Q. And I just want to look at the county splits here for a moment, particularly that chart on the right. So, this shows the number of county splits in your state wide VRA simulation; is that correct?
A. That's correct.
Q. Okay. And it looks like in some of these simulations the plans have three or four splits or five splits; is that right?
A. Yeah. It sort of shifted a little bit, so I think maybe

it starts from four and then -- yes, 10.
Q. And four or five county splits in a seven-district plan is fewer than the realistic minimum number of splits, isn't it?
A. Why do you say that?
Q. Well, a seven-district plan drawn to a one-person deviation, you'd expect to see six county splits, wouldn't you?
A. Not necessarily.
Q. Well, only a combination of counties was exactly the right size, correct?
A. I don't necessarily follow that.
Q. We've had testimony in the record that, realistically, when drawing a map to one-person deviation, you'd expect to see six county splits at the minimum in a seven-district plan. And, here, you've got four or five -- you've got plans with four or five splits, correct?
A. Yeah, four or five splits. Okay. Well, I don't follow what you're saying. But, okay.
Q. Well, we'll move on.
A. Yeah. Okay.
Q. That's fair.
MR. GORE: Let's go back to page nine if we can, Mr. Traywick.
BY MR. GORE:

Q. And I just want to look at the bottom of page nine, that final bullet point.
A. Uh-huh.
Q. Will you read that for us?
A. "All districts are, on average, at least as compact as in the enacted plan."
Q. Okay. But that's not exactly what you tested for, correct, compactness?
A. I'm sorry. Can you repeat the question again?
Q. So, let me ask you this: You say that all districts are, on average, at least compact as the enacted plan, but that's not correct, right?
A. Oh, I see. You mean this is not a district-by-district comparison.
Q. Correct.
A. That's correct. Yes. It's an average across districts.
Q. So, you analyzed compactness at the plan level, not the district level, correct?
A. That's correct, in part, because one of the measures is the county-wide *(phonetic)* measure.
Q. So, within your simulation set, some of the plans are worse on compactness than the enacted plan, correct?
A. Yes. That's possible. So, some districts may be less compact than, you know, the ones under the enacted plan.
Q. All right. Let's move on, if we can.

MR. GORE: Let's go to page of Dr. Imai's report, which is Figure 1.

BY MR. GORE:

Q. So, this is your Districts 1 and 6 simulation here. Do you see that?

A. Yes.

Q. And so, Figure 1 on the left, you have shaded for BVAP numbers; is that right?

A. That's right.

Q. And you're using total BVAP rather than a percentage; is that correct?

A. That's correct.

Q. And so, VTDs with the same total number of Black voters might have a different BVAP percentage, correct?

A. That's right.

Q. And moving VTDs of different BVAP percentages has a different effect on the total district's BVAP percentage, correct?

A. I'm not sure what you mean by that.

Q. So, let's say I've got a VTD that's 30 percent BVAP, and a VTD that's 70 percent BVAP.

A. Uh-huh.

Q. When I move each of those between districts, they'll have a different effect on the BVAP percentage of the district?

A. Oh, I see. Yes.

Q. Now, if we look to the right here, under your constraints, the precinct in which Nancy Mace lives always ends up in District 1, correct? She's the incumbent in District 1?
A. Right. So, that's a hard constraint.
Q. That's a hard constraint?
A. Uh-huh.
Q. And if I look here -- if I'm understanding the cool color-coding you have here --
A. Thank you.
Q. -- it looks like Congresswoman Mace ends up in a district with large parts of Charleston County -- large parts of the city of Charleston, the county of Charleston, in maybe like 90 percent of the plans; is that right?
A. Right. I don't recall the specific number, but that's basically the --
Q. It's very high, right?
A. That's right. Yeah.
Q. And are you aware of any reason why the map drawer may not have wanted to place Nancy Mace in that kind of district?
A. Again, I don't analyze the intention of the map drawer.
Q. And you didn't analyze the political effect of this move on Congresswoman Mace's reelection chances, correct?
A. That's not really in our guideline. So, no.
Q. Now, I wanted to ask you a question about part of this

map right here.
A. Uh-huh.
Q. Right here, this lighter blue-shaded area --
A. Okay.
Q. -- that's in Charleston County, you see that?
A. Yes.
Q. So, I'm not sure which color that's supposed to be here on the right, but it indicates that, in your analysis here, there are a fairly significant number of plans that split Charleston County right there; is that right?
A. It's hard to say what the proportion of the plans would split in -- you know, in specifically that way, but there are some. Otherwise, there wouldn't be a color difference.
Q. You would agree that, right here, this portion of Charleston is being placed in District 1 90 percent of the time, right?
A. Yeah, about 90 percent.
Q. Or more.
A. By judging the color, yeah.
Q. And over in this other area, it's less than that, right?
A. Which area? Oh, on the left. Yes, that's right.
Q. So, in some scenarios, Charleston County is being split, right?
A. Right. Yes, that's right.
Q. Okay. And, here, if we look at Berkeley County, we see a

similar phenomenon, right?
A. Right. So, there's a color difference, yes.
Q. And so, your simulation here seems to split Berkeley County fairly frequently, doesn't it?
A. Right. Again, it's hard to see until you actually compute the number of times that, you know, it does that. But at least there are some cases where the split happens there.
Q. Right. And so, this light shading here appears to be your 10-percent-to-30-percent color, right?
A. Yeah.
Q. And that would mean that that portion of Berkeley County is in District 1 only between 10 and 30 percent of the time, correct?
A. Yeah. It would be part of District 1 for that part. But, you know, you can compute these just from the map I generated using the software.
Q. Right. And are you aware that Charleston County was split in the benchmark plan?
A. I don't recall the specifics, but I'd assume you know it.
Q. And you didn't control in your model for where VTDs are located within counties or districts, correct?
A. VTDs? What do you mean by that?
Q. So, you didn't control -- in this model you didn't consider which district the VTD was in in the benchmark plan, did you?

A. Oh, I see. Yeah. I did not use the benchmark plan input.
Q. And in the Choropleth on the left, you also didn't consider which district the Black voters lived in under the benchmark plan; is that right?
A. Right. I did not consider the benchmark plan at all.
Q. Okay.
MR. GORE: Mr. Traywick, let's scroll down a little bit to paragraph 29 right here.
BY MR. GORE:
Q. And if we go over to the top, I think your next figure shows this bar graph, right? This is BVAP proportion in District 1; is that right?
A. Uh-huh -- yes.
Q. And so, when you were calculating this, I think you said that, on average, the simulation plans have about 5.8 percentage points higher BVAP than enacted District 1; is that right?
A. That's probably right. Sounds right.
Q. And because you're only looking at Districts 1 and 6 here, that means that District 6 has a correspondingly lower BVAP, right?
A. Right. So, one goes up and the other one goes down. That's right.
Q. And the other is in. So, District 6's BVAP is going down

by 5.8 percent; is that right?
A. Yes.
Q. Or percentage points or whatever the mathematical term is.
A. Right.
Q. So, that would mean the average BVAP in District 6 here is closer to about 41 percent; is that right?
A. That's about right, probably. Again, I didn't calculate the exact numbers, but that sounds right.
Q. And you didn't conduct any analysis of whether reducing the BVAP in District 6 by that amount would harm Black voters' ability to elect candidates of their choice, right?
A. Right. I didn't do any racially polarized voting analysis in my analysis. I wasn't asked to do that.
Q. And here in Figure 2, you also didn't consider certain alternative explanations for the BVAP level in 1, right? You didn't consider whether politics explains this, right?
A. What do you mean by "politics"?
Q. Well, partisan performance, or Congresswoman Mace's re-election chances.
A. Okay. Well, yeah. That's right, because it wasn't written in the guidelines.
Q. So, if I look at this Figure 2 as well, it looks like here at the very right -- far right area --
A. Uh-huh.

Q. -- there are some plans in your simulation that draw the BVAP in District 1 to 27 percent, 28 percent, maybe 29 percent. Does that look about right?
A. Right. Yeah. Some, not a huge amount, but some, yes.
Q. But those are as much as 10 or 12 percentage points above enacted District 1's BVAP, right?
A. That's correct.
Q. And so, correspondingly, it's a 10 or 12 percent decrease in District 6's BVAP, correct?
A. That's what would happen.
Q. And you didn't do any effectiveness analysis on that change, correct?
A. Yeah, I did not do any effectiveness analysis in my report.
Q. And so, here you've given us a chart of the District 1 BVAP comparison. Did you give us a chart of the BVAP comparison with District 6?
A. For this simulation?
Q. Yes.
A. Oh, right. I didn't do that because it's just a mirror image -- a view pointed out.
Q. And if, in the simulation, the BVAP in District 1 is going up, that means BVAP in District 6 is going down?
A. Right. That's the only option in the localized analysis, so I didn't bother to put the -- essentially same figure, but

reversed.
Q. So, Dr. Imai, we stalked about this in your deposition. Some of your simulation plans crack Black communities, right?
A. Depends on what you mean by "crack."
Q. Well, you tell me what you meant by "crack" in your report?
A. Yes. So, I basically meant split the community of voters in a particular geographical area.
Q. And in your view, where does that happen in the enacted plan?
A. In the enacted plan, or in the case of Districts 1 and 6, basically they place the Black voters in District 6 in a proportionately large number.
Q. And some your simulation plans do exactly the same thing, correct?
A. Again, I didn't look at, you know, a particular plan, but you know, to the lesser degree in this simulation, so that we can see, none of the 10,000 simulations has as low, you know, the BVAP proportion as the enacted plan. So, varying degrees.
Q. But because you didn't program the algorithm to consider communities of interest, you didn't program it to avoid splitting Black communities of interest, correct?
A. Right. Not directly, but to the extent that shared boundaries correspond to those communities, you know, I did take into account.

Q. So, one of your criticisms of the enacted plan is that it splits the city of Charleston, correct?
A. Yes.
Q. And some of your simulation plans also crack the city of Charleston, correct?
A. Again, you know, I did not look at each specific simulated plan. But even if it does, it would be to lesser degree because, as you can see, the enacted plan is the outlier.
Q. And the same with North Charleston. In North Charleston you criticized the enacted plan for following county boundaries and splitting the city of North Charleston?
A. Right.
Q. And your simulation plans also -- at least some of them do crack the city of North Charleston, correct?
A. May, but may not. It just happens -- you know, examine that carefully because the difference so large.
Q. But you didn't control for, or examine that, correct?
A. Right. I didn't specifically impose constraints saying don't do that.
Q. Okay. So, we've talked about your local simulation analysis which concerned Districts 1 and 6, correct?
A. Right, because those are race-blind. So I didn't use race, basically.
Q. And you didn't conduct a similar location analysis for

Districts 2 and 6, correct?
A. By location analysis, what do you mean by that?
Q. So, we're talking about your first localized simulation. And this is District 1 and District 6, right?
A. Right.
Q. Did you conduct a similar analysis for Districts 2 and 6?
A. Oh, 2 and 6 localized. No.
Q. Or for Districts 5 and 6?
A. No.
Q. Okay. Thank you.
A. Separate. No.
Q. Thank you.

MR. GORE: Mr. Traywick, if you can help me out, I'd like to go down to the next page.

BY MR. GORE:

Q. And this is your Charleston County simulation, correct?
A. That's correct.
Q. And as I understand that simulation, the only thing that can change is the border between District 1 and District 6 in Charleston County; is that correct?
A. That's right. Charleston County.
Q. Now, we're looking here at this histogram you created, which is Figure 3. Do you see that?
A. Yes.
Q. And you didn't analyze whether politics explains this

chart, correct? Again, partisan performance or Nancy Mace's reelection chances, right?

A. Right. I didn't use any partisan information.

Q. And you didn't analyze whether adherence to natural boundaries, such as rivers, explains the BVAP in District 1 in the enacted plan, did you?

A. No. But to the extent that administrative boundaries align with those boundaries, it gets incorporated.

Q. Do you know whether the administrative boundaries align with those boundaries in Charleston County?

A. Some of them, I think they do. But I don't recall the specifics.

Q. And you didn't do any analysis of whether preservation of cores explains this BVAP level in District 1, correct?

A. Not directly.

Q. And if we scroll down here to Figure 3 -- oh, we're on Figure 3 -- this displays total BVAP number, correct?

A. That's right.

Q. And it's not a percentage correct?

A. Right. It's a number.

Q. And so, I think you said the average difference between the simulation plans and the enacted plan is about 9500 Black voters being in District 1; is that number right?

A. Right, because this is focusing on Charleston County alone.

Q. And so, given the ideal district size of 730,000 people, that's about 1.3 percent, correct?
A. That's -- you probably did the calculation correct.
Q. And, Dr. Imai, did you present any data about the difference in the BVAP of the Charleston County portion in District 6 and the Charleston County portion in District 1 under your simulations?
A. No, because, again, it's a mirror image of this.
Q. Right. But now I'm asking you about the percentage.
A. Oh, right. Okay.
Q. So, in plans that split Charleston County, we're hearing a lot of evidence about the BVAP in the portion that's in six and the portion that's in one. Did you do any analysis of that for your simulation plans?
A. Yes. I didn't do the percentage, but, like you did, you can divide that by the total number of district populations.
Q. So, a little bit of math will help us answer that question; is that what you're telling me?
A. That's right. Yes.
Q. Thank you very much. Now, we've been talking about your Charleston County analysis. And you did talk about the difference in BVAP in the enacted plan in the Charleston County portion in District 6 and the Charleston County portion in District 1, correct?
A. Uh-huh, yes.

Q. Okay. And you report those numbers in your report; is that right?
A. Right.
Q. But you don't report, say, the Biden vote share; is that correct?
A. No, I did not use partisan information.
Q. And you didn't look at whether those numbers could be explained by partisan politics or Nancy Mace's reelection chances, correct?
A. No, because it was not in the guidelines.
Q. And you didn't look at whether they were correlated to partisan performance or Nancy Mace's reelection chances, correct?
A. No, I did not look at that.
Q. Dr. Imai, are you aware that Districts 1 and 6 split other counties in South Carolina in addition to Charleston?
A. Under the enacted plan?
Q. Under the enacted plan.
A. I think it does.
Q. And you didn't do any analysis of those counties, correct?
A. No.
Q. So you didn't analyze -- do this analysis for Dorchester County, correct?
A. No.

Q. And you didn't do it for Colleton County; is that correct?
A. No.
Q. And you didn't do it for Jasper County; is that correct?
A. No.
Q. Let's scroll down a little bit, because I want to talk about your statewide simulation. So, as I understand it, your statewide simulation doesn't freeze the districts in place, correct?
A. That's correct.
Q. So, the districts can move around the state as long as the incumbent lives in that number district, correct?
A. That's correct.
Q. So, they can represent much different geography or populations than they do in the enacted plan; is that right?
A. Yes, that's right.
Q. Okay. And the VRA constraint you applied was to keep the overall BVAP percentage in District 6 between 45 percent and 50 percent, correct?
A. That's correct.
Q. And District 6 in your simulation is the district where Congressman Clyburn resides, correct?
A. That's correct.
Q. And are you aware of whether the General Assembly had a goal of drawing a version of District 6 that had a BVAP

percentage between 45 and 50 percent?
A. No. Again, I don't analyze the intent.
Q. And was that 45-to-50-percent criterion anywhere in the redistricting guidelines?
A. No.
Q. Do you have an opinion whether a district drawn between 45 and 50 percent BVAP complies with the Voting Rights Act?
A. No. I don't make any legal judgments.
Q. So, Mr. Cepeda asked you earlier, as an academic, if you think compliance with the Voting Rights Act is a compelling state interest; do you recall that?
A. Yes.
Q. But you didn't do any analysis to determine whether that compelling state interest is applicable here, right?
A. By "determine," what do you mean by that?
Q. Did you do any analysis of whether drawing a district to a 45-or-50-percent BVAP would comply with the Voting Rights Act?
A. Oh, no. No.
Q. Now, as I understand it, your VRA constraint is a soft constraint, correct?
A. It's a hard constraint in the sense that the old submitted plans would have District 6 in that range.
Q. Okay.
A. I think we meant it as a soft constraint, but I removed

the small number of plans that don't meet that range.
Q. And you used this 45-to-50-percent BVAP level in District 6 as a target, correct?
A. Yes. That's right.
Q. Okay. And so, you put that into the algorithm, and the algorithm generated a set of simulation plans; is that right?
A. That's correct.
Q. And you discovered after you did that, that some of the plans in that simulation fell outside of that BVAP range, right?
A. Right. I think it was mostly on the lower side. I don't recall if there were submitted plans that are above that range.
Q. And for any plans you found outside of the range, you went through by hand and just removed them from the simulation set, correct?
A. And by computer, yes.
Q. Okay. I'm dating myself. So, you made sure that every plan in your statewide ensemble fell within that target range of 45 percent to 50 percent, correct?
A. Could you repeat the question again?
Q. So, you made sure that every plan in your statewide simulation fell within that range of 45-to-50-percent BVAP in District 6, right?
A. That's right. Yes.

Q. And any plan that didn't fall within that target, you excluded, right?
A. Right, except it's a very small number.
Q. Right. And so, you did not compromise on that VRA constraint, correct?
A. Right. But that wouldn't change the results, because it was a very small number.
Q. Against the statewide simulation, the only plan you compared was the enacted plan, correct?
A. That's correct.
Q. You didn't look at the Harpootlian Plan or LWV Plan or any other plan we discussed earlier, right?
A. I was reminded that I may have looked at one of those plans, but I don't recall even which plan it was.
Q. But none of that is in your report, correct?
A. Right, it's not in my report.
Q. Let's go down to page 15, Figure 4. And, again, this is the BVAP in District 1 compared to your simulation plans, correct?
A. Right.
Q. And we've already plowed that you didn't look at politics or other explanations for this BVAP level, correct?
A. That's correct.
Q. So, let's go down one more page to here. Okay. So, again, I really appreciate these cool color charts.

A. Thank you.
Q. Very easy to see.
A. Yep.
Q. So, Figure 5 here on page 16, again, shows the proportion of the counties that end up in District 1 when you apply the VRA constraint; is that right?
A. That's right.
Q. So, you recall before, when you didn't have the VRA constraint, we determined that your simulation split Berkeley County fairly often, right? There was that light-colored area at the top that, in about 10 or maybe up to 30 percent of the plan, was included in District 1 but, otherwise, was excluded, right?
A. Yeah. But I don't want to second guess how often that happens. Just by looking at the color, you can look at the simulated plan that I gave you guys to see how often that happens.
Q. And we also saw before that in the other simulation, which didn't consider race at all, there was this portion here of Charleston that was split in a fairly significant number of plans, correct?
A. Right. But, again, I don't want to second guess because this is just focusing on District 1. So, even if it's not part of District 1, it may not -- I just don't know how often that happened. I didn't look at a specific number.

Q. But you would agree with me, Doctor, that when you considered race in the statewide simulation, Charleston County ended up being placed as a single county in District 1 far more often than in the other simulations, right?

A. Oh, I see. Yes, that's true. Yes.

Q. Those other simulations didn't consider race, right?

A. Right. So, the first one is race-neutral. That's correct.

Q. So, let's scroll down, if we can, to paragraph 37 of your report. And I'd like to ask you to read the sentence that starts with "in fact?"

A. "In fact, a large spike around 74,600 implies that a vast majority of simulated plans, 76.3 percent, assign the entire county to District 1."

Q. So, in your simulation that considered race, District 1 was assigned -- or Charleston County, as a whole, was assigned to District 1, 76.3 percent of the time, right?

A. That's correct.

Q. And that's a higher rate than in the other simulations where you didn't consider race?

A. Right, because in other localized simulations, there is no other place to go, because I'm only looking at Districts 1 and 6.

Q. And, again, you didn't control here for where the VTD was placed in the benchmark plan, correct?

A. Right. I did not use the benchmark plan.
Q. So, focusing again on this 76.3 percent number, if the map drawer preferred to keep Charleston County split, he or she would have rejected all of those plans, correct?
A. That's correct. Yeah, that's right.
Q. So, if the map drawer had a reason for not keeping Charleston County whole, it would have rejected all of these plans that were drawn based on race, correct?
A. Right. If they don't want to split -- if they don't want to keep it intact, then yeah.
Q. And if the map drawer had decided that it didn't want it drawn based on race, it would reject these plans based on race that put Charleston County in the 1st District, right?
A. Again, I don't analyze the intent of map drawers, so I don't -- it's just too many factors that would go in that I just don't want to speculate what they would have done.
Q. And you don't know whether the map drawer had a reason to keep Charleston County --
A. Right. I don't know that. I don't analyze the intent.
Q. And you didn't review any public testimony or legislative record here, right?
A. I did not review, other than the guidelines that I had access to.
Q. And, Dr. Imai, would you agree with me that making Charleston County whole would require changes in other parts

of the map?
A. Right. That's relative to which plan are you talking about?
Q. Let's talk about the enacted plan. If you wanted to change the enacted plan to make Charleston County whole in a single district, we'd have to make changes to the plan elsewhere, right?
A. That's correct.
Q. To balance population?
A. Yeah, that's right.
Q. To comply with traditional redistricting principles, right?
A. That's correct.
Q. And did you do any analysis of what those changes would have to be?
A. Well, that's what the simulated plans represent, right? I'm not sure -- I'm not -- I'm not generating the plan that can be enacted, so --
Q. Right. But your simulation plans aren't plans that the General Assembly could have adopted at the time, right?
A. No. This is just for the purpose of evaluation.
Q. Now, in this analysis between Districts 1 and 6 in your statewide simulation, you're looking at Charleston County, right?
A. Yes.

Q. But you didn't look at the other county split between Districts 1 and 6, correct?
A. You mean in the statewide analysis?
Q. In the statewide analysis.
A. Yeah, I did not.
Q. So, you didn't look at Dorchester, correct?
A. Right. That's because the places where the Black voters are being split under the enacted plan is Charleston.
Q. And you didn't look at Colleton or Jasper, right?
A. No, I didn't.
Q. Okay. Let's go to the next page of your report, Districts 2 and 6. And you focus here on Richland; is that right?
A. That's correct.
Q. I want to make sure I understand what I'm seeing here. So, are you aware that Richland County was split in the benchmark plan?
A. I know that.
Q. And you mentioned this hook shape in District 2 in Richland County before.
A. Uh-huh.
Q. Are you aware of any explanation for that shape?
A. No. I don't analyze -- what do you mean by "explanation"?
Q. Do you know why that hook is there?

A. I don't know.
Q. And are you aware that this Court has upheld this hook shape in prior cases?
A. I don't know. I didn't analyze the prior cases.
Q. And so, are you aware of whether the map drawer had any reason to the keep this hook shape?
A. Again, I don't analyze intent, so...
Q. And again, these are total BVAP numbers in the Choropleth, correct?
A. Oh. Yes, on the left. That's right.
Q. So, let's scroll down. I believe you said in your report that Richland County, in the statewide simulations, ends up whole in District 6, 39.4 percent of the time?
A. That's about right, I think.
Q. We can go to that. That's on page 19. The carry-over paragraph is paragraph four. So, when you used the VRA constraint and drew the districts on race, Richland County was 39.4 percent of the time in District 6; is that right?
A. Yes, the whole county.
Q. Do you happen to know the BVAP in Richland County?
A. Oh, about 50 percent? I'm guessing, so I shouldn't guess.
Q. Is it higher than the statewide average, you think?
A. Oh, yes, I think.
Q. Because I think Richland County is about 48 percent BVAP.

Does that sound about right?
A. Oh, I was close.
Q. Yeah, you were.
A. Yeah.
Q. And that's about maybe almost twice the statewide level, or at least 20 percentage points higher; is that right?
A. Yeah.
Q. And so, did you do anything to analyze the effect of packing all the Richland County Black voters in District 6?
A. Can you elaborate on that? Like, what analysis do you have in mind?
Q. Sure. If we pack all the Richland County Black voters into District 6, what does that do to the BVAP in District 2?
A. By packing, you mean assigning the entire Richland County to the --
Q. Correct.
A. Okay. What does that do to?
Q. To the BVAP in District 2.
A. Oh, District 2? It will flop. Again, I didn't analyze that, but it would lower it, right.
Q. Right.
A. Well, it depends on where the District 2 goes, I guess.
Q. But in the enacted plan, I think one of your criticisms is the enacted plan places Black voters from Richland County in both District 6 and District 2, correct?

A. Right. So, it splits Richland County into two districts. That's unusual, compared to the simulated plan.
Q. And if you move all of Richland County into District 6, what does that do to Black voters' ability to elect their candidate of choice in District 2, where you just lowered the BVAP?
A. Well, I didn't do, you know, the racially polarized voting analysis for any district, so I don't have any opinion on what that would do to the Black voters in District 2.
Q. And in any event, if the map drawer preferred to keep Richland County split, he or she would've rejected these plans to keep it whole and place it in District 6, correct?
A. Sure. Again, I don't want to speculate on what they would do. But if they don't want to split -- if they want to split, then they will split.
Q. All right. So, let's scroll down to Figure 8, I think, page 19. So, this histogram shows a subset of your plans, the 2,388 plans, that actually do split Richland County between District 2 and District 6, correct?
A. That's correct.
Q. And the enacted plan places more Black voters in District 2 than the average simulation plan, right?
A. That's right.
Q. And that means that the average simulation plan is placing more Black voters in District 6 than the enacted plan,

right?
A. That's right.
Q. These are mirror images?
A. Right. Mirror images, yes.
Q. And so, again, did you analyze in this set of plans what the effect of that would be for Black voters in District 2?
A. Right. I did not analyze. But these voters would be shifted to District 6, so they would have a higher chance of electing a candidate of choice. Again, I did not analyze it, because we're talking about the same voters going either to District 2 or 6.
Q. So, Dr. Imai, I think this bar on the left may run from zero to 5,000 total Black voters in Richland County, correct?
A. That's right.
Q. And that's the number of Richland County Black voters in what seems to be almost 50 percent of your simulation plans, correct?
A. Yeah, close to that.
Q. And so, when you draw by race --
A. Out of this, 2,300.
Q. Out of this -- this --
A. Subset.
Q. Subset.
A. Yes.
Q. Fair enough. So, when you draw by race here, you're

placing only that number of voters in District 2, correct?
A. That's correct.
Q. Okay. And that's a lot fewer than the enacted plan, correct?
A. Yes.
Q. The enacted plan is over here, and there are way more Richland County Black voters in District 2 in the enacted plan than there are in this set of simulation plans, correct?
A. That's correct.
Q. So, when you drew, based on race in the statewide simulation plan, there were far fewer voters who ended up Black voters in District 2 than who ended up in District 2 under the enacted plan; correct?
A. That's correct.
Q. Okay. And did you do any analysis of whether the Black voters here in your simulation plan in District 2 have the ability to elect their candidate of choice?
A. No, I didn't do, you know, a racially polarized voting analysis. But many of them would be placed in District 6, so they have a better chance, just -- you know, we know District 6 has a higher percentage of BVAP.
Q. So, the voters placed in District 6 have the ability to elect, but you don't know about District 2; is that right?
A. Right. That's correct.
Q. Now, Richland County is not the only county split between

Districts 2 and 6, correct?
A. That's right.
Q. Orangeburg County is also split between 2 and 6, correct?
A. Uh-huh. That's right.
Q. And you didn't provide any analysis of Orangeburg County here in your report, correct?
A. Right, because the city of Orangeburg is not split by the enacted plan.
Q. But the county is?
A. Yeah, the county is.
Q. Let's scroll down to the next page, if we can. I think Mr. Cepeda asked you a few questions about Sumter County.
A. Uh-huh.
Q. And I think we looked at the chart before, where -- I think it said in 90 percent of your statewide simulation plans, Sumter County was placed as a whole in District 6; is that right?
A. That's right.
Q. So, again, when you were drawing by race in the statewide simulation plan, Sumter County ended up in District 6, 90 percent of the time; is that correct?
A. That's correct.
Q. And are you aware that Sumter County was split in the benchmark plan?
A. I recall that was the case.

Q. And you know it's still split in the enacted plan, right?
A. Yes. It's showing here.
Q. But you don't know why; is that right?
A. No. I don't analyze intent.
Q. And do you know whether any of the changes to Sumter County that were made in the enacted plan reflected requests from Congressman Clyburn?
A. No, I don't. I didn't analyze any of that.
Q. Thank you, Dr. Imai.

JUDGE GERGEL: Does the House have any questions?

MR. MATHIAS: Mr. Gore took all the good questions. Nothing from the House.

JUDGE GERGEL: That's not surprising.

Mr. Cepeda, redirect?

MR. CEPEDA DERIEUX: Thank you, your Honor.

REDIRECT EXAMINATION

BY MR. CEPEDA DERIEUX:

Q. Dr. Imai, Mr. Gore said several times that you drew maps in your simulations. You didn't draw maps, did you?
A. I simulated maps.
Q. And could you remind us again what the purpose of your simulations are? Is it to -- I'm sorry. What's the purpose of your simulation?
A. Yeah. So, the purpose is to evaluate the characteristics of the enacted plan, not to generate the plan that can be

enacted.
Q. Thank you. And Mr. Gore said several times that the simulated maps were based on race. When you set a parameter between 45-and-50-percent BVAP, what were you setting out to do?
A. Right. So, the only thing I was doing was to make sure that District 6 had the similar level of BVAP proportion as in under the enacted plan.
Q. So, you were trying to reflect District 6's BVAP in the enacted plan, right?
A. That's right.
Q. Okay. Mr. Gore tried to point out that some of your simulations split Charleston County; do you remember that?
A. Yes; in the statewide simulation analysis.
Q. Sure. Is the legislature's particular split of Charleston County still a statistical outlier across your simulations?
A. Yes.
Q. Now, Mr. Gore identified some portions of your draft paper on SMC. Do you remember that?
A. Yes.
Q. Do any of the critiques you raised in that paper undermine the methods or findings in this case?
A. No.
Q. He also suggested that SMC is better than MCMC; do you

remember that?
A. Yes.
Q. You developed SMC, didn't you?
A. Yes, I did.
Q. But you chose to use MCMC here, right?
A. That's correct.
Q. If you believed SMC would have produced more reliable results, would you have used that method?
A. Yes. Because that's what I developed and generally try to promote my own work.
Q. Makes sense. And SMC is open source, right?
A. Yes.
Q. So, if Mr. Gore wanted to test his hypothesis, he has the tools to do so, right?
A. Yes. He has data and he has the package that can be done.
Q. Thank you, Dr. Imai. You'll recall that Mr. Gore mentioned you tried to use a core retention constraint at some point; do you remember that?
A. I remember that.
Q. And why did you eventually choose not to use that constraint?
A. Oh, because I don't believe in, you know, imposing the constraint that's motivated by any other plan, for the reason that the I suggested, which is that, essentially, if you use

this directly, you end up inheriting all the factors that went into the previous plan and you have no ability to isolate the role race played.

Q. Would using a core retention constraint mask the effect of race in the current plan?

A. That's another way of saying that. If you do that, and if race was used in the previous plan, that could mask the role race plays.

Q. You'll recall, Mr. Gore brought up Mr. Ben Fifield. Do you remember that?

A. Yes.

Q. Is it actually Dr. Fifield?

A. Yes. He's defended PhD's successfully a few years ago.

Q. Good to hear. And he asked you about validating your data after he read your quote about your simulation model. Do you remember that?

A. I remember that.

Q. The data you used was census data, right?

A. That's correct.

Q. Is census data generally considered reliable in the field?

A. Yes. I mean, that's basically the data we all rely on.

Q. And Mr. Gore asked you about controlling for communities of interest; do you recall?

A. I remember that.

Q. Do you know Mr. Sean Trende?
A. I've never met him in person, but I know his name.
Q. Are you aware Mr. Trende used your methods in his New York report?
A. I know that somebody told me that he used.
Q. And are you aware that, in Mr. Trende's New York reply report, he describes communities of interest as a notoriously difficult concept to nail down because they have vague definitions?
A. I agree with that statement.
Q. Okay. Mr. Gore talked to you about your statewide map simulations, and he suggested that they're only tied down by incumbency; do you remember that?
A. Yes.
Q. But that simulation is still constrained by all the other constraints we discussed during my previous examination, right?
A. That's correct. Additional constraint was given, but all the other constraints are maintained.
Q. So, it still respects municipal boundaries in the enacted plan?
A. That's right.
Q. It still respects county boundaries in the enacted plan?
A. That's right.
Q. It's contiguous?

A. Yes.
Q. Compactness?
A. Yes.
Q. Mr. Gore challenged your methods, Dr. Imai. How many redistricting cases have you worked on?
A. Oh. Seven or eight or something like that. I can't --
Q. Were any of those racial gerrymandering cases?
A. Yes. I submitted an expert report in the Alabama case, which is now at the Supreme Court. And most recently -- this case obviously, and most recently, Jacksonville case in Florida, as well as, I guess I did the State House for South Carolina as well.
Q. All right. In this action, sure. And in those cases, did you perform a similar analysis that you did here?
A. Yeah. Very similar.
Q. And do you know how the district courts resolved those cases?
A. So, in all those cases, the district courts credited my analysis and made a decision in support of the plaintiffs, for which I was working for.
Q. And how do your findings in those reports compare to the strength of your findings in this one?
A. In comparison terms? What do you mean by that?
Q. How sure are you of your findings in this case?
A. Oh, I see. Well, I only put forward the conclusion I

feel strongly -- you know, strongly believe in. So, not just other cases, but in this case as well. In any of my academic work, I don't put out evidence that's fragile. I only put in evidence that is robust *(phonetic).*

Q. Thank you, Dr. Imai. I have no more questions.

JUDGE GERGEL: Thank you. Thank you, sir.

Okay, folks. As we leave today, I want to congratulate everyone on their hard work. I know everyone is exhausted and I expect tonight everyone will sleep very will. In five days, we're going to either stipulate as to data, or you're going to tell me why -- you're going to tell me what you agree on and what you disagree on, why you disagree, so the Court can make findings of fact, conclusions of law, due on November 3rd. Closing argument, 9:00 a.m., November 22nd.

Everyone travel safely.

Yes?

MR. MATHIAS: Your Honor, I'll just briefly renew the House's motion for a directed verdict.

JUDGE GERGEL: The record is not closed yet because I need the data in first before I rule on that. We'll take that up -- you and Mr. Gore will raise that at the closing argument, because only then will the record be complete.

And what's this thing about last night? Remind me again what the issue is.

MR. TRAYWICK: Your Honor, if I might?

JUDGE GERGEL: Yes.

MR. TRAYWICK: So, I want to correct something I said earlier about what Breeden said in his deposition. I went back and looked at his 295-page deposition transcript and --

JUDGE GERGEL: I hope you're not giving it to us.

MR. TRAYWICK: I'm not -- well, I don't know. They actually made it a lot to counter designate. I don't think it was relevant, but that wasn't my decision in the first instance.

But I will say, he was never asked about it. And so, we'd just renew our motion that this isn't probative. This was a draft that he sent to himself. I'm happy to put it up on the screen. The portions they want to use are highlighted and have a bunch of Xs, which clearly show that he was just sending it to himself to go work on at home, and --

JUDGE GERGEL: Mr. Freedman, what's the relevance?

MR. FREEDMAN: So, it is the penultimate version of the talking points that were actually used on the floor. It has different statistics and more information that we believe is supportive of our case, particularly about --

JUDGE GERGEL: Does he -- is there any evidence anybody but Mr. John looked at it?

MR. TRAYWICK: No.

MR. FREEDMAN: I will admit that there's not, but it is consistent with other analyses in the defendants' own

internal records that we believe that they understate on the floor of the Senate, the core retention. So, I think it's --

JUDGE GERGEL: We can look at the debate on the floor of the Senate. I just think if you've got a staff member who is sending something to himself -- I do that all the time, I send it to my aol account sometimes, so I don't have to go through the court security system, and nobody sees it. I mean, I can understand exactly what he was doing.

MR. TRAYWICK: 10:30 the night before.

JUDGE GERGEL: To the extent -- I mean, Mr. John is not a defendant in the case. He might have gotten his numbers wrong. It seems to me what's relevant to the case is what was actually said and done regarding the map.

Are all the numbers already in evidence that you think he got wrong? Are they otherwise in the record?

MR. FREEDMAN: One of the numbers that we are concerned about is in the official analysis the Senate did. We believe that the document, it is the -- okay. So, it is the night before. It is the penultimate version of what is then delivered the following morning to the Senator --

JUDGE GERGEL: It's like somebody's draft. To me, I'm struggling on the relevance of a draft that never is used.

MR. TRAYWICK: And the danger of unfair prejudice. I'd like to jump to the second part of the 403 analysis. The purpose --

JUDGE GERGEL: What is the number you're so worried about?

MR. FREEDMAN: It's not a number that we're worried about, it's that they presented on the floor that the 6th Congressional District had 87 percent core retention. This document uses 77 percent, which is consistent with the internal analysis that Mr. Roberts ran. They delivered a false number on the floor.

JUDGE GERGEL: Well, let's just let it in for whatever it's worth. It seems pretty marginal to me. So, I overrule the objection for whatever it's worth.

What's the exhibit -- the motion is 449?

MR. FREEDMAN: The motion --

DEPUTY CLERK: Yes, your Honor.

MR. FREEDMAN: The proposed exhibit is Plaintiffs' Exhibit 651.

JUDGE GERGEL: We're going to admit it for whatever it's worth. And I'll make a determination once I get into the record. I think it looks pretty marginal, but it's late in the day, let's just get it in and take a look at it with the totality of the record.

MR. TRAYWICK: Thank you, your Honor.

JUDGE GERGEL: Plaintiff's 651 is admitted.

(Plaintiffs' Exhibit 651 was admitted into evidence.)

JUDGE GERGEL: Okay, folks. Everyone be safe.

MR. MOORE: Your Honor, I hate to belabor, but just two quick points.

JUDGE GERGEL: Yes, sir.

MR. GORE: Your Honor, before we do that, would you like to excuse the witness? I think he's just hanging out.

JUDGE GERGEL: Oh, I'm sorry.

THE WITNESS: Thank you.

JUDGE GERGEL: Dr. Imai, thank you for being here.

THE WITNESS: Yes, your Honor.

JUDGE GERGEL: Okay. Mr. Moore?

MR. MOORE: Yes, sir, your Honor. Just so we make sure we don't run afoul of any of the Court's rulings, with respect to demonstratives, if we're going to use demonstratives in closings -- demonstratives are usually sort of excluded from the disclosure issue with respect to arguments, I would think. My question is: Are we required to share them or not?

JUDGE GERGEL: Let me tell you the one thing I kind of like. There was always this different debate, which is: Are the findings of fact and conclusions of law shared with the opposing party? I always want that, because if somebody misreads something or misrepresents something, I want the other side to tell me. I might not appreciate it. So, in the same way, I think you ought to share. We want to see it ahead of time. And if we're going to see it, I think you should

share it.

MR. MOORE: So, you want to see demonstratives ahead of time?

JUDGE GERGEL: I would. We would like to see it ahead of time so we can study it. I think it will help the closing argument be more meaningful.

MR. MOORE: And when would your Honors like it? Would you like it -- i guess Monday is 24 hours. Would you like it the Friday before? What's the Court's preference?

JUDGE GERGEL: When you send the proposed findings of fact and conclusions of law, why don't you just send it then.

MR. CHANEY: Well, your Honor, that would be way in advance. And we wouldn't have the benefit of --

JUDGE GERGEL: Friday before. By noon on Friday before. I don't want to deal with the claim -- somebody gave it at Thanksgiving and nobody was -- I want it at noon on Friday before.

MR. MOORE: And so, my second point, your Honor, is with respect to these deposition designations. And I heard your Honor about the House. Of the 11 designations that were filed, are the summaries that were filed last night, 10 of them are House witnesses. And of those House witnesses, at least four of them have designations from the House phase of this case, not the congressional phase. And as I understand it --

JUDGE GERGEL: Put it in your summary. Giving it here now won't mean much to us. When we get the designations, you're going to highlight the point you're trying to make, and you can make that point in that.

MR. MOORE: I'm wondering if we can file something or have oral argument on these issues. I'm just concerned --

JUDGE GERGEL: No, we're not having oral argument. We'll weigh it. And if it's not relevant, we know what to do with it. There's a trash can always nearby, okay?

MR. MOORE: Right. Thank you, your Honor.

JUDGE GERGEL: Thank you.

Everyone, be safe.

(Adjourned.)

* * * * * *

I certify that the foregoing is a correct transcript from the record of proceedings in the above-entitled matter.

s/Lisa D. Smith, 12/30/2022

Lisa D. Smith, RPR, CRR Date