Transcript of the Testimony of

The Joint United States Coast Guard/Bureau of Ocean Energy Management Investigation

Date taken: April 4, 2011
AM Session

USCG/BOEM Board of Investigation (Re: Deepwater Horizon)

*****Note*****

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USCG/BOEM BOARD OF INVESTIGATION

INTO THE MARINE CASUALTY, EXPLOSION, FIRE, POLLUTION AND SINKING OF MOBILE OFFSHORE DRILLING UNIT

DEEPWATER HORIZON, WITH LOSS OF LIFE

IN THE GULF OF MEXICO, 21-22 APRIL 2010

MONDAY - APRIL 4, 2011

AM SESSION

* * * * * *

The Transcript of the Joint United States Coast Guard/Bureau of Ocean Energy Management Investigation of the above entitled cause before James T. Bradle, a certified court reporter authorized to administer oaths of witnesses pursuant to Section 961.1 of Title 13 of the Louisiana Revised Statute of 1950, as amended, reported at the Holiday Inn Metairie New Orleans Airport, 2261 North Causeway Boulevard, Metairie, Louisiana, on Monday, April 4, 2011, beginning at 8:00 a.m.

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DAVID DYKES
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HON. JUDGE WAYNE R. ANDERSEN
U.S. DISTRICT JUDGE (RET.)

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UNITED STATES COAST GUARD

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LCDR. ROBERT BUTTS, COURT RECORDER
UNITED STATES COAST GUARD

REPORTED BY:

JAMES T. BRADLE
CERTIFIED COURT REPORTER

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4 WITNESS - NEIL G. THOMPSON, Ph.D.

5 (with counsel Mark Cohen, Esq.)

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CAPT. NGUYEN:

Good morning, everyone. Please take your seats.

HON. JUDGE ANDERSEN:

Everybody situated? The first witness today will be Mr. Thompson.

Mr. Thompson, thank you very much for being here.

CAPT. NGUYEN:

Good morning, everyone. The Joint United States Coast Guard and the Bureau of Ocean Energy Management, Regulation and Enforcement Investigation is now in session.

Court reporter, let's go on the record. I am Captain Hung Nguyen, Coast Guard District 14, the Chief of Prevention.

The Department of Homeland Security and the Department of Interior have determined that a joint investigation of the April 20th through 22nd, 2010 explosion and sinking of the Mobile Offshore Drilling Unit DEEPWATER HORIZON, leaving 11 persons missing, is warranted.

The Commandant of the Coast Guard along with the Director of the Bureau of

Ocean Energy Management, Regulation and Enforcement, formerly known as the Minerals Management Service, has designated Mr. David Dykes and I as co-chairs of this joint investigation, which they have convened under the authority of Title 46 U.S. Code 6301 and Title 43 U.S. Code 1348 and the regulations thereunder.

The joint investigation shall have the powers of both agencies and, for the public hearing portion of this joint investigation, shall follow the policies and procedures for Coast Guard investigation as contained in Title 46 of the Code of Federal Regulations, Part 4, and the Coast Guard Marine Safety Manual, Volume 5.

The gentleman on my left is Mr. David Dykes, Chief Officer of Safety Management, New Orleans for the Bureau of Ocean Energy Management, Regulation and Enforcement, and co-chair of this investigation.

On Mr. David Dykes's left is Mr. Jason Mathews, a petroleum engineer with the Bureau of Ocean Energy Management,

Regulation and Enforcement.

The gentleman on Mr. Mathews' left is Mr. John McCarroll, the District Manager, Lake Jackson District, for the Bureau of Ocean Energy Management, Regulation and Enforcement.

The gentleman on my right is Judge Wayne R. Andersen, retired.

To his right is Captain Mark R. Higgins, the Staff Judge Advocate for the Coast Guard Atlantic Area.

The gentleman to Captain Higgins' right is Lieutenant Commander Robert Butts, currently assigned to the Coast Guard Training Center at Yorktown, Virginia.

This Board will submit its report of findings, conclusions and safety recommendations to prevent a recurrence of this type of casualty to the Commandant of the United States Coast Guard and to the Director of the Bureau of Ocean Energy Management, Regulation and Enforcement.

This investigation is intended to determine the cause of the casualty to the extent possible and the responsibility

thereof, subject to the final review and approval of the Commandant of the Coast Guard and the Director of the Bureau of Ocean Energy Management, Regulation and Enforcement to obtain information for the purpose of preventing or reducing the effects of similar casualties in the future.

This investigation is also intended to determine if there is evidence that incompetence, misconduct, unskillfulness or willful violation of the law on the part of any licensed officer, pilot, seaman, employee, owner or agent of such owner of any vessel involved, or any inspector or officer of the Coast Guard, Bureau of Ocean Energy Management, Regulation and Enforcement, or other officer or employee of the United States, or any other person who caused or contributed to the cause of this casualty, or if there is evidence that any act or violation of any of the provisions of the United States Code or any of the regulations issued thereunder was committed.

This Board is also empowered to

recognize any committable actions by persons involved and to make appropriate recommendations in this regard.

The scope of this five-day session will focus on the operation and the forensic analysis of the blowout preventer.

I would like to request the cooperation of all persons present to minimize any disruptive influence on the proceedings in general and on the witnesses in particular. We will continue to allow full media coverage as long as it does not interfere with the rights of the parties to a fair hearing and does not unduly distract from the solemnity, decorum and dignity of the proceedings.

Unless there is pre-approved media availability, no interviews will be conducted inside the hearing room or in the adjacent common area. Any violation of the guidelines previously agreed upon may result in the removal of pool media representatives.

The use of laptops, PDAs, cell phones or iPhones to capture video or still

photography during the proceeding is prohibited. Audience members are also prohibited from using video recorders, cameras, PDAs, cell phones and iPhones during these proceedings.

There will be only one official transcript of these proceedings developed by the Board. Any other transcript developed by any other party is for informational purposes only.

When called upon, a witness will be placed under oath by Judge Wayne Andersen. When testifying under oath, a witness is subject to the federal laws and penalties for perjury and for making false statements under 18 U.S. Code 1001. Penalties include a fine up to $250,000 or imprisonment up to five years, or both.

The Board members and the court reporter are reminded that you are still under oath.

Also, as a reminder, no part of a report of a marine casualty investigation conducted under Title 46 U.S. Code 6301, including findings of fact, opinions,

recommendations, deliberations, or conclusions shall be admissible as evidence or subject to discovery in any civil or administrative proceedings, other than an administrative proceeding initiated by the United States.

Prior to receiving testimony during each session of the proceeding, we shall call for and receive appearances by counsel for the Parties In Interest or for the witnesses.

In the interest of time and efficiency, we respectfully request Parties In Interest to honor the scope of these five days, as we will examine other areas later, if needed. We expect Parties In Interest to conduct themselves in accordance with the rules for the Parties In Interest.

If procedural questions arise, Judge Andersen and/or Captain Higgins will address the matter and resolve the issue with the Parties In Interest.

During these five days of testimony, we are expecting personal appearances by each person listed on our

witness list, which is posted on our website. As a reminder, prior to receiving witness' testimony, witnesses, with the exception of Parties In Interest, shall be excused from the room and moved to a separate designated waiting area.

This waiting area shall be far removed from the primary hearing location, so that witnesses cannot hear or be aware of any testimony presented to the Board.

The sources of information into which this investigation will inquire are many and varied. The investigative resources of the United States Coast Guard and the Bureau of Ocean Energy Management, Regulation and Enforcement have made attempts to locate every available piece of evidence having a pertinent bearing on the casualty. This Board will hear all such evidence. Should any person have or believe he or she has information not brought forward, but which might be of direct significance, that person is urged to bring that information to my attention.

Thank you, Judge.

HON. JUDGE ANDERSEN:

Mr. Cohen, could you --

MR. JONES:

Before we start, David Jones on behalf of Cameron. I need to make a brief objection for the record. We let Mr. Dykes and Captain Nguyen know that I would be speaking.

We're here this morning to get testimony from two witnesses from DNV who, as everybody knows, prepared a final report for their forensic investigation of the BOP.

That report contains a single hypothesis for why the BOP didn't seal the well. That hypothesis is based not on testing, but on computer models that DNV has run. And the input data, the underlying data that supports those computer models is not included in the report.

We understand that that report was given to the panel on March 20th and it didn't include the back-up data. It was given to the Parties In Interest on March 23 and it didn't include the back-up data.

We requested the back-up data on

March 25th, and it's my understanding that that request was put to DNV to get that data. And it's also my understanding that the panel didn't even get that data until this weekend and the Parties In Interest still don't have that back-up data. And that we believe is improper, we believe it's prejudicial, and it makes it virtually impossible for the Parties In Interest to analyze that report and the conclusions in the report and draw any conclusions from it.

It's my understanding that the Department of Interior is going to be issuing a report that addresses the blowout preventer, addresses the findings or the conclusions of the hypotheses in the DNV report as part of that report in 10 days, and I think the record should reflect that 10 days from before that report is supposed to be issued, the Parties In Interest don't have the back-up data underlying all those hypotheses.

HON. JUDGE ANDERSEN:

Okay. Thank you very much.

MR. GODFREY:

Judge Andersen, Rick Godfrey on behalf of BP. We join in Cameron's objection. Thank you.

HON. JUDGE ANDERSEN:

Okay. Thank you. All right. Are we ready?

Mr. Cohen, would you state your name for the record, and then I will swear in Mr. Thompson.

MR. COHEN:

Your Honor, thank you. Mark Cohen, Cohen, Gorman & Putnam, Houston, Texas, representing Det Norske Veritas and Mr. Neil Thompson.

HON. JUDGE ANDERSEN:

If the other witness who's supposed to testify here is here --

MR. COHEN:

He's not.

HON. JUDGE ANDERSEN:

Is he in the room?

MR. COHEN:

He just left.

HON. JUDGE ANDERSEN:

Oh, okay. Super.

Mr. Thompson, could you please stand up and I will swear you in. Thank you very much for being here.

* * * *

NEIL G. THOMPSON, Ph.D., after having been first duly sworn by the Honorable Judge Andersen, did testify as follows:

HON. JUDGE ANDERSEN:

Please be seated.

Captain Nguyen did point out before the testimony was about to begin that your statements are under oath. They're subject to penalties of perjury if you deliberately don't say something that's true.

But thank you very much for being here. Ultimately, when we get to questioning, if there's a question you don't understand, please let us know, and we will try to make sure it's clarified.

And I want to emphasize, also, based on our meeting this morning with all the lawyers, there are a lot of subjects that one could go into. Our goal with this

1 witness and this week is as much as possible
2 to try to stay focused on the testimony that
3 the witness is called to present and not to
4 get into other areas. So I will try to be
5 alert to that, and don't take any offense if
6 on my own initiative I limit some questions.
7 Okay. Mr. Dykes. Or Mr. Mathews.
8 EXAMINATION BY MR. MATHEWS:
9 Q Mr. Thompson, for the record,
10 could you please state your full name and
11 spell your last name?
12 A Neil G. Thompson, T-H-O-M-P-S-O-N.
13 Q And at any time if you feel you
14 need to take a break during the questioning,
15 please advise the Board, and we will
16 recognize that request.
17 By whom are you employed, sir?
18 A I'm employed with the Det Norske
19 Veritas (U.S.A.)
20 Q And what position do you hold with
21 them, sir?
22 A I'm vice president in the
23 Materials & Corrosion Technology Center
24 located in Columbus, Ohio.
25 Q How long have you held that

position?

A That position, just this year.

Q And what other experience have you had with DNV, sir?

A DNV acquired a company that I started in 2005, and for the two years after the acquisition, I remained president of CC Technologies, Incorporated.

I then took a position as section manager. I'm currently the section manager of the litigation support group within DNV in the Columbus office.

Q Can you please give us a high-level overview of your forensic experience, sir?

A I have been in the area of research since 1980, and during the time, practical research is really a problem-solving type of research, and many of the jobs over the years have had some aspect of failure analysis and forensic investigation in them.

The last two years I focused very heavily in forensic investigations, but have had experience in failures and forensic

investigations for several years.

Q Can you explain what your educational background is?

A I have a Bachelor's and a Master's of Science in engineering with a specialty in materials science from the University of Alabama Birmingham and I have a Ph.D. from Vanderbilt University in material science engineering.

Q Can you please explain to the Board how DNV got involved with this contract?

A DNV responded to a request for quote from the Bureau of Ocean Energy Management, Regulation and Enforcement, BOEMRE, and we responded to that toward the end of August, and were awarded a contract for the forensic investigation on September 1st.

Q And how was the initial contract set up? I recall there being multiple contracts or revisions. Can you explain the initial contract, sir?

A The initial contract was based again on the RFQ, which was primarily

1 looking at the function testing of the
2 blowout preventer and the objectives of that
3 were to look at the performance of the
4 blowout preventer, any failures and the
5 sequence of events, you know, leading up to
6 and around the loss of well control.
7 We also had then some
8 modifications to the scope, one being to
9 perform pod flushing, and that was issued a
10 month or so later. So the end of September,
11 we had that modification.
12 In late December, early January,
13 we had a modification to do a much more
14 detailed metallurgical examination of the
15 drill pipe, and there's a modification
16 associated with that.
17 And then we also had a
18 modification that just took into account the
19 general, the time and other issues, delays
20 that were associated with the project.
21 Q Okay. Can you briefly describe
22 the make-up of the DNV team that they had
23 performing the forensics both at Michoud and
24 in Columbus?
25 A Yes. The team that was proposed

and conducted the work had myself as the project manager, and that was administrative role. I also had the lead role for the materials evaluation portion of the project.

We had Phil Nidd was my deputy project manager, dealing with administration issues and financial issues.

Gary Kenney we brought in as an outside consultant, and we had worked -- I had worked with Gary on prior projects, so we brought him in at the proposal stage as our lead investigator, and he had the on-site lead in conducting all of the function testing for the project. But he was on-site manager for the project.

We had Bryce Levett, who had significant experience in BOPs, and so he was on the team.

And then we had a fairly significant team of engineers that had both BOP experience, so within the DNV group, we took -- The Columbus team took the lead for the forensic investigation, and that's what we brought to the project. Our DNV Houston had the lead for the blowout preventer.

They had the blowout preventer and subsea equipment experience, so that was that part of the team.

Within Ohio, we also had people working on document control. And then we had a whole staff of engineers that had experience with the modeling, with materials evaluation as well. They reviewed ROV footage. They reviewed documents.

So this was certainly several members, you know, within the DNV organization on the team.

Q And approximately how many members do you think DNV had on the total forensics?

A You know, I'm not sure of the number of people total, but it had to be in the order of 20 people probably that provided significant input on the project, and then others that may have provided smaller amounts.

Q Earlier, I believe -- And I hope I got his name right. Bryce Levett?

A Yes.

Q You mentioned that he had some experience with BOPs. Can you explain what

his experience with BOPs was, sir?

A He had worked with drilling companies prior to DNV. He had some patents on BOPs. So other than that, we would have to pull his resume to look, but he did have significant experience.

Q Was he a DNV employee or was he a contractor?

A No, he is a DNV employee.

Q I believe you had mentioned that Mr. Gary Kenney was contracted by DNV to participate in this investigation, forensic investigation with you, and you had worked with him on other forensics. Can you please explain those?

A We had worked together on a pipeline failure that occurred in Australia, and that was where I had gotten to know Gary. Dr. Kenney also had worked at Patel for several years prior to going out on his own as a consultant about five years ago. So multiple people within DNV also knew Dr. Kenney.

Q As the project manager, did you oversee all the operations at Michoud as

well? I know you said Houston DNV was handling the forensics at Michoud. Did you oversee the total project?

A I oversaw the total project, and like I said, the day-to-day operations at Michoud were conducted by Dr. Kenney.

Q Can you briefly describe some of the delays that you ran into during the forensic process, sir?

A From the start of the forensic project, it seemed to expand and change, so when we originally proposed it and as it was awarded on September 1st, for instance, the pod flushing was not part of that, because at that time, they had not completed even pulling it up and bringing it to shore from the Q-4000, where it was brought up to, so the pod flushing part of that was added to the project during the time when we were pulling together protocols for the testing. So that, you know, from the very start, within the first week, we were adding to it.

The overall process of the developing of the protocols, we developed this concept of the Technical Working Group

and bringing and allowing the Parties In Interest to have input into the testing program.

That was also something that was added after the original proposal, and we worked closely with the Technical Working Group, even during the stages of the protocol development. And before the final protocol was issued, we had reviewed and commented on probably over 200 comments from the Technical Working Group to include that into the protocol. So that, the development of the protocol itself took longer.

During the investigation itself, to remove the drill pipe, which was one of our -- always one of our high priorities was to remove the drill pipe and not damage that, we ended up removing and dismantling all of the rams in the lower BOP section, and that wasn't envisioned going in. But it certainly was required when we saw the damage and it was required to remove the drill pipe from the BOP.

So there were things along the way that took much longer than we expected, so

the whole change in emphasis from just function testing over to actually dismantling, removing and analyzing the drill pipe. All of the laser scanning that we did to characterize the drill pipe and the different rams was not envisioned in the original proposal.

So there were several things that are really not untypical in a forensic investigation. In a forensic investigation, you outline what you want to do going in, you have protocols that you think will work, but as you find evidence and make discoveries of evidence, that often changes the focus of the investigation, and that happened as a course, matter of course here in this investigation.

Q You mentioned the Technical Working Group. Did they have the advantage to review the stuff as the attorney from Cameron had brought up, the modeling and some of the inputs? Did they have any review of that protocol?

A They did not have a review of our analysis. So they had a review of our

testing protocol, but the analysis, they did not have access to until the report.

Q With DNV providing services to the rig owner in the past for surveys, how did DNV address any potential for conflict of interest?

A Right in the proposal, we had a conflict of interest disclosure, where DNV disclosed projects that could have been or were possible conflicts of interest, and that continued during the course, a matter of course of the project, you know, as other projects came to light.

DNV is a large organization. I work in the energy side of the organization. There's a whole maritime side to the organization.

So what we also did, and was approved by the contract manager, contract officer, we looked at isolating our team, so our team members had not worked previously on the HORIZON, on the accident.

There was some work that Bryce Levett did originally that we disclosed. But the whole idea here was to isolate the

team members, not have them involved with any other employees within DNV that were associated with work for the different parties involved specifically in the HORIZON accident. And by that isolation, and then with non-disclosure agreements that we had, that's how we controlled the possible conflicts of interest on the project.

Q How did DNV obtain or gather the information for the testing protocol involved in the forensics?

A I mean, the testing protocol itself was developed, you know, first from examining the BOP and the LMRP when they were brought to the site at Michoud, looking at some of the changes that had been made, looking at modifications that we could document, but we also had a fairly early meeting, my recollection is a couple of weeks after the issuance of the contract, with Parties In Interest, discussed our ideas on the testing protocol, how we were going to approach it, and provided a chance to have input from the Parties In Interest.

After that, we then wrote the

testing protocol as we saw it, and then had at that point the Technical Working Group that had been developed then participate in providing comments.

Q When you just said you reviewed the condition of the stack when you received it, what did you compare it against? Did you have documents or background info that were made available to you and how did you receive those?

A They were received -- Most of our documents were received from BOEMRE as previous documents that they had collected, and I think over the course there were some additional documents that we may have requested from Cameron on the actual original design and maybe Transocean from operating drawings and schematics.

But what we ended up with was the original design drawings and we ended up with some operational drawings that were 2004 vintage drawings. And from that, we then looked at what we had on the BOP and the circuits and compared that to those drawings.

Q I know earlier in your testimony, you talked about some of the time lines with some of the, I guess, evolution of the contracts that you had, at least some of the problems that you had. Were you ever given a deadline by anyone to have a report out on a certain date?

A Well, we had a deadline in the original proposal, and that was a fairly short deadline. The way it was written, it was basically 60 days after start of testing.

The start of testing was a little bit open, because there were so many days to develop the protocol, and then there were some days for review, and the review process wasn't specified.

But during the process and with the pod flushing and some of the other delays and the protocol development, you know, that was pushed back fairly soon, and we had those discussions in early November before we even started the testing with our contract officer representative. So that was known.

And then eventually -- And I have to go back and look exactly when, but we proposed March 20th as the deadline date, and that was -- you know, that was more of a discussion with BOEMRE as well as our proposed date as to when this work needed to be completed for BOEMRE to meet their requirements for reporting.

Q And with that March 20th approximated deadline, were there any tests or any type of forensics that were pulled back?

A Well, during the -- The way the forensic investigation proceeded was that we worked very much on some collection of fluids, some measurements up front, but then the dismantling of the lower BOP stack, so all the -- the five pairs of rams were dismantled, and most of that, that took most of the time up to early December, mid December, so getting into the Christmas holidays.

We wanted to -- We also had another problem, and the most significant delay was the erection of the enclosure

around the BOP components, and we delayed that until after we had dismantled all of the rams, because we needed lifting equipment in and around the BOP stack. So we kind of coordinated our needs for testing and our needs for heavy lift equipment with that for the erection of the enclosure.

And so there in that mid December time frame, we finished removing the rams. We moved into a time where we had the erection of the enclosure was going on, and it was during that time we did a significant amount of the work on looking at the drill pipe and the rams, trying to piece the drill pipe together, and it became apparent from our analysis that the blowout preventer's blind shear rams had activated, they had cut pipe, and that had occurred prior to the sinking of the rig. And for our purposes, it's the kinking of the pipe at the top of the FlexJoint -- kinking of the riser, I'm sorry, at the top of the FlexJoint that really pinned the pipe in place. That kink pinned our pipe.

We were able to look at that and

make a decision that the pipe that had been cut by the blind shear ram was pinned up in that region. And from that, we then looked at, well, what are the critical paths that we needed to look at to work on, you know, to finish this investigation.

So after the building was erected and we started back the testing program, it was at that point we knew that we wanted to focus on those paths, which was the critical circuits involved with the activation of the blind shear rams before the rig sunk, and so from that standpoint, we were in the process of limiting the work, but the deadline itself was a deadline, and so that also had some effect.

But it was a mixture of the deadline that we had to complete, and also the fact that we were focusing the investigation down from the prior evidence and findings that we had. It was a combination of those two that then led to, you know, focusing down the testing protocols.

Q So is it your testimony as project

manager, that the removal of tests had no weight or factor on the, I guess, cause of the failure that DNV identified in their report?

A We looked -- Would you repeat that?

Q Yes. The removal of the certain tests to meet the deadline, did that in any way have an impact on DNV determining what the primary cause of the BOP failure was?

A No, the tests that we removed we felt were not going to impact our decision on the cause of failure. We looked at where we were in our analysis and we focused on those tests that would give us information on the cause of failure that we had worked toward.

There probably were some of the tests that we would have continued with and made some examination a little bit further except for the deadline, but we felt like we completed most of the tests we needed.

Q Now I'm going to move into the report itself. I know you brought some slides with you. I saw you working with the

projector earlier. If at any point you feel that you can answer a question with the slides better, feel free to go up to the presentation and go from there.

A Okay.

Q I want to refer to section 6.2.2, which is a three-dimensional laser scanning of the ram blocks, and I think I have it noted as Page 74 of the report.

Basically, I would like for you to explain to me what actually laser scanning is, what it involved, and what you determined from it.

A Well, the laser scanning provides the surface topography of the component, so it is a laser, it's a dimensional laser, so it can be set up, and you can then get -- From the scan, basically, what you have is the surface topography. It's a line of sight.

If your topography is very complicated, it's sometimes difficult to get around some of the, you know, some of the components. Again, there has to be a line of sight, so you sometimes lose some of the

depths of some of the features if they are blocked by other features.

Q Where was this laser scanning performed? Was this performed at Michoud or was this performed in Columbus?

A This was performed at Michoud. And we moved the components from the primary site on the dock to a building there on the Michoud property that gave us more room to work around the components.

Q And this was after cleaning and removing all the debris from it?

A The laser scanning was performed after cleaning. So we had photography, we had video prior to the cleaning, and then we performed the laser scan following cleaning.

Q Can you please explain to the Board what you were able to determine from the laser scanning that DNV conducted on the blind shear rams?

A The laser scanning, you know, by providing the topography, it actually characterized the damage on the rams and some of the flow patterns from the erosion. So most of the damage on the rams that we

found and on the pipe itself was damaged due to erosion from the fluids in the well and the flow of the fluids.

Q Specifically, what does that erosion mean? How did you come to that erosion?

A The erosion is removal of the metal from a high velocity fluid. Most of the time that fluid would have some solid particles of sand, some solid particles in it, which would make a fluid much more aggressive as far as erosion is concerned.

Q So all you can conclude from that scan was the erosion and flow paths?

A Yes. And it can be quantitative with dimensions.

I would like to show one of the video clips, if I could, at this point.

Q Please.

A I hope everybody can see the screen from where you're at.

What I have is a short video clip, and I have a few of these during this time and we can look at a few of these. This video clip right here -- I was seeing if I

had a pointer here. This video clip shows the two rams. The yellow ram is the upper blind shear ram. The green is the lower. And the upper and lower refers to the cutting blades on the rams. And then we also show here the pipe as it was located on the top and the bottom of the rams that were cut.

We do see on the yellow ram some significant damage on the side, that as I run the clip, we can see a little bit closer. So we're focusing on just the rams. At this stage here, these rams are completely closed.

When we found the rams, we found areas where we had metal-to-metal contact from the block faces and we found multiple points that we felt were metal-to-metal contact. So at some point these rams had closed completely and had this metal-to-metal contact.

This is the top surface coming around to the side here. This would be the choke side. And if you will look at this side, because as we will rotate back, you

can see that we have damage, we have a fair amount of damage to the side packers with a lot of the metal missing. But, you know, these on the choke side, they're fairly close.

Underneath here, you can see in the green the lower blade surface. There's a fair amount of erosion on that. And in looking at it and analyzing it, there's more erosion on the kill side of the ram block.

And as we come around here, you can see that there is much more damage on the kill side, especially on the upper ram, on the one in yellow, and on the upper portion of that, we're missing a whole portion of the ram block on that side, and we're missing much more of the pieces of the side packers that you can see that are in the middle of the ram blocks on the very side, which are supposed to seal the sides of the rams.

At this point, we have inserted the pipe and we moved the rams to a point where that pipe would fit in, and this is also where we think the position of these

blades were when they initially closed and cut the pipe.

But you can see a significant opening there on the side, and the damage on the rams are much more severe on the side where we have fitted this pipe. And we will talk about how the pipe fits in and matches there a little bit more later. But this is where we believe the pipe was.

So this is what the data does, the laser scan allows us to do, is we scan these individual blocks, but we can also then work at moving them together, piecing them together, and looking at how the pipes and the rams fit together during operation.

And while I'm here, maybe I will show the casing ram. Is that all right?

Q Yes, sir, please.

A So this is the casing ram, and this is after the ram is closed and cut the pipe. You can see the pipe is offset, just because the ram blocks, when they cut, they just push the pipe apart as well.

And again, we will focus primarily here on the rams themselves. That's the top

pipe and this is the lower one, and when we remove the pipe, you will see quite a bit of damage on the lower one especially.

And what you can see here is that damage is actually the outline of the pipe, so the flow at the time of cutting is through the drill pipe. The fluid is flowing through the pipe itself. The variable bore rams are closed. And that fluid then is impinging on the bottom of the ram following the ram closing and cutting the pipe. So these are the two pieces of pipe that were associated with the casing ram.

Going down, on the down, we can see in a few minutes a video where the different variable bore rams were as well.

We had moved the rams out just a little bit, just so you can see, but for the casing shear rams, there are no sealing surfaces on the casing shear ram, so the blades don't seal, there's no side sealing that happens, and as flow -- Here you can see on the top surface, on the blue ram here, this is looking down on top, so

essentially you have flow coming up, impinging on the bottom ram, where we saw that where the pipe was located. It's coming out from between the ram blades and causes the erosion that you see on that blue ram, and then the flow then goes up the wellbore.

So the primary flow would be through the blade surfaces themselves, and then out the top. And this is what the bottom looks like, where the pipe was, so this is the bottom, so the fluid is coming through the pipe, impinging on the ram, and on the blue, at the top here, you can see some erosion there as well.

So there's also some fluid in the channel that went out to the side and caused the erosion on the back of the ram blade as well. And from there, it had a path up through the ram cavity into the wellbore.

Okay. And I do have one video that shows the variable bore rams and the pipes associated with it if you would like to see that now.

Q Sure, please.

A So this is the casing ram at the top. These are the upper and middle variable bore rams associated with the pipe that was pulled out, and then if we look at the pipe, we can see the damage on the pipe.

So this is the pipe and how the casing shear ram cut. That's what the casing shear ram cut looks like. This is where the upper variable bore ram was, showing the damage associated with where the segments of the upper variable bore ram contacted the pipe, and you can see we had the pipe is almost separated at this point.

This is the middle variable bore ram. And again, we also had some of the erosion all the way through at that point.

And this is where the lower variable bore ram was, and at this point, the pipe had eroded and separated. So below this point of the pipe, we had no additional drill pipe to look at.

Thank you.

I will add that the video, you know, certainly we couldn't take a lot of the frames from the video and put them all

in the report, so the report then, at various places in the report, and here, 70 through 77 and 78 for the casing shear rams just shows different frames from the video.

Q And from your testimony, do you know what size drill pipe was across the blind shear ram and the casing shear ram when it was cut?

A What?

Q The size of drill pipe?

A The size was five and a half inch drill pipe.

Q Was there any difference between the erosion between the casing shear ram and the blind shear ram?

A Well, what we saw there was that at the casing shear ram, there are gaps in the blades, there's no sealing of the blades, so we had erosion where the fluid impinged on the bottom of the ram as it came up. We had erosion between the two blades where it flowed through. But the total volume of metal loss was much less on the casing shear ram than it was for the blind shear ram.

The blind shear ram had seals. You know, when we looked at it, the seals did not meet and close. And so we did have much more erosion on the blind shear ram from the flow coming through the pipe that was sheared there.

Q And exactly how many pieces of drill pipe did DNV recover from the LMRP, BOP and the riser?

A We had eight pieces of drill pipe that we recovered.

Q Can you briefly explain the location of each one? I don't know if you have a graph or anything.

A There is a graph in here.

Q Page 80, I believe.

A Yes, on Page 80, it shows the different pieces of the drill pipe. So we recovered the drill pipe, which we labeled 148, is the evidence number for that pipe. That was recovered at Michoud, and it was recovered out of the lower BOP. And this was the one that we showed here at the end that had the damage from the variable bore rams and ended at the cut of the casing

shear ram.

There's a pipe, item evidence No. 94, that was recovered from between the blind shear ram and the casing shear ram.

The other piece of pipe that was recovered at Michoud was section 39, and it was recovered from the LMRP, and so there was just a small amount of that pipe sticking out of the upper annular, and then we were able to recover that through the annulars at Michoud.

We had two pieces of pipe that were recovered at the Q-4000 when it was first brought up. Those pieces are labeled Nos. 83 and 84, and they're shown here where they were located at. But basically, they were on the top of the upper annular and pulled out through the FlexJoint.

Then there is a riser that was recovered, and the portion of the riser that was recovered contained pipes 1-A-1 and 1-B-1.

When we went to recover those pipes, we had to cut the riser to pull them out, pipe 1-B-1 separated at the kink, so

although it looked to be intact, when we pulled it apart, it just separated into two. So the kink then was severe enough to basically shear that pipe, and that then is labeled 1-B-2 and 1-B-1, those two pieces.

Q And how were these drill pipes handled from the Q-4000 to DNV? How did you obtain them?

A The Coast Guard had custody of those pipes and they had those stored then in a container, and we were given access to them at that point.

Q So did the scanning only take place at Michoud of those drill pipes?

A Yes.

Q And how did you actually match the drill pipe segments up?

A The drill pipes were matched by looking at the ends of the pipe and matching them that way, so some of them were relatively easy to match up. Some of the sheared surfaces, some of the ones from the casing shear ram cut, the end surfaces were similar enough that we could match those together just by the shape of the ends and

the features on the ends of the pipe matched together.

So on other times, on the casing shear ram, for instance, we actually used indentations on the pipe that came from the upper ram of the blind shear ram. And so for the blind shear ram, we had indentations on both the pipe that was above it and below it that matched up, and we looked at that, and we were able to match those up there.

There was the failure that occurred on pipe that we believe was at the top of the upper annular, and this was one where there was much more erosion on one end of the pipe than the other end of the pipe, so we really couldn't match features up in that case. But in that case, we looked at the measurements of the pipe, so we looked at the measurements between the two drill -- We had two sections of drill pipe involved. We had two joints to look at.

So we could match up dimensions, and they came out to be -- I think it was -- It's in the report, but 45 maybe point seven feet between the tool joints, and

that's a reasonable measurement for a tool joint.

The other matching then -- So it's dimensional, but the other matching is that for the two joints of pipe involved, one had an internal coating on it and one did not have an internal coating.

So we were able then to use the fact of that internal coating also to be sure that was consistent with the way we had matched all the drill pipe up.

Q Earlier you talked about some of the erosion that you had identified around the blind shear ram. We're trying to locate an exhibit right now, but if you can, to the best of your knowledge, explain some of the depths and some of the lengths of these.

Is this the erosion that you were referring to earlier, sir? I know it's a black and white image.

A Yes, I'm good. Can I stand up and look?

Q Yes, sir. And we do have a Bates number for all of the lawyers. It's actually BP-HZN-MBI00208232 through 235.

A I can't identify exactly where those pictures are from, and I don't know if those are even -- Are those from the blind shear ram?

Q Yes. Those were submitted by BP --

A Okay.

Q -- in the subpoena response that we gave. We didn't actually share it with DNV.

A I mean, that looks in general --

Q And this was from footage from the Q-4000.

A Okay. I mean, in general, that looks like the type of damage we're talking about. The erosion damage in some instances can be very smooth and, you know, actually look like waves almost smooth.

In other cases, depending on the turbulence that's going on of the flow, it can be very sharp, and there can be very sharp edges and there can be very sharp undercuttings, depending on those flow patterns.

So all I can say on that exhibit,

you know, that's typical of what we have seen, but I can't identify exactly what those are from.

Q Fair enough. Can you please explain why you performed the metallurgical, mechanical and chemical assessment of the drill pipe?

A Well, for different reasons. The metallurgical assessment, again, we wanted just -- If we had found anything unusual in the mechanical testing that could maybe be explained through the metallurgical testing. Also, we had two joints of pipe. We wanted to see if they had the same metallurgy. Again, though, you would use that either as an identification for drill pipe or you would use it to explain differences in the mechanical properties.

The mechanical properties came out to be within the specifications for the drill pipe, so, you know, it's a high-strength steel that we're looking at.

We ran the toughness measurements as well as looking for the tensile strength and the yield strength of the steel, and all

that came out well.

The metallurgy, we didn't really need the metallurgy to be able to identify the different joints, because we had one joint had an internal coating and one external, and that was the best identifying markings that we could have.

The chemistry is the same thing. If we would have seen anomalies in the mechanicals, they would help explain that. But also, the chemistry was to look to see whether we could see a different chemistry in one joint versus the other, and the chemistries came out very similar between the two joints of pipe.

And again, though, we did not need that, because we also discovered the internal coating.

Q We will move directly into the causes. What did DNV identify as the primary cause of the BOP failure?

A The primary cause of the BOP failure -- And I was going to go to the causes to read, because the causes are, you know, what they are.

Q And it's Page 174 of the report.
A But the primary cause is that the drill pipe was off-centered in the wellbore, and being off-centered, when the casing shear ram activated, a portion of that pipe was deformed into the area of the ram blocks on the edges, and, also, where the side packer, the seals of the side were, and in doing so, it prevented the rams from closing all the way.
Q I believe you said "casing shear."
A Oh, I'm sorry. "Blind shear." I'm fine. In the blind shear.
So the deformation of the pipe into an area where the ram blocks, the solid ram blocks were and where the side packing was prevented the blind shear rams from closing.
Q And what were some of the contributing causes that you had identified?
A The contributing causes included the inability of the ram block from moving the pipe or the rams from centering the pipe. So the pipe was not able to be centered in a fashion where the cut could be

made, and basically, the fold-over of the pipe into the cavity, into the cavity of the rams the way it was designed for.

We also have video of these cuts from the models, if that may help.

Q Yes, sir.

A We have two that I would like to show. This first model here, what we have is a video with the pipe centered in the wellbore, and then we have a model, the fracture model that shows how that is cut.

So we have the two ram faces on either side, and then the pipe in the center, in the blue or purple. And this is also showing levels of stress as the colors. So the colors are the level of stress that's applied as it begins cutting.

And this shows -- It repeats a couple of times, and you can see how the pipe is cut. And then inside the ram block, there's a cavity, where this pipe then folds over and goes down. So that's the process of cutting. And it will just show here from a couple of different directions.

And in this one, we just removed

one of the blocks from the picture, so you can see how it folds in, into the ram cavity. So that's what it looks like when the pipe is in the center of the ram.

So in this case, the pipe is off-centered, and again, we have indentations into the pipe that match up to that, and this model will show that those indentations are seen in the model in a very similar way that we see them on the actual pipe.

So now the pipe is off-centered in this model, and you can see the pipe begins to fold in, but there's a portion of pipe that is caught between the two ram block faces.

At this point, the shearing is just beginning to take place, and it's actually here initiating right at the point of that upper ram block. And I will rotate around here so you can see a little bit better.

So you can see now the material being trapped, and that's very clear how the deformation occurs and the pipe is pushed

out into that area of the ram blocks. And then it's in between the ram blocks and they can't fully close.

Again, in this case, we just removed the front blocks, so you can just see the cutting a little bit better, and you can see that it does fold down in cutting. On the right-hand side, it begins to fold in, but then is held in place between the ram blocks.

And this is just a solid model and the lighting isn't all that great, but if you look at what we have at the very end here, I will just point out, and I will walk up here, if I may, that this piece that begins to fold over here is missing completely, so we never had it. So from here up, this part of the pipe is completely gone. It either eroded away or was pushed out in the flow and was missing.

So we had two things: Initially, we had a piece of pipe that was actually cut and sheared here. Because it's bending over, when it does bend over, it puts a very high stress along this point. So we're

missing this piece, and so we didn't have the surfaces to match up. We did not have these matching surfaces anymore.

What we did have is we had this indentation here that you can see on the actual pipe that we have and we have this indentation from this upper portion of the ram block. This is the indentation from the bottom. And this indentation right in here is still there, although this whole piece is missing.

Then we also had this corner that was really deformed in between the ram block face is also missing. So there's a lot of stresses put into here. Whether eroded away or fractured along the high stress lines, we don't know, but we know this is missing this corner, and then this corner is missing as well.

So in matching up these, we were matching them up based on these indentations from the blocks, but also we were missing both corners of this pipe. And that matching occurred prior to the model. So we did all the matching before we had performed

the models.

So that kind of took us to the primary cause, which was the deformation of the pipe in between those block faces and the inability then for the ram blocks to close.

And if we look at the other contributing factors then, it was that although the blade, as you could see, had a "V" to it that would help center the pipe, but it was not able to do so with the pipe over to the side the way it was in this case, so that was contributing.

The deformation of the pipe itself outside of the -- you know, outside of the this cutting area, the ability of this cavity to fold the pipe into was a contributing cause and would be looked at.

Q Can you explain further how it actually became buckled? How were you able to confirm that the annular never allowed for upward movement of the drill pipe past the annular and what actually caused the buckling?

A The buckling was an explanation of

how we felt the drill pipe got to the position that we found it in. So there's no question that the evidence of the recovered pipe indicates that the drill pipe is to the side of the cutting and those indentations from the blocks provide that evidence. And so we know that the pipe was over to the side. So the buckling is a way of explaining how that happened.

Because we had the pipe centered as it went into the upper annular, and the tool joint was in the annular, and that was either by design, through well control practices, or it was pushed up there fully maybe from the forces that we believe caused the buckling. But the tool joint being into the annular would not be that unusual.

Then we also had the variable, the upper variable bore ram was also closed. So it's also centered at that point.

So we're centered between those two points, and so we were looking at a way to explain how that happened. And if the pipe then has a force, an upward force, where the tool joint is actually pinned by

the tool joint going into the upper annular, if there is a bottom well force that's pushing the pipe up, then that is one explanation of the buckling.

And what we did with the buckling model was just run a model to establish how much force would it take to cause that buckle.

So what our buckling model does is tells us what the magnitude of that force requirement is. And so if we look at the pipe being pinned in the upper annular, we look at the pipe being centered at the upper variable bore ram, and then we look at how much force is required, axial force in the upward direction below the variable bore ram to buckle the pipe, the model says it's 113,000 pounds of force, so that's the force requirement.

So what the buckle modeling told us was that that could be one explanation of how the pipe got to the side of the wellbore.

Q Was that the only explanation that you deemed reasonable or was that the only

one you looked at?

A That was the only one that we could come up with that we felt, you know, was a way of producing that pipe to move over. Because you have to remember, when the pipe was cut and we pulled it out, the pipe is straight, the piece of pipe above and below, although now it's cut into multiple pieces, because the casing shear ram cut it below, but the pipe above the blind shear ram came out straight, so this also had to be an elastic process.

It was over at the side of the wellbore, but when we look at the pipe, there's no curvature to it. It's straight. So the elastic process would mean that it would recover. It's not permanent deformation. So the buckling would have to be an elastic buckling process.

And so we're looking at a process that gets the pipe over to the side of the wellbore, but when the blind shear ram was cut, the pipe then is straight.

Q Okay.

A Okay. And we felt the buckling is

the only explanation that we were able to come up with that would allow that to occur.

Q And I understand that you're saying the pipe was straight, but was any consideration given to the crown block collapsing or any type of consideration to the rig being off location from any other additional forces above, or would that in your mind affect the pipe above the blind shear ram and casing shear ram from being straight?

A We did not look at the forces above. We assumed that during the drifting of the rig, that that would probably produce some tensile forces on it. So we did not consider that the drill pipe was not connected at the rig level and holding a tensile force on there. You know, there could be other means of producing those forces, that's true, but we did not look at that.

Q Can you please explain what "common mode failure" is?

A "Common mode failure" is a term where you have a common occurrence that it

actually causes multiple types of failures. So your one occurrence caused multiple failures.

In the case, say, of the EDS, we believe that the explosion, you know, caused loss of power, loss of communication, and possibly also severed the hydraulic connections from the rig down to the BOP.

Q Was there any common mode failure that you recognized within your forensics outside of the explosion referenced?

A I do not think so. That may also be a question you would want to ask Dr. Kenney as well on some of the functioning of the BOP.

Q Okay. And a lot of the recommendations were in the questions that we had for Dr. Kenney. Was there any recommendations that DNV made within their report that you would like to discuss considering the elastic buckling study?

A The elastic buckling is one of the recommendations, and certainly Dr. Kenney can address that with the others, but we do believe that, you know, there are other

1 considerations that you could make with the
2 elastic buckling.
3 We calculated the force required
4 for the buckling. We did not do any
5 detailed calculation of what produced that
6 force. Okay. In the report, we mentioned,
7 well, you have the weight of the pipe string
8 down. You have the bouyancy up.
9 If you have significant flow that
10 is directed through the drill pipe, because
11 the variable bore rams are closed, then
12 there's a friction force on the inside of
13 the drill pipe that's also an upward force.
14 So we looked at possible forces,
15 but we did not do a detailed calculation.
16 And we do believe that, you know, doing flow
17 modeling and doing calculations to identify
18 what those forces are and how large they
19 could be would be additional work for the
20 buckling.
21 For instance, when we ran the
22 failure model, and some of this we were
23 doing kind of in parallel, but when we ran
24 the failure model, we did not include the
25 stresses produced by the buckling itself,

and that's something else you could look at with the buckling.

Because those buckling forces could alter that failure mode as far as the magnitude of forces required. We do not think it will alter the fact that the pipe was deformed and moved into an area of the ram blocks, such that the blocks could not close would be changed at all, though.

Q I'm pretty much finished with the forensics questions, but I do have one question just from some of the stuff you had said about your previous experience in a pipeline investigation, and hopefully the judge will allow this question.

I know DNV was not challenged with discussing any of the flow path or pollution volumes, but from your pipeline experience, knowing that the blind shear ram was closed and the erosion patterns, would you agree that the flow potential is actually less than the blind shear ram being closed and having flow wide open and up through the drill pipe?

A I'm going to get you to repeat

that again, because I'm not sure I got the actual focus of that question.

Q Okay. There was flow path work done by the federal government to come up with a determination of the pollution volume that entered the Gulf of Mexico.

A Okay.

Q With assumptions that the blind shear ram was not closed. If the data that you have presented the Board indicates that the blind shear ram was closed and you had some erosion wash-outs, from your pipeline background, would you agree that the flow rate would be reduced, knowing that the blind shear ram is closed?

A It probably has little to do with my pipeline background, by the way, but I do think that with the blind shear ram closed, you have a different path you have to consider, and we did have a lot of erosion that went on.

Our analysis of both when we looked at the pipe as it fit into the rams and from the model that we performed says that the side packers would be -- And I want

to be sure I don't confuse the side packer number from the blade seal numbers, but the side packers were one inch apart when the pipe, deformed pipe within the ram blocks stopped the process.

The blades were closed and cut, but the side packers were one inch apart and the blade and the seals and the rear seals were 1.4 inches apart. So we had gaps where you could flow. We had flow. We had significant erosion on the side, and most of the erosion and the patterns would be consistent with that pipe being over on the kill side, off-centered on the kill side of the wellbore.

And then, also, the wellbore itself was severely damaged through erosion. And the worst erosion on the wellbore was on the kill side, which would be on the side of that pipe, and we had depths associated with that. And so I think that you would have to include those types of paths analysis to get true flow volume calculations.

MR. MATHEWS:

Thank you, Dr. Thompson. I have

no further questions.

HON. JUDGE ANDERSEN:

Any other Board questions?

EXAMINATION BY MR. McCARROLL:

Q Just one clarification. You talked about the Technical Working Group. Exactly who was in the Technical Working Group and what government agencies were involved?

A The Technical Working Group was made up of -- And I will count on my fingers if that's okay. We had the Department of Justice had representatives. We had the multi-district litigation I think had two representatives. We had BP, Transocean, Cameron, CSB were the organizations represented on the Technical Working Group. There was both an alternate representative and a primary representative, and then there were some substitutions that went on.

So I would have to go back and grab my list to get all those names correct. But those are the organizations.

Q How about government agencies?

A Not on the Technical Working

Group. BOEMRE had representatives there that also worked with us on site, and then were present for most of the testing.

Q Did you have any FBI agents there?

A I'm sorry. Yes, we had FBI Evidence Response Team members that were anywhere from probably two to four people, and when we were working on both the dock and at the site, maybe there were some more. We also had -- Any time we were collecting fluids, we had EPA representation from their evidence team, and then for fluid analysis, that was performed at the EPA labs in Denver as well. So we had those representatives on site as well.

Q Was the FBI videotaping?

A The FBI did their own videotape and photography of the evidence, and then we had as far as part of our project team four videographers/photographers. They were interchangeable. And we usually had multiple video cameras going all the time during any of the testing that was being performed. And that's in addition to what the FBI did during the evidence recovery

portions of the project.

MR. McCARROLL:

Thank you, Doctor.

HON. JUDGE ANDERSEN:

Any other Board questions?

Okay. Perhaps we could take a brief break before the Marshall Islands asks questions.

CAPT. NGUYEN:

Why don't we take 10 minutes and reconvene at 9:35.

(Whereupon, a break was taken.)

HON. JUDGE ANDERSEN:

The Board will be back in session, and the Republic of the Marshall Islands will have a chance to ask you questions, Mr. Thompson.

As I mentioned before you began to testify, if anyone asks a question that's confusing, just let us know and they can clarify it.

And before any attorney asks questions, perhaps you could state your name, so it's clear on the record.

EXAMINATION BY MR. LINSIN:

Q Good morning, Mr. Thompson. My name is Greg Linsin. I represent the Republic of the Marshall Islands, the flag state for the rig.

I have a couple of questions. I am not certain, sir, if my questions might go to your area of expertise or experience with this report or to your colleague, Mr. Kenney. So if my question would be better posed to him, please just let me know. All right?

A Okay.

Q I believe I heard you testify in response to a question from Mr. Mathews that in explaining the bowing of the drill pipe above the blind shear ram, that you did not consider the drift of the rig off location. Did I hear you correctly?

A That's correct.

Q And why is that, sir?

A If the drift is producing a tensile force on the top and the upper annular -- or the tool joint is actually pinned at the upper annular, that force is not really translated downward beyond that,

because we're looking at -- If there's compression up and our tool joint is fixed at that point, the tension would be applied maybe at the top of that annular, but would probably not have any effect if that tool joint is being pushed up into the annular from the bottom well forces. We do not believe that the tension portion of it would affect us.

Q It would not have been transmitted to the portion of drill pipe below the annular; is that correct?

A Right.

Q Let me ask you, your hypothesis, if I'm correct, is that the tool joint had become trapped in the annular; is that correct?

A That the tool joint was pinned at the upper annular.

Q All right. What is it that led you to believe that it was the upper annular that was closed as opposed to the lower annular?

A If we look at the dimensions of the pipe, they would correspond to drill

pipe in the upper annular.

Q Did you consider the testimony of the crewmembers on the rig that it was the lower annular that had actually been closed during the negative test?

A We talked about that, but because the evidence shows that the erosion and the tool joint was pinned, you know, from the dimensions of the pipe at the upper annular, that's what we looked at.

Q So you're going based on the dimensions of the drill pipe and the tool joint, even though it was in conflict with the testimony of the crewmembers on the rig; is that correct?

A In our calculations, we looked at the upper annular.

Q All right. Did you find that conclusion to correlate to the testimony of any crewmember on the rig? Did you find any crewmember who had testified that it was the upper annular that was actually closed?

A No, we did not look at that. Or I do not recall whether my team looked at that, the document review team looked at

that or not.

Q All right. In your report, you made some statements about -- Well, let me ask this general question. Did you review the Sperry-Sun data and the information that that data contained regarding the beginning, the initiation, and the termination of, for example, the negative tests?

A We did look at that data.

Q Do you recall, sir, that the Sperry-Sun data indicates that the second negative test actually concluded at about 2000, about 8:00 p.m. that night?

A Yes.

Q And so would you agree with me then that that was about, almost two hours before the actual blowout occurred?

A The number I have was about 30 minutes difference between that end of that test and when the blowout and explosion occurred was the number I recall.

Q And that's the reason for my question. I think there's no doubt that all the testimony indicates that the blowout occurred about 2149 or something in that

time range, shortly before 10:00?

A Yes.

Q Is that correct? Does that fit with your recollection?

A Yes, 2149, yes.

Q But the Sperry-Sun data, as I asked a moment ago, the Sperry-Sun data indicates that the second negative test had concluded at about 2000 that night?

A I thought it was 2110 or 2120 were the numbers I recall. And then the last part of that I recall was that the annular pressurized from 1900 to 1500 psi, and there's no other information beyond that.

Q Are you able to -- Do you have the Sperry-Sun data with you? I assume not.

A I do not have it with me.

Q All right. But can we agree that the best indicator of when the second negative test concluded would be the Sperry-Sun data itself? Is that a fair statement?

A Yes, I think so. I would agree.

Q I'm going to ask you to consider a couple of the schematics in your report

together, and help me understand the locations that are depicted in these two schematics. And I'm talking about Figure 38 and Figure 55 in your report, and those are on Pages 80 and 95 respectively. Just let me know when you have been able to locate those two schematics.

A Yes.

Q All right. First of all, when you compare the location of section 39 in Figure 38 with the location of section 39 in Figure 55, it appears that that section of pipe is lower in the schematic than it is depicted in Figure 55. Do I have that correct, sir?

A Correct.

Q All right. And can you explain to us what would account for that section 39 having moved lower in the lower marine riser package?

A If we look at in Figure -- Hold on one second and let me situate my -- I think I'm good right here. If we look at Figure 55, and then look at the middle schematic in that, at some point we have

that the section 1-B-1 at the very top above the -- at the very top of that, which is labeled "E," that whole section was down and the "E" was connected to the bottom. So the top of 1-B-1 was connected to the bottom of 39, and bottom of 83, which is marked "B," is connected to the top of 94, which is marked "B." So the letters match what we think are the matching joints. Okay.

And at some point then we had a failure in the top of the upper annular, and we indicated that we weren't sure exactly when that could have occurred, but we had a failure there, and then the blind shear ram cut occurred, and that whole section then moved up due to flow.

Q I'm with you so far.

A All right. In "C," we see that we have the kink, and the kink in the pipe pinned those sections in place. Okay.

And then at some point we had the intervention cut of the riser, and the first intervention cut of the riser was a saw cut, and we believe that is the cut that's at our joint "C," and at that point then joint 83

dropped down to the top of the upper annular. And then later they went in and sheared the hull riser, because the saw blade got pinned and only went partially through, and then they sheared that.

So then we ended up with a sample that was 84, which is a short, small piece, and it fell down to the upper annular, and then 39 went down to the upper annular. Okay. And at some point then we go back to the prior figure --

Q Prior, Figure 38 you're saying?

A Figure 38.

Q So the drill pipe pieces 39 and 84 fall down, even though this is still occurring during a flow event; is that correct?

A Well, they're cut, and probably the weight -- I mean, they are almost -- The dimensions indicate that they're very close to the top of the upper annular anyway, so the fall is not very far, but they're cut and basically they're loose, and the lower part that they have to rest on would be the top of the upper annular.

Q Well, but if you look in Figure 38, the lower part of section 39 is well below the upper annular?

A Yes. So at some point in time, then 39 worked itself free, worked itself to the center, and then dropped down through the upper annular.

Q Perhaps even after flow had been arrested?

A Perhaps after flow. But at some point it dropped down by the time we then had the BOP brought to the surface.

Q Okay. It is your view or DNV's view that the flow initially was through the drill pipe; is that correct?

A That's correct.

Q And did you consider at all in reaching that conclusion what the configuration of that drill pipe was on the rig itself, what connection that drill pipe had on the rig at the time of the initial blowout?

A Would you ask that question again?

Q If the flow is initially through the drill pipe when the blowout first

occurs, did you consider, do you know what the connection was of that drill pipe up on the rig itself?

A No.

Q Do you know if it was closed, the drill pipe closed?

A I do not know.

Q Would that affect your opinion if, in fact, the drill pipe was sealed at the rig at the time of the initial explosion, the initial flow?

A I would have to consider that. That was not considered.

Q So if the drill pipe was, in fact, screwed into the top drive preventing flow through the drill pipe, that is something you probably should have considered before concluding that the flow was through the drill pipe; is that correct?

A We would have to look at that. I don't have a comment on that now.

Q Was it within your sphere of focus to evaluate the testimony and evidence regarding activation of the EDS?

A That testimony was looked at

1 within our review.
2 Q And your communication is -- Am I
3 correct that your conclusion is that the
4 activation of the EDS from the rig did not
5 cause the blind shear ram or any other
6 functioning on the BOP to activate; is that
7 correct?
8 A That's correct.
9 Q And can you tell us, do you have
10 an opinion, does the report contain an
11 opinion as to why the BOP didn't activate
12 when the EDS was activated on the rig?
13 A The report suggests that we --
14 What we know is that the EDS should have
15 released the LMRP, and that did not occur.
16 It should also have retracted the pods, the
17 stingers, and that we can see from ROV did
18 not occur. So we have a few -- we have two
19 indications of things that should have
20 happened that did not. And we then say the
21 likelihood is that the communications and
22 the power was lost due to damage to the MUX
23 cables, the communication cables at the time
24 of the explosion.
25 Q Did you examine those? Did you

have any portion of that cable to examine?

A No, we did not.

Q You had made some findings regarding the functioning of a solenoid on the yellow pod, is that correct, and the battery on the blue pod; is that correct?

A That's correct. But that work was overseen by Gary, by Dr. Kenney, and I was not there at the time, and I think questions along the functioning of those items would be best held for his discussion.

MR. LINSIN:

All right. Very well. I have no further questions.

Thank you, Your Honor.

HON. JUDGE ANDERSEN:

Thank you.

Mr. Cohen, would you like to ask any questions before we go to the Parties In Interest?

MR. COHEN:

No, thank you, Your Honor, not at this time.

HON. JUDGE ANDERSEN:

Okay. Cameron?

EXAMINATION BY MR. JONES:

Q Good morning, Dr. Thompson.

HON. JUDGE ANDERSEN:

Counsel, could you state your name for the record, please?

MR. JONES:

I will do so. I'm David Jones and I represent Cameron.

HON. JUDGE ANDERSEN:

Thank you, Mr. Jones.

EXAMINATION BY MR. JONES:

Q Dr. Thompson, do you have any operational experience working on a drilling rig?

A I do not.

Q Before your involvement in this investigation, had you laid eyes on a blowout preventer?

A I had not.

Q The original estimate for the forensic investigation, it was to be completed 60 days after the Joint Investigation Team approval of the Forensic Testing Plan; is that correct?

A Correct.

Q And so that would have put, if my calculations are correct, with the plan being submitted to the Parties In Interest on October 22nd, that would have had final testing completed before Christmas, correct?

A The approval was the 27th.

Q Okay. So right around the holidays?

A Correct.

Q And that didn't occur? In fact, it took three months longer than anticipated for you all to finish -- Well, to get to issuing your report, correct?

A Correct.

Q And I don't want to go into the reasons for that, and I believe you touched on some of the reasons, but is it fair to say that the process took longer than you expected that it was going to take?

A Correct.

Q And as a result, various tests that were in the Forensic Testing Plan were not run, correct?

A There were some tests within the protocols that were not performed.

Q For example -- Well, I think there are 151 numbered tasks that were in the test plan. Does that number sound correct to you?

A Yes.

Q And one of those tasks, item No. 109, was to "remove and inspect the annular elements for damage and anomalies." Do you recall that being in the testing plan?

A Yes.

Q And that wasn't done, correct?

A That's correct.

Q And you were also going to "inspect the annular cavities measuring damage and anomalies." That was item 110. That wasn't done either, was it?

A For the LMRP, that's correct.

Q Okay. And your hypothesis, your buckling hypothesis depends on essentially the performance or actions of the upper annular, correct?

A That's correct.

Q And would it then make sense that if part of your opinion or your hypothesis

is based on performance of the upper annular, that you would have wanted to look at the upper annular?

A The primary cause of the deformation of the pipe into the areas of the ram block preventing the ram to close, that primary cause would not be affected by that examination.

Q But the buckling and whether or not this buckling that you have described occurred would be affected potentially by looking at the annular, correct?

A It could be.

Q Okay. One of the tasks that you were going to do, I believe it was item 137, was you were going to "refit the components of the BOP stack to the pre-incident condition and reattach the control pods to the LMRP." That didn't occur, correct?

A Correct.

Q And you were going to then reattach the LMRP back onto the BOP. That didn't occur, correct?

A Correct.

Q And I think you were also in the

testing plan going to fit an exemplar pipe within the wellbore to permit full function testing of the BOP stack, and that didn't occur, correct?

A That's correct.

Q This may be a question for Dr. Kenney, but item 78 of your testing plan, there's the statement that "if at any time any of the rams do not move with 500 psi or less," you're going to terminate the function and proceed to a forensic investigation of this fault.

Did you have tests out at Michoud where the pistons didn't move with 500 psi or less?

A You would need to ask Gary that question.

Q Okay. Throughout the report, your report, there's a discussion of one of the things that you're going to do is that you're going to record all externally visible serial numbers and identification numbers on all the components of the BOP and the LMRP. Do you know if that was done?

A You will need to ask Gary that

question.

Q That's a "Gary" question.

Of the 151 tasks in the test plan, did you prepare a list of which of those were done and which of those weren't done?

A We did not.

Q Did you ask for additional time to complete the tasks in the test plan?

A We looked at the deadline we had. We also considered the failure cause that we were working on and the evidence we had at the time, and we thought we would focus on those functions that were critical to look at that or to describe or have input into that cause.

Q Okay. And in answer to my question, you didn't ask for more time to complete the additional tasks that were in the test plan, correct?

A We did not.

Q Beyond what was in the test plan, you also identified various additional tests that you may want to run beyond what you originally thought you were going to run, correct?

A That's correct.
Q And I think those are listed starting on Page 8 of your report in section 1.7.1, correct?
A That would be the executive summary of those tests, yes, and I think those would be identical to the recommendations.
Q Okay. And what you say on Page 8 is that "there are additional studies and tests that could be undertaken to examine" further your proffered hypothesis about the buckling and the cut, correct?
A You're referring to section 1.7.1?
Q Yes, 1.7, second paragraph, last sentence, where it says, "However, even here DNV recognizes there are additional studies and tests that could be undertaken to examine this scenario further."
A That's correct.
Q Okay. One of the tests that you suggest, it's the first one in section 1.7.1, is to "supplement the finite element analysis buckling model with a computational fluid dynamic simulation of the flow through

the drill pipe," correct?

A Correct.

Q And just to make sure that I'm clear, you didn't do any flow modeling as part of your analysis, correct?

A We did not.

Q And you did no flow modeling in connection with your analysis on buckling and you did no flow analysis to determine whether or not and to what extent that might have affected the BOP's ability to shear and seal, correct?

A We did no flow analysis.

Q All right. Is that something that you think is an additional test that should be run, both looking at flow for buckling and looking at flow in connection with shear and sealing?

A Looking at flow for the buckling would help establish where the forces for buckling were originated, how they were originated, and so that would be important into confirming that buckling occurred.

Q And it would also be important, would it not, to determine whether and to

what extent the flow conditions that existed on April 20th impacted the ability of the blind shear rams to close and seal, correct?

A That's correct.

Q Okay. In fact, you say on Page 9 that "it is suggested the industry perform field tests on the ability of blind shear rams to shear and seal a section of five and a half inch drill pipe under internal flow conditions that existed at the time of the incident," correct?

A Yes.

Q And that wasn't done in connection with your analysis?

A It was not.

Q The second task in section 1.7.1 is to "run the finite element analysis of drill pipe-cutting model to include the buckling stresses that would have existed in the drill pipe." And I believe you mentioned that a moment ago, correct?

A Correct.

Q Are there any other finite element analysis or FEA models that you think would be appropriate to run on your drill

pipe-cutting analysis?

A If there are other stress loads that could be identified and confirmed that were on the pipe that we have not included, you would look at a more comprehensive model to incorporate those. You could do that.

Q Okay. But you're, at least for purposes of this report, comfortable with the FEA modeling you did on the drill pipe?

A The FEA modeling on the drill pipe, the buckling model that we performed, indicated that buckling was a possible scenario for elastically moving the pipe over to the side of the wellbore in the position that it was in when the blind shear rams closed.

Q And you're also comfortable with the FEA modeling you did for the shearing of the drill pipe?

A For the purpose of showing deformation of the drill pipe with the drill pipe located on the side of the wellbore, yes.

Q Okay. The next item in section 1.71 says, "Field test the blind

shear rams shearing a section of off-centered (buckled) five and a half inch drill pipe." Do you see that?

A Yes.

Q And just to be clear, your drill pipe-cutting analysis is based on calculations, correct?

A Yes.

Q It's based on computer models?

A The FEA model was our fracture model that we did. It was a model.

Q Okay. And you never stuck pipe in a BOP and applied closing pressure to see what would happen?

A Correct.

Q And you would agree with me that FEA models are only as good as the input that goes into that model?

A That's correct.

Q Bullet point No. 4 says, "Field test the ability of a closed annular to restrain the upward movement of a five and a half inch drill pipe tool joint at the forces calculated for buckling."

Do you see that?

A Yes.
Q What was the basis for your assumption that the annular preventer, specifically the upper annular preventer could hold that tool joint?
A The erosion on the tool joint we believe indicated that the tool joint was in the upper annular for some period of time, and that the dimensions of the tool joint, seven inches in diameter, is certainly greater than the five and a half inch diameter that the annular was holding in general, and we felt that that would provide the pinning, but we did not have a calculation on what forces that annular could hold.
Q And you also didn't look at when those forces would have been applied, correct?
A What we were looking at is that the forces were developed from the flow in the drill pipe.
Q Okay. But you did no analysis to determine when that annular may have let go, for lack of a better word, correct?

A Correct.

Q When you say on Page 8 of your report that you recognize that "there are additional studies and tests that could be undertaken," can we take that to mean that this is a preliminary report or this reflects preliminary conclusions?

A No, the conclusions that we have drawn and the causes that we have in the report, we believe are conclusions in this report and they're not preliminary.

Q Okay. Can we take your statement to mean, though, that there are other possibilities for the failure to seal?

A Would you repeat that?

Q Sure. Are there other possibilities other than buckling and the pipe being compressed between the side packers that would explain the BOP's inability to seal?

A The inability of the blind shear ram to seal and the evidence that we have with the pipe, the drill pipe that was recovered indicate that the drill pipe was on the side of the wellbore, and that the

pipe was deformed into the side packers and the rams, and that prevented the blind shear ram from sealing, and we believe that conclusion would not change.

Q Okay. So you don't believe that there are any other possibilities out there besides the hypothesis that you all have put forward?

A As far as the cause. The hypothesis for buckling, maybe there are other hypotheses that we could have that would get the drill pipe to the side, but the fact is that the evidence shows that the drill pipe was on the side of the wellbore when the blind shear rams closed.

Q Okay. Did you look at the effect of wellbore pressure on the ability of the blind shear rams to shear and seal?

A No.

Q Okay. Did you look at the likely or consider the likely condition of the side packers on the blind shear rams on April 20th?

A Our conclusion is that the side packers did not close because of the pipe

present, and so we did not consider the condition of the side packers, and we had no material from the side packers remaining to make that or to look at the condition of the polymeric material of the side packers.

Q Did you look at any events that may have occurred since splashing the BOP in April 20th to see if anything might have happened to damage the side packers?

A In looking at the evidence, there was very little material left on the side packers. Some of the metallic, the pin and the back plate, but there was no evidence to look at.

Q I'm not talking about forensically looking at the packers. I'm asking did you look at whether or not there were any events that occurred between splashing the BOP on April 20th that could have damaged the side packers?

A No.

Q Okay. You would agree that damage to side packers can affect the ability of a blind shear ram to seal?

A Correct, I would agree.

Q Did you look at the possibility that the deadman fired would apply closing pressure for less time than the program timed in the sequence?

A We considered different scenarios of the deadman and when it may have closed, and did not rule that out as possible. We did not look at the timing issues associated with that.

Q Okay. So you made no analysis -- Well, let me ask this first. Out at Michoud, you did see that happen, correct, that the deadman fired for, I believe, seven seconds instead of the programmed 30 seconds, correct?

A I will let Dr. Kenney discuss those function tests.

Q Okay. But you didn't look at the question of what might happen if the deadman fired for seven seconds or 10 seconds or 15 seconds, something less than the programmed 30 seconds on the drill pipe that was in the well?

A We did not look at that.

Q Okay. Let's talk about your

1 findings, which I believe appear in
2 section 6 of your report.
3 Well, first, you talked about it
4 in response to Mr. Mathews' questions. You
5 performed laser scanning of the blind shear
6 ram blocks, correct?
7 A Correct.
8 Q And you performed laser scanning
9 of the fish in the BOP, correct?
10 A That's correct.
11 Q And when was that scanning
12 completed?
13 A The scanning was performed during
14 the January time frame. I'm not sure
15 exactly when that was completed.
16 Q Okay. A couple months before your
17 report was issued?
18 A Sometime before the report was
19 issued, yes.
20 Q Okay. Why were the scanning data
21 not given to the members of the Technical
22 Working Group?
23 A When asked for it, the process
24 started to have that transferred.
25 Q Okay. But it wasn't transferred,

was it?

A It's in process of being transferred now.

Q As I'm standing here at the podium, we're in the process of getting the scanned data that was put together several months ago, correct?

A That's correct.

Q All right. By not giving that scanning information to the members of the Technical Working Group, they weren't able to do the computer animations that you showed here on the screen this morning, correct?

A They would need that data to perform that.

Q Okay. On Page 97 of your report, you're talking about pipe No. 83, which is the fish above the blind shear ram, correct?

A Correct.

Q You say in your report that figure -- It's about the second or third or fourth line there. It says, "Figure 58(c), (d) and (e) shows the ends of the pipe curled inwards. The forces required to

cause the deformation were probably responsible for the splitting and opening of the side wall of the pipe."

What forces are you referring to?

A We had two drill pipes that showed the ends of the pipe that had curled, had curled in significantly, and so we were talking about the forces required to cause that deformation of the ends.

Q Okay. What forces? What applied those forces?

A We do not know what applied those forces, but the two pieces or the pieces that were on the top of the annular at the time that the rig was sinking, so that would have been this piece and No. 39, both of those had severely curved ends, and we speculate that that's likely, those forces would have come from the rig sinking and driving the pipe into the top of the upper annular.

Q Okay.

A But we do not know, you know, of that. We're speculating that that is the likely point at which forces could have been

applied.

Q My next question was going to be when were those forces applied? I guess you're going to tell me that you speculate that it might have been when the rig sank?

A That's correct.

Q On Page 98, you're discussing pipe No. 94, which was the fish below the blind shear ram, correct?

A That's correct.

Q And you say that "94-B may be missing a short (1.5 to 2-inch) length, which may have been folded over during the BSR cut." Do you see that?

A Yes.

Q When you say "may be missing," are you saying it may have been there and it may not have been there; you're just not sure?

A We do believe that it's missing, and it's the piece that was folded over that was suggested in the model that we had ran.

Q Okay. But in your report, you say it "may be missing." Are you changing that now? Was it there or wasn't it there?

A It was not there.

Q It's not there physically when you saw it, but was it there at any time?

A Not on the pipe that was recovered.

Q Okay. But my question is not on the pipe that was recovered. Do you believe that there was this piece there at some point?

A Yes.

Q Okay. So when it says "may be missing," I need to change that to "is missing"?

A That would be correct.

Q Okay.

A We would change that in the report.

Q All right. But if it was there originally, how did it go missing?

A We believe that when it was sheared, it was the fold-over from that shearing process, and at what point it went missing or how, we do not know.

Q So it was there, but then it's not there. We don't know where it went and we don't know when it disappeared, correct?

A You will have to go through those things again.

Q Okay. You believe it originally was there, correct?

A Correct.

Q At some point, it's not there, correct?

A Following the cutting process of the blind shear ram, after that process, yes, it's missing.

Q And you don't know when it goes missing, correct?

A After the cutting from the blind shear ram is the only time stamp we would have.

Q And you don't know how it disappeared, correct?

A Correct.

Q On Page 104, you're talking about cut 1-B-1-E, which is the cut above the upper annular or the break above the upper annular, correct?

A I'm sorry. What page are you on?

Q I'm sorry. It's 104.

A Okay. And what is your question

again?

Q My question, just to put it into perspective, cut 1-B-1-E is the cut for the break above the upper annular, correct?

A Yes.

Q All right. And you say there at the end of the first paragraph on Page 104 that this break was caused by a tensile failure?

MR. COHEN:

Objection. Misstates the evidence.

EXAMINATION BY MR. JONES:

Q What the document says is "this is typical of a tensile failure of a high strength steel," correct?

A Correct.

Q And "tensile," that's talking about pulling, correct?

A Yes. An axial force, yes.

Q All right. And how did that occur? What was applying that force?

A We're not sure when it occurred, but the possibilities would be the drifting of the rig could have caused the tensile

force on the pipe at that point or it could be when the rig was sinking and was going off to the side and it could have caused tensile forces.

Q Okay. Did that break at 1-B-1-E occur before or after the blind shear rams were activated?

A We do not know.

Q Section 2.7 on Page 111 has two paragraphs that refer to other evidence in the BOP stack. Do you see that?

A Yes.

Q And is the evidence that's discussed here in section 6.2.7, is that something you analyzed or are those questions better presented to Dr. Kenney?

A Some of the evidence, that was collected under Dr. Kenney's testing program, and then the cleaning of the evidence and the examining of it was done under the materials section that I was involved in.

Q Okay. Some of the evidence that was recovered was cement, correct?

A Correct.

Q And some of that cement was found in the blind shear rams, correct?

A It's likely we found small pieces of cement in several places, but I would have to look into the report to see what was found in the blind shear rams.

Q Okay. I will represent to you that evidence items 58A and 58B are identified as cement found in the blind shear rams, and my question is just simply, did you analyze the cement that was found in the blind shear rams?

A We did not analyze any of the cement.

Q Okay. There's also a reference in the appendix showing items 76 and 69A of metal being found in the blind shear rams. Did you analyze that metal that was recovered from the blind shear rams?

A We did not analyze the metal from the blind shear rams.

Q So sitting here today, you don't know if it's drill pipe, if it's from the downhole assembly or where it comes from?

A That is correct.

Q All right. You have your scanned pipes, you have your scanned rams and you have the actual pipes and rams themselves, and from looking at them, you come to the conclusion that the drill pipe was not in the center of the wellbore at the time the blind shear rams were activated, correct?

A That's correct.

Q And you don't just say that it's off center. I think your report says on Page 151 that it was being held "against the side of the wellbore," correct? The last sentence on Page 151.

A Yes, I see it. I just want to look at the reference above it. So that's referring to the buckling model that was performed.

Q Okay.

A That would indicate that it was held to the side of the wellbore at some point above the blind shear ram.

Q Okay. In the blind shear ram itself, how far from the side of the wellbore was it?

A It was within a half an inch. It

was very close.

Q Half an inch. And to explain how the drill pipe got to the side of the wellbore and to analyze the effect of having the drill pipe at the side of the wellbore, this is where you start doing your FEA modeling, correct?

A We did the FEA -- The buckling model was an FEA model, and then we looked at the failure model.

Q Okay. On Page 149, the first paragraph, third sentence, it says, "To explain the position of the drill pipe within the wellbore at the time of the BSR activation, buckling of the drill pipe within the wellbore between the UA," the upper annular, "and the upper VBR," variable bore ram, "was examined," correct?

A Correct.

Q And I believe in response to questions by both Mr. Mathews and Mr. Linsin, you said that other possibilities were not examined; is that correct?

A That's correct.

Q And you said, I believe, that one of the reasons why you didn't examine the rig drift-off question is because you believe that the upper annular was closed, correct?

A I would have to look at the reference for that. I don't quite recall.

Q Okay. Well, I believe what you said is that if the upper annular was closed, that you wouldn't see buckling below the upper annular? That if there was buckling from the rig drift-off, it would have been above the upper annular?

A The rig drift-off with the pipe connected would have caused the tensile force and probably not buckling. The buckling is from a compression force actually up.

Q Okay. Did you consider whether or not rig drift-off would cause pipe to move to the side of the wellbore if the upper annular was open?

A We looked at that, but all indications that we had was that the upper annular was closed.

Q But just so I'm clear, you don't know during what period of time the upper annular was closed, correct?

A We believe that it was closed, you know, from the time of the negative pressure test on.

Q "From the time of the negative pressure test on." The upper -- Well, they had to open the upper annular after the negative pressure test, didn't they?

A The last indication we have is that the pressure was reduced to 1500 psi, and we don't have an indication that it was changed before the well control problem.

Q Okay. So on Page 149, you say to get buckling, you assumed that the closing force of the upper annular element restricted the drill pipe movement upward. What was the closing force of the upper annular?

A At the time, with the data we have, there was still a force of 1500 psi applied to the upper annular.

Q And you believe that force was applied all the way until the time the rig

sank?

A The indication we have is that the upper annular was closed, and the evidence shows that the erosion that occurred in the upper annular was significant, that it would indicate that it was closed, you know, it was also closed.

Q Other than your looking at the drill pipe, what evidence are you referring to to suggest that the upper annular was closed all the way until the rig sank?

A Just the fact that we have erosion on the drill pipe.

Q Okay. On Page 149, you also say, "Upon closing the upper VBR, the wellbore flow was directed only through the drill pipe, resulting in the pressure within the drill pipe increasing." Do you see that?

A Yes.

Q And so is it DNV's opinion that the BOP was at least sealed for a part of the time?

A Sealed in what fashion?

Q Well, you said, "Upon closing the upper VBR, the wellbore flow was directed

only through the drill pipe, resulting in the pressure within the drill pipe rapidly increasing."

And my question is, at that point the BOP is sealed, in your opinion?

A The wellbore is sealed.

Q Okay. And so then the only reason that the well flowed again is because you had a failure of something above the BOP, correct?

A Or that the wear within the upper or the variable bore rams were allowing some leakage or passage through, yes.

Q But your report doesn't talk about that. All it says is that it was sealed and flow was going through the drill pipe, correct?

A Correct.

Q On Page 154, talking about buckling, you say, "Based on conditions likely present in the wellbore at the time of the incident, calculations indicate that the force needed to buckle the drill pipe was present." What conditions?

A This would just be the conditions

that we talked about, the variable bore ram closed, the flow in the pipe.

Q Well, what was the flow in the pipe?

A We don't have a detailed analysis of the flow. We made some -- We did no flow calculations or flow modeling to determine that. We looked at some different flow, some different flow velocities, and looked at the forces that would be applied from friction on the side of the walls.

Q Did you look at wellbore pressure?

A Instead of wellbore pressure, we looked at velocity or flow in the pipe.

Q Did you consider the pressure exerting on the bottom of the drill pipe?

A We looked at these pressures and we considered -- And we looked at the pressures on the drill pipe, and one of the members of our team made some calculations, and with the flows that we used, our calculations showed that you could develop forces on the drill pipe.

Q Okay. Who was it who made those calculations?

A The calculations within our team was made by Hans Belfos.

Q When did Mr. Belfos make his calculations?

A I'm sorry. It's "Bratfos." I will have to check the spelling of the name.

Q When did Hans make his calculations?

A Those were made during the report-writing portion.

Q Are those calculations in your back-up data that you're in the process of making available to the Parties In Interest?

A No, they're not at this point, no.

Q The last sentence on that paragraph says, "Detailed numerical simulations were not performed as part of this investigation." What does that mean?

A The numerical simulations would be the flow modeling, and that's why it was included in our recommendations, that the flow modeling should be performed to look at the forces that could be applied to the drill pipe.

Q All right. So you do some

calculations to determine that there was sufficient force applied to the drill pipe to cause buckling and move it to the side of the wellbore, and then you do some finite element analysis "to simulate the effects of a non-centered drill pipe on the ability of the blind shear ram to cut the drill pipe and seal the well," correct?

A That's correct.

Q And when you say "simulate the effects," that means, again, you didn't cut any drill pipe?

A We did not cut any drill pipe, no.

Q When were those computer simulations completed?

A These were completed during the early March time frame.

Q Why were those simulations or those models not provided to the members of the Technical Working Group?

A The detailed models were provided when they were asked for.

Q And again, that's part of the information that's in the process of being uploaded right now?

A Yes.
Q And according to the report and your testimony this morning, you did two finite element analyses with respect to cutting the drill pipe, correct?
A That's correct.
Q You did one first by putting the drill pipe in the center of the rams, and then one with the drill pipe displaced to the far side of the wellbore as it says in your report, correct?
A That's correct.
Q And you have on Page 156, you show where those two placements of the drill pipe were in your finite element analysis, correct?
A That's correct.
Q Why did you put the drill pipe to the far side of the wellbore in your FEA analysis?
A Because that's where we believe the drill pipe was located based on the markings on the drill pipe.
Q And it was also based on your buckling calculation that put it, as you

said, a half inch from the side of the bore, correct?

A The buckling calculations indicated a little offset, that's right.

Q Okay. In your FEA analysis, did you take that little offset into consideration or did you jam the pipe all the way against the side?

A The pipe was positioned to the side and there probably was not an offset. I would have to check the very details of the model, though.

Q And that model information, is that part of the information that we're standing here waiting for right now?

A It's part of the information that's being transferred, yes.

Q On Page 156, the paragraph that appears between the two figures, you state in the last sentence that "the lateral forces due to buckling would likely have kept the drill pipe off center in the position illustrated in Figure 134." Do you see that?

A Yes.

Q What forces or what force did you calculate was being applied to hold that pipe to the side of the wellbore?

A The axial force was about 113,000 pounds.

Q Okay. What was the force pressing it to the side?

A We did not calculate that force to the side.

HON. JUDGE ANDERSEN:

By the way, I understand all the information is uploaded on Homeport now, so it's not in the process. It's done.

MR. JONES:

I'm glad the record reflects when it has been uploaded.

HON. JUDGE ANDERSEN:

Well, it will just save you 11 questions. That's all.

EXAMINATION BY MR. JONES:

Q All right. Let's talk about your pipe-cutting finite element analysis. On Page 155, you say that to do your FEA, you put together -- And this is the second sentence in the second paragraph. You put

1 together, "a three-dimensional shell model
2 was developed representing the blind shear
3 ram blades, block faces, and a section of
4 5.5-inch diameter drill pipe as shown in
5 Figure 133," correct?
6 A That's correct.
7 Q And that's what you did, right?
8 A That's correct.
9 Q And so you created essentially a
10 3-D model that was composed of three things:
11 You had the ram blades, you had the ram
12 block faces, and you had a piece of drill
13 pipe, correct?
14 A That's correct.
15 Q And so was there anything else
16 that went into your model? Let me ask it
17 this way. Did you model the wellbore
18 itself?
19 A The wellbore was not modeled.
20 Q So you create your 3-D model of
21 the blades, the block faces and the pipe.
22 You put the pipe over to the far side of the
23 wellbore, up against the side, and then you
24 hit the "go" button on the computer and say
25 "squeeze" and watch what happens, correct?

A Very simplified, yes.
Q Okay. And your computer then runs through the progression of the shear cut, and that's described on Pages 160 through 164, correct?
A Yes.
Q And after the computer progression runs its course, you say on Page 160, at the very last sentence, that a portion of the drill pipe was "pinched and deformed between opposing side packers," correct?
A That's correct.
Q And for the benefit of everybody who's here, the side packers are the rubber sealing elements that are on the side of the ram bodies, that when the rams come together, they touch and create a seal, correct?
A That's correct.
Q And you show that pinched and deformed pipe between the side packers in Figures 142, 143, and 144, correct, or at least the right-hand side of 144, correct?
A That's correct. And it's not just the side packers. It also shows the ram

blocks.

Q Okay. And what's depicted in these figures, 142, 143, and 144, that's what you have described as the "final deformed configuration of the shear cut," correct?

A That is the final results of the model, yes.

Q Okay. So when your model ran its course, this is where it says the pipe was located, correct?

A Yes.

Q And to illustrate, we have a blow-up here. This is taken from 143 and 144, correct?

A Yes. Well, it looks like 144 on the right-hand side. Is that correct?

Q Well, I will represent to you that I took this from your model or from your report.

A Okay.

Q And so when we're looking at this, what we have is you have the drill pipe over here on the far left-hand side, correct?

A Correct.

Q And what this is looking at is straight on at the upper blade of the blind shear ram, correct?

A That's correct.

Q And your side packers are here and here?

A Right.

Q And this is where you concluded that the drill pipe was positioned when the ram stopped, correct?

A That's correct.

Q And this positioning, which you show in your report from the sides and from the top and you show it isometrically and you show it head-on, is important to your analysis, correct?

A It is important to the analysis and it confirms what we found from the data that we collected on the pipe and the rams.

Q Okay. This figure doesn't show the wellbore, does it?

A It does not.

Q And I know you already told me that you didn't include the wellbore in your finite element analysis modeling, but did

you consider where the wellbore would be in relationship to this final position of the drill pipe?

A Following the model, we looked at that, yes.

Q Okay. And what did you determine?

A And the question is whether the pipe had deformed below the ram cavities, whether that would have -- the pipe would have had the room to deform all the way over.

Q And what did you conclude from that?

A Well, we concluded that the model was supposed to confirm what we found from the scans and how we put the blocks together, and they did that for us.

Q Okay. But what did you confirm with respect to this model when you put the wellbore in it?

A The deformation was moving over to the wellbore in this model.

Q Okay. And just so everybody understands what we're talking about, do you recognize that as a cross-section of a

Cameron TL BOP?

A I will take your word for it.

Q Well --

A It looks like the schematics I would have seen.

Q On Page 95, you actually have a cross-section of a Cameron BOP; do you not?

HON. JUDGE ANDERSEN:

While he's turning to that, we have been going for about a little over an hour. At some point we will need to break. About how much longer do you think you will need?

MR. JONES:

I only have about five more minutes.

HON. JUDGE ANDERSEN:

Okay. Fine. Then we will plan to break when Cameron is done with his questions. Thanks.

THE WITNESS:

Yes, it's not as detailed as that.

EXAMINATION BY MR. JONES:

Q On Page 95, you show the cross-section of the entire BOP stack from

the riser adapter all the way down to the wellhead, but halfway through, you see the blind shear ram cavity, correct?

A Right.

Q And the shape that you see there is basically the same shape that we see here, except blown up, correct?

A And with more details, correct.

Q "More details." And what this is depicting here, that's the wellbore down the middle, correct?

A Yes.

Q And so if you had drill pipe, the drill pipe would be running down the middle, correct?

A Correct.

Q And what we're looking at here is looking straight at the ram block, the upper ram block for a shearing blind ram, correct?

A Correct.

Q And that slides in and out along the ram bore, correct? It goes into the wellbore and comes back, correct?

A Correct.

Q And this, these hashed areas,

that's the wall of the BOP? That's the steel bore of the BOP, correct?

A Correct.

Q Going back to this drawing, your illustration, can you tell me where would the wall of the BOP be if you overlay it over your drawing?

A Well, some of the pipe is deformed into where the wall would be.

Q Okay. If we overlay the cross-section of the BOP with your final deformed configuration, you have the pipe going where the wall of the BOP is, correct?

A It would be moved over, yes.

Q And specifically, here and here, you have the pipe inside the wall of the BOP under your final model, correct?

A That's correct.

Q The pipe can't be there, can it?

A The pipe cannot be where the wellbore is.

Q And the pipe cannot be where you have it in the final model that you put together in this analysis, correct?

A The pipe would need to be moved

over some, yes.

Q And you say on Page 162 of your report, even though your computer model puts this pipe someplace where it is impossible to be, you say that it shows good alignment -- I'm sorry -- "the comparison between the aligned laser scanned sections with the final configuration predicted by the FEA model showed good agreement," correct?

A Yes.

Q It doesn't show good agreement, does it?

A It shows good agreement in that the rams -- It shows the agreement in that they produced the marks on the pipe, they show the areas where the pipe is pinched and we're now missing those corners of the pipe, and it just shows that the pipe is going to be more toward the center than what the model is.

Q And in the actual placement, where you believe the pipes were located, they're not jammed up against the side of the ram cavity, are they?

A They're not all the way against the side, that's right.

Q In fact, they're not even against the side of the BOP bore, are they?

A They're offset -- They're offset from the wellbore.

Q And the pipes are not showing -- They're not inside the side packers, are they?

A The pipes are -- The pipes -- The portions that are missing would have been in between the rams, the ram blocks.

Q But they're not showing between the side packers where you put them before, correct, in your finite element analysis?

A That's correct.

Q So you have the pipe in the wrong place in your finite element analysis, correct?

A The pipe is moved over more than it would have been.

Q In a place where it's impossible to be, correct?

A The deformation process is where it should not have been, yes.

Q Okay. And you didn't consider any damage to the side packers in your analysis in coming up with your hypothesis, correct?

A We did not consider damage to the side packers.

Q And you didn't consider the rams stalling out for any reason other than there being off-centered pipe, correct?

A That's correct.

MR. JONES:

I have nothing further.

HON. JUDGE ANDERSEN:

Okay. Thank you. We will take about a 10-minute break now.

CAPT. NGUYEN:

We will reconvene at 11:05.

(Whereupon, a break was taken).

HON. JUDGE ANDERSEN:

Okay. The next Party In Interest is Transocean.

EXAMINATION BY MR. HYMEL:

Q Sir, my name is Richard Hymel. I represent Transocean.

HON. JUDGE ANDERSEN:

Could you spell your last name for

the record?

MR. HYMEL:

H-Y-M-E-L.

HON. JUDGE ANDERSEN:

Thank you.

EXAMINATION BY MR. HYMEL:

Q The first issue I want to talk to you about is your testimony that the tool joint was pinned in the upper annular, and I want you to turn to Page 4 of the report.

A Okay.

Q The third paragraph under the section 1.4, "What is Considered to Have Happened," it starts with "A drill pipe." Do you see that?

A Yes.

Q Okay. And it says there, "A drill pipe tool joint was located between the upper annular and the upper VBRs. With both the upper annular and the upper VBRs closed on the drill pipe, forces from the flow of the well pushed the tool joint into the upper annular element."

Did I read that correctly?

A Correct.

Q Okay. And I just want to make sure we understand when you use the term "pinned." It's your understanding and your opinion that the tool joint was below the upper annular before the pressure pushed the tool joint up?

A It was below or right at it, yes.

Q Okay. Well, I want to make sure we understand that it's not your opinion that the upper annular closed around the tool joint, is it?

A No. I mean, that may have occurred. I do not know. But it was pushed up in there, and from the erosion, there's erosion of so many inches that are on the actual tool joint itself. So we think it ended up some number of inches into the upper annular.

Q But in any event, your report says that the tool joint was below the upper annular before it was pushed up by the force; is that correct?

A Right.

Q I want you next to turn to Page 18 in your report, and this is the "Objectives

and Scope" portion of your report, and the first bullet point there says that one of the things that the DNV was going to look for was "if leaks on the BOP were critical to the non-performance during the blowout and during the ROV intervention attempts"; is that correct?

A That is correct.

Q And the DNV did look at that?

A Yes. But I would like to -- Dr. Kenney would be better at answering the questions on that, because that has to do with the functioning of the BOP stack.

Q Okay. And similarly, I had questions about the next bullet point, that says "if any modification is made to the control logic and stack inhibited the performance."

Should I direct those to Dr. Kenney as well?

A Yes.

Q The third bullet point also discusses whether "deferral of necessary repairs affecting functionality" had anything to do with the blind shear rams

failing to close.

Should we direct that question to Dr. Kenney as well?

A Yes.

Q And similarly, in that same paragraph, it talks about the maintenance history, whether that had anything to do with the blind shear rams contributing to the BOP's failure to operate as intended.

Should we direct those questions to Dr. Kenney?

A Yes.

Q You talked about elastic buckling, and I want to make sure I understand what you were talking about there. When I think of buckling, I think of a highway after an earthquake, where part of the highway falls down and part of the highway falls up.

Is your reference to buckling really just a bowing of the pipe?

A It is a buckling in the standpoint that it's an unstable positioning of the pipe. So under axial forces, it actually moves over to the side, and it's more of a bending, though. The buckling itself has

these compressive axial forces that cause it.

Q Okay. And if we look at Page 182 in your report -- I'm sorry. It must not be 182. I can't read my own handwriting here.

It's 152 of your report. Sir, can you turn to Page 152 of your report?

A Yes.

Q And the figure there, Figure 129, shows the drill pipe as DNV believes it was positioned in the wellbore?

A Yes, as predicted by the buckling model.

Q Okay. And so it's that type of movement of the drill pipe that you refer to as buckling?

A That's correct.

MR. HYMEL:

Okay. Those are all the questions I have. Thank you.

HON. JUDGE ANDERSEN:

Thank you.

BP, please.

MR. GODFREY:

Thank you, Your Honor.

May I proceed, Your Honor?

HON. JUDGE ANDERSEN:

Sure. Thank you.

MR. GODFREY:

Thank you.

EXAMINATION BY MR. GODFREY:

Q Good morning, Doctor. My name is Rick Godfrey. I represent BP.

A Good morning.

Q This elasticity buckling theory that is outlined in the DNV report, is this reported anywhere in any country's literature of metallurgy?

A I mean, buckling is reported in literature in a lot of different -- a lot of different ways and a lot of different materials, so I'm not sure what your question is.

Q Well, has anyone before the DNV ever produced a study or an analysis or a documented hypothesis that five and a half inch steel drill pipe casing will deform due to elasticity, and then when it's removed from the sea, undeform and return to its non-elastic state?

A To my knowledge, there's no studies that show that between the upper annular and the variable bore ram that an elastic buckle would occur or has occurred.

Q Thank you. Now, you have the 28-foot long five and a half inch steel drill pipe casing, right?

A We do have the drill pipe, yes.

Q Did you do deformation studies to determine its elasticity?

A We did mechanical studies to determine the elastic properties and the mechanical properties of the drill pipe.

Q And did you find deformations based upon the physical studies that you did, or in looking at the pipe today, is it undeformed?

A The drill pipe that we recovered that came from the top of the blind shear ram was not deformed. It was straight.

Q All right. You're a metallurgist, right?

A Yes.

Q There are different types of failure that takes place for metals,

correct?

A That's correct.

Q Fatigue failure as an example?

A Fatigue is an example of a failure.

Q A classic type of fatigue failure is you take a paperclip and you bend it and it becomes deformed due to elasticity, right?

A It's not deformed due to elasticity, but it's deformed and it undergoes a cracking mechanism and breaks.

Q And it doesn't undeform itself when you top twiddling with the paperclip, does it?

A That's because it was deformed, as opposed to an elastic process, which is not deformation.

Q I see. So your theory is that 28 feet of five and a half inch drill pipe casing was deformed when it was in the sea and became undeformed when it was outside of the sea, back on land?

A It did not deform. It underwent an elastic process.

Q I see.
A Deform would in itself indicate a plastic process.
Q Is there any physical evidence of the elastic buckling, since we're not using deformation?
A No.
Q Is the theory that you have with respect to the reason for the BOP failure as far as you can tell a novel and unprecedented theory, something that we can't look to and find in any other literature?
A I don't know, you know, of any other instance of the cause of failure that we have defined here.
Q Is it fair to say then that the possibility of 28 feet of five and a half inch casing being buckled between the upper variable bore ram and below the upper annulars is something that no one in the industry was aware of prior to your study coming out?
A I'm not sure if no one was aware of it or not.

Q Did you look to see whether anyone had ever heard of it before?

A We discussed it, but we did not do a search of the literature to see.

Q Did you find anyone who had ever heard of this theory that the DNV has published in this 182-page report before?

A You're speaking of the buckling?

Q Yes.

A No.

Q So is it fair to say then that the theory of failure for this BOP was unknown to Transocean, was unknown to BP, was unknown to every other driller in the industry, and was unknown to the government regulators before your report came out a few weeks ago?

A The primary cause of failure was not the buckling. The primary cause of failure, as we indicated in the report, is that the drill pipe was over to the side of the wellbore and part of that drill pipe was deformed between the ram blocks, and the rams then did not close.

Q So the drill pipe -- I will come

1 back to that in a second. Was the drill
2 pipe deformed when it was on the side of the
3 ram blocks? Is that your testimony?
4 A During the cutting process.
5 Q And then it became undeformed when
6 they took it out of the sea?
7 A The drill pipe was deformed as it
8 was sheared on the ends and that's the
9 condition that we recovered it in.
10 Q Looking at the drill pipe today,
11 is there any evidence of physical
12 deformation?
13 A Yes.
14 Q And the evidence is what?
15 A The evidence are the ends of the
16 drill pipe that are deformed.
17 Q Where the cuts took place?
18 A Correct.
19 Q But there's no evidence of the
20 buckling of the drill pipe, correct?
21 A That's correct.
22 Q So to go back to my predicate
23 question, is it fair to say that prior to
24 your report, no one at Transocean, no one at
25 BP, no one else in the drilling or the

1 petroleum industry and no one in the
2 government would have known or been aware of
3 the possibility that a BOP would not work
4 because the drill pipe between the upper
5 variable bore rams and below the upper
6 annulars would be deformed, preventing a
7 shearing by the BSRs?
8 MR. COHEN:
9 I'm going to object, because it
10 calls for him to speculate.
11 EXAMINATION BY MR. GODFREY:
12 Q Based upon your own personal
13 knowledge?
14 HON. JUDGE ANDERSEN:
15 Well, you don't need to guess or
16 speculate. If you have an opinion with
17 respect to a question, you can answer it,
18 but if you don't have an opinion, you don't
19 have to sit here and sort of make one up on
20 the fly.
21 So if you can answer the question,
22 answer it, but if you don't have an opinion
23 at this point in time, we can accept that as
24 your answer.
25 Now that we have talked long

enough to have forgotten the question, if counsel would like to repeat it, then you can let us know if you have an answer to it.

MR. GODFREY:

Thank you, Your Honor.

EXAMINATION BY MR. GODFREY:

Q Based upon your own personal knowledge, are you aware of anyone in the industry or the government, BP, Transocean, any other drilling contractor, any other driller, any other petroleum industry or anyone in the government, who prior to the date of the DNV report, your report, had any basis to believe that drill pipe casing could buckle, and therefore prevent a BOP from operating properly?

A I'm not an expert in this industry. I don't have a comment on that.

Q Well, thank you. I appreciate the answer.

When did the DNV conclude that the BSRs activated, the blind shear rams activated?

A The report indicates that the blind shear rams activated in either the

condition of an AMF/deadman activation or during the Autoshear, when they cut the plunger of the Autoshear circuit. And we felt that it was more likely the case of the Autoshear, but we could not rule out the AMF/deadman.

Q And the most likely date that the DNV thought that the blind shear rams activated, at least in part, was April the 22nd of 2010, a day and a half after the explosion, right, sir?

A That's when the Autoshear ram plunger was cut.

Q So I'm correct on the April 22nd date?

A Yes.

Q Yes. That's Page 174, Paragraph 3 of your report if you want to refresh your recollection.

So between 10:00 p.m. Central Standard Time or 2200 on the night of April 20 and the morning of April 22nd, 2010, that 30-hour period or so between the explosion and the probable activation of the BSRs, according to the DNV report, did the

DNV come to any conclusion as to what prevented the blind shear rams from activating during that 30-hour, roughly, period?

A We looked at the different possible activation periods. We looked at EDS, and decided that it was unlikely that the EDS command activated the blind shear rams. We looked at the AMF/deadman, when it could have occurred, and the Autoshear. And like I said, we could not distinguish -- we could not rule out the AMF/deadman, but we thought it more likely to be the Autoshear.

Q On Page 174, Paragraph 3, the first line says, quote, "Of the means available to close the BSRs, evidence indicates that trapping of the drill pipe occurred when the hydraulic plunger to the Autoshear valve was successfully cut on the morning of April 22nd, 2010," end quote, and then it goes on.

Do you see that?

A Now, where was that at?

Q Paragraph 3, the first three lines, Page 174 of your report, sir.

A Yes.
Q All right. So that trapping of the drill pipe is when DNV concluded or estimated or speculated, whatever word you want to use, that the buckling took place, right, sir?
A We believe the buckling occurred and was caused by the flow of the fluid inside the drill pipe and that that probably occurred at the point when the upper variable bore ram was closed.
Q And what was the time of the buckling based upon your model? When did that take place?
A The model had nothing to do with timing of the event.
Q Sitting here today, is it correct then that you do not know at what point in time after April 20, 2010, the buckling that you have hypothesized took place?
A We believe the buckling took place upon loss of control of the well and the flow up through the drill pipe.
Q But in any event, you believe that the first time that the BSRs were activated

was probably the morning of April 22nd?

A We say that's the most likely, but we could not rule out the possibility of an AMF/deadman event.

Q One more series of questions, sir. Earlier in your testimony with Mr. Mathews, you said there is evidence that the BSRs actually not only activated, but fully activated, that there was metal on metal. Do you recall that?

A Yes.

Q Okay. That means both shears from each side hit together metal on metal?

A That's correct.

Q And for there to be metal-on-metal evidence of contact, that's a very strong contact between the shears on opposite sides, correct, sir?

A It's contact between the two, yes.

Q Right. And those blind shear rams are V-shaped; are they not? They're V-shaped?

A The upper blade has, yes, a "V" angle to it.

Q And the "V" is designed to take a

drill pipe, a pipe and force it into the center of the cutting; is it not?

A That is -- That would be one of the purposes. I don't know what others there may be.

Q Okay. That's kind of an important purpose, though, when you're trying to shear a pipe, right, a pipe, a round pipe, right?

A You want the pipe to be centered.

Q Right. And so the "V" comes like this glass here, the "V" comes and it centers the pipe, right?

A Yes.

Q So when you have metal-on-metal contact from the two shear rams hitting each other, your conclusion was the metal-on-metal contact somehow missed part of the pipe; is that DNV's conclusion?

A We believe that when the blind shear ram activated, that the rams did not close because deformation of the pipe was within the ram blocks. Later, after that, during intervention process, there were multiple other times when they tried to close the blind shear rams by hot-stabbing

1 into the BOP panel, and they even increased
2 that pressure up to 5,000 psi on two events,
3 and we believe that's probably when they
4 closed and had metal-to-metal contact, after
5 the erosion had occurred and after the rig
6 had sank and several days after or a few
7 days after the cutting, the original cutting
8 event.
9 Q And would metal-to-metal contact
10 imply complete shearing of the drill pipe
11 casing?
12 A We believe that the drill pipe had
13 already been sheared. We had already had a
14 lot of erosion, there was very little
15 elastomer present for sealing, and when that
16 pressure was applied at that point, there
17 was nothing to stop the rams from just
18 closing and having metal-to-metal contact.
19 The pipe was already sheared.
20 Q Is there any evidence you can
21 point to that tells us the date when the
22 blind shear rams had metal-to-metal contact,
23 other than the model that DNV came up with?
24 A Again, the model tells us nothing
25 about the timing.

Q So as far as you know, the blind shear rams could have had metal-to-metal contact on April the 22nd?

A The indication is that when the blind shear rams closed initially, if we look at the pipe and all the indication, the pipe was deformed into the area of the ram blocks and that prevented the rams from closing. So, no, I do not believe that it occurred at that date.

Q And the deformation into the ram blocks, that's what you discussed with Mr. Jones in terms of the placement of the pipe having to be not just into the ram blocks, but into the bore?

A That was the model. We have the evidence from the pipes themselves and from the rams that indicate that the metal was in the area of the ram blocks, and those are the torn areas of the pipe that's missing.

MR. GODFREY:

Thank you. No further questions.

HON. JUDGE ANDERSEN:

Thank you.

Halliburton?

EXAMINATION BY MR. BOWMAN:

Q Doctor, how you doing?

A Fine. Thank you.

Q I just want to try to understand a few things and maybe a little bit different angle.

HON. JUDGE ANDERSEN:

Could you state your name for the record?

THE WITNESS:

Certainly. My name is Bruce Bowman. I represent Halliburton.

EXAMINATION BY MR. BOWMAN:

Q Now, you were asked briefly about some cement that was in a debris. Do you recall that?

A I recall that, yes.

Q Did you actually see it?

A Yes.

Q Do you know where it is?

A Yes.

Q Where?

A It's in the evidence lockers and containers at Michoud. So it was entered into evidence at that point.

Q Okay. Do you know who that means has possession of it?

A Custody would be with the Coast Guard.

Q Thank you. Now, you talked about the upper annular being closed. Do you remember that?

A Yes.

Q When did it get closed?

A We believe the upper annular was closed during the negative pressure tests and it was not opened after that probably.

Q Okay. And what makes you believe that?

A There was an indication that the pressure was dropped from 1900 psi to 1500 psi, and then there was no indication of anything else after that, and it was within about 30 minutes after that that the well control problem initiated, and then the explosion.

Q You talked about that 30 minutes. Now, we have all been in a lot of hearings and we have seen a lot of data, and I think if you look at the Sperry data, most people

think the negative test concluded around 8:00 and not 9:00.

A Okay.

Q Now, I'm not trying to throw stones at you, whether you're right or wrong, but does it make any difference in your analysis if the negative test actually concluded at 8:00 and not 9:00?

A No.

Q Okay. So under your analysis, if it concluded at 8:00, the upper annular just kept on being closed and no one bothered to open it?

A We saw no indication from the data and the documents we had that anything was done after the fact that the pressure was dropped and it was left at that point.

Q Okay. Now, then, do you know who it was or what it was that activated the blind shear ram?

A We believe the most likely scenario is that the blind shear rams were activated when they cut the Autoshear plunger.

Q That was on the 22nd?

A That was on the 22nd. I forget the exact time.

Q Okay. There's something -- Let's see if I can find it. Maybe Page 164 or 168 of your report.

On Page 168, you talk about the manual function of the emergency disconnect sequence, and you list at least two scenarios that would cause it to shut. Did you try to analyze whether any of these functions did cause it to close?

A Would you repeat exactly where you're talking about?

Q Yes, sir. On Page 168, 6.6.2.

A Okay.

Q You talk about an account of the EDS being initiated from the bridge at 2156. Do you see that?

A Correct.

Q Now, first of all, were you able to find any evidence to support that time one way or the other?

A The time frame?

Q Yes, sir, the 2156.

A Well, I would have to look back

and look at that. I'm not -- We have to look in the timeline and see where the reference is. But that should be referenced in the timeline in the report.

Q The supporting evidence?

A The reference would be the supporting evidence.

Q Well, can you show it to me?

A On Page F-102. I'm sorry. F-102, Appendix F.

Q Okay. I have it.

A The timeline -- or the evidence is that the EDS announced by the captain at 2156. And then the event, "While on the bridge, before hitting the EDS button, Chris Pleasant looked at the panel and observed that it indicated the lower annular was closed," and that was closed. That was all.

And then there is an indication that the EDS button, the lights were flashing, but there's no indication they went solid. I mean, that is the indication and that's the evidence we're using for the 2156.

I would have to talk with our

1 people that did the timeline to get anything
2 more detailed than that.
3 Q Okay. Now, were you able to
4 substantiate any physical evidence from
5 examining the BOP, one way or the other, as
6 to whether that had, in fact, been activated
7 at 2156?
8 A The only visual evidence that we
9 could look for was whether the LMRP was
10 unlatched, which was part of that sequence,
11 and whether the blue and yellow pod stingers
12 had been retracted, which were part of that
13 sequence. And the ROV footage indicated
14 that those two things did not happen, but
15 those were the only two sequence points that
16 we could verify visually.
17 Q So because of those two things not
18 happening, what would that indicate to you?
19 A We took that as an indication that
20 the EDS function had not occurred.
21 Q Okay. Somewhere over here we talk
22 about batteries and the blue pod and the
23 yellow pod and all that. Is that kind of
24 your bag or should I wait until this
25 afternoon on that?

A Dr. Kenney would be better at answering that.

Q That's fine. We will talk to him this afternoon.

Now, then, let me ask you this. As I understand, there's someplace in your report that you indicate that there's not enough pressure, there wasn't enough pressure for the ram shear to actually cut through this drill pipe the way it was leaning on the side?

A No, we did not indicate that there's a pressure problem. Until the ram -- You know, that would be the model that we had looked at, the FEA model, and to initiate shearing, until you had deformation between the ram blocks, it actually took a lower pressure to initiate shearing.

Q Let me ask you then if you could turn to 164 and help me figure out what it says then.

A Okay.

Q If you look in the middle of the page, it talks about an "equivalent to 4,273 psi for this BSR design. Based on this

analysis, the BSR would likely stall at that point, if not prior to this, as the required pressure exceeded the hydraulic system." Do you see that?

A Yes.

Q Okay. Now, are you saying that under this pressure, it would have or would not have cut through the drill pipe?

A It cut through the drill pipe at this point. We ran the model with the deformation that's occurring between the ram blocks. You can put more and more pressure on the model and get very little movement, because the pipe is being deformed between the ram blocks.

So you stop the model at some point. We stopped the model at 4,273, and said that is probably consistent with the amount of pressure that was available for activating the rams.

Q And at that time, what was the condition under your model of the drill pipe?

A The drill pipe is cut and the model shows only a few nodes on one side

that are still connected, but primarily -- I didn't make the calculation, but 98, 99 percent of the drill pipe is cut.

Q And it's that last two or three percent on the side that causes the problem?

A No.

Q "No"?

A That's not what causes it. Whether the drill pipe is severed or not would make little difference. It's the pipe that is between the rams, that's deformed between the rams that stopped the blades from moving -- or the ram blocks, I'm sorry, from closing.

Q Okay. Now, did you look for any other data or run any other kind of tests to see if any other type of BOPs would have this same situation?

A We did not.

Q You did not. Do you know if there's any literature on that?

A I do not.

Q And did you do any type of analysis to see if any of the maintenance or

the condition of the BOP contributed in any way to what you arrived at as your conclusion?

A To the primary cause, no, but I will let you address that question to Gary Kenney about any of the other functioning.

MR. BOWMAN:

Thank you. No further questions.

HON. JUDGE ANDERSEN:

Thank you very much.

Anadarko?

MR. NEGER:

Thank you, Your Honor. Peter Neger on behalf of Anadarko and MOEX Offshore 2007.

HON. JUDGE ANDERSEN:

Thank you.

EXAMINATION BY MR. NEGER:

Q Some very quick questions, Doctor. First, am I correct that neither Anadarko nor MOEX Offshore 2007 was a member of the Technical Working Group that worked with you?

A That's correct.

Q Second, I believe in questioning

by Mr. Godfrey, there was some challenge or some discussion concerning the theory of the failure being unknown to industry prior to this incident.

Am I correct, sir, that the concept of elastic buckling between two fixed points is a well-established principle of engineering?

A Yes.

Q And finally, sir, does anything that has been said so far this morning affect your confidence in the conclusions reached in your report that the primary cause of the failure was that the BSRs failed to fully close and seal due to a portion of the drill pipe trapped between the blocks, and that the drill pipe was trapped between the blocks as a result of the elastic deflection to the side of the wellbore due to the forces applied by the well flow?

A That total statement was never part of our primary cause. The elastic buckling was a contributory cause. The primary cause, you would stop with the

deformation of the drill pipe and between the ram blocks, preventing the ram blocks from closing and sealing.

Q And you believe that the reason that the ram blocks did not seal is because the drill pipe was stuck in them; is that not right?

A Right. Because the drill pipe was, again, deformed in between the ram blocks.

Q And it was the conclusion of DNV, was it not, that the most plausible explanation for the reason that the drill pipe was stuck between the blocks of the BSR was because of an elastic buckling of the drill pipe due to forces caused by the well control event?

A It's the position that the pipe was moved off center to the side of the wellbore most likely due to the buckling mechanism.

Q Okay. And does anything that has been said this morning affect your belief that that conclusion is an accurate one?

A No.

MR. NEGER:

Thank you. No further questions.

HON. JUDGE ANDERSEN:

Thank you.

Douglas Brown?

COUNSEL REPRESENTING MR. BROWN:

No questions.

HON. JUDGE ANDERSEN:

Mike Williams?

COUNSEL REPRESENTING MR. WILLIAMS:

No questions at this time.

HON. JUDGE ANDERSEN:

Patrick O'Bryan?

COUNSEL REPRESENTING MR. O'BRYAN:

No questions.

HON. JUDGE ANDERSEN:

Robert Kaluza?

COUNSEL REPRESENTING MR. KALUZA:

No questions.

HON. JUDGE ANDERSEN:

Jimmy Harrell?

COUNSEL REPRESENTING MR. HARRELL:

No questions.

HON. JUDGE ANDERSEN:

Curt Kuchta?

COUNSEL REPRESENTING MR. KUCHTA:

No questions.

HON. JUDGE ANDERSEN:

Steve Bertone?

COUNSEL REPRESENTING MR. BERTONE:

No questions.

HON. JUDGE ANDERSEN:

M-I Swaco?

COUNSEL REPRESENTING M-I SWACO:

No questions.

HON. JUDGE ANDERSEN:

Dril-Quip?

COUNSEL REPRESENTING DRIL-QUIP:

No questions.

HON. JUDGE ANDERSEN:

Weatherford?

COUNSEL REPRESENTING WEATHERFORD:

No questions.

HON. JUDGE ANDERSEN:

The Marshall Islands, before the Board gets back to follow-up and Mr. Cohen has a chance, I think you had a question or two. Thank you.

MR. LINSIN:

Thank you, Your Honor.

EXAMINATION BY MR. LINSIN:

Q Dr. Thompson, let me just see if I can clarify a point that there may be some confusion about.

You have testified, if I recall, that there was an indication that you had seen 1500 psi on the upper annular and no further indication that that pressure had been reduced, and so you presume that that indicated that that upper annular remained closed; is that correct?

A That's correct.

Q All right. Are you aware of any of the testimony that indicated that after the negative test was concluded, that the rig crew opened the annulars, so that they could continue the displacement of the riser?

A I'm not aware of that.

Q Do you recognize or would you acknowledge that the rig crew could not have continued the displacement of the riser unless they had opened these annulars?

A I don't have a comment on that. We would need to have someone that -- Maybe

Gary Kenney may be able to comment to that.

Q All right. If you stay with me for a moment, though, assuming that the rig crew had continued the displacement of the riser after the conclusion of the second negative test, and at some point after that the well had begun flowing, you just referenced in your testimony a moment ago to F-102, I believe, where there is a reference at 2156 to Chris Pleasant looking at the panel and observing that the lower annular was closed. Do you recall that?

A Yes.

Q Do you recognize that in response to the well having begun flowing, that the rig crew might then have reclosed one of the annulars in an effort to regain well control? Does that fit with your understanding of the standard practices?

A Yes.

Q But the indication from Chris Pleasant's testimony is that it was the lower annular that he saw as having been closed?

A Yes.

Q Does that change your view then, sir, as to whether or not we should be focused on the lower annular or the upper annular as the upper point of tension for this drill pipe?

A The flow patterns indicate that it's more likely that the upper annular was where the drill pipe was pinned. That's where the erosion was.

If, in fact, it was the lower annular and we moved toward, again, still looking at a buckling phenomena having caused this, that would tend to move the point of the node or the point of most inflection against the wellbore, it would actually move that down toward the casing shear ram, closer to the casing shear ram. It would not overall affect the final cause of what the failure is.

Q I understand. When you say the flow patterns indicating that it was more consistent with being the upper annular as the point of pressure, flow patterns in the drill pipe or flow patterns in the annular? What flow patterns are you talking about?

A Just one second. Let me find the reference.

Q Of course. Sure.

A Let's look on Page 150, Figure 126.

Q Okay. I'm there.

A In this figure, we have indicated two dimensions, kind of one starting at the initiation of erosion, in the lower part of the figure, and then going up to where we have a failure, and we have dimensions of 17 inches and 20 inches, and that dimension we believe is associated with the dimension of an annular. So we have an annular would be about 18 and a half inches in dimension. So those dimensions correspond to that of an annular. And then the length of the pipes that we have put this piece of pipe at the upper annular.

So we believe that the erosion occurred and that this failure occurred at the top of the upper annular. And it would be unusual if the annular was open and not closed for those erosion patterns to occur there.

So we believe that the upper annular was closed on this drill pipe, at this drill joint, and that the failure at the top of this piece of pipe occurred because of erosion at the top side or the top of the upper annular. And so that's why we believe the upper annular was closed during this event.

Q Okay. So it's the flow patterns that you observed in the drill pipe itself that lead you to this conclusion; is that correct?

A That's correct.

Q All right. And how do you balance that opinion with the testimony we just referenced again from Chris Pleasant, that the indication on the panel was that it was the lower annular that was indicated as being closed after the blowout?

A We cannot, you know, we can't reconcile that difference, but the evidence we have indicates the upper annular, and we don't see the same type of erosion down at the lower annular level. And in either case, it would not affect -- It may affect

the force required for the buckle in some small amount, but it would actually move the inflection point of where the drill pipe hits the wellbore, it would move that point closer to the blind shear ram, and would not affect the overall conclusion of the primary cause in the report.

Q And in evaluating this part of your study, did you have or did you examine the annulars themselves? Had those components been completely eroded by the flow? Were you able to evaluate that, those components at all?

A Just one second.

On Page 107, and it's Photograph 69, so it's 106 and 107, we see the photographs of the top part of the upper annular. We see some erosion on those, but we do not see, you know, a large-scale erosion.

So we see some, but not a lot. But we do believe this is where the drill pipe came through the upper annular at this point.

Q Did you examine the lower annular?

A The lower annular has not been looked at closely, no.

MR. LINSIN:

No further questions.

Thank you, Your Honor.

HON. JUDGE ANDERSEN:

Before we get to the Board, Mr. Cohen, are there any questions you would like to ask?

MR. COHEN:

No, thank you, Your Honor.

HON. JUDGE ANDERSEN:

Any Board questions?

MR. DYKES:

Yes, I have one.

HON. JUDGE ANDERSEN:

Okay.

EXAMINATION BY MR. DYKES:

Q Dr. Thompson, if you could back into it based on what you show us on Page 80, with the layout of the drill pipe, and you took that diagram that you just showed us, the scan of the tool joint with the erosion, with the 17-inch and the 20-inch, if you placed that at the lower

annular, what would that do to your model?

A What we have here is that the -- If we look at this 1-B-1 up at the top in blue marked surface "E," okay, that's where we believe is at the top of the upper annular. And so now you have to add 1-B-1 together, 1-B-2, and then 83, and move that down to the upper annular, and you're very close to the blind shear ram.

So basically, if you had that coming out the top of the lower annular, none of the dimensions of the drill pipes would fit together.

Q So based on that, what we know beneath the blind shear rams, based on what we saw when you all entered the BOP stack, you've got additional pipe that you can't account for in the spacing?

A That's correct.

MR. DYKES:

Thank you.

HON. JUDGE ANDERSEN:

Any other questions from the Board?

Mr. Thompson, we want to thank you

for your participation. Before you leave, is there anything that you would like to add that you haven't had a chance to address?

THE WITNESS:

No.

HON. JUDGE ANDERSEN:

Well, thank you very much for your efforts and your good thoughts in this important work.

Captain?

CAPT. NGUYEN:

Mr. Thompson, are you going to be here this afternoon or are you going to leave?

MR. COHEN:

Can he sit in and listen to this afternoon's session?

CAPT. NGUYEN:

Yes, sir, he can.

MR. COHEN:

Just in case something comes up.

THE WITNESS:

Sure. I will be here.

CAPT. NGUYEN:

So in case we need you to come

back up?

MR. COHEN:

Absolutely.

CAPT. NGUYEN:

That would be great.

Mr. Thompson, thank you for being here, and you are dismissed, sir.

We're going to take a lunch break and reconvene at 1:00.

(Whereupon, that concludes the a.m. session for 4-4-11).

* * * *

REPORTER'S CERTIFICATE

I, James T. Bradle, Certified Court Reporter, do hereby certify that the foregoing proceedings were reported by me in shorthand and transcribed under my personal direction and supervision, and is a true and correct transcript, to the best of my ability and understanding;

That I am not of counsel, not related to counsel or parties hereto, and not in any way interested in the outcome of this matter.

_____

JAMES T. BRADLE, CCR

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