UNITED STATES OF AMERICA

NATIONAL TRANSPORTATION SAFETY BOARD

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Investigation of: *
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ENBRIDGE - LINE 6B RUPTURE IN * Docket No.: DCA-10-MP-007
MARSHALL, MICHIGAN *
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Interview of: CLINT GARTH
and GEOFF FOREMAN

Crowne Plaza Hotel
Edmonton, Alberta
Canada

Friday,
December 9, 2011

The above-captioned matter convened, pursuant to notice.

BEFORE: MATTHEW NICHOLSON
Investigator-in-Charge

APPEARANCES:

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Office of Railroad, Pipeline, and
Hazardous Materials Investigations
National Transportation Safety Board
[redacted]

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National Transportation Safety Board
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APPEARANCES (Cont.):

WILLIAM KILLORAN, ESQ.
General Counsel
GE PII Pipeline
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I N D E X

I N T E R V I E W

MR. NICHOLSON: This is NTSB Pipeline case number DCA-10-MP-007, Enbridge Energy July 2010 crude oil release in Marshall, Michigan. These are the Integrity Management Group interviews being conducted at the Crowne Plaza Hotel in Edmonton, Alberta, Canada. Today is Friday, December 9th, 2011.

This interview is being recorded for transcription at a later date. Copies of the transcripts will be provided to the parties and the witness for review once completed.

And for the record, Clint, please state your full name, with spelling, employer name, and job title.

MR. GARTH: Clint Garth, C-l-i-n-t, G-a-r-t-h, GE PII Pipeline Solutions. What was the other question?

MR. NICHOLSON: Your job title, please.

MR. GARTH: Global analysis manager for ultrasonics.

MR. NICHOLSON: And for the record, please provide a contact phone number and e-mail address.

MR. GARTH: [redacted] and it is [redacted]

MR. NICHOLSON: Clint, you are allowed to have one other person of your choice present during this interview. This other person may be an attorney, friend, family member, co-worker or nobody at all. If you would, please indicate for the record whom you have chosen to be present with you.

MR. GARTH: Bill Killoran.

MR. NICHOLSON: Okay, all right. We will go around the room now and have each person introduce themselves for the record. Please include your name, with spelling, your employer's name, contact phone number and e-mail address. I will begin, Matthew Nicholson. That's M-a-t-t-h-e-w, N-i-c-h-o-l-s-o-n. I am the NTSB IIC. My phone number is [redacted] My e-mail is [redacted]

MR. FOX: Matt Fox, M-a-t-t, F-o-x, NTSB Materials Lab. Phone number is [redacted] e-mail is [redacted]

MR. JOHNSON: Jay Johnson, Enbridge Pipelines. I'm the Enbridge Party rep and I'm the supervisor of audits and inspections. [redacted] cell: [redacted]

MR. IRONSIDE: Scott Ironside, S-c-o-t-t, I-r-o-n-s-i-d-e, Enbridge Pipelines. My phone number is [redacted] e-mail is [redacted]

MR. FOREMAN: Geoff Foreman, G-e-o-f-f, F-o-r-e-m-a-n. I'm the growth and structure (indiscernible) leader for GE PII Pipeline Solutions and the nominated party member for this investigation. My phone number is [redacted] My e-mail address is [redacted]

MR. KILLORAN: I am William Killoran. I am the general counsel for PII and the assistant general counsel for GE Oil and Gas Environmental. It's W-i-l-l-i-a-m, K-i-l-l-o-r-a-n. My e-mail is [redacted] And my phone number is [redacted]

MR. PIERZINA: Brian Pierzina, B-r-i-a-n, P-i-e-r-z-i-n-a, with the PHMSA Central Region in Kansas City. My e-mail is [redacted] My phone number is [redacted]

MR. CHHATRE: Ravindra Chhatre, Integrity Management Group chair on this accident, NTSB. E-mail, Ravindra.Chhatre, that is [redacted] Web phone [redacted]

INTERVIEW OF CLINT GARTH

BY MR. NICHOLSON:

Q. Okay, Clint, I think maybe to begin with, if you could go back and explain your background, your title and maybe some of your responsibilities at GE currently?

A. Sure. So I have been with GE for 11 years now. I started in 2000 as a CD analyst and I progressed up through there as an EMAT analyst, and I became the EMAT team leader in 2005. I held that position until 2008 when, in October 2008, I took the role of global analysis manager for ultrasonics.

The global analysis manager for ultrasonics is in charge of the analysis, delivery of reports and analysis of data for certain technologies, like CD, WM, Duo and EMAT.

Q. Okay. Can you tell us, for those of you aren't as up to speed with the whole process of running an inspection tool, and then taking that raw data and interpreting into or characterizing it, and then calling out defects by size and type, can you just walk us through, you know, from tooling the line through the analysis stage, until Enbridge receives results, what kind of --

A. Sure. So the part of the process that I start with is when we get the data into the analysis center. So the tool will collect data -- depending on the technology, it will collect data stored into the storage of the online computer or storage bank of the pig. That data is then downloaded from the tool, or the pig, and is then sent to the analysis center where my team then picks up the data.

We have a team specifically focused on receiving that data, called the data control team, and that is a group of people that will take that data, because it comes in a raw format, and they will process that format into a format that is visually acceptable for analysis.

Q. Okay. And maybe you could elaborate a little bit more on how that process takes place?

A. So we have got some proprietary software that will take the format of the raw data and process it into certain format and folders, so that we can process that data and be able to view it in the -- for CD, the C scan, the B scan, the A scan. And these are scans that the analysts will look through.

The data control team will process this data using offline parameters that have been defined based on that tool, the medium that was used for that tool, other things as well as, you know, what -- how much data is there, and, you know, process it into 1-1/2 kilometer sections for the analysts to analyze.

Q. So the data control team processes raw data through an application or another program. This is --

A. Correct.
Q. Okay. And you said that results in an A scan, B scan, C scan?
A. Yeah.
Q. And it lost the -- what's the meaning of the A, B and C?
A. So that is the scans that we use to do the analysis in.
Q. Okay.
A. So a C scan is the unruled map view of the pipeline from --
Q. Okay.
A. -- from left to right, the distance from the flow of the tool. And then from -- in the Y axis, it is the orientation of the pipe itself.
Q. Okay, yeah, I think we have seen those.
A. Okay. And then, the B scan is where you go in and you look at certain sensors, only one sensor, but multiple shots, multiple shots from that sensor. And then, the A scan is just one shot from the sensor. So most of the analysis and discrimination and decision-makings are made on the B scan itself.
Q. Okay, and why is that? What is it the B scan gives you the C scan doesn't?
A. Yeah, the B -- the C scan is more of an overview of the pipeline itself, and the B scan is more detail on the features that are in the C scan.
Q. Okay. Okay. So the analysts -- at that point, it

becomes a manual operation?

A. No, it happens as well with the data control team as they will, with the software, once they process it into a visual state. They will run our auto-boxing software that will automatically box reflectors of interest, based on a certain threshold or criteria that is defined. And then those boxes are then analyzed by the analysts when they are assigned their section to analyze. And so, the software basically directs the analyst where to go in the distance, what boxes to analyze. And when they analyze the box, they will classify the feature and size the feature, if necessary.

Q. That is the auto-boxing software that will do that?

A. No, the auto-boxing software will box the location.

Q. Oh, okay.

A. The analysts will then go into those boxes and classify those features, analyze those features of those boxes.

Q. So when we hear about new algorithms that GE -- for in-line inspection on CD, which of these steps are we talking about? The visual state conversion, the auto-boxing, what typically is changing?

A. Well, the -- it's mostly to do with the sizing algorithm, which is after the boxes are created, and the analyst will analyze the feature. But the algorithms have changed since 2005 for sizing of crack fields.

Q. Okay. And what exactly has changed about it, can you talk to that?

A. The high level of understanding is that, in the past, we would get an indication in the B scan that is seen in the half skip, which is our external wall. So the sensor is internal, right?

Q. Um-hum.

A. And it is shooting into the wall.

Q. Right.

A. It is trying to get a 45-degree angle into the steel, and it will get a reflection off that internal -- the external surface, and that is our half skip. It will then go back another 45-degree angle, back to the internal surface, and another 45-degree angle, and that is the internal side and that is called our full skip. And it will go the external again, which is the skip and a half.

So in the past, what we were doing was if we found a crack in the half skip, which is the external, we would size the feature basically only on the half skip type detected feature or reflector. Now, the new software, what it does is it will add in a factor, if the feature is also seen in the skip and a half, because what that is telling us is the feature is a lot wider than you would expect. Well, it's actually a lot wider than normal, just narrow corrosion or cracking, right?

Q. Okay.

A. And so, it will apply a correction factor using the skip and a half data, instead of basically excluding it in the past. And that has been based on a lot of digs over the years of technology, and technical lead has, you know, introduced this change.

Q. Okay. So if we get specific here on 6B, then in 2005, algorithm was only looking at the half skip?

A. Correct.

Q. Okay, to box that feature.

A. Yeah, just to size the feature.

Q. To size it.

A. The depth, yeah.

Q. The depth, oh, okay.

A. Yeah.

Q. And now, it's the half skip and the skip and a half --

A. Yeah.

Q. -- that's used. And I'm sorry, tell me again what that does. I guess you get better depth.

A. It gives you -- it takes all the information available to you, and it will -- in most cases I have seen, it will make the depth sizing more conservative, I would say.

Q. Okay.

A. So it will -- the depth will be using all the information, not just one sensor that is closer to the defect.

Q. I see. And what we have heard then from Enbridge is that, using this new algorithm, gone back to the 2005 data and

rerun it. Is that true for the USCD?
A. Correct.
Q. That had been done, okay.
A. I think so, yeah.
Q. And based on that new algorithm, it's actually coming -- this linear crack feature or crack-like defect was then coming back as crack field. Is that -- am I saying this correctly?
A. No, the algorithm isn't changing the classification of the feature.
Q. Okay.
A. It is just changing the sizing depth. What we have been asked to do or we have looked at is this feature in the 2005 data, and applying what we know today on how to classify that feature. So --
Q. Okay.
A. -- there is a feature classification, and then there is a feature sizing. So in 2005, it was classified as a crack-like feature. And what we are saying at this point is, based on our knowledge today and our processes today, we would have classified it, or we would classify it as a crack field.
Q. That is the analyst's job?
A. Yes, correct.
Q. Okay. But what about the -- did the depth change then, based on the algorithm?
A. The depth would change, because now you would call it a

crack field. And we have -- now, we have a different sizing algorithms for crack fields, versus crack-likes.

Q. Okay.

A. 2005, we would size crack-likes and crack fields with the same sizing algorithm.

Q. Okay.

A. So just using the half skip to size, if it is a crack-like versus a crack field, it did not matter.

Q. Okay.

A. So now that it would be classified as a crack field, it would be applying this new sizing algorithm.

Q. Okay. And when did all this come about, when did this new algorithm --

A. I think the new sizing algorithm was around 2008, that's my recollection, 2009.

MR. NICHOLSON: Okay. Geoff, I notice you are sketching a diagram here.

MR. FOREMAN: Yeah, yeah.

MR. NICHOLSON: Should we -- I'm a big fan of sketches.

MR. FOREMAN: Okay, we have gotten into the analysis, and I just thought --

MR. NICHOLSON: Yes.

MR. FOREMAN: -- it's just one of these things I picked up. (indiscernible) Geoff Foreman here, yeah. First of all, Clint talked about the off-board parameters, and he mentioned quickly (indiscernible). If we look at the variables on a (indiscernible) inspection -- sorry, Ultrasonics, and this type of Ultrasonics needs a coupling between the sensor and the pipe wall. In this case, it's the product. So what we do is we get a sample of the product from Enbridge, pre-job.

MR. NICHOLSON: Okay.

MR. FOREMAN: We sample it. We -- when we talk about attenuation, that is the amount of speed sound will travel through the medium. So we look at the medium, and it is important, especially with Enbridge, because they run a lot of batches of different products, so we have to make sure that we get the right attenuation, the right product.

The reason I am bringing this up is, the very first attempt to do this inspection failed, due to the parameters to the tool lock being the same as the attenuation required for this product.

MR. NICHOLSON: This is back in 2005?

MR. FOREMAN: Yeah.

MR. NICHOLSON: Oh, I hadn't heard that.

MR. FOREMAN: And so we -- what we do, as a matter of caution, is we take -- when we arrive at site, we measure the attenuation by the technician that is going to run the job at the launch site. And then, we take another reading at the receive, because these are long pipeline runs. Batches can change, we could start in one product and end in another. So it is important that we know at the end of the run that we are in the same attenuation as in the start.

MR. NICHOLSON: Okay.

MR. FOREMAN: So those parameters are what are fed into -- so we set parameters on the tool, depending on the attenuation, and we set those same parameters in the analysis, to make sure that the analysis software understands that attenuation. That is the first point I wanted to clarify.

MR. NICHOLSON: Good, okay.

MR. FOREMAN: The second one is, when you find (indiscernible) a sound into the pipe wall, sorry.

MR. NICHOLSON: That's all right, no.

MR. FOREMAN: As Clint mentioned, there is a 45 degree angle for crack detection. Forty-five degree angles have traditionally been the angle that you are trying to detect.

MR. NICHOLSON: Okay.

MR. FOREMAN: So what the sound is looking for is a corner effect, a corner effect between a pipe wall and the crack itself. So that you have got the maximum amount of energy going into here. It sees a crack and it will come back, that is the half skip, that is what he mentioned by the half skip.

MR. NICHOLSON: Okay.

MR. FOREMAN: If it sees something, it will come back. If, however, it was an internal defect, then that energy would then disappear and reflect at another 45 degrees into the inside of the pipe. Now, that energy is disappearing all the time, okay. Then, eventually, it will come to the one half skip. Now, they are adjacent sensors that would perhaps see this crack also in the one half skip, so there's redundancy in the senses.

So when that happens, so what Clint explained there was we have a certain sized nogrin (indiscernible) for the half skip. We also have now an enhanced-sized algorithm for SSC fields, because you can mask some of the sound with cracks close together. So we -- and you also understand that this is disappearing. It has now gone through the pipe, so we add that new factor to try and compensate for the sound that is being dissipated because it is traveling at one and a half skip.

We don't normally -- sometimes we say, but we don't normally analyze anything beyond the one half skip. This sound actually keeps going until you can't -- you know, because it doesn't stop. But because we are traveling down the pipeline between one and two units (indiscernible) per second, you only get so many looks at, even though the sound is traveling extremely fast. You only get so many looks at it, so that is where -- that is what we call our analysis window.

MR. NICHOLSON: But the algorithm has to see it on the half skip and on the skip and a half, or what was --

MR. FOREMAN: No. If we see it on the half skip, we leave the algorithm the way it is --

MR. NICHOLSON: Oh, okay.

MR. FOREMAN: -- because that is a good, solid indication. But if it is on the one half skip, only in crack fields, we add dBs to allow for any sound that has disappeared, or the close proximity of cracks, which could be masking the sound.

MR. NICHOLSON: Okay.

MR. FOREMAN: And that is just the experience, the feedback we have had on experience that, in crack fields, we could be under calling the crack, due to this effect. So we -- that's as soon as we got it in (indiscernible).

MR. PIERZINA: This is Brian. I want to make sure I understand that. So did you say that if you get the reflector on the half skip, then you don't go to the skip and a half? Or do you enhance the half skip amplitude with whatever you get, something additional --

MR. FOREMAN: If we see it at the one and a half, we go to the enhanced, rather than just the direct --

UNIDENTIFIED SPEAKER: That's not what he asked. Listen, can you repeat your question?

MR. PIERZINA: Yeah, so I thought I heard you say that if you get the reflector on the half skip, then you don't go to the skip and a half.

MR. GARTH: No, that is not correct.

MR. PIERZINA: Okay.

MR. GARTH: So if you only receive it on the half skip, then the sizing of that feature will be based only on the half skip.

UNIDENTIFIED SPEAKER: Algorithm.

MR. GARTH: If you see it on the half skip and the skip and the half, the skip and the half information will also be used to size the feature. So the sizing would not only be based on half skip, it would be based on the skip and a half, and the half skip.

MR. NICHOLSON: So then, I would ask, what effect that has on your depth sizing, compared to if you only use the half skip versus both. So does that make -- so if it looks like 15 percent deep feature on the half skip, and you get a reflector on the skip and a half, you know, how much effect can that have on your depth sizing?

MR. GARTH: Well, there is a correction factor added if a reflection is seen at the skip and a half, and that will then be added to the overall depth sizing of the feature. I am not completely sure if a feature at the half skip was 15 percent, how much that would increase it off my head.

UNIDENTIFIED SPEAKER: And that's not likely to get a sense of the order of magnitude effect that the size of the algorithm would have on your depth classifications.

MR. FOX: This is Matt Fox here. Does it generally make it deeper?

UNIDENTIFIED SPEAKER: Yes, it will.

MR. GARTH: Anytime you add that one and a half, it's going to essentially make it deeper, just there's a question of how much.

UNIDENTIFIED SPEAKER: Exactly, yeah.

MR. FOX: Okay.

MR. NICHOLSON: So it is adding something to the depth that you are getting from the half skip, correct?

MR. GARTH: So, for example, if seeing a skip and a half with a certain decibel level. There is a correction factor added to that decibel level, but I don't know what that decibel level is, right, at this point, because it is different for every feature, if it sees a skip and a half, right.

MR. NICHOLSON: So what we would be interested in isn't a range that could be added, based on, you know, real life scenarios, you know, features that you are seeing.

MR. IRONSIDE: Scott Ironside, as a point of clarity, the -- when we talk about a half skip and a skip and a half, is that the same sensor seeing it or that is data from a different sensor that is being translated to that feature?

MR. GARTH: It's data from a different sensor.

MR. JOHNSON: This is Jay, and you said a correction factor is put in. What, I mean, where does that correction factor, I mean, how -- maybe -- I don't understand that.

MR. GARTH: So if you see an amplitude of, let's say 38 dB in the skip and a half, a correction factor is added to that dB level. So I don't know off-hand what that amplitude is, but it will then raise the amplitude from 38 to something else, say 45. And then, that size is based on that amplitude of 45, but also whatever the amplitude is at the half scale. So all the sensors that see the defect are included in the sizing of the feature.

MR. FOX: This is Matt Fox. So the sizing is determined essentially from the amplitude, including the correction factor if that is applied. But the overall sizing is based on the amplitude of the sound that is received back.

MR. GARTH: Correct.

BY MR. NICHOLSON:

Q. I guess one other additional question then, Clint, would this algorithm then, you know, you said it doesn't change your feature classification necessarily. But it seems like, I'm just curious, if you wouldn't end up with more features being classified as SCC or crack fields, if you're, you know, seeing more reflectors in the skip and a half. Does that make sense?

A. You can see a linear crack, which is a crack-like, in the half skip and in the skip and a half. Okay, it's just we are not making a correction factor to the crack-likes, it's only to the crack fields, so SCC, right.

Q. Okay, all right.

A. So if you've got a linear indication, it's only -- it's using different sizing algorithms or a normal sizing algorithm.

Q. So the feature is classified initially --

A. By the analyst, yeah.

Q. -- and then, the algorithm is applied based on the future classification.

A. Correct.

Q. Okay.

MR. JOHNSON: So while Geoff -- this is Jay, while Geoff is drawing that, so my understanding is with the skip and a half, normally you get -- the crack ends up being deeper normally. Is that -- was that correct?

MR. GARTH: It could be, yes. That's --

MR. JOHNSON: Okay.

MR. GARTH: In most cases, it would be deep --

MR. JOHNSON: So prior to that 2008 or 2009, then would you rely on calibration dates to -- it sounds like your original readings in 2005 then would have been shallower than with current software?

MR. GARTH: I think so, yeah.

MR. NICHOLSON: I'm sorry, you have got to speak up, Clint.

MR. GARTH: I said I think so, if I understand your question.

MR. JOHNSON: And if I --

MR. NICHOLSON: Wait, Clint, if you don't understand the question --

MR. GARTH: Okay.

MR. NICHOLSON: -- ask for it to be (indiscernible).

MR. GARTH: Can you repeat it another way?

MR. JOHNSON: My understanding was that, with the new technology, the new software, that the skip and a half will give you a better reading, and you can size the depth better.

MR. GARTH: Correct.

MR. JOHNSON: Okay. So in 2005, it seems like that perhaps the crack depth was not as deep as it would have been with the new software. So then, would you calibrate that field digs, or how did -- I mean, how did you --

MR. GARTH: Yeah, that is how the new sizing algorithm was developed, was using dig results over time to understand that the information in the skip and a half can help you size the feature better, right.

MR. JOHNSON: So in a run for Enbridge in 2005, when we went out and first did digs, immediately that's -- and I somewhat know the process, I am just looking for verification that, as soon as the NDU reports came back, then you would take that and go into your findings to validate the depth from your software or --

MR. NICHOLSON: If you know, Clint.

MR. GARTH: No, I just -- I think the sizing algorithm itself was built over time, and not just with data from Enbridge, all of our customers. So we use the sizing algorithm for crack fields for all of our customers. So it wouldn't be specifically based on one pipeline or one inspection, right.

MR. JOHNSON: Um-hum.

MR. GARTH: It's based on multiple inspections and dig data provided back to our technology team.

MR. FOX: This is Matt. Are you --

MR. JOHNSON: No, go ahead, Matt.

MR. FOX: The -- I guess it's sort of -- I think it's already been stated, but I just wanted to verify. The -- a crack-like feature would be determined from just the half skip, or sized from just the half skip, or is the one and a half included, as well?

MR. GARTH: The crack-like today would -- and before, as well, would be depth sized, using all the information, whether it is a half skip or the skip and a half.

MR. FOX: Okay.

MR. GARTH: But there would be no correction factor applied to the skip and a half for crack-likes.

MR. FOX: Okay.

MR. CHHATRE: This is Ravi. You want to go ahead?

MR. FOREMAN: Well, I was just picking up on Brian's question.

MR. CHHATRE: I need to (indiscernible).

MR. FOREMAN: Okay. It's Geoff Foreman again. The reason why Clint couldn't give you like X percent change, it's not that. When we are talking about correction factor, in 2005, when we sized crack-like features and crack field features the same, we used the mean of five strongest amplitudes to determine the size depth. For crack fields now, we take the strongest indication, so not the mean of five. So it is not necessarily a linear change, but what we are seeing is, in the past, we wanted to be confident that we were seeing consistent depth. But what we found with the crack-like feature that is possible. But in a crack field, because of the cross proximities of the cracks, you could possibly get a crack being influenced by a deeper crack behind it. So therefore, if we get one pixel, we will use that. Whereas in the past, we have taken the five strongest ones and took a mean, so it's more conservative now. There is more room for error because we could oversize, because it could be with one -- just one reflector a superior reflector. But we would rather include that, so that is how the algorithm has actually changed, just for clarification.

MR. CHHATRE: Ravindra, as we -- just for (indiscernible) we want to make sure that the understanding we get from (indiscernible) he is saying. Can you describe the crack-like features, crack fields, just so that we can know what (indiscernible) he describes?

MR. GARTH: Okay. So we would classify a crack-like feature if you see it as one linear indication, meaning the length reporting specification. We would -- so if it is one linear indication, we would call it a crack-like feature. If there are multiple indications in the box of the feature, that have characteristics of multiple cracks, we would classify it as a crack field.

UNIDENTIFIED SPEAKER: Can you maybe draw out the sort of features that an analyst would see to draw those -- the type of distinctions, the typical type of, you know, what they would be using to make that distinction?

MR. GARTH: So like in the B scan, I guess or -- well, this is just a general drawing of our B scan. And you'll see on the right side, we have got the half skip, full skip, half skip, full -- second skip, where we have the external at the half skip. If you have just one linear indication in the B scan, you would call that a crack-like. If you have multiple indications in the B scan, you would call it a crack field.

UNIDENTIFIED SPEAKER: That is supposed to be your half skip over here on the right, is that what you are saying?

MR. GARTH: Correct, yeah, and the E is for external.

UNIDENTIFIED SPEAKER: Okay.

MR. GARTH: So then, when we talk about a skip and a half, this crack field, from another sensor, would see up here the indication.

UNIDENTIFIED SPEAKER: Okay. Now, for the crack-like feature, could there be other reflectors that could potentially confuse an analyst, or make it more challenging, to make the distinction?

MR. GARTH: We also have a classification of notch-like, but it's more of a gauge, more flat, straight. And so, we would classify the feature as a crack-like, if it has an irregular shape like that. And where the amplitude is varying, as well, in that indication, that's irregular. But the notch-like that is just flat, your amplitude is going to be very -- pretty constant, so they would classify it as a notch-like.

MR. CHHATRE: This is Ravindra Chattre. So crack-like, is it the same thing as crack or you classify crack as different?

MR. GARTH: No, we just classify it as crack-like.

MR. CHHATRE: So crack-like is similar to crack?

MR. GARTH: Yep.

MR. CHHATRE: And crack field is nothing but cracks?

MR. GARTH: Yep.

MR. CHHATRE: (indiscernible)

MR. GARTH: Correct, yes.

MR. JOHNSON: This is Jay. When you can't determine, you say crack-like, because you can't determine it's a crack until field examination?

MR. NICHOLSON: If you know --

MR. GARTH: I don't know where the term "crack-like" came from, to be honest. I started in 2000, and that's how we were trained, was to classify them as crack-like and crack field.

MR. JOHNSON: And Robby -- Shawn talked about that, and so did Steven, so, you know, crack-like is a determination we use until it is verified in the field.

MR. CHHATRE: That is why you cannot make sure, and I heard what you guys told us. I just want to make sure that there is no miscommunication or misunderstanding. So the GV post (indiscernible) as I understand it now with my vast experience, indeed it was crack-like. To them, it's a crack-like, and to them, it's a crack field, and to them it's a notch-like.

MR. GARTH: Um-hum.

MR. CHHATRE: You guys can go and do the dig and (indiscernible). And we would communicate if that is not the case, but that's -- as far as they are concerned, the signal tells them, that's what it is.

MR. GARTH: Crack-like.

MR. CHHATRE: Crack-like, notch-like and crack field.

MR. GARTH: Correct.

MR. CHHATRE: If I understand you correctly.

MR. GARTH: Yeah.

UNIDENTIFIED SPEAKER: Correct, and I agree with that. I just, you know, I had heard crack-like is crack, and I don't believe that is where we are at.

MR. FOREMAN: Well, I think just for clarification, Jeff Foreman here, we don't change the report and then take the "like" off once somebody comes back and says, "We verified it's a crack." I think that, as far as we are concerned, the report says "crack-like."

MR. CHHATRE: Yeah, that's what I thought --

MR. FOREMAN: Yeah.

MR. CHHATRE: The (indiscernible) I have ever seen is crack-like, and those were crack, but we have got all this different (indiscernible) and make sure that everybody is in the same page.

UNIDENTIFIED SPEAKER: And Clint, while you are drawing, what is a metal loss (indiscernible) ?

MR. GARTH: Well, we don't call or classify metal loss features anymore.

UNIDENTIFIED SPEAKER: Okay.

MR. GARTH: But it's really more of a -- just write it in a space here, you can see in the data -- so you can see the crack fields more linear indications, where pixels are lining up to meet a length criteria, right? The metal loss would just be scattered pixels, where none of them are actually, you know --

MR. CHHATRE: The pixel have no leg attached to it (indiscernible) .

MR. GARTH: Exactly, and then the amplitude is probably lower, as well. You might get one higher one, but you are picking up just the metal loss kind of surface, right.

UNIDENTIFIED SPEAKER: It looks a lot like --

MR. FOREMAN: Geoff Foreman. So if this, in an surface, is corroded, then the sound would scatter. So what you are seeing there is the scatter effect.

UNIDENTIFIED SPEAKER: Now, could that scatter effect combine, you know, say you've got a crack-like feature in an area of metal loss. Could that scatter potentially lead to maybe misinterpretation of a crack-like feature, and maybe report it is a crack-like field feature?

MR. GARTH: That's a good question. I am not --

MR. NICHOLSON: If you know the answer.

MR. GARTH: I am not entirely sure, I'm sorry.

MR. PIERZINA: This is Brian, and I am not sure if this is too far off topic, just let me know. But I would like to have a good sense of the amplitude, the degree of amplitude that we are talking about, basically as far as, you know, the signal that enters the pipe, and how much is lost in the single entry and how much is reflected by various reflectors. If you could just kind of give me a sense of --

MR. GARTH: Well, that depends on the --

MR. PIERZINA: -- the range of values?

MR. GARTH: Yeah, that depends on the medium itself, right? But from general ultrasonics, when you are using water as your couplet, what I remember from ultrasonic training was when you enter a surface with the medium, 88 percent of the sound will continue into the surface you're testing, and 12 percent will be returned. And that will happen at every interface, so if you are going and bouncing off the external again, it is the same type of, you know, repeat or reflection back, right. But that is based on the amplitude, as well, of the --

MR. PIERZINA: And that is water as a couplet.

MR. GARTH: Yeah.
MR. PIERZINA: But then, when you hit the external surface, you -- if you are in steel to earth and reflecting, you have got maybe a different value percent loss. But then --
MR. GARTH: It will just continue on at a 45 degree angle, like Geoff said earlier, dissipating or losing energy --
MR. PIERZINA: Right.
MR. GARTH: -- as it hits every interface.
MR. PIERZINA: So crude oil and pipeline steel, what are we talking about, as far as a percentage, if you have a sense.
MR. NICHOLSON: If you know.
MR. GARTH: It's not something that I do, so I don't know what the exact amount.
MR. PIERZINA: This is Brian still, when we talk about a reflector amplitude being 39dB, for instance, on a half scale --
MR. GARTH: Um-hum.
MR. PIERZINA: -- how does that compare to, say, a reflector on a full scale?
MR. GARTH: So the full scale being the internal surface?
MR. PIERZINA: Yes.
MR. GARTH: And the half scale being the external surface. So a 39dB at the half scale, and then again at the full scale?
MR. PIERZINA: Yeah, and I guess if we don't know, we

don't know. I just -- dB is the amplitude value that we are talking about, right?

MR. GARTH: Correct, decibel.

MR. PIERZINA: I would just like to get a sense of what percentage that is of the initial energy that is put into the steel.

MR. GARTH: Okay. Well, maybe an easier way to explain it is, what we will have in our data is we will have a reference amplitude.

MR. PIERZINA: Okay.

MR. GARTH: Okay. So if we have set our reference amplitude at 50dB, we know that 50dB is our saturation point. So anything greater than 50dB is greater than 3 millimeters, okay?

MR. PIERZINA: Okay, that helps a lot.

MR. GARTH: And then, you subtract 6dB from that, which gives you 44. That will give you a 2 millimeter reference point . And then, you need another 6dB to get down to our tool specification of 1 millimeter, would give you your 38dB. So if you have a half skip crack-like feature that is only seen in the half skip, that would -- with 38dB, you would have a 1 millimeter deep crack.

MR. PIERZINA: That helps incredibly.

MR. GARTH: Okay.

MR. PIERZINA: Thank you.

MR. GARTH: And that's what our analysts use. And the color schemes on the data on the B scans will use this information, so anything greater than 38dB will have a color code of red, so that it sticks out to the analyst, that anything that is red could be above the tool specification of 1 millimeter.

MR. FOREMAN: So in these previous diagrams, what he is talking about here, this is Geoff Foreman here, is these would be red indications. There could be other colors on the screen, but they are below 38dB, the noise. So anything with red has to be greater than 1, and therefore greater than the minimum report and depth, and that is what the evidence is homing in on.

MR. PIERZINA: This is Brian still. Is this a linear property, or at least in the range that we are talking about from 3 to 1 millimeters?

MR. GARTH: Yeah, it's pretty linear from when you use this example. But of course, the reference amplitude of 50 is not always 50 for every run.

MR. PIERZINA: Okay.

MR. GARTH: It could be different based on the media type that is used. So every couple intermediate type, like I said earlier, water is different than, say, diesel or crude oil, because they have their own properties, and have their own attenuation levels.

UNIDENTIFIED SPEAKER: Sure. Would the saturation point increase with -- let's say you were running a pipeline with nominal half-inch thick wall. Would you have a higher saturation point than 50, or is that not effective?

MR. GARTH: I'm not sure.

UNIDENTIFIED SPEAKER: Okay.

MR. FOREMAN: Just for clarification, if you look at a graph, Brian, it would look like this. It is linear, and then it saturates.

MR. PIERZINA: At the saturation point.

MR. FOREMAN: Right.

MR. PIERZINA: Okay.

MR. CHHATRE: Can either of you maybe send us a brief e-mail or letter because there is a lot of good information as far as tangibly, actually look at stuff. And I think I feel I understand everything now, but when I go back, I probably will forget most of it. It would be nice to have some (indiscernible) and explanation about the track like (indiscernible). Can that be done?

MR. NICHOLSON: I'm sorry, Ravi, what exactly are you asking him to do?

MR. CHHATRE: I am asking them to summarize what they have told us on the different sketches to a document and summarize that. And they could put some more talk on it, and we can hold that and we understand (indiscernible). Right now, there are different sketches that are not (indiscernible) much easier to a consider document.

UNIDENTIFIED SPEAKER: What I would suggest that might be even more helpful to you is to take one of the actual screenshots, and use that and describe it in reference to a screenshot.

MR. CHHATRE: Whichever way they want to do it. I am not telling you how to do it.

UNIDENTIFIED SPEAKER: Right.

MR. CHHATRE: I am just saying as long as we get the information.

UNIDENTIFIED SPEAKER: No, we can do one.

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: We did it before.

UNIDENTIFIED SPEAKER: Yeah, we did it. That's what I am saying.

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: And just to go back, Clint, what you draw on there on your sketch pad, that 50, 44 and 38, that is your half, full, skip and a half with your 88 percent?

MR. GARTH: No, no.

UNIDENTIFIED SPEAKER: No, okay.

MR. GARTH: That's the reference amplitude set for a 3 millimeter feature, because anything greater than 3 millimeter is a saturation point.

UNIDENTIFIED SPEAKER: Saturation.

MR. GARTH: So any -- we have a greater than 3 millimeter call in our depth bucket right now.

UNIDENTIFIED SPEAKER: But you took 12 percent off of that to get your 44?

MR. GARTH: No, these aren't percentages. This is dB levels.

UNIDENTIFIED SPEAKER: Oh, okay.

MR. GARTH: So every 6dB is equal to 1 millimeter.

UNIDENTIFIED SPEAKER: Okay.

MR. FOREMAN: Geoff Foreman, just maybe to make things in the limits to, because we are talking a lot of (indiscernible). If this crack, right, is longer than 3 millimeters, the reason why we saturate or we (indiscernible), we must have this notch effect and we have a fixed beam diameter. So it's just trigonometry really, how much of the beam is still, you know, is being reflected back, and that is why it's saturated.

MR. CHHATRE: So -- this is Ravi, (indiscernible) say that maybe a beam (indiscernible) so then you lose the cognitive effect, that your beam is too (indiscernible).

MR. FOREMAN: The beam is bigger than 3 millimeters --

MR. CHHATRE: Okay.

MR. FOREMAN: -- but it needs to have some of this part, as well as the cracked part, to get the strongest reflection.

MR. CHHATRE: Okay. (indiscernible) coming in.

MR. FOREMAN: Correct.

MR. CHHATRE: Now, is (indiscernible) for us to understand.

MR. FOREMAN: Yeah.

MR. CHHATRE: So that's why --

MR. FOREMAN: No, everyone asks us the question, "Why can't you go deeper than 3?" Everybody would love to go deeper than 3, but we just -- but it would be a different center. And there is -- we are looking at stuff like that, but with the conventional sense, there is a fixed beam.

MR. CHHATRE: That is why we did this stuff --

MR. FOREMAN: Yeah.

MR. CHHATRE: -- so we can digest it once you send it to us. Now, the other question I have is, so for crack-like, you only get one reflection, whereas for crack field, you get more than one reflection. Is that (indiscernible) ?

MR. GARTH: You can also get a crack-like indication seen with more sensors, and also seeing at different skips.

MR. CHHATRE: Okay. But that can only be half?

MR. GARTH: Well, you can have a half skip feature, which says that, like Geoff's diagram --

MR. CHHATRE: -- you have got an external crack. But you could also see that the skip and the half with the sensor behind that sensor, right?

MR. FOREMAN: So this is clockwise and this is counterclockwise, then you have -- you are looking at a crack from both directions. And sometimes, that one might (indiscernible) in the one and a half skip, and that one will --

UNIDENTIFIED SPEAKER: (indiscernible) the half skip, okay.

MR. FOREMAN: The sensor carrier is also rifled so that we cover all of the circumstance. So as a sensor carrier passes a crack, it will see -- you will see the crack in the data moving across the sensors. And we expect to see it several times because the sensor carrier is this long. So as it passes the crack, this kid will see it, and then the next kid coming up will start to see it. And what the software does in the C scans is -- and the B scans is actually the analyst can click through all of the sensors at clockwise and counterclockwise, just part of the process. And one of the reasons we want to see a crack more than once, because it might just be (indiscernible) or we want to see the crack as many times as we possibly can, if that helps.

MR. CHHATRE: (indiscernible) questions that I asked in the (indiscernible) the next question (indiscernible). Can you see the same path again and again?

MR. FOREMAN: Yes.

MR. CHHATRE: Okay.

MR. IRONSIDE: Scott here. So just to -- so I am clear then, if an individual crack or crack field exists, your tool would then see it with multiple sensors, and also depending on the orientation of the sensor relative to the crack, you might see it at the first half skip --

UNIDENTIFIED SPEAKER: Or the one --

MR. IRONSIDE: -- or the one and a half skip, depending on its orientation; that's correct?

MR. GARTH: Yes.

MR. FOREMAN: Okay. Do we need (indiscernible) ?

MR. FOX: This is Matt Fox here. Compared to looking at an external crack versus an internal crack, would you get more signal loss as it goes through that, you know, to get that full skip? And then, is that going to affect the, you know, the correlation between the return dB and your expected depth from an internal crack?

MR. GARTH: Yeah, I'm not sure that it has to do with the internal crack. But when the sound is traveling longer, so it's measured in microseconds, right, from when the sensor sends the sound. So obviously, if you are traveling through the steel a longer time, your sound is being weakened.

MR. FOX: Right.

MR. GARTH: So externally, in the past, right, we would use the sensor that is closest to the defect. So if we see it in the half skip, we would trust that and size it based on that. So with the internal features, we would use the internal full skip for the kind of classification and sizing.

MR. FOX: So then, would that -- we have got a correlation between return value of, say, 50 corresponds to 3 millimeters. Would it be a lesser value that would correspond to 3 millimeter internal crack?

MR. GARTH: I'm not totally sure about that.

MR. FOX: Okay.

MR. PIERZINA: This is Brian. You had talking about losing, well, with water as a couplet, losing 12 percent per -- was it per half skip or per full skip?

MR. GARTH: Per any interface, so --

MR. PIERZINA: Interface.

MR. GARTH: So from the internal to the external, back to the internal.

MR. PIERZINA: Right. So wouldn't it follow that if you were looking at a feature at the full skip, you might subtract -- you might start with 44 as a saturation, and then 38 as 2 millimeter and 32 as 1 millimeter?

MR. GARTH: Yeah, I don't -- this is my reference for half skip. I am not completely sure about the full skip.

MR. CHHATRE: Can you get some of this information back and it's available to us? I don't want to --

MR. GARTH: Sure.

MR. CHHATRE: -- (indiscernible) at all, so (indiscernible).

MR. GARTH: Yeah, I don't want to say (indiscernible).

MR. CHHATRE: If you just can give us all these questions that you can't remember to answer, you know, because somebody can look into (indiscernible).

MR. GARTH: For sure, for sure.

MR. CHHATRE: If somebody make note of it (indiscernible) things back to us.

MR. GARTH: Yeah.

MR. PIERZINA: This is Brian again. The question would be what is your saturation amplitude and your next level size and amplitudes are for each half, like the half skip, full skip and skip and a half, for sure. I would expect it to be something less each half skip, correct?

MR. GARTH: Well, that's assuming that you only see the reflector and not skip, right?

MR. PIERZINA: Right, which -- so whichever skip you see it in, you probably have a sizing amplitude that would correspond, and that would be different, depending on how long it takes you to see the reflector, right?

MR. GARTH: So we can -- yeah, we can add that to the list, yeah.

MR. FOREMAN: So you are asking -- just for clarification, on the internal feature, which is the full skip, in a perfect situation, you will see it on a full skip from both sides.

UNIDENTIFIED SPEAKER: Right, two --

MR. FOREMAN: Whereas an external, you will see it on a half skip, or one and a half skip.

MR. GARTH: With the defect at the full skip, you can see it from the clockwise side.

MR. FOREMAN: (indiscernible) side, with the same intensity.

MR. GARTH: Right. And I am just saying you can see it. With an external feature, you can see it at the half skip, from the clockwise side, and the half skip from the counterclockwise side. You could also potentially see it, the one and a half skip from both sides.

UNIDENTIFIED SPEAKER: Please explain that also in the (indiscernible) --

MR. GARTH: Okay.

UNIDENTIFIED SPEAKER: -- you provide because I guess I would think that you would see -- even on an internal feature, you are going to see it from the clockwise and counterclockwise side. And also on an external feature, you are going to see it. You are going to see it with multiple features, clockwise and counterclockwise, no matter where it is.

MR. FOREMAN: If it is on the inside -- Geoff Foreman here, by the way, so what we will mean is it is going to be seen like that from that side, and like that from that side, because it is internal. You can't see it that way, because it is on the internal services. So actually, on internal services, such as cracks, it's actually easier or more reliable because you are going to have equal undershoots from both sides. So it is actually -- should be theoretically the easier width size, because you can actually normalize from both sides.

(off the record.)

(On the record.)

MR. NICHOLSON: Back on the record. GE Part 2. And Geoff, you were explaining to us some of the basics on the tools.

MR. FOREMAN: Okay, so on the white board here we have a diagram which this is the -- represents the pipe wall thickness. We have a set of sensors on the sensor carrier, on this particular tool being between 24 and 36 inches, a single sensor carrier, which has clockwise and counterclockwise sensors. So let's call the clockwise blue and the counterclockwise red for clarity. So if we have cracks in the external surface of a pipe, then the counterclockwise -- you can see it in this particular diagram, as we'll change the (indiscernible). We'll see in the half skip (phonetic sp.) and there's a good chance that the other bank (phonetic sp.) sensors on the other side will see it in the one-and-a-half skip. If it's an internal crack of the internal surface, then both sensors will see it on the full skip. So this is to try to give a bit of depth -- understand the redundancy that is built in. So if this is the sensor carrier -- I really can't draw the sensor carrier. But if this is a crack, then as the pig travels through the pipe at the one to two meters per second speed, it will fire clockwise and counterclockwise on a number of bank of sensors. So if you think of it in the old British Navy days, if you were the poor ship that was stuck in the middle and the two (indiscernible) are sailing side-by-side and they're firing their guns as they go past, there's not much left when you're finished, but that's exactly what it's doing. So that's what this diagram's trying to get you to understand on how the redundancy for this is the half skip, the full skip and the one-and-a-half skip.

INTERVIEW OF GEOFF FOREMAN

BY MR. CHHATRE:

Q. And Geoff, how many sensors you had on this particular tool?

A. I'd have to come back on that to give you the exact number.

Q. Okay, (indiscernible) make a note of --

A. But I will come back to you on that one.

BY UNIDENTIFIED SPEAKER:

Q. So if I have a defect right here --

A. Yeah.

Q. -- what happens?

A. Well, you just shift -- because this is a spiral you just shift to a separate -- another bank of sensors.

Q. So the one behind it is going to pick it up? Okay.

A. So the idea with the sensor carrier design is that it covers 360 degrees, and even if it's spiraling, the next skid of sensors will start a bigger --

INTERVIEW OF CLINT GARTH

BY MR. CHHATRE:

Q. Now, this is Ravi, NTSB again, and (indiscernible) can you describe or explain to us as to -- as an analyst, what are your job functions? Because for the inspection, you start negotiating the contract and the crew goes (indiscernible) goes through somebody, and it just comes back to Enbridge. As an analyst, what's your job function?

A. So as an analyst, you will be assigned a section of data. As I said earlier, we process for CD. We process a section of data, each section is equal to one-and-a-half kilometers distance.

Q. I'm sorry, each section is one-and-a-half kilometers?

A. Correct.

Q. Okay.

A. And as I said earlier, as well, the software will create the boxes, and so the analyst will go through the data and the software will take them to the boxes that need to be analyzed.

Q. Okay.

A. And the analyst will go through each of the boxes that they've been asked to -- or the software has taken them to, and they need to go into the V-scan (phonetic sp.) and look at all the sensors from the clockwise side and the counterclockwise side that were in the list of sensors to be looked at for that feature. So each feature has a list of clockwise side and counterclockwise sensors that were the reason the box was created. So you will look at, depending on the feature, anywhere from two or three sensors on the clockwise side and two or three on the counterclockwise side, or look at maybe five to ten from both sides, depending on the feature.

Q. So as an analyst, the computer gives you the data with boxes marked on it?

A. Correct.

Q. And so what happens if you feel that there are some data that you are seeing, raw data, that maybe something should be boxed or looked into? Are you allowed to do that?

A. You can insert boxes if you feel that they needed to be inserted.

Q. Okay.

A. But there's -- I've never seen that, an issue with that.

Q. And these boxes are standard size? Are they -- depends upon the data that you are receiving?

A. It's based on the software, so the software will create the dimensions of the box, and it's used on -- it's different parameters and settings so that --

Q. And as an analyst, do you know those parameters?

A. No, you're not expected to know that. You're expected to classify the feature based on the rules that you've been trained on how to --

Q. So as an analyst, you only look at the boxes and clarify crack-like, notch-like or cracked field. Is that --

A. That's some of the classifications. There's also other classifications like irrelevant. So even though the boxes are made by software, there might be reasons why the box was created that you will understand but it's not an injurious defect. So for example, at the long seam (phonetic sp.), we get a lot of high amplitude reflections from just the well cap itself because you get that corner effect Geoff was talking about from the sound hitting the external or the internal well cap. It will return a sound back with a high amplitude, and the box will be created based on that high amplitude, and the analyst has been trained on identifying that as not a crack but as just a reflection from the well cap.

Q. Okay.

A. So they can't -- they won't call that a crack; they'll call it an irrelevant feature.

Q. But when you call it irrelevant feature, do you ever place it in your notes some place in that analysis?

A. Yeah, so there's static data which is the ultrasonic data; that does not change. And then we use an SQL database. So when you put the -- or you analyze the box, the box is part of the SQL database, and that's like a table system where it collects all the information. So if you classify it as an irrelevant, it gets a classification as irrelevant, and that is in the information of the database.

Q. But do you have --

A. It's in the feature information.

Q. Do you do justification why you called it irrelevant or not?

A. You don't have to explain why it was called irrelevant, no.

Q. Okay. So as an analyst, do you get the entire Enbridge Line 6B or there will be several people working on it besides you? Because I think you mentioned one-and-a-half mile, is it, or --

MR. FOREMAN: One-and-a-half kilometers.

BY MR. CHHATRE:

Q. One-and-a-half kilometers, yeah.

A. As an analyst, they'll work on that section, yes, by them self, and when they're finished that section, they'll work on the next assigned section.

Q. And typically how long it takes (indiscernible) is data dependent?

A. Yeah.

Q. Can you give me a (indiscernible) was typically how long? Each get one-and-a-half kilometers?

A. I can't reference Line 6B because it was in 2005, and I wasn't doing the analysis then.

Q. You're not doing 6B? I'm sorry.

A. No.

Q. Okay.

A. But general CD analysis, I can tell you, from a global manager position, my expectation is that the analyst will analyze about five to 600 boxes in a day. And so depending on the feature density in that one-and-a-half kilometers, it could be -- if the features to analyze is only 600 features, then it will only take the analyst eight hours to do that. Okay? But there's different densities of boxes in each section. And we know that up front when we start the sections.

Q. And so as an analyst, then, you report those back to whom in GE?

A. So that's -- we talked about the first pass analysis, so the analyst will go through and analyze all the boxes given to them. Then we have a quality check process, as well, where we have any Level 2 or higher analyst tasked to do QC. Nobody can do QC unless they're at least a Level 2. And we have a certification process, program and training where we have Level Zero, Level 1, Level 2 and Level 3. So in most cases, the Level 1s or Level Zeros will check the first pass analysis and then their work will be checked by a Level 2. If it's a Level Zero, as per the standard of the -- sorry, the --

Q. Just you said check. You said the Level Zero and the Level 1 would check it. Do you mean analyze?

A. They would analyze the data, sorry.

Q. Right, because the transcription's going to come out as check.

A. Sorry, analyzed. So based on the industry standard of -- is it, PLQ 2005, we have to have certifications, and anyone that's a Level Zero has to have 100 percent of their work checked or supervised. So we check 100 percent of all of our Level 2's work.

Q. Now --

A. I'm sorry, Level Zero's work. Okay?

Q. Okay. And this Level Zero, 1, 2 and 3 are internal classifications?

A. Yes, this is our internal training and certification process.

Q. Are there certifications outside of GE like (indiscernible) societies or you have --

MR. FOREMAN: This is in line with the EPI.

MR. CHHATRE: Let him answer, please.

MR. FOREMAN: Sure, sure.

MR. GARTH: Yeah, so when the first pass analysis is done --

UNIDENTIFIED SPEAKER: Wait, Clint, did you ask -- answer Ravi's question, are there external certification by external third parties?

MR. GARTH: No.

MR. NICHOLSON: Okay.

MR. GARTH: So then -- sorry.

BY MR. CHHATRE:

Q. So Level Zero is 100 percent checked by Level 1, 2 or 3?

A. Level 2 or higher.

Q. And Level 1?

A. Level 1 will then have a percentage check of their features based on their level, and the other thing to note is, if an analyst goes through the process and classifies a feature as a reportable feature, which is cracked-like, cracked field, notch-like, 100 percent of those features were checked by a Level 2, regardless of their level. Features that are not reportable features, like the "irrelevants" we talked about, a percentage check is checked on their work based on Level 1 or higher. Level Zero is still checked 100 percent.

MR. FOX: Are these the processes that were -- Matt Fox here.

UNIDENTIFIED SPEAKER: Matt --

MR. FOX: Well, I was just going to -- are these the processes that were in place in 2005, as well, or is this a current process?

MR. GARTH: This is my current -- this is how I understand the current process.

UNIDENTIFIED SPEAKER: Do you know what the process was in 2005?

MR. CHHATRE: Excuse me, you're not supposed to ask questions, please.

MR. GARTH: No, I don't. I was not involved at the time.

MR. JOHNSON: This is Jay. Geoff, would you know if the process changed from 2005 to now?

MR. FOREMAN: No, I personally wouldn't know. You could -- I would have to supply that.

MR. JOHNSON: You can just get back to us.

BY MR. FOX: This is Matt with NTSB. Repeat again, you said Level 1 has a percentage. I didn't hear what percentage of their work was checked.

MR. GARTH: It depends on the feature type.

MR. FOX: Okay, then you went on to say something about notch-like, crack-like.

MR. GARTH: So we have a reportable feature type to report to the client, and so the mission of the tool is to report cracks. So when a analyst finds a reportable feature, 100 percent of those features are checked again by an experienced Level 2. If they classify it as a non-reportable feature, which is like an irrelevant feature, a percentage of the irrelevants are checked.

MR. FOX: Thank you.

MR. JOHNSON: This is Jay. Is that a stated percentage? You say a percentage.

MR. GARTH: It's a stated percentage in our software, yes.

MR. JOHNSON: All right, thank you.

MR. GARTH: And it's based on the person's level.

BY MR. CHHATRE:

Q. And going back over the process again, so the data's checked and rated and QC'd, and that's what I believe you called it, QC, is that --

A. Yeah, correct, yeah.

Q. So once that's QC'd, then what happens to the information?

A. So then the final features list is made after the QC, and we will produce a listing, an Excel listing of all the reportable features, all the pipe information, like the girth welds and the long seam orientations and all that. We also produce a Word document report which will include information about the pipeline, like the tool, the information when the line was ran, information like that. And it explains a little bit about some of the classifications that are in the report and other information about that inspection.

Q. So that's all, as an analyst, your job function?

A. So as an analyst they really -- the junior people would just do the first pass analysis. At Level 2 or higher, Level 3, would create the report. And we have a software that creates the report with all the information that's collected in that SQL database.

Q. Okay, and then that's where the analyst's group function stops? As a supervisor you -- as supervisor, what's your function, then? These are the people under you, I believe?

A. Correct, yeah. I have a -- team leaders for each technology that will supervise their analysts that do that work and also supervise the delivery and the creation of the reports.

Q. So once the report is generated, does that mean that, as the analyst group, your job is done?

A. Once we've created it and delivered the report, yes.

Q. Okay.

A. It's done.

Q. So that's internally delivered or is it delivered to the client?

A. We deliver it -- well, what we do prior to delivering it to the client is we send the reports to the Project Manager --

Q. Okay.

A. -- who's in the Operations Team and is our point of contact with the client. They will do what they call a PM audit of the report, and they will review the report, give any feedback on the report, and once we've received approval from the Project Manager, we are allowed to send the report to the client.

Q. PM is Project Manager?

A. Correct.

Q. Okay, so the Project Manager on (indiscernible) site --

A. Correct.

Q. -- will go through the report? Now, is that discussed with the client before it is officially shown or do you officially issue it and give it to the client?

A. Well, we give it after the PM has given us the approval to send the report.

Q. And then it's issued to the client?
A. Yes, yes.
UNIDENTIFIED SPEAKER: Is it issued as a draft or it's final?
MR. GARTH: No, as a final report.
BY MR. PIERZINA:
Q. This is Brian. Getting back to the expectation for an analyst to review 500 to 600 boxes a day, can you, just in general terms, how many are determined to be irrelevant?
A. Well --
Q. Just in orders of magnitude, you know.
A. It depends on the pipeline.
Q. Okay.
A. But the numbers I've heard is as high as 95, 97 percent are irrelevant features, are non-injurious features.
Q. Okay, so a large --
A. Large number of features.
Q. The majority end up being irrelevant features, so it's a real screening process? The ones -- and I would imagine that when an analyst is reviewing these boxes, and they find one that's not irrelevant, they spend quite a bit more time on those?
A. Exactly. They'll spend more time on it.
Q. Okay, and then as far as -- what type of percentage are we talking about, on a random basis, of the irrelevant boxes are quality checked, I guess?

A. I don't know the number off by hand, but there's a percentage defined in our software on how much irrelevant features need to be checked based on the person's level.

Q. Okay, and you say in your software, but that's actually -- a Level 2 analyst has to review them, right?

A. Yeah, the software will take them to those features.

Q. So the software -- okay, and is that strictly random or is it based on the nature of the box or --

A. It has some prioritization of checking, for example, irrelevant features that have a higher amplitude and overlap. So these are variables that would point us into the direction of features that potentially could have been misclassified.

Q. Okay.

A. So it prioritizes those to be looked at. It's not just a sample check.

Q. All right, well that's --

A. Okay?

Q. Okay. Then as far as -- let's say in that process, a reportable feature is picked up on. Does that drive any type of review process to look at more --

A. If the QC process finds?

Q. Right.

A. The process is, if you're reviewing a feature type that is a non-reportable feature type, like irrelevant, and you find a reportable feature, you have to get the analyst to review that feature type again with some coaching and training on this feature that you've maybe misclassified.

Q. Okay, so it wouldn't, like, drive a recheck of the entire section that --

A. No, just that feature classification.

Q. Okay, just a second.

MR. JOHNSON: I'm just curious -- this is Jay. Obviously, there's a lot of the data comes back because of the weld seam, as you talked about.

MR. GARTH: Uh-huh.

MR. JOHNSON: How is that when you get a crack in the weld? I mean how is it -- can you give me an idea of how it's going to show up different than, you know, depending on, you know, certainly different types of seam welds, you know, how a crack in a weld would show up?

MR. GARTH: A single crack in -- and mostly I'm saying, like, in the tow (phonetic sp.) of the weld for, like, a D-saw (phonetic sp.) pipe, you could see it's kind of in front -- it's easier to draw it, but if you can --

UNIDENTIFIED SPEAKER: You can draw it up here if you'd like.

MR. GARTH: Okay.

UNIDENTIFIED SPEAKER: I hate to erase Geoff's stuff there, but --

MR. FOREMAN: That needs to -- that needs erased.

MR. GARTH: So you've got your D-saw pipe here. I'm going to say it's like this. If you've got a tow crack on the tow of the weld here, and you've got your sensors, sends out, get the corner effect here, and as well here. In your data, you're going to see -- at the half skip, you're going to have, also, from this sensor and some of the sound from this sensors, sound that's missing this defect and hitting the corner effect here, the weld. So this corner will reflect sound back to these sensors. And how that will be viewed is sometimes you'll have, kind of, a linear indication throughout the pipe. But when you've got a crack here, you're going to have a change in, we call it, time of flight, where you'll have an indication that comes in before your expected reflection from the weld cap. Is that -- do you understand that?

MR. JOHNSON: As well as I can.

MR. GARTH: Okay, so you'll have this break where the sound is not passing this area because the crack is here. But you're going to have a reference point of the weld cap reflection that you know is just the weld cap, and this side -- this reflector will show up at a sooner time of flight.

MR. FOREMAN: Clint, might I make -- just for clarification, explain --

MR. CHHATRE: You can ask him questions but don't explain. I mean --

MR. FOREMAN: Okay.

MR. CHHATRE: (Indiscernible).

MR. FOREMAN: Can you show where the sound starts and what the direction of the sound? When you're talking about an earlier reflection, so where does the sound emanate, where does it touch -- hit the inside of the pipe, and then where does it go to? Like, like if -- like this half skip, one skip?

MR. GARTH: Right, so this is the half --

MR. FOREMAN: (Indiscernible) why is that earlier than you expect?

MR. GARTH: Because this is a measurement in microseconds, right?

MR. FOREMAN: Right.

MR. GARTH: And so this is also a measurement in microseconds. So, for example, if we just take away this sensor, that's the skip and a half, and just put in the half skip, the sound is going to enter the pipe surface here, which is sometimes around 30 microseconds. So all this is traveling from the sensor to the internal surface. That's this part here. And from this distance to that distance is this distance to this distance. Okay?

MR. FOREMAN: Okay.

MR. GARTH: And so you'll get this indication at the half skip right here, from this defect, but it's not just one like Geoff drew. It's not just one corner effect like -- it's really it's a beam spread of sound. Some sound will go past the crack. What we'll see is corner effect. And so you'll have this. From this sensor here, this half skip is going to draw this line where the weld cap reflection is. It returns amplitude.

MR. FOREMAN: And the reason you know it's the weld cap is, it's continuous?

MR. GARTH: Correct.

MR. PIERZINA: This is Bryan. As far as amplitude levels, what kind of amplitudes levels, what kind of amplitudes would we be talking about for a long seam?

MR. GARTH: I'm not completely sure.

MR. PIERZINA: Okay.

MR. IRONSIDE: But would that -- sorry, it's Scott. That would be entirely dependent on the shape of the weld, would it not, because the shape of the weld will drive the amount of response that --

MR. FOREMAN: Yeah.

MR. IRONSIDE: -- comes back, is that correct?

MR. GARTH: Yeah.

MR. FOX: This is Matt Fox here. From the counterclockwise direction would -- well, I guess we're looking at counterclockwise here. From the opposite direction, the clockwise direction, what sort of reflectors would you expect to see?

MR. GARTH: Well, from this side, you're going to have the same type of --

MR. FOX: You can draw that one --

UNIDENTIFIED SPEAKER: Start over.

MR. FOX: Can you do it in the red marker?

MR. GARTH: Yes. You're going to potentially get the same indication from this well cap, from this side. This is where it gets a little bit more complicated. This indication from the well cap would be from the sensor, maybe. You can see it, as well, from this sensor. But the sound is now traveling through a different material than the material of the steel itself, right? So if you get a reflection from this defect, you may not be able to really trust the amplitude that you're getting back because the sound is traveling through a different material, the weld itself, and so the amplitude returned will be higher or lower than expected. So that's why we would trust this side better because it has a clearer view of the crack from that side. When we were talking earlier about, we were talking everything in the (indiscernible) both sides. You do the corrections and all that. We would base our sizing and classification mostly on this side. This will be information for us. We may or may not see that reflection.

MR. IRONSIDE: Scott here. Would you have a similar scenario, though, where if it's following along the length of that weld, do you have that similar thing, but when -- if there was a crack here, would there be a difference that you would see?

MR. GARTH: Yeah.

MR. IRONSIDE: Either in amplitude or time?

MR. GARTH: So it would be close to a half skip. You would have, also, a referenced corner effect, but then you're going to have it after, right, because it's a later time of flight than the corner effect, right? It's after the corner effect. So it's going to, kind of, show up behind that.

MR. FOREMAN: And it makes even the one-half skip rather than the one skip depending if the front of the weld is (indiscernible) it.

MR. GARTH: Exactly. So this well could also -- this sensor could be riding on this area of the long seam and then it's just getting -- all the energy it's turning -- trying to send it to the pipe will be returned back to that sensor. So that's why there's so much redundancy.

UNIDENTIFIED SPEAKER: So then in your graphs down here below, you've got the signal lower, you've got the signal higher. If you overlay them, are they, pretty much, going to be on top of each other with --

MR. GARTH: Yeah, with the orientations, yeah, they'll be pretty much on top of each other.

MR. FOREMAN: But when you look at the sensors, clockwise, and you've got counterclockwise, you're looking at them separately.

MR. GARTH: Yes.

MR. FOREMAN: So you're not getting confused with them on top of each other. You're looking at one set of sensors --

UNIDENTIFIED SPEAKER: Can you overlay them, though, when you -- I think I have something here. Would you overlay the other ones to see?

MR. GARTH: You would put a -- we have a mouse, and you would put a mouse over this reflector, and this one, and you would get the orientation, and you would know, okay, this one's 94, this one's 93-and-a-half. It's the same reflector.

UNIDENTIFIED SPEAKER: All right, (indiscernible).

MR. NICHOLSON: We're off record for (indiscernible).

(OFF THE RECORD)

(ON THE RECORD)

MR. NICHOLSON: Okay, back on record.

MR. GARTH: Okay, so I just wanted to clarify one of the statements I made earlier about the QC process. If a feature is found by a QC analyst that -- when they're doing the non-reportable checks, so when they check all the irrelevants and they found a feature that the analyst may have misclassified, it should have been a reportable feature, say a crack, like a cracked field. What happens in the process is the QC person will then sit down with that analyst or give feedback to that analyst about that feature, specific feature, and then they will be asked -- that analyst will be asked to reanalyze all the features in their section that had been classified by them as irrelevant. Okay?

BY MR. CHHATRE:

Q. This is Ravi. So really, everything that, I guess, your (indiscernible) that is checked by 100 percent, so are you guys really using this as a training, ongoing work training for the analyst?

A. Yeah, the first year it's basically a training year for our analysts, because 100 percent of their work is --

Q. Checked, that's right, okay.

A. -- checked by our Level 2s or higher.

Q. Now, after the report is done, if there are any questions, I guess, or discrepancies coming back from the operator or client, you know, you classify (indiscernible) this at this grade and (indiscernible) field numbers are different. How do you resolve that? Do you know what I'm talking about? If you -- should I clarify more or --

A. Sure, please.

Q. Verification digs are done --

A. Correct.

Q. -- based on the report you send --

A. Correct.

Q. -- to, in this case, Enbridge. And they go and look at your data, and I think you -- and depending upon what your report says, they go and do some digs.

A. Uh-huh.

Q. And they have --

MR. CHHATRE: And Jay, correct me if I'm (indiscernible) you wrong.

BY MR. CHHATRE:

Q. But then they have their (indiscernible) people go and do the dreg (phonetic sp.) maintenance on the exposed pipe.
A. Uh-huh.
Q. And if there are discrepancies between what you guys are telling them and what -- I think what Enbridge classified as outliers --
A. Okay.
Q. -- what is the back and forth of that? What -- how do you hear from Enbridge as an analyst?
A. Well, as an analyst, so we have set up with Enbridge a dedicated person to respond to any issues or point of contacts. So we have a Project Manager, but we also have someone in Calgary that will get that information back from the client.
Q. And that would be zero, 1, 2 or 3?
A. That's actually --
MR. FOREMAN: An engineer.
MR. GARTH: -- desk-side (phonetic sp.) engineer is his title, I think.
BY MR. CHHATRE:
Q. Okay.
A. And so he would then take that information and feed it back to our team.
Q. Okay.
A. We'd have, maybe, a meeting set up with Enbridge to discuss the results.

Q. Okay.

A. It's mostly handled by that individual. And if the feature is something that needs to be fed back to -- at the specific analyst, that information would also be given to them and coached on what they found in the field.

Q. And okay, so it went (indiscernible). What happens then? He looks -- he or she looks at the data and then -- and they do a reclassify, or do you say, "No, we are correct?" I'm just trying to understand the process on what --

A. They really --

Q. How these things are resolved is what I'm trying to understand.

A. It really depends on the situation, all right? We could get feedback that a feature was undersized but if it's in -- if it's within the specification of the tool, because have a tolerance on our sizing, it really depends on the unity of the entire line, not just one or two outliers. Because if you change your sizing of all your features based on one or two outliers, then all the other unities of sizing might be off, right? So we get the feedback and we also get from Enbridge the unity plots of the whole line, not just the outliers, and then we work together to try and understand, you know, if there is anything to learn from those outliers.

Q. And what would -- I guess how many of these outliers or discrepancies, for lack of a better word, would raise question in your mind, as an analyst, that maybe we need to revisit and take another look at the entire set of data?

MR. KILLORAN: If you know.

MR. GARTH: I don't know of any specific --

MR. CHHATRE: And just to save everybody trouble, absolutely, your counselor wouldn't have to repeat all the time, from this point on and earlier, also, answer only if you know. So I'll just save you the hassle. So you don't have to remind him every time because then you are distracting me. I listen to you, so --

MR. GARTH: Okay.

MR. JOHNSON: This is Jay. One of the ones we talked about earlier this week was the Line 6A tool. It seemed earlier on --

MR. CHHATRE: Can you let him finish answer first on how --

MR. JOHNSON: I thought you were done. I'm sorry.

MR. CHHATRE: No, no, no. He's answering.

MR. GARTH: I'm not aware of any specific trigger that would require us to reanalyze the whole line. We, kind of, work together with our clients. If they want a re-grade done on the line, based on a reason, then we can do that for them.

MR. CHHATRE: Okay. Now, as an analyst, how familiar you are with the tools? I know a lot of questions are asked of you about if tool (indiscernible). Are you familiar with the tool or you are not? Maybe we are asking the questions to the wrong person.

MR. GARTH: Yeah, the tool, that's not really my domain. It's more of -- you know, I'm more of the high-level analysis process and how we do things.

MR. CHHATRE: So is -- are you the right person to ask for the tool?

MR. FOREMAN: If it's within my domain of knowledge. I mean I might have to refer --

MR. CHHATRE: To somebody else.

MR. FOREMAN: -- to the Technology Center of Excellence if it starts talking about amplitudes because I'm -- I only know the references.

MR. CHHATRE: Sure.

MR. FOREMAN: I don't know the absolute --

MR. CHHATRE: (Indiscernible) ask you analyst.

MR. FOREMAN: Right, right.

MR. CHHATRE: I want to make sure we are not directing the questions to the wrong person. Okay.

MR. FOREMAN: Yeah, but ask away, Ravi, and I'll answer if I can.

MR. CHHATRE: Okay.

BY MR. CHHATRE:

Q. Now, has it ever happened with your tenure that you had to go back and do the whole analysis all over again because there were some questions?

A. No, I wouldn't say the whole analysis, no. We've been asked to review features and --

Q. Okay.

A. -- reissue the listing for that, yes.

Q. And who in your team did 6B in 2000 -- I forget the year now. Was it 2005?

MR. KILLORAN: One thing that --

MR. CHHATRE: What?

MR. KILLORAN: One thing that I've got to interject. We're subject to data privacy rules in Europe. We cannot disclose the names of the analysts. We can use Analyst A, Analyst B, but, right now, we're prohibited by German law.

MR. CHHATRE: That's fine. My question is, is your person still around, because maybe we can talk.

MR. KILLORAN: Sure.

MR. CHHATRE: Because --

MR. KILLORAN: Yes.

MR. IRONSIDE: It's Scott here. Is it safe to say there would be multiple analysts that would have looked at Line 6B? Like that tool run would be analyzed by how many analysts?

MR. GARTH: Multiple analysts. Maybe 10, 15.

MR. CHHATRE: So is it possible, based on your records, to find out who the analyst was who did the ruptured section?

MR. GARTH: I think that's possible, yes.

MR. CHHATRE: Okay. I'm sorry, I didn't mean to interrupt you, Jay. Go ahead and ask your questions.

MR. JOHNSON: No, that's okay. And I'll move onto -- on 6A, a run on Line 6A, I want to say it was -- it would be 2010 or 2011. I'm kind of losing track of time. Early on, there were some features that were found to be deeper than predicted, if you will. At what -- and if you're the right person or Geoff is -- at what point in time, then, when Enbridge got back to you with field data that said, "We're seeing something a lot more severe than you're showing," just, kind of, what's that process, then, and how you would go about that, reviewing that?

MR. KILLORAN: I'm sorry, what's your question?

BY MR. JOHNSON:

Q. Well, in the case of a tool run on Line 6A, Enbridge came back with field data that said the defects were more severe than predicted. I don't know if predicted is the right term. Is that a fair question?

A. More severe than estimated?

Q. Yes, more severe than estimated and then at what -- so obviously your PM's working with an Enbridge PM --

A. Yeah.

Q. -- and that data goes back and, you know, "Here's what we're seeing; what are you seeing?" You know, I'm curious to what process, then, you would go through on your side.

A. So you're asking specifically about 6A or about the general process?

Q. I just know that was -- you can go general, if you want. I just know that was a situation on Line 6A.

A. Okay, yeah, so, like --

MR. FOREMAN: Well, Geoff Foreman here. I'll take the question because I know more about it, probably, than Clint does. But the process is, as Clint mentioned, the first person that gets to know that an issue is the Enbridge desk engineer. He then raises it internally. We have a process called a fit (phonetic sp.) which basically it's a process that we go into that we've got a situation here where it doesn't -- the findings in the field don't correlate with the report. The first question we ask the operator is, "How did you measure that defect?" Because the first thing we've got to understand is the protocol in which the operator has measured it. We have -- through experience, trust and sometimes don't trust feedback we get from the operator, depending on the type of technician or equipment or process that's been used to measure the defect. There is a number of protocols which I believe the operators can use. One -- the one we like the most is when they grind the defect away and then you know exactly where the actual crack has disappeared. And that's a really good way of doing external corrosion. Then there's all the ultrasonic methods of measuring defects, and then you get into an argument of which ultrasonic measure is the most accurate. So the verification itself has been an issue. On this particular kind of incident, we would look: How was it measured; could we maybe send somebody from GE to come in and take an independent measurement to make sure that we're comfortable with the information we're getting; then we look at or try to understand the geometry of the feature, the geometry of the crack. Because, as Clint stated, we as -- you know, in general will not change our algorithm on the outlier. So it has to be -- if we had a statistical significant number of feedback that something was consistently in one direction or the other, then we would look at reissuing the report at a different -- with different parameters. But until we're convinced we have more than just a defect that's behaving strangely in our equipment, we wouldn't do that. So then we go open an investigation with Enbridge on what does this defect really look like, what does it -- how does it -- why is this sound appearing to us the way it is, if it's appearing to you in a different way? And especially defects around the weld area, it depends on the type of weld, the corner effects that we've already mentioned on (indiscernible) or even worse on different types of welds because of the way the weld's constructed. So we have to really understand in detail. Ideally, what we would love to do is to see the defect itself, you know, like, open, like, cut the thing in two, do a forensic, if you like, is the perfect, you know. So we would work with the operator and try and understand why the sound was traveling. Because we're looking at the defect from the inside out. They're looking, the majority of the time, from the outside in. So our half skip is their one-half skip and vice versa. So you look at it slightly differently. So we would want a exhaustive investigation on why is this different. That would be a learning on how we might want to do something differently in the future, or if it was a case of a misclassification or an analyst issue, then we would go through the same process that Clint mentioned about the missed feature. We would make sure that all the analysts were aware of this type of feature and understood that -- what it looked like, if it had a unique signature. That would be a learning process and would be included in our training material for the future. But that's the kind of process that we undergo if we get a call from the customer saying, you know, we disagree with what the tool said.

MR. CHHATRE: Does that answer your question?

MR. JOHNSON: Yes, it did, very well.

BY MR. FOX:

Q. Well, I wasn't clear. Were we -- this is Matt with NTSB. Were we talking one feature at the top or do you get -- I mean I know Enbridge does unity plots where they're basically trending digs to highlight performance. Then they must share that with you, as well, then. That's something you both have a shared interest in understanding, is that correct, Clint?

A. Correct, yeah, we do get information from them.

Q. What do you do with that?

A. About what they found. We look at it, and if there's any features that they need explanations for, we will re-look at the data for them and provide them with any information we can get from the data.

Q. That unity plot and there's no specific confidence interval or anything you look for that would drive you to change algorithms or methods of analysis?

A. Not to my knowledge, no.

Q. Okay, then what changed your -- what prompted you to change the algorithm in 2008?

A. Well, that was a series of digs over time with other vendors -- or sorry, clients and our technology team and our Center of Excellence in Germany would have taken that information and, kind of, validated it, right? So my process is -- I follow the process that's outlined in the analysis process. If any changes need to be made by that, it's made by our Center of Excellence, and then their training -- they will train my analysts on how to analyze the data if there's any changes that need to be done.

MR. FOREMAN: But to specifically answer you question -- it's Geoff Foreman.

MR. CHHATRE: Well, hold on, hold on let the analyst answer if he can --

MR. FOREMAN: Okay, but he doesn't know the answer.

MR. FOX: And I'm good with that. If, Geoff, if you've got an answer, I understand.

MR. FOREMAN: Right, I mean as I mentioned, the statistically significant sample. So over time, we had enough feedback from various operators that we had a statistically significant reason that we should improve.

MR. FOX: Okay.

MR. FOREMAN: (Indiscernible).

MR. CHHATRE: There's a need -- this is Ravi. There's a need coming from -- I wouldn't quite, maybe -- I don't know the better word but maybe (indiscernible) discrepancies. You know discrepancies are drawing your attention.

MR. FOREMAN: Yeah, that's right.

MR. CHHATRE: That maybe something needs to be (indiscernible) done.

MR. FOX: Well, this is Matt. Can you be a little more specific than discrepancies? These are specifically cracked field discrepancies?

MR. FOREMAN: Well, for instance, you -- okay, it's Geoff Foreman here. What we were talking about, there were the -- referring to the algorithm for the cracked field increase and that was because the feedback we were getting, generally, was that we were underestimating, not necessarily significantly, but underestimating all the calls or significantly a majority of the calls that suggested that we should increase the algorithm.

MR. FOX: Underestimating the depth?

MR. FOREMAN: The depth.

MR. GARTH: Correct.
MR. FOREMAN: Not -- it's just purely on depth algorithm, on cracked fields.
MR. FOX: You're saying, also, something changed in the analysis, too. Didn't you also -- or you changed your characterization from crack-like to cracked field, right?
BY MR. FOX:
Q. Is that right, Clint?
A. Can you --
Q. It's a two-fold change, an algorithm change and something on the analyst side.
A. Are you referencing specifically a feature or just a process?
Q. I'm referencing a process. I'm basing this on how you answered before, where you said -- and we're talking about the 2005 USCD (phonetic sp.) run in Enbridge, right, the crack-like features that are now -- you're come back and looked at it and said now it should be cracked field. You said that's using a new process or something that the analyst will perform on those features. I'm trying to figure out what drove that change? What is that change? What drove it? Was that in tandem with this algorithm change or --
A. I would say it's more knowledge over the years on getting dig data over cracked fields and how to discriminate them between crack-likes and cracked fields. And then when that is

decided, then you can apply the new algorithm where we found that. Like Geoff says, we were underestimating cracked fields, and so the new algorithm was applied to increase the depths of the features or to improve it.

Q. Okay, so from 2005 until 2008, GE was getting unity plots or some sort of feedback from multiple, not just Enbridge, multiple clients saying that they were underestimating and mischaracterizing crack-like and cracked field features?

A. Uh-huh.

Q. Is that accurate?

MR. FOREMAN: Well, PII was getting feedback.

MR. FOX: Yeah, I'm sorry, yeah, that -- okay.

MR. GARTH: That's my understanding, yes.

MR. FOX: Thank you.

MR. PIERZINA: This is Bryan. I just had a quick question to clarify what Geoff had said. So the feedback that you were getting, are you talking about something that's more than one tool tolerance deviation or is it just a significant number greater than but still within, like, one tolerance? What are --

MR. FOREMAN: You can't make that generalization because it really depends on -- and it's Geoff Foreman here. You can't -- it depends where you are in the band. If you're at 24 percent or 26 percent, that would be a band change. So that's -- you can't really answer that question, Bryan.

MR. PIERZINA: Okay.

UNIDENTIFIED SPEAKER: By band change, you're talking depth?

MR. FOREMAN: The next tolerance band.

UNIDENTIFIED SPEAKER: Okay.

BY MR. FOX:

Q. This is Matt Fox here. When you -- you indicated that the analyst refers to rules or -- you know, when they're trying to characterize the indication. Is that a specific document that the analyst refers to?

A. Yeah, they're provided information during their training. So they receive -- depending on their technology, they receive a certain amount of hours of classroom training and material, and then they're provided with, kind of, a guidelines document on how to discriminate between a crack-like and a cracked field.

Q. Okay, is that -- what's the name of that guidelines document?

A. I don't know off the top of my head.

Q. Okay. I'm wondering if we could get a copy of that guidelines document, both as it exists now and as it existed in 2005?

MR. KILLORAN: That's highly proprietary.

MR. FOX: We understand that, and we have mechanisms in place to keep that as proprietary document within the NTSB investigation. I don't know if we need to go off record to discuss --

MR. KILLORAN: Let's go off the record because --

MR. NICHOLSON: Okay, off record.

(OFF THE RECORD)

(ON THE RECORD)

MR. NICHOLSON: Okay, back on the record.

MR. IRONSIDE: Scott here. I'd just like to get a little more understanding of if you have a cracked field that has significant circumferential orientation, is that a situation that would be obvious that it's a cracked field, but if it's -- the circumferential, I guess, width of this overall feature gets a lot less, is that generally where you would have trouble telling if it's -- or the discrimination between a crack-like or a cracked field is based on that circumferential extent?

MR. FOREMAN: Can you break it down into one question --

MR. GARTH: Yes, (indiscernible).

MR. FOREMAN: -- at a time?

MR. IRONSIDE: It's easier by a sketch, if you could --

MR. GARTH: Right.

MR. IRONSIDE: So if the circumferential orientation, if this is ten inches, for example, or you have something here that's a half an inch, this could still be a cracked field, as could this, but you could also have a single crack. Where is the actual circumferential width of the feature what -- is what causes a challenge to discriminate between a crack-like and a cracked field?

MR. FOREMAN: There is a -- Geoff Foreman here. There's also another one, Scott. What about, like, (indiscernible), like an intermittent? You can have a cracked field of a single crack that isn't joined together. Scott, draw it.

MR. IRONSIDE: Yes.

MR. FOREMAN: That would also -- that could also -- that's the hardest one. Is that a single crack or a cracked field? Because there's different types of (indiscernible), right?

MR. IRONSIDE: Can Clint answer? I want to hear an analyst's perspective.

MR. GARTH: Yeah, so I am the manager of analysis, and I don't really do analysis, but I know there are rules for the analyst to discriminate those types of features. So if --

MR. IRONSIDE: So do the rules include, then, circumferential extent of the box feature? Is that --

MR. GARTH: It's hard for me to say that. I don't know for sure.

MR. IRONSIDE: Okay.

BY MR. FOX:

Q. So the analyst -- this is Matt, NTSB. The analysts are analyzing -- they've got a series of documents that, kind of, walk them through how to analyze these features? That's probably --

A. Yeah, they'll have -- they've got a classification, so cracked field, and then, beside it, what kind of characteristics you should use when classifying a feature with that classification.

Q. Okay.

A. So, kind of, a guidelines rules. Okay, here's -- if it has this, this and this, it's a cracked field. But I don't know all those attributes.

Q. While we're on the subject, because this is very relevant, I think, to the crack-like feature that failed in Marshall, what is it that changed between the analysis in 2005 and the reanalysis using this new procedure that would have led you to call this a cracked field over crack-like?

A. Well, I wasn't the person that did that review in 2010, so I don't really want to speculate. We have expertise within our team, globally. We have a Center of Excellence in Germany and the people that reviewed that data were the ones that would have made that.

Q. Was there a report generated?

A. No, not to my knowledge.

Q. Who was requested to reanalyze? Where did the request come from to reanalyze the data? Is that from Enbridge?

A. I believe so, yeah. I believe.

MR. FOX: Geoff, I look to you, then. Do you know who made the request?

MR. FOREMAN: I can but it's a German person.

MR. GARTH: No, no, he's asking (indiscernible).

MR. FOREMAN: Oh, who made the request? Yeah, the request came from Enbridge, that there had been an incident and could we re-look at the data.

EXAMINATION OF MR. FOREMAN

BY MR. FOX:

Q. Okay, and was a report produced? Is there something we can get? Or can you get the analyst that did the work, because Clint's unable to answer the question. And we're eager to know what changed.

A. We know the analyst that did the review, who was the technical expert for the Center of Excellence.

Q. Which is, what, in Germany?

A. Yeah.

Q. Okay.

A. The feedback that I received was that this was a very complex defect. It contains more than one type of crack type, it has what would be now evaluated at SCC (phonetic sp.). It has two cracks and it has external corrosion. So there's three different types of defect type going on in that particular length of feedback area that was boxed in 2005. In 2005, there was no difference how we would report the cracked field or a crack-like as far as the overall length and the maximum depth, of course. So I believe that the decision was made to call it a crack-like at the maximum length -- the overall length and a peak depth, at that time. The review today would indicate that we could call it a cracked field or we could call it cracked field with tool cracks within it. We don't even -- we don't have a category for cracked field with tool cracks in it. So we would probably call it a cracked field today.

MR. CHHATRE: Did you say dual crack (indiscernible)?

MR. FOREMAN: Tool. Sorry, that's my accent.

MR. CHHATRE: No, that's all right.

MR. FOREMAN: It's a tool crack. So it's a strong linear indication along -- as Clint, kind of, on the board there --

BY MR. FOX:

Q. Right.

A. Right? So it's very complex and it's on -- it's sitting in an area of external corrosion. So we don't see all of it all of the time, but we see strong bits of it, and it's complex. So it's not just a single crack indication.

Q. And the statement that it's really just a change in procedure, that doesn't sound right. I mean this thing had to go all the way to Germany, to your Center of Excellence, and this analyst that looked at it is probably greater than a Level 1.

A. Level 3.

Q. You know, Level 3 analyst.

A. Yeah.

Q. So it sounds like it's more than just a process change, that it might have been caught now at a -- you know, with someone under Clint. It sounds like it's a very complex feature that required specialists in the German office --

A. The analyst that did the initial analysis has also looked at the feature again and would call it a cracked field today based on where -- how we look at things today.

Q. Okay, using the new process?

A. Yes.

Q. Okay, so that was confirmed. But going into it, that analyst knew that what he was looking at was a failed -- a section that failed at Marshall.

A. Not the analyst that did the actual analysis initially, only the specialist.

Q. Okay.

A. As a rule, we don't go telling our analysts. We blind test them.

Q. Okay.

INTERVIEW OF CLINT GARTH

BY MR. PIERZINA:

Q. So have you blind tested your current level -- this is Brian -- your current Level Zero and Level 1 analysts with that feature to see if it's called a cracked field or a crack-like?

A. That was done after the failure --

Q. Okay.

A. -- by our -- sorry?

Q. You were asked if a Level 1 or a Level Zero blind tested it.

A. We tested all of our analysts, along with other features, like a blind test, not just here's one feature.
Q. Sure.
A. Here's ten features, tell us what you see. And that was done by our Center of Excellence and our training certification team.
Q. But you're -- okay, and if --
MR. CHHATRE: Off the record, please.
MR. NICHOLSON: Off the record.
(OFF THE RECORD)
(ON THE RECORD)
MR. NICHOLSON: Back on the record.
BY MR. PIERZINA:
Q. So Clint, you were about to describe the blind test that you subjected your Level Zero and Level 1 analysts to.
A. Yeah, my understanding from what happened was, all the analysts that do CD analysis, after the failure, were asked to look at a group of features and provide a classification and size of that feature, features, and that was all provided to the individual in Germany who's in charge of this heart of our process training and certification processes and also is our technical analysis lead.
Q. Could you speak up a little?
A. Sorry. And they have that information on what these people would classify it as today.

Q. Okay, and how many analysts are we talking about?
A. It's our global team, so that would be about 40 people.
Q. About 40 analysts? And in general, was it consistently that that feature would have been classified as a cracked field or a crack-like or was it still a mixed bag or --
A. I don't remember the results. I'm sorry. I just know that it had happened.
Q. But it was done by your Center for Excellence?
A. Yeah, yeah.
Q. Did --
MR. PIERZINA: Sorry.
UNIDENTIFIED SPEAKER: I guess I would just open it up, then, if Geoff or if anyone else has a sense for the results of that.
MR. FOREMAN: I don't know the results of that. I'd have to specifically find out for you.
MR. PIERZINA: Okay, so then -- but somebody has made the statement that today it would be classified as a cracked field, the rupture feature, correct? I don't know if that would be PII or if that's Enbridge or both?
MR. JOHNSON: My understanding -- this is Jay -- Bryan, is the original analyst, in 2005, based on the new criteria, said that. Did I hear that earlier?
MR. FOREMAN: You did.
MR. JOHNSON: Okay. Does that answer your question,

Bryan?

MR. PIERZINA: All right, so what new criteria?

MR. JOHNSON: The 2008 criteria. Is that when the new criteria came in for the --

MR. GARTH: For the sizing.

MR. JOHNSON: The sizing?

MR. FOREMAN: No, no, that's --

UNIDENTIFIED SPEAKER: Yeah, that's the sizing algorithm, not a classification.

MR. FOREMAN: That's two different things.

MR. JOHNSON: I'm sorry.

MR. GARTH: Yeah.

MR. FOREMAN: Yeah.

BY MR. PIERZINA:

Q. So what new criteria in the classification for features has been established that would make that a cracked field classification now versus the crack-like that it was originally classified as? To Clint if he can answer.

A. I don't really know why they would do that. I -- like the person that was involved has more technical experience than I do and understanding of it. I'm CD technology.

Q. Sure.

MR. FOREMAN: Geoff Foreman here. I answered before that it would now be classed as a cracked field, and my understanding is, it contained crack field-like indications, tool crack indications, and external corrosion. And the general feeling was that now we -- well, we always go with the most conservative call, so, therefore, it would be called a cracked field because to Jay's point, the sizing algorithm that would be applied would be the new algorithm so, therefore, the resulting maximum depth would be deeper. So we would, therefore, in theory, because we will have to have a little bit of real data, but so in theory, the call on the conservative side, now, will be to call it a cracked field rather than a crack-like. In 2005, there was no difference between a crack-like and a cracked field in the way we reported it, in that it was the maximum depth, maximum length, overall length, maximum depth, and the algorithm sizing was exactly the same.

MR. FOX: So can we, as an IR, get the results of the blind test that was done on the 40 or so analysts, specifically related to the failure feature and how they -- you know, how these analysts classified that feature? If the answer is yes, then let's make that an IR.

MR. FOREMAN: Yes.

MR. GARTH: Yes.

MR. FOREMAN: As long as we can get the (indiscernible). As long as it stays privileged, yeah.

MR. KILLORAN: Well, off the record.

(OFF THE RECORD)

(ON THE RECORD)

MR. NICHOLSON: Okay, back on the record.

MR. FOX: This is Matt Fox here. At the time of the 2005 study, the analyst that did the analysis, what level was he at that time?

MR. FOREMAN: Can we say a "they" because we haven't established it's a man. Right?

MR. FOX: Okay, he/she.

MR. GARTH: So the information I have on the analyst and the person that QC'd it was more about their experience with the technology, other than the level.

MR. FOX: Okay.

MR. GARTH: So the analyst experience that I was told was they had about three years of experience analyzing CD data, and the QC person that QC'd that section had about six years of experience with CD analysis.

MR. FOX: Okay.

MR. JOHNSON: So this is Jay. So they weren't classified levels at that -- in 2005?

MR. GARTH: I don't have that information. I do know that the certification process, the PLQ, Pipeline Qualification of 2005, came out in 2005, which regulated vendors to be -- or had vendors be certified at a certain level for analysts and field crew. And then prior to that, we did have our own internal certification process. But we are now in analysis at Global Analysis Group and we became a global analysis team in April of

2006. So prior to that, the analysis teams were, kind of, divided into regions. And there were certification processes and levels at the time, but I don't know what the level of the person was at the time because I wasn't involved.

MR. JOHNSON: Is there a recurring training program?

MR. GARTH: There is. We do a reassessment of a person's level, recertification, every three years. And also, if the analyst is out of the technology for more than a certain amount of time, there's criteria that has to be met for them to be recertified, as well. Six months, I believe, it's -- they have to take the test again. And if it's more than 12 months, they have to receive a refresher training and then take the test again.

MR. PIERZINA: This is Bryan. So getting back to that analysis, so it was classified by an analyst and QC'd by an analyst. Subsequent to the failure, has it been looked at by both the analyst and the QC analyst?

MR. GARTH: That was our understanding, right?

MR. FOREMAN: Yeah.

MR. GARTH: Yes.

MR. PIERZINA: Because we talked about -- so when we talked about the analyst now would call it a cracked field feature, are we talking about the original analyst or the QC analyst?

MR. GARTH: I think it was both.

MR. FOREMAN: Both were involved.

MR. GARTH: That were communicated to.

MR. PIERZINA: Okay, thank you.

UNIDENTIFIED SPEAKER: Did you ask -- or what -- or maybe I missed it. What level is the analyst that did the original analysis? What level now is that person?

MR. GARTH: Now, I believe they're both -- actually, I don't know for sure but I could get you that information. I have that documentation. I just don't know exactly each person.

UNIDENTIFIED SPEAKER: Okay.

MR. GARTH: I have a pretty big team.

UNIDENTIFIED SPEAKER: Sure.

MR. GARTH: But they're at least a Level 2 or higher.

UNIDENTIFIED SPEAKER: Okay.

MR. GARTH: Yeah.

UNIDENTIFIED SPEAKER: So they would be on -- more on the review side at this point?

MR. GARTH: Yeah.

UNIDENTIFIED SPEAKER: Okay.

MR. FOX: This is Matt, NTSB. I guess I'm still behind here. I thought I heard you say the Level Zero, 1, 2, 3 wasn't in place in 2005. Is that not accurate?

MR. GARTH: The PLQ -- sorry, PLQ, 2005, came out in 2005 for all vendors, right? Prior to that, we had, kind of, a more regional analysis certification process which was trying to get ready for this, kind of, requirement (indiscernible).

MR. FOX: What's the PLQ? That's --

MR. GARTH: Pipeline Qualification.

MR. FOX: Okay.

MR. GARTH: 2005 document. Came out from the AMSE.

MR. FOX: Okay.

MR. FOREMAN: But the question he asked was, what are they today.

MR. FOX: I heard that, as well, but I was backing up because I was --

MR. FOREMAN: Right.

MR. FOX: -- confused with the regions and the PLQ.

MR. GARTH: Yeah.

MR. FOX: Okay, so that was just starting in 2005.

MR. GARTH: From the industry's standpoint.

MR. FOX: Yes.

MR. GARTH: From -- prior to that, we were taking, you know, earlier time and, you know, getting our analysts certified, as well, building up to --

MR. FOX: Okay, so the Level Zero, 1, 2, 3 did exist in 2005, it was just done in a regional level?

MR. GARTH: Correct.

MR. FOX: Okay, thank you.

UNIDENTIFIED SPEAKER: But then I thought I heard you say, when Matt Fox asked what level were the -- was the person that analyzed the 2005 data, I thought you said it wasn't so much about level, it was experience with the technology.

MR. GARTH: Sorry, I said I did -- maybe I didn't. But I don't know their level at the time --

UNIDENTIFIED SPEAKER: Okay.

MR. GARTH: -- because I was not involved. But I was told recently that, at the time, that was their experience level with the technology.

UNIDENTIFIED SPEAKER: Okay.

MR. GARTH: Yeah, I don't know what level certification --

UNIDENTIFIED SPEAKER: Going on, I just want to follow up on that, then. Because earlier, Ravi asked if you knew the tool, and you said, no, the tool's really not my thing; that's more Geoff's. And then now you're saying that the analysts had three years, six years experience with that CD technology. That seems like a disconnect to me. Don't you have to understand -- sounds to me like they do have to understand the tools side to do the analysis, but yet you acted like you weren't familiar with the tool side.

MR. GARTH: They're given a general basis of what the tool can do during their training but most of their focus is on how to interpret the data that's provided in the software and how to classify the feature. If you ask an analyst to explain all the limitations about the tool, it would be very difficult for them to do that because that's not their main task. I mean they need to know -- I know a little bit about the tool, but I also have other tools that I manage, as well, or analysis. So there's more people in my group that would know a little bit more about the tool that they work with, but their main focus is understanding analysis and all the principles of that.

UNIDENTIFIED SPEAKER: But when you say an anomaly in the analysis, can't it sometimes be a function of a misfiring transducer, an angle being wrong, or a couplance (ph.) wrong? Don't you have to get into some of the understanding of the tools to be an effective analyst?

MR. GARTH: We have engineering and Center of Excellence to handle that stuff, so if there are issues that are found, that would be, then, communicated from the analyst to, you know, the Center of Excellence to maybe help and explain the situation, but we don't expect the analyst to know why it's happening that way. They need to classify the feature based on the data that's provided to them.

MR. FOREMAN: So Geoff Foreman here. Just to add a little bit to that, because Ravi started going through, which I thought was quite good, the logical process --

UNIDENTIFIED SPEAKER: Yes.

MR. FOREMAN: -- and Clint, kind of, skipped over some of the front end and went straight into the analysis. So when the tool comes out the line, the field technicians verify the quality of the data. It has what we call the flight recorder, just like a black box on an airplane. So we can tell when the tools misfunctioned [sic] or malfunctioned during the run. We can look at the data quality, like we have parameters that are set that would tell us if it's had any issues. And then it goes, as Clint mentioned, to the engineering group or where we do the DQ, we have the data quality assessment where it's transformed from digital tool data, ones and zeros to something that we use in analysis which produces all these lovely scans and screens. And that takes quite the time which -- and in our process would be where you would find out if there was misfiring, misbehaving sensors or whatever. So when it -- by the time the analyst gets it, it's already data quality checked, good to go for analysis.

MR. FOX: This is Matt Fox here. Is there, I guess, a tool check that's done prior to the run and after the run to, basically, check the calibration of the tool and check to -- you know, to a known feature both before and after or one or the other?

MR. CHHATRE: These are questions to Clint or questions --

MR. FOX: Probably --

MR. FOREMAN: That's a better question (indiscernible).

MR. CHHATRE: I just want to make sure, yeah.

MR. FOREMAN: That's a tool question and so --

MR. FOX: Sure.

MR. FOREMAN: So basically, what you've got on the tool is a fixed-frequency sensor. All right? The thing that we're worried about is getting that 45 degree angle right, and, as you know, with water there's refraction, right? So we don't fare (phonetic sp.) at 45 to get 45 in the steel. We actually fare it at a refracted angle to get the 45. That's why it's important to get the attenuation right. So we've had to sample the liquid. So the thing that we would adjust on the tool, if anything -- well, there two things. But the mechanical thing is the angle of the heads to make sure we get that right 45 degrees, which is why we take the sample at the launch site now, as well, to make sure that we haven't set up for a different attenuated fluid. The second thing you set on the tool, really, is, if you think of a guitar, we're picking up the amplification, not hitting the strings, because it's a fixed frequency. So the only other thing we can set on the tool is how much sound do we listen to or store back, a threshold, if you like.

MR. FOX: Okay.

MR. FOREMAN: Which, what we're really worried about there is to make sure that we're not missing anything below one millimeter (indiscernible), and that's the main settings that the tool has. And other than that, the tool is designed to function as it does, and that's why the majority -- so we check at the launch that all of the sensors are responding.

MR. FOX: Okay.

MR. FOREMAN: So that's what we call a commissioning or pre-launch commissioning check. And then, at the end, the process I just already explained with the flight recorder, that tells you exactly how the tools function for the duration of the run. So now you're inside the brain of the tool and you know how it's performed.

MR. FOX: Is there any check of the alignment of the heads when it comes out, you know, that they haven't shifted or changed in some way?

MR. FOREMAN: No, but when -- that's why we go to the DQ. We have a process, because if the angle had changed, then it would be very --

MR. FOX: It would be apparent.

MR. FOREMAN: -- obvious that you were getting nothing back because you need that 45 path.

MR. FOX: Okay.

MR. FOREMAN: Right? So you would either get a lot of blank data or a lot of what we call echo loss.

MR. FOX: Okay.

BY MR. PIERZINA:

Q. This is Bryan. Clint, getting back to you, so the analyst, when they're looking at the data, they're getting or using a wall thickness measurement for the material that they're going through. Is that wall thickness based on sensors from this tool run or is it -- where are you getting the wall thickness that you're using in your report and in your analysis?

A. Right, so the CD tool has, like, a set of wall thickness sensors on it, as well, which is more for sampling the, kind of, nominal wall thickness in that pipe. So that information is then collected, and then when an analyst analyzes the feature, they have, on the right side of the feature, they'll have a bunch of information about the feature. So where the feature is in the pipeline in reference to the (indiscernible) girth weld, what the orientation is. When you get through this list, at the bottom, it will have a calculated depth or an estimated wall thickness -- not depth, sorry. An estimated wall thickness using those sampling wall thickness sensors on the tool. But it doesn't have the redundancy like the CD sensors has. It's more of a -- it's checking, you know, the wall thickness for that pipe, and it, kind of, gives you the nominal wall with all that information of what that wall thickness is at that location.

Q. Okay, and how many sensors are we talking about on that 30 inch tool?

A. Like just literally, I'd have to get back the exact number.

Q. Okay.

MR. FOREMAN: I'll get back to you, but basically there's one at the front and one in the back of every one of the skids.

MR. GARTH: Right.

MR. FOREMAN: So the skid can have 50, and you'll have two wall thickness sensors for a 50 (indiscernible).

MR. PIERZINA: Okay, so we could be talking, probably, maybe, 32 wall thickness sensors for a --

MR. FOREMAN: We'll have to get back to you. I can't remember. On the 30 inch particular -- the specific carrier, I would have to work -- I would have to remember how many actual skids there were.

MR. GARTH: How many skids there is, yeah.

MR. FOREMAN: But I'll get back to you on that.

MR. PIERZINA: But for each skid there is one in the front, one in the back?

MR. FOREMAN: One in the back, yeah.

MR. PIERZINA: Is that right?

MR. FOREMAN: Yeah.

MR. PIERZINA: Okay, and then the -- so the value that the analyst sees at the -- on this box is an average of --

MR. FOREMAN: It's an average size.

MR. PIERZINA: -- all those sensors?

MR. GARTH: For that pipe.

MR. PIERZINA: Okay, is there any QC or QA done to validate those -- that measurement or that calculation?

MR. FOREMAN: Geoff Foreman here. So when we talk about -- when the Project Manager, at the end, sort of looks at it, at the report, from a logical point of view, from, like, not an analytical point of view but from the project point of view, one of the things he checks is to make sure that the questionnaire supplied by Enbridge, which has got the different nominal wall thicknesses that they believe are in the pipeline, correspond to what the tool's actually seen. So if it's in seven millimeter wall pipe, and we're reading 7.2, then we're in seven millimeter pipe. But it's as close as that. It's not a precise measurement to .1 of the millimeter, like we would be doing if it were carrying out a wall measurement, that kind of inspection. It's just are you in the right wall thickness, like you should be in. So it really comes into its own where you step into a pipeline that's got more than one wall thickness.

MR. FOX: Okay, that -- I was going to ask why you even need wall thickness. This is Matt with NTSB. Is that -- and I think you just said the reason.

MR. FOREMAN: Yeah, because it depends on the type of construction of the pipeline but, say, if a river crosses, a road crosses, or whatever it might be, thicker wall pipe in that part of the pipeline, and you would need to know you're in there because, obviously, it's all time of flight that you're measuring so your half skip and your one-half skip would move because it takes longer to get there. Right? So that the software needs to know that you're in different -- in a different wall thickness.

MR. CHHATRE: This is Ravi (indiscernible). So far -- and this question is meant for (indiscernible) the analyst. Which wall thickness they will use when they classify the defects as 24 to -- what (indiscernible) to 35 percent wall thickness and 35, 40, more than 40. Do you take the number given by the operator or the one that you measure in the tool?

MR. GARTH: It would be the value that's measured by the tool that's in the feature area. So -- and that's when you're estimating the depth in a percentage. When you're doing a millimeter bucket, which is what we normally do now, you really don't need that value because you're just giving it a depth in a millimeter bucket. Right?

MR. PIERZINA: So did I hear that changed that you -- clearly, in 2005, it was percentage. Now --

MR. GARTH: Percentage, yeah.

MR. PIERZINA: Now your reporting is an absolute.

MR. GARTH: I wouldn't say it's changed. That option has been made available. But we can still report in percentages, as well. We have some clients that still like percentages.

MR. PIERZINA: So that's something that the customer will ask for?

MR. FOREMAN: Right, but really, it's a calculation because we're working out in the half skip and the one skip, so we calibrate it in millimeter steps, and then you use it in an equation to come up with a percentage. And Enbridge, for one, said, you know, "This just clouds the issue. What's a percentage of what? Give us the millimeter depth if you can because that's something we can work with." And so that's what we've -- that's one of the changes that -- on a standard, we would tend to go on millimeter steps now, but we can still do the percentage wall.

MR. NICHOLSON: This is Matt here. Just trying to understand, you know, maybe a little bit more about exactly what readings go into the wall thickness and into the calculation of the percent thickness and the defect or the indication. So for -- we've got a bunch of sensors and it's traversing this entire joint, 40 foot joint, you know, so how many, I guess, you know, returns would you expect to get for each sensor to -- that would be used in the average -- in averaging the depth?

MR. FOREMAN: Do you want me to answer that first?

MR. GARTH: Okay.

MR. FOREMAN: It's a sample (indiscernible) so it depends on the speed, but basically we're sampling every three millimeters.

MR. NICHOLSON: Okay, so same thing, about three millimeters? Okay, so then there's a fairly large volume of data and if you have some variation as it's going through the pipe, that's essentially going to take the average --

MR. FOREMAN: Yes.

MR. NICHOLSON: -- across all those?

MR. FOREMAN: Yes.

MR. NICHOLSON: And would that include, even, if there's metal loss, you know, or isolated metal loss or is it going to exclude --

MR. FOREMAN: That's a good question, yeah. That's why we take an average because if the pipeline's heavily corroded, it's actually going to influence the readings. But normally, there's enough good pipe to get the average to what the standard stock wall thickness is.

MR. NICHOLSON: Okay, okay. So regardless of, you know, whether, you know, it's low or high or whatever, it's going to take that average?

MR. FOREMAN: It is.

MR. NICHOLSON: For every sensor?

MR. FOREMAN: It is.

MR. NICHOLSON: Okay, all right. And then when we look at, you know, sizing the feature indication, if I understood what you had said earlier, it was going to take the wall thickness around that, in the vicinity of that feature, to determine the percent?

MR. GARTH: There's a box around the reflector, and that box will have information that's collected, and that value of whatever the wall thickness is, is the -- my understanding is the value of the nominal wall for that length of data you're looking at. So the CD data is analyzed viewing about 1.2, 1.3 meters at a time. You can put in one box view, and so that value, my understanding is, it's the value of the whole view, not just the box itself. Right?

MR. NICHOLSON: Okay.

MR. GARTH: So the information is for the whole area.

MR. PIERZINA: This is Bryan. I need to have you repeat that because I thought -- it sounded like you were going to say that the wall thickness sensors are measurements close to that box, but then that's not what you said, right?

MR. GARTH: Yeah, no, my understanding is that value is for the whole pipe that you're viewing at the time.

MR. PIERZINA: Okay, so the value -- whatever the value is for the joint, then that's going to be used for every feature on that -- every box on that pipe joint?

MR. GARTH: That's my understanding, yes.

MR. PIERZINA: Okay, thank you. This is Bryan again. I wanted to get back to what you were talking about as far as amplitudes and depth sizing. It may get off the topic that we were on, so if we want to wait, that's fine, but I'd like to understand a little better the amplitude values that the analyst looks at and the various things that might affect how they size the feature, you know, based on that amplitude. Like, you know, things that affect, you know, some amplitude loss or, you know just -- or is it -- I mean, you know, boom for this value is this depth. Is it that straightforward or is there a certain amount of judgment and interpretation that needs to be done?

MR. GARTH: Is that related to how we do things now or is that how it was done then?

MR. PIERZINA: I would, I guess, first, ask how things were -- would have been done in the 2005 era, if you can speak to that. Or if you can't, I'd settle for how things are done now.

MR. GARTH: Yeah, I can speak for, from a high level, what we do now, when we find a feature and we size it. So with finding a feature and classifying it as a crack-like or a cracked field, what the analyst will do, there's a different process now with the algorithm that's been introduced where, if you have a crack-like, what you will do is every time you see the crack-like, you will put a box around --

UNIDENTIFIED SPEAKER: Did you want to go (indiscernible)?

MR. GARTH: Yeah, okay. You'll put a --

MR. FOREMAN: Just for cheers.

MR. GARTH: Thank you. I'm going to have to erase this.

MR. NICHOLSON: Why don't you erase some stuff?

MR. GARTH: Yeah.

MR. NICHOLSON: Take the (indiscernible).

MR. GARTH: Yeah, why don't (indiscernible).

UNIDENTIFIED SPEAKER: We've done that.

MR. GARTH: Yeah.

UNIDENTIFIED SPEAKER: Do we get Geoff to sign it first?

MR. FOREMAN: No, no, I'll have to charge you.

MR. CHHATRE: The reason (indiscernible) Enbridge at that time.

MR. FOREMAN: (Indiscernible).

UNIDENTIFIED SPEAKER: Yeah, the one (indiscernible) by the white board. I think it will still show up pretty good.

MR. PIERZINA: And like I said, I don't know if we were totally done with the wall thickness type of discussion but --

UNIDENTIFIED SPEAKER: I think we'll be back there.

MR. PIERZINA: Yeah. I didn't.

UNIDENTIFIED SPEAKER: We were not done. I can tell you, I've got more.

MR. PIERZINA: That's fine.

MR. CHHATRE: I would even like to go back to my original --

UNIDENTIFIED SPEAKER: (Indiscernible) process?

MR. CHHATRE: From the beginning (indiscernible) because --

UNIDENTIFIED SPEAKER: No, you're right, Ravi, you had a methodology to what you were --

MR. CHHATRE: Well, at least you know how this all works (indiscernible).

UNIDENTIFIED SPEAKER: So and that's -- I'm fine. I just, kind of, sometimes I forget to ask the question if I don't, you know -- I know, I know. But then I forget what I wrote down.

MR. GARTH: Okay, so, what we do now for crack-likes is we can have -- let's do counterclockwise. We can have a feature. I'll just go with an external feature, perhaps, again. We've got a linear indication here and a half skip, and then here is a clockwise and a counterclockwise, as well. We've going to have a skip and a half. Sorry. We're going to see that same reflector right here. We're going to have on this side -- and this is the clockwise. Let's just say for -- pursuant to consistency, we're going to have the same indication again -- sorry. at skip-and-a-half, we're going to have the same indication. So the analyst has now decided that this is a crack-like based on the rules, right? So now what they will do is, they'll go in and they'll put what we call a frame around this feature. And only the amplitude that is in this box -- these boxes will be used for calculating the depth of the feature. And it's -- they just push a button now after they're done the frame. In the notebook, they can say calculate depth, and then that value is put into the feature. That's for crack-likes. So now, what they would do for cracked fields, which is a little different, is they're going to have -- let's say the same thing.

MR. PIERZINA: Clint, just getting back to the first -- the crack-like, would that upper-right sensor be a counterclockwise? Or no, okay, all right, you've got two counterclockwise, two clockwise.

MR. FOREMAN: Two clockwise.

BY MR. PIERZINA:

Q. Sorry, thank you.

A. So for a cracked field, you're going to have these multiple indications that we've decided is cracked field. And they're going to have it (indiscernible). You're also going to have other sensors that may see other indications that are not related to the cracked field because it's wider indication than just a linear defect. You might have a sensor here, if it's near the long weld, we'd say, where you have your normal weld reflection that we talked about earlier at the half skip. So what the analyst will go in now and do, instead of putting a frame like we did here, around the crack-like, they're going to do an exclusion frame on this sensor. Okay? Because you don't want to include the amplitudes collected by that reflection from the weld cap in your sizing. You only want the amplitudes that are in here. Okay? And you'll have the same thing from the other side. You might have that same reflection of the weld cap here, as well, and you'll exclude that one. And then only the amplitudes in here are the sensors that you still leave in that feature and haven't been excluded are used for the calculation of the depth.

Q. So then, I guess, then -- this is Bryan again. So the question I'd have, getting back to the crack-like feature, so you just -- the way you've described it is, the analyst frames the feature from every -- whatever sensors he can see and pushes a button and gets the depth?

A. Yeah.

Q. The question I would ask, then, can that be repeated by a human being, you know? Can -- you know, so that's a program function --

A. Uh-huh.

Q. -- but could, you know, could a human being reliably take each value, you know, to validate, you know, that you're getting, you know, a reasonable interpretation of what the depth of that feature is?

A. Yes, because you already -- you know you're going to look at it two times on this side, two times on that side, and you know the orientation of the feature. Right? And you can put a mouse on here and make sure that this is the right feature, that it's the same feature seen four times, and then you just need to draw a box around the reflector.

MR. FOREMAN: Forgive me, but what Bryan's talking about was the actual amplitudes.

MR. GARTH: Right.

MR. FOREMAN: So you -- we press a button and it gives a depth based on the mean average of five on crack-like, correct?

MR. GARTH: I'm not totally sure about what the software does when calculating the depth.

MR. FOREMAN: Well, that's the question, was -- can -- what is the calculation or how can it be calculated by a human being? I think the answer is: we don't know. We don't know, but we can find out for you.

MR. GARTH: Yeah, we can find out.

MR. PIERZINA: Okay, yeah.

MR. GARTH: So I guess the answer is that it certainly -- so the manual part of the process is framing the feature and the actual depth calculation is an automated --

MR. FOREMAN: Yes.

MR. GARTH: -- process.

MR. FOREMAN: Today.

MR. PIERZINA: Okay, and then -- so -- and actually the question that I had asked was, what can affect that depth sizing as far as, you know, what things can affect your amplitude values and how can that be accounted for in the, you know, in the sizing of features?

MR. FOREMAN: I'll answer it because I think it's a tool question rather than an analysis question. Because the analysis software does what it does repeatedly. So what you're asking is, what could cause the deviation? So distortion of the sensoring for -- maybe it's gone over a dent or a girth weld. So you're getting a different standoff from the pipe when it's faring the sound in. So therefore, change the angle of your attack and, therefore, your attenuation is the same but your angle would change and that would be an issue or debris, (indiscernible), something on top of the sensor. But other than that, if the attenuation is right and the angle is right, then the repeatability should be there.

UNIDENTIFIED SPEAKER: But I think Bryan was asking what could go wrong in this example, and I could see if he makes the box too small or if the box is too tall --

MR. FOREMAN: Well --

UNIDENTIFIED SPEAKER: -- could you get weird averaging through your algorithm?

MR. FOREMAN: It's not the size of the box, it's the amplitude, the signal inside the box that's generated. So the sizing algorithm is purely based on amplitude. The length measurement doesn't come out of this view; it comes out of the C-scan (phonetic sp.), where you've got the whole feature. Because, remember, you're looking at different bits of the crack. You may not be seeing all of the crack from all of the sensors in these individual -- these are V-scans? C-scans?

MR. GARTH: No, these are V-scans.

MR. FOREMAN: These are V-scans. But in the C-scan, which is the -- where it all overlaps into the picture of the pipeline (indiscernible), that's where the box, the overall length, the width, is taken from. So this is purely for just looking at amplitudes.

MR. NICHOLSON: So then it will take -- this is Matt here. It will take the -- you know, each one of these, you know, boxes of these drawings, you know, it will give -- or he or she -- the analyst has drawn would give, you know, a certain depth value within that, and then the V-scan, you know, the analyst would draw, you know (indiscernible) what the features come off the C-scan, I guess, you know, to get the length. And then each of those V-scan analyses would be accumulated within whatever that box that was drawn on the C-scan.

MR. FOREMAN: Right.

MR. NICHOLSON: To determine the depth of that feature that's determined from the C-scan.

MR. FOREMAN: Right, and the deepest -- therefore, to find the deepest point because the cracks aren't uniform, right?

MR. NICHOLSON: Right.

MR. PIERZINA: And this is Bryan. So and the, Geoff, did I hear you say that on a crack-like feature, it will take the mean of the five strongest amplitudes within that frame and, for a cracked-field feature, it takes just the strongest amplitude?

MR. FOREMAN: Right, that's -- I'm glad you picked that up because that is the major change in the algorithm, the sizing between crack-likes and cracked fields. Cracked fields will not use any averaging and we're also looking -- so that was the point I made before about picking up even the tiniest pixel. That will be one -- that will be just one shot, whereas in the boxes that Clint's identified, there's a number of shots that are taking the average of five. Now, we like to take ten shots to generate a good look, so we're going to -- so the cracks are different, so on the cracked field, if one of those little pixels is a high amplitude, we will use it today, where we didn't in 2005.

MR. GARTH: And just one thing to add about the framing, as well, is when the analyst find this and calls it a crack, they'll put the framing in, right, (indiscernible) calculate. But when it's QC'd again, it's another second set of eyes with experience will validate that the framing is right.

MR. CHHATRE: This is Ravi. So for cracked field, how the depth is assigned? Just one more time.

MR. FOREMAN: So for the cracked fields, the highest single amplitude --

MR. CHHATRE: Now. But I mean in the good old days --

MR. FOREMAN: In the good old days, no, it was the five averaged.

MR. CHHATRE: (Indiscernible).

MR. FOREMAN: It was the same as crack-like today. Right, that was the point I made when we were talking about conservatives in the report and there was no difference in 2005, so from the analyst's point of view, it could have called it a crack-like or a cracked field, but it would still have an overall length and a peak depth of the same volume; whereas, today, if you were given the same set of data, and you had an option of two calls, the conservative call is cracked field because then you would go with deeper depth because of the change in the (indiscernible).

MR. NICHOLSON: This is Matt. Except there was one other key difference. If he said cracked field, you'd also get a longest indication.

MR. FOREMAN: You got the --

MR. NICHOLSON: Longest indication.

MR. FOREMAN: Right, because I think Scott was trying to pertain to that on the difference between a crack-like and a cracked field. So a cracked field is a number of cracks, so it's got a length and a width. A crack-like has a length but no width because it really hasn't got a width.

MR. FOX: Right, right. But then, I guess, another -- this is Matt here, Matt Fox. Another distinction with a cracked field is that there's going to be a determination as to what the longest continuous crack within that cracked field. So could you describe that process and how that is determined?

MR. GARTH: Yeah, just very high level is that if you have a cracked field, you've got one big box around the whole cracked field.

MR. FOX: And that's on the C-scan?

MR. GARTH: It's on the C-scan, right, yeah.

MR. FOREMAN: Yes.

MR. GARTH: So you've got the length and you've got the width dimensions. Then you go on the V-scan and then you have -- you can look and check all those little interlinked cracks or those indications. You can try and measure the length of the longest one that is continuous. Then you'll put that information into the notebook of the feature.

MR. FOX: So the longest indication is determined from the V-scan as opposed to the C-scan?

MR. GARTH: Correct.

MR. FOREMAN: But the overall field is a C-scan because you can't see it in the V-scan. That's the point I was trying to make before. Geoff Foreman.

MR. FOX: Is there a limitation on the maximum length that can be determined from a V-scan?

MR. GARTH: Maximum length?

MR. FOREMAN: What's your maximum frame width? 1.2 meters?

MR. GARTH: Frame length of area length that we will visualize is 1.2 meters.

MR. FOREMAN: 1.2 meters.

MR. FOX: 1.2 meters is the longest length you'll look at in a V-scan?

MR. GARTH: That we will analyze at. We can compress the data, so that's at a compression of one. We can compress down to a highest is, I think, a compression of 20. So that will extend the visualization, if you want to look upstream and downstream to see joints. I don't know the exact number, but it's not 1.3 meters long. You'll be looking at, let's say, 12 meters.

MR. FOX: So is that, basically, in the V-scan, combining the reflectors from multiple sensors at that point?

MR. GARTH: The V-scan is one sensor it's reviewing at a time.

MR. FOX: Okay.

MR. GARTH: The C-scan is doing all the sensors overlapping.

MR. FOX: Okay, so then as it's firing, as it's going through it's -- you're firing that sensor and --

MR. GARTH: Yeah.

MR. FOX: -- then you can get up to 1.2 meters?

MR. GARTH: Yeah, you can visualize that.

MR. FOX: Okay.

MR. GARTH: Or you can visualize more.

MR. FOX: Or you can do more at a compression?

MR. GARTH: Right, but our analysis is done, obviously, in that type of -- the compression of 1.2, right, because it's the -- basically the standard view.

MR. FOX: Okay.

MR. CHHATRE: Did you want to take a five-minute break or --

MR. FOREMAN: That's a good idea, Ravi, because --

MR. GARTH: Yeah.

MR. FOREMAN: -- I'm ready.

MR. NICHOLSON: Let's go off the record. Five minute break.

(Off the record.)

(On the record.)

now. Thank y MR. NICHOLSON: Ravi, do you want to put that on --

BY MR. CHHATRE:

Q. Yeah, we'll go back a little bit to this, you know, thought I had and, for the record, I don't believe we have Clint's formal education and experience, that kind of background.

A. Okay.

Q. Okay?

A. Sure. So prior to PII, 2000, when I started, I worked for a company that inspected rail in Canada and the U.S. The company was called Andrew Jackson. It's based out of U.S. And I worked there for 5 years doing rail inspection using ultrasonics looking for cracks.

And then education-wise I've taken, obviously, grade 12 education and I have a diploma, a ECIT for ultrasonics level 1.

Q. Okay. And just 0, 1, 2, 3, qualifications for the analyst, are you level 3, grade 3, whatever, the right (indiscernible)?

A. I'm not a level 3. I'm a level 2 in EMAT.

Q. Okay.

A. And I used to be a level 2 in CD.

Q. Okay. Thanks. Now, going back to 0 and 1, I think you said every feature identified by grade 0 -- is it grade 1 or level --

A. Level, level 0.

Q. Level, okay.

A. Level.

Q. Yeah, level 0 will be evaluated or reviewed by level 2 or 3?
A. Correct.
Q. Level 1 random -- level 1 is -- what features are reviewed by 2 and 3?
A. Level 1 person's features are reviewed by level 2 or 3. For level 0 and level 1, all reportable features are reviewed.
Q. Okay.
A. The non-reportable features for a level 0, 100 percent check. A level 1 --
Q. Random check.
A. -- is a random check.
Q. Okay.
A. Or a percentage check.
Q. Now, what about level 2 and 3, is their analysis, features, reviewed by anybody or that --
A. Yeah. Sometimes we will have level 2's do the first pass analysis as well, and there is a percentage check of their work as well, which is less than a level 1. Because it's based on the person's level and experience.
Q. Okay. So level 3 really is kind of independent and their work is not checked by anybody. Or there is no level 3?
A. There is a level 3. Very rarely that they actually do first pass analysis.

Q. Okay. How is that -- now, how many different tools is level 1, 2 or 3 analysts look at?
A. We have analysts that are trained and certified in CD technology.
Q. Okay.
A. We do have some other analysts as well that are trained in multiple technologies.
Q. And could you give examples, or --
A. I was an example. I was certified in CD and in EMAT.
Q. Okay.
A. But we tend to keep people in their primary technology, their experience level, in order to be flexible and as well manage the amount of work that we may get.
Q. Okay.
A. Some tools don't have as much work; some do. So, for example, EMAT, I have an EMAT team. We only have one EMAT. So if the tool is not running, we don't have any data, so some of those analysts are cross-trained and CD certified.
Q. Okay. Are the assignments client specified, like certain group of analysts will only look at (indiscernible) inspections, ILI inspections, certain will do some other operator or it's kind of a mix and match as they come?
A. What I have set up for me here now in CD is I've got a team leader in Canada and I've got a team leader in Germany that

I've assigned as my Enbridge people. The resources that -- the people under them can be working on anything.

Q. The other person I have on these different tools, well, let's just focus on crack detection ultrasonic. I'm going back to my previous discussion with Geoff. As an analyst are you familiar with probability detection, identification limits on this ultrasonic tool that you've analyzed?

A. I know that we have specifications for our tools and we have stated PODs and POIs, yes.

Q. Okay. And are the analysts, different levels, familiar with this terminology and what the numbers are?

A. They would have that information because that information is in all the reports, and if they're creating the reports, they would see that there. It's also part of their training to understand it on a basic level.

Q. Okay. And as a supervisor, what does that mean to you, the probability detection and probability of identification on the ultrasonic?

A. My understanding is probability of detection is when the tool detects the indication based on a certain declared percentage.

Q. I don't think I understand what you're saying.

A. You said from a supervisor standpoint how do I understand the POD and POI?

Q. Right. Do you report that in your final report to the client?

A. No.

Q. You don't?

A. No, we don't do that. Sorry.

Q. Okay. Do you know what the limitations are for the -- the specifications are for this tool, ultrasonic for Enbridge?

A. I don't know off the top of my head for sure. I can get you that information. It's in the spec sheets, I believe. I wouldn't want to speculate, but --

Q. Okay.

A. I'll stick with specifically for CD.

Q. Okay.

MR. CHHATRE: If it's a tool question, Geoff, can you tell us?

MR. FOREMAN: Probability of detection, I believe, is 98 percent. Probability of identification is 80 percent. It's around 85. I'll have to check on the PI.

MR. CHHATRE: If you can get back to us?

MR. FOREMAN: Yeah.

MR. CHHATRE: Now, tell me from layman's term for especially the non-technical people, what the probability of identification means 80 percent?

MR. FOREMAN: It means that when we classify a feature, we've sort of classification here between CL, CF and non-reportable.

MR. CHHATRE: Right.

MR. FOREMAN: The number of times we get it correct.

MR. CHHATRE: Okay. So if you see a certain feature is 25 to 40 percent wall --

MR. FOREMAN: That doesn't come into the POD, POI --

MR. CHHATRE: Okay.

MR. FOREMAN: -- because that's depth size. And so that's really around is the sizes --

MR. CHHATRE: Give me an example --

MR. FOREMAN: -- thick.

MR. CHHATRE: Okay. So give me an example of 80 percent, what you are trying to tell me with that spec.

MR. FOREMAN: That if we run over the seam defect 100 times, more than an 80 times we would call it the correct classification.

MR. CHHATRE: Okay. So you identify 80 times. On the same defect, if your tool runs 100 times --

MR. FOREMAN: Yeah.

MR. CHHATRE: -- at minimum you will see that defect 80 times?

MR. FOREMAN: At least, yes.

MR. CHHATRE: Okay. You may see more, but at minimum we are guaranteed we --

MR. FOREMAN: Yes.

MR. CHHATRE: -- that we will see --

MR. PIERZINA: Time out. I think I heard something different.

MR. FOREMAN: No, that's what I said.

MR. PIERZINA: Well, you said you'd see the -- Ravi asked if you'd see the --

MR. FOREMAN: Oh, see it and classify it.

MR. PIERZINA: Right.

MR. FOREMAN: Yes.

MR. PIERZINA: Yeah. The 80 percent is classify --

MR. FOREMAN: Is classification. I'd see it more than 95 times.

MR. CHHATRE: Okay. You'll see it more than --

MR. FOREMAN: Ninety-five times.

MR. CHHATRE: -- 95 times.

MR. FOREMAN: And I will classify it right more than 80 times.

UNIDENTIFIED SPEAKER: And that takes (indiscernible)

MR. CHHATRE: Sure. You're --

MR. FOREMAN: Classifying it --

(Simultaneous conversation.)

MR. CHHATRE: Do you want to say it again? I mean --

MR. FOREMAN: Okay. So, POD is believed detection. That's -- that doesn't take into account classification. That means the tool gets a blip, it sees something. So that's more than 95 times out of 100 it will see something at that location.

MR. CHHATRE: Okay.

MR. NICHOLSON: Something greater than its minimum --

MR. FOREMAN: Reporting specification. That's correct. Something greater than 30 millimeters by 1 or 60 millimeters by 1, depending on what specification.

The number of times I pass it and my analyst tells me it's the correct feature, is more than 80 times.

MR. CHHATRE: And that is classifying it as --

MR. FOREMAN: As the correct -- as a reportable feature saying or was it a non-reportable feature.

MR. CHHATRE: Non-reportable feature, okay. And what is the accuracy between that reportable feature that when you say 2-1/2 to 55, 55 to 40 --

MR. FOREMAN: Now you've got me, Ravi, because on MFL and -- I could give you off the top of my head --

MR. CHHATRE: You can get back to us, but --

MR. FOREMAN: But I'll have to give you what the -- I don't know what the level of -- you're talking about confidence level here -- of the size and accuracy being within the specification.

MR. CHHATRE: Right. Right.

MR. FOREMAN: I couldn't tell you that off the top of me head.

MR. CHHATRE: Okay. If you can back to us with the specs for --

MR. FOREMAN: Right.

MR. CHHATRE: -- Enbridge for 2005 and 2010? I mean, if you want, in the document you can just go ahead and give an example and elaborate, you know, approximate number of times --

MR. FOREMAN: Yeah.

MR. CHHATRE: I mean, anything you can do to clarify it, that's great. That's fine.

MR. FOREMAN: Yeah. I think we went through that last time? Yeah, we did.

MR. CHHATRE: Okay. Now, since you guys have very limited time, I don't want to -- all the time. My other question is do you review reports that go out from your group before it goes to the next step?

MR. GARTH: I do not, no. Our team is (indiscernible).

MR. CHHATRE: Okay. And the (indiscernible) are level 3 or they are different features?

MR. GARTH: Yeah, they're level 3.

MR. CHHATRE: On the tool side, Geoff, what kind of cleanliness you need to do the ILI?

MR. FOREMAN: Ravi, you've just asked the $100 million question. When is a pipeline clean enough to be inspected? When you can get a good inspection without impairing the inspection tool. I would say the only way you really know is when you've completed the inspection and you've looked at the data. And if you no echo loss due to debris, then that was good. If you have got impaired detection because you're talking about detection mainly, because of debris -- and that could be like on the bottom of the pipe; it could just covering the sensors -- then that would associate not being clean enough for 100 percent inspection. But that means that the areas that you do see is inspected but you could actually isolate areas that were degraded due to debris.

MR. CHHATRE: Before you start your ILI run, is there a requirement you can (indiscernible) to the operator?

MR. FOREMAN: Yes. We ask the operator -- and in this case, in Enbridge's case, they clean -- it's their responsibility to clean the pipeline as to the best of their ability before we run the inspection tool.

MR. CHHATRE: Okay. And do you require them to pass a cleaning pig?

MR. FOREMAN: Yes.

MR. CHHATRE: As a requirement?

MR. FOREMAN: Yes.

MR. CHHATRE: Okay. And do you inspect the pipe at the launch valve and receive out if it's meeting at least at those two locations, meet requirements?

MR. FOREMAN: We normally officially give the report from passing the launch valve to passing the receive valve. The two accounts (indiscernible) prior to that, as soon as it (indiscernible), but essentially the report starts officially at the center line of the launch valve and the center line of the receive valve.

MR. CHHATRE: And what kind of impact the debris may have in your classification of the defects? I mean, you still may see the defect --

MR. FOREMAN: Right.

MR. CHHATRE: -- depending on what the debris. You know, does that impact --

MR. FOREMAN: It's a very hard question. It's a very hard question to answer, Ravi, because you'd have to specifically know it was there and it's masking, because you can't see what you can't see. So it's a very hard question to answer that. But we do -- we can see evidence of debris. So if we're going along a pipeline, as I mentioned before -- I'm going to (indiscernible) on echo loss. So it appears green in the data. That means the sounds not coming back. So if there's something stopping that sound from getting from the sensor back to the sensor, then we won't get any data. So we can tell quite immediately if we're being blinded by debris.

MR. CHHATRE: So then that data when you retrieve your pig and unload the --

MR. FOREMAN: That's part of the DQ. We have processes to -- is to specify what percentage of the pipe has been degraded due to echo loss or --

MR. CHHATRE: So degraded data will not go to the (indiscernible)?

MR. FOREMAN: It'll depend. And if the amount of degradation is substantial, then it would be classed as a failed run. If it's intermittent or if it's -- if we didn't believe the specification would be impaired by the -- by what we see, then it would go ahead to analysis, but we would inform the customer. If we think there's areas, so -- so, for instance, if you had a low spot in the pipeline, for instance, and you had some debris accumulated and you've got like 100 kilometers and you've got 500 meters of bad inspection, we would inform the operator that we can give a good inspection to here and a good inspection from here, but in this area it would be out of specification. And that's what we call a degraded run. And it would be on the operator's decision, whether they would want to accept that or not or run again.

MR. CHHATRE: Now, when the -- (indiscernible) the semi-contaminated or degraded data then goes to analyst, are they aware that this data is --

MR. FOREMAN: Yes. Yes, they are, and they'll flag it up themselves also. Because when the -- when they do their first pass through the data at the DQ end, they will -- they would go to

Clint or back to engineering group if they felt they were seeing something that DQE should have picked up, if they're not comfortable with the data.

MR. CHHATRE: And will that be identified in your final report to the client?

MR. FOREMAN: It would either decide whether we continue with the report or we've got to go straight to the client and say this is -- we have issues. And if the client is aware of the issues, then we will detail in the Word document the areas where we're not comfortable --

MR. CHHATRE: And the questions are handled to somebody else, but who tell (indiscernible)? Was that a situation in the ruptured pipe? If you do not know, can you double check that and get back to us?

MR. FOREMAN: I'll get back to you because I do not know what the DQE -- I've seen the DQE documentation. I didn't see anything that would flag, but I'll go back and double check.

MR. CHHATRE: Okay. We may have a continue on the phone on some other day.

MR. FOREMAN: Yeah. I'm sure we will --

MR. NICHOLSON: Yeah, we talked about doing a conference, another follow-up.

MR. CHHATRE: Okay. Can we continue -- I mean off the record.

(Off the record.)

(On the record.)

MR. NICHOLSON: Back on the record.

MR. CHHATRE: Go ahead.

MR. PIERZINA: Real quickly, getting back to the wall thickness for the failed joint at Marshall on Line 6B. It was reported by PII as .285-inch wall thickness and the nominal pipe wall thickness was 250 wall. I'm curious whether -- and it's open to you, Geoff; or you, Clint -- has anyone gone back to validate where the .285-inch wall thickness came from and whether that was a valid number for that pipe joint?

MR. FOREMAN: Well, we see the millimeters. We see the 7.22.

MR. GARTH: 7.25 in the data.

MR. FOREMAN: 7.25 millimeters is what we saw in the data using the random sensors.

MR. PIERZINA: That's a wall thickness average?

MR. FOREMAN: That's a nominal wall -- that was a nominal wall that was used for the percentage depths.

MR. PIERZINA: Using random sensors?

MR. FOREMAN: Using the wall thickness sensors on the tool.

MR. PIERZINA: Oh, okay. And I'll --

UNIDENTIFIED SPEAKER: They converted to 285.

MR. PIERZINA: That does convert to 285.

UNIDENTIFIED SPEAKER: Someone just did it.

MR. FOREMAN: It's nice to have somebody that --

UNIDENTIFIED SPEAKER: Oh, yeah.

MR. PIERZINA: Okay. And I guess if -- you know, so that pipe joints been removed from service and inspected and evaluated and I don't know of anything that's been indentified outside of the longitudinal seam that represents that wall thickness. So, I guess I'd open it to Matt Fox if you've seen anything approaching that?

MR. FOX: I'd have to review my data.

MR. PIERZINA: Okay.

MR. CHHATRE: Anything else?

MR. PIERZINA: Yeah. I guess, there was one indication that had been profiled at the time of the 2005 analysis and then I think they were profiled again later after the accident. Could you describe the crack profiling process? And if you know how it was done at the time, you know, in 2005 or, if not, what's done now?

MR. GARTH: I don't have that much instant detail on the crack profiling. I know that we do crack profiling for crack-like indications or linear indications, and we do, for crack fields, we do a crack field statistics.

MR. PIERZINA: Okay.

MR. GARTH: But I don't know -- it's the software that, you know, creates it and stuff so it's not something I have all the intimate detail on.

MR. FOREMAN: Could I be permitted to assist here with a diagram? I think --

MR. NICHOLSON: Please. Please, yeah.

MR. FOREMAN: -- it's probably the easiest way. Because I can see everybody getting glazed over here. So, a crack -- well, looking -- we're splitting the pipe down the middle. Okay. So this is --

MR. PIERZINA: So, we're looking at depth?

MR. FOREMAN: We're looking at depth. This is the wall thickness here. So for single cracks, because the tool is sampling every 3 millimeters, so we can build up a profile of what the crack shape is and we -- but we tend to normalize it a little bit. We'll end up with a representative crack profile. I would say that's what we would -- let's go with that. That's what we would say it would be. But if the crack's quite irregular. Say that it's got a little bit of a irregular depth, then you can see a crack profile -- and it looks a bit boxy because its depth changes. So it might look something like this. It's not perfect. Well, actually, (indiscernible) weld. But it might look something like this. To try and identify where the deepest part of the cracks are. Now, (indiscernible) to try and work to manufacture the (indiscernible) on what the rupture pressure would be for it. Now, that's on single cracks, right? And we're looking -- we're building that up by looking at both sides through everything we've talked about here.

But on crack fields, because you've got multiple cracks in width that are basically SCC, then we can't produce this profile because the depths are not uniform. It's not just one depth. It would be a mess. So what the operators want to know is what is the interaction that would cause a rupture. So you would -- the crack field statistic that we produce looks like this. And basically, what we've done is we've attempted to map the SCC. So, just purely in (indiscernible) positions, that's what we provide. There is -- the next step would be a fracture mechanics where you would apply, say, the (indiscernible) interaction rules and then decide if this SCC field was to rupture, which ones -- which path would it take through this field. And there is a rule that SEPA came up with on how close these features should be together on and then in depth. Sorry, and the width. That we -- actually, we're doing some (indiscernible) tests that prove that the SEPA interaction was pretty good and we would, as a company, recommend using them.

So that's the difference. So we can't do the profile, but we do this crack field statistic as we call it.

MR. CHHATRE: But you do depth?

MR. FOREMAN: The depths, yes. But the -- when we do the depth, it's, again, as I said before, it's the deepest one over the field.

MR. CHHATRE: Right.

MR. FOREMAN: We can't -- well, we can map the position of the cracks; we can't map the depths. If we could, we could do a fantastic profile of everyone and it would be like -- we're not there yet.

MR. NICHOLSON: This is Matt with NTSB. I just want to point out this is all post-Marshall or, I'm sorry, post-2005?

MR. FOREMAN: Yes.

MR. NICHOLSON: This is all new?

MR. FOREMAN: Yes.

MR. NICHOLSON: The SEPA report is like 2007.

MR. FOREMAN: Yes. Yes. This is today. This is what we do today as treating them differently.

MR. NICHOLSON: And then --

MR. FOREMAN: Between the profiles and crack fields.

MR. NICHOLSON: I think Clint was hinting at that this is an automated process now, the profiling, where it's making this elliptical curve.

MR. GARTH: Yeah. So, like I said, the frames will be put in by the analyst that are crack-like, right, and then the profiles are made, like generated up through the software.

MR. NICHOLSON: And you were asked, but I can't remember your answer. 2005, were they generating these manually?

MR. GARTH: I'm not sure. I wasn't in charge. But that's what we do now.

MR. PIERZINA: This is Brian. And this question would be for either Geoff or Clint. Do your clients have available to them something to analyze the tool results on their own?

MR. GARTH: Yes. Like Primus?

MR. FOREMAN: They can't analyze it though. They can visualize but --

MR. GARTH: Visualize.

MR. FOREMAN: -- but they can't analyze.

MR. GARTH: Yeah, visualize.

MR. FOREMAN: There's a difference, there's a difference between the two.

MR. GARTH: Our standard deliverable is to give a client version of the data for them to visualize.

MR. PIERZINA: Okay.

MR. FOREMAN: So they can see B scans and C scans of the final feature set.

MR. NICHOLSON: And I can draw boxes around --

MR. FOREMAN: No, you can't. That's --

MR. GARTH: No, you can't change it.

MR. FOREMAN: Because that becomes analyzing rather than visualizing.

MR. GARTH: Right.

MR. NICHOLSON: Well, no, I --

MR. FOREMAN: And then why would you need our analysis group? And why (indiscernible) the IP, right, where we -- we don't want people necessarily to do their own analysis because it's very important that the analysts are certified and controlled and tested and then you get, you know, every Tom, Dick and Harry sending you an analyst and then we can't control it.

MR. PIERZINA: So then to follow that up, your clients have a visual that they -- a version of the data to visualize features, but in order to further evaluate specific features, they need to get with -- who do they interact with then at that point?

MR. GARTH: They'll contact us and our team leader or an experienced analyst will have a call with them or review a picture with them.

MR. PIERZINA: And is that where you talked about like a desk-side engineer or something like --

MR. FOREMAN: With the desk -- the Enbridge desk engineer is the specific point of contact for integrity issues and reports.

MR. PIERZINA: Okay.

MR. FOREMAN: So that -- in our organization from just purely the CD -- so we've got to be careful between stepping between boundaries between consultants and CD. So to the CD contract -- you know, as long as Enbridge are happy that the report has the right lengths and depths and the features, okay, that ends there.

If Enbridge were to come to us and say, we want to do a post-inspection crack assessment or we want to do some further work, then that would become a consultancy that we can provide from a set of engineers. That's different, right? So there's a kind of demarcation between what's contractual and what's consultancy.

MR. PIERZINA: Okay. It comes to a failure investigation, is that consultancy or is that -- go back into the contract?

MR. FOREMAN: Well, that -- can you -- well, you have to be a bit more specific on that one.

MR. PIERZINA: All right. Well, let's say -- all right, let's go specifically to a different pipeline, a different tool run.

MR. FOREMAN: Right.

MR. PIERZINA: A failure in January of 2010 on a 26-inch pipeline, does that review -- you know, as the client is reviewing that failure with you, does that -- is that part of the tool run contract or is that something outside of that?

MR. FOREMAN: No, it's -- if that was the case and there was questions about the inspection, then it would be part of the tool run contract and we would work with the operator and PHMSA or NEB, whoever, to understand that would cause (indiscernible) what corrective actions could we take.

MR. PIERZINA: Thank you.

MR. JOHNSON: This is Jay. And I'm going to have to leave here. What I think I'll do is our -- yesterday there seemed to be a fair amount of questions I'll say from the PHMSA and the NTSB, both sides, where we got the 285 wall thickness number, and then if you're doing calculations on crack depth, is it a percentage? So, my -- the impression I was getting is that if you've got a crack depth and you're doing it and the wall thickness is incorrect, how -- you know, jump in here, Brian, because I know that was a -- it's a big concern. You know, how do we normalize that when your data says 285. We believe it's 250. And if you've got a crack that's a percentage of that --

MR. FOREMAN: Then go away from the percentages. The percentages are such --

MR. JOHNSON: Just -- I don't understand it. If you could explain it to me (indiscernible)?

MR. FOREMAN: Right. Right. Well, that's why we're going with millimeter actual depths now. Because the confusion that ends up around whether it should be a 25 percent defect or a 26 percent defect, or a 24 percent defect, it's much easier to just say what is the actual millimeter size of the feature? Which is what we do today. Because there's so much confusion about the depth percentage. So, if we were to, you know, calculate the actual depth of the feature -- and I think we did today -- it was 2.5 millimeters at the deepest point.

MR. JOHNSON: But the report in 2005 gave what?

MR. FOREMAN: It gave it 25 -- 12-1/2 to 25 percent wall thickness.

MR. JOHNSON: So of the 285 are there --

MR. FOREMAN: So if 2.3 millimeters today, in today's money, based on 7.25, which is the same figure we used in 2005, will be a 30 percent defect. That's applying the new rules as well where take the deepest pixel. We would -- if we were to do that today, it would be a crack field with a maximum depth of 2.3 millimeters. I think, if I'm correct, in 2005, it was a crack-like with a 1.6 millimeter depth.

MR. PIERZINA: And -- this is Brian. And that's based on an average of the five --

MR. FOREMAN: Yes.

MR. PIERZINA: -- (indiscernible)?

MR. FOREMAN: That's the difference between the announcement of the algorithm of depth based on characterizing as a crack field.

MR. PIERZINA: So if it's today and it's classified as a crack-like feature, it's still 1.6 millimeters?

MR. FOREMAN: It is.

MR. PIERZINA: But if it's a crack field, it's 2.3 millimeters?

MR. FOREMAN: Well, this particular one, because again, you know, there's no rule it's going to be X percent or X times bigger. It really depends on the real amplitudes that we see.

MR. JOHNSON: So with that, and I know Brian and Ravi and Matt are -- you're going to run some of those numbers this afternoon, flaw?

MR. CHHATRE: I think that's what we decided to do, right?

MR. JOHNSON: Yes. And they're pulling the numbers together for you. So, I just -- and Scott's going to be there. And I just -- that seems to be quite an area -- I don't want to say confusion, but concern. I just want to make sure -- you know, I don't pretend to understand it, but I wanted to make sure that we got their take on that, we go into this afternoon and look at those numbers before we -- because you're basically taking the -- what I saw you doing yesterday was you're taking some of the crack depth and running it at a 250 wall thickness through some of that flaw software.

MR. PIERZINA: Okay. Yup.

MR. JOHNSON: So that's where I'm at. I'm trying to make sure --

MR. FOREMAN: Right.

MR. JOHNSON: -- and then try to get Scott up to speed, as they run these numbers I want to make sure that we have your -- everyone's on the same page is what I want to make sure we are.

MR. FOREMAN: Yup. Yup. And the only thing that I would add is, and that we mentioned -- we mentioned the crack fields. We mentioned the crack-like indications that were in there as well, and then the presence of the external corrosion over the top, or the cracks are in or appear to be in corrosion, doesn't give us a perfect picture. Because as we mentioned before, corrosion can scatter the sound. So you're not working on beautiful perfect pipe with a crack field in it. And really, the contour of the corrosion, whether it's steep-sided corrosion, whether it's nice smooth corrosion, it all depends about making that corner effect. That's where we're getting our sound back from, the corner effect. So sometimes we -- and I just want to -- because I don't want to (indiscernible) or he's call me because I'm going to start giving you stuff that I shouldn't be giving you. But I think you can ask me anyways why did we stop calling things metal loss today compared to before? And one of the reasons we did that was that we were reporting metal loss and a lot of operators were upset because we would go into a joint to look for some real defects and then find very low level SCC that we called metal loss. And the reason for that is the scatter. Like the very (indiscernible) sketch that Clint put on, you know, if we were to choose the real data, which hopefully we will do on the WebEx, of what a corrosion cloud looks like versus very low level SCC, because it's less than 1 millimeter. It's less than -- then it looks very similar. So what we decided to do as one of the step changes in the analysis process, was to -- we will stop calling metal loss. And if it's deeper than half a millimeter, we'll call it as a crack field. And the reason for the half millimeter is the tool minimum spec is 1 millimeter plus or minus half a millimeter. So it said it doesn't exist, so it would be silly to be less, or it's 1 millimeter. So we decided internally that we would only give features that were greater than half a millimeter and that were in the metal loss area as crack fields. Now, that puts our POI down, but it's on the conservative side. And most operators have said they run a grinder over that -- those areas and they vanish. But some operators want to know where the onset of SCC is so we leave it in.

Now, for reinspections, where we're inspecting for the second time, our POI goes up because we're looking at defects that may have been borderline. We've put -- classified them in one book or another. If it was, as Cliff said, undecidable or irrelevant, and we've included it as a crack-like to be on the conservative side, and it hasn't changed after 5 years or 3 years or 10 years, whenever the reinspection, that would help increase your confidence level that it's inert, that it's definitely irrelevant. Vice versa the other way, if it starts to grow or if something appears to have depth, we go back to all of the old data and compare. So if it was an irrelevant there, that now has depth and we're sure it's a crack, we'd say, uh-uh, it was a very low level crack which is now a crack. So our POI goes up on reinspection because we do compare from the previous run data.

So I just wanted to sort of just put that out there on the processes now were changed. So, we don't call it metal -- but if there had been a feature there, Scott's got a problem if we give him a lot of features that all of a sudden vanish. Like this pipeline's now healed. So we've added a column called information feature. That basically means there was something in the previous report, it's not there now, but it's not relevant. See? So that his people don't go, Jesus Christ, every time I run the pig, the pipeline heals. You know, this is great, we'll just keep running the pig.

So, that's -- I just wanted to try and level out -- because I think the question was asked in a kind of pointed way before what were the changes and I just wanted to make sure that we captured all the changes.

MR. PIERZINA: Right. No, I appreciate that.

MR. CHHATRE: Well, you know that -- this is very hard for (indiscernible) getting information from experts --

MR. FOREMAN: Right. Right.

MR. CHHATRE: -- which we don't have. Some questions we ask the way we ask because we don't understand the subject matter, right?

MR. FOREMAN: I'm just trying to preempt lots of phone calls here.

MR. CHHATRE: Oh.

MR. FOREMAN: Christmas is coming.

MR. CHHATRE: That's (indiscernible) we don't have.

(Laughter)

MR. JOHNSON: And that's why I want to get (indiscernible) because -- to make sure that Scott has the data from you and they have the understanding from you as we run some of those things this afternoon with Scott. So if you've got any questions in that, by all means.

MR. NICHOLSON: Well, I do.

UNIDENTIFIED SPEAKER: : I just want to clarify just to make sure I got it straight, because we're -- you know, if we're going to run data this afternoon there is no point in running it if we don't know exactly what we're running. So if we had a depth feature that was sized and within a bin up to 25 percent --

MR. FOREMAN: That's right.

UNIDENTIFIED SPEAKER: And that was based on a wall thickness of .285 inch?

MR. FOREMAN: Yes.

UNIDENTIFIED SPEAKER: And so -- so, if we look at that max depth, that's relative to the 285, so we'd be running, you know, 25 percent of 285 at our max depth from that date? Okay. Now, if we look at, you know, a after-the-fact profiling of this stuff, if we analyze that crack as -- or that indication as a crack-like feature, the depth would have been profiled at 1.6?

UNIDENTIFIED SPEAKER: No.

MR. PIERZINA: Yes.

UNIDENTIFIED SPEAKER: The maximum depth?

UNIDENTIFIED SPEAKER: 1.6 millimeters.

MR. FOREMAN: In the 2005 mode, not in today's mode.
MR. FOX: Right. Right.
MR. FOREMAN: Today's mode was 2.3.
MR. CHHATRE: 2.3, okay, that's like --
MR. FOX: But that has a crack, analyzing as a crack --
MR. FOREMAN: As a crack field.
MR. FOX: Crack field.
MR. FOREMAN: Right. Over the full length.
MR. FOX: Right. Over the full length of 51 --
MR. FOREMAN: Fifty-one inches, yeah.
MR. FOX: -- .6?
MR. FOREMAN: Yeah.
MR. FOX: Okay. Okay.
MR. NICHOLSON: I heard 1.6. I'm not sure what that number was, but 1.3 was the depth?
MR. GARTH: That was crack, that was crack-like.
MR. FOREMAN: The crack-like indication depth.
MR. NICHOLSON: Oh, okay.
MR. FOREMAN: The actual depth in the 12-1/2 to 25 percent bucket, was actually 1.6 millimeters, whatever that --
MR. NICHOLSON: Okay. Crack-like.
MR. FOREMAN: -- turns out as a percentage of that. It was 23 percent. I forget what it is or whatever it is. But it would be re-sized now under the new rule at about 30 percent. So it would put it in the 25 to 40 percent bucket. I hate the

buckets because there's such a big tolerance, but it would 2.3 millimeters. Plus or minus a half of millimeter. So it could be 2.8; it could be 1.7.

MR. GARTH: No. The tolerance is half a millimeter on the bucket on the --

MR. FOREMAN: Oh, on the bucket. So no -- on the bucket.

MR. NICHOLSON: The tolerance is on the bucket.

MR. FOREMAN: On the bucket.

MR. FOX: Not on the outside depth. So in other words, the mean of the five strongest amplitudes resulted in a depth 1.6 millimeters, but the strongest amplitude resulted in a depth of 2.3 millimeters?

MR. FOREMAN: And that's one tiny single pixel.

MR. FOX: And that includes a correction factor, too, the 2.3?

MR. FOREMAN: Yeah, we weren't aware that the software is set to the --

MR. FOX: So the strongest amplitude plus a correction factor?

MR. GARTH: Right. From a (indiscernible) and a half sensor.

MR. JOHNSON: So is that what we were running yesterday with Aaron?

MR. FOX: No.

MR. JOHNSON: I don't think so.

UNIDENTIFIED SPEAKER: No.

MR. NICHOLSON: No, we did with bias, because we were .07 without and then we did bias and we were 2 plus.

MR. FOX: Right.

MR. JOHNSON: So I was (indiscernible) and then I just wanted to make sure we we're running the right numbers.

MR. FOX: Well, we'll do -- yup, we should be running the -- well, we're running the 1.6.

MR. PIERZINA: I think we've got the information we need to run the calculations.

MR. JOHNSON: So, okay. Well, good. Like I say, I didn't -- I can't say I know it. I just know that people here did.

MR. FOX: I guess the only other question I would have as far as that depth, is there any effect from the, I guess, analysis data that if the actual wall thickness is, you know, a quarter inch, .25, and the total thickness that's being reported during this profiling is .285 based on the average across the whole joint, would that affect that number at all, the result --

MR. JOHNSON: I don't believe so, no. But you can answer that.

MR. GARTH: No, I -- can you say that again? I got confused --

MR. FOX: I guess is the actual thickness -- if the thickness at that particular location is different than the thickness that's reported across, the average across the entire joint, is that going to affect that, 2.3 or 1.6, reading off of that particular indication?

MR. FOREMAN: Oh, you can answer. I was going to clarify the question. 2.85 versus 2.5. So 75 --

MR. GARTH: No, .285.

MR. FOREMAN: .285.

MR. GARTH: .25.

MR. FOREMAN: Right.

MR. GARTH: So we used .285 because that's what was in the feature area information.

MR. FOREMAN: Right.

MR. GARTH: They're saying in the field it was verified to be .25.

MR. JOHNSON: Right. But now we don't know yet, Matt?

MR. FOX: That's ball park.

MR. GARTH: So if we had that measurement of .250 when we sized the defect, then that's going to change the percentage.

MR. FOX: It would change the percentage but it doesn't --

MR. FOREMAN: But it doesn't absolute value.

MR. FOX: -- change the absolute value of the --

MR. GARTH: No, it does not.

MR. FOREMAN: Which is one of the reasons why we want to go actual depth.

MR. FOX: Yeah.

MR. GARTH: Yeah, why introduce --

MR. FOX: Another error --

MR. CHHATRE: I know you're packing up.

MR. GARTH: I apologize to you guys, but we got to stop.

MR. CHHATRE: Now, (indiscernible) there, you are more than welcome to join the afternoon session. I just want to offer that. Not that you have to, but --

MR. FOREMAN: Yeah, but I'll be leaving him walking home, so -- I appreciate the offer and I'll --

MR. NICHOLSON: Okay. Let's end the interview you, guys, for coming out and talking to us. I appreciate it.

(Whereupon, the interview was concluded.)

CERTIFICATE

This is to certify that the attached proceeding before the

NATIONAL TRANSPORTATION SAFETY BOARD

IN THE MATTER OF:	ENBRIDGE - LINE 6B RUPTURE IN MARSHALL, MICHIGAN Interview of Clint Garth/Geoff Foreman
DOCKET NUMBER:	DCA-10-MP-007
PLACE:	Edmonton, Alberta, Canada
DATE:	December 9th, 2011

was held according to the record, and that this is the original, complete, true and accurate transcript which has been compared to the recording.

____
Valerie R. Baxter
Transcriber

Page 9

8 A. So a C scan is the ~~unruled~~ unrolled map view of the pipeline

Page 21

3 whatever the amplitude is at the half ~~scale~~skip. So all the sensors

Page 22

11 MR. GARTH: In most cases, it would be deep~~--~~er

Page 23

17 as the ND~~U~~E reports came back, then you would take that and go into

Page 26

8 the right side, we have got the half skip, full skip, skip and a half~~ skip~~,

9 ~~full --~~second skip, where we have the external at the half skip.

25 but it's more of a ~~gauge~~gouge, more flat, straight. And so, we would

Page 31

19 MR. GARTH: So the full ~~scale~~ skip being the internal

23 surface. So a 39dB at the half ~~scale~~skip, and then again at the full
24 ~~scale~~skip?

Page 45

20 they need to go into the ~~V~~B-scan (phonetic sp.) and look at all the

Page 49

18 standard of the -- sorry, the – ANSI/ASNT ILIPQ-2005 In-Line Inspection Personnel Qualification and Certification

25 of -- is it, ANSI/ASNT ILIPQ-2005 In-Line Inspection Personnel Qualification and Certification~~PLQ 2005~~, we have to have certifications, and anyone

Page 50

2 or supervised. So we check 100 percent of all of our Level Zero's work with a Level 2.~~'s~~
3~~ work~~.

Page 84

Line 21 on page 4 until line 9 of page 86 is referring to my knowledge of what happened for another failure other than Line 6B. All this information in these pages is not related to Line 6B, which is what the original question was about. We have not carried out what is described in my testimony for Line 6B.

Page 85

20 individual in Germany who's in charge of this ~~heart~~ part of our process

Page 87

21 do and understanding of it. I'm ESCD technology.

Page 92

4 MR. GARTH: 2005 document. Came out from the ANSI/ASNT~~AMSE~~.

Page 98

14 of, gives you the ~~nominal wall~~value of with all that information of what
15 ~~that wall thickness~~the most measured value is ~~at that location~~for that pipe joint from girth weld to girth weld.

Page 111

12 MR. GARTH: No, these are ~~V~~B-scans.

Page 114

18 width dimensions. Then you go on the ~~V~~B-scan and then you have –

Page 114

8 company was called ~~Andrew~~ Pandrol Jackson. It's based out of U.S. And I

12 education and I have a diploma, a ~~ECIT~~ BCIT for ultrasonics level 1.

Page 119

16 example, EMAT, I have an EMAT team. We only have one EMAT tool. So if

Page 135

4 MR. GARTH: Yes. Like Primus Client?

book or another. If it was, as ~~Cliff~~ Clint said, undecidable or

GEOFF FOREMAN'S CORRECTIONS TO THE INTERVIEW HELD ON DECEMBER 9TH 2011, IN EDMONTON ON ENBRIDGE LINE 6B RUPTURE IN MARSHALL MICHIGAN

Page 6 PII	16	I'm the Growth ~~g~~growth and ~~structure~~ Strategy ~~(indiscernible)~~ leader for GE
Page 9	8	A. So a C scan is the ~~unruled~~ unrolled map view of the pipeline
Page 16	25	then ~~disappear~~ dissipate and reflect at another 45 degrees into the inside
Page 17	1	of the pipe. Now, that energy is ~~disappearing~~ dissipating all the time, okay.
	4	one half skip, so there's redundancy in the ~~senses.~~sensors
	6	we have a certain sized ~~nogrin (indiscernible)~~ algorithm for the half skip
	9	So we -- and you also understand that this is ~~disappearing~~dissipating. It
	17	between one and two ~~units (indiscernible)~~meters per second, you only get
	18	so many looks at it, even though the sound is traveling extremely
Page 18	3	fields, we add dBs to allow for any sound that has ~~disappeared,~~dissipated
Page 21	3	whatever the amplitude is at the half ~~scale~~skip. So all the sensors
Page 25	6	because of the ~~cross~~ close proximities of the cracks, you could possibly
	12	reflector a ~~superior~~ spurious reflector. But we would rather include that,
Page 26	25	but it's more of a ~~gauge~~gouge, more flat, straight. And so, we would
Page 34	15	and explanation about the ~~track~~ crack like ~~(indiscernible).~~ Can that be
Page 36	10	If this crack, right, is ~~longer~~ deeper than 3 millimeters, the reason why
Page 38	8	~~kid~~ skid will see it, and then the next ~~kid~~ skid coming up will start to see
	13	it might just be ~~(indiscernible)~~spurious reflections or we want to see the
crack as		
Page 42	15	going to see it with multiple ~~features~~sensors, clockwise and
	21	internal services. So actually, on internal ~~services~~reflections, such as
Page 45	20	they need to go into the ~~V~~B-scan (phonetic sp.) and look at all the
Page 47	5	amplitude reflections from just the ~~well~~ weldcap itself because you
	7	hitting the external or the internal ~~well~~ weld cap. It will return a
Page 49	8	whom in ~~GE~~PII?
	16	Zeros will ~~check~~ carry out the first pass analysis and then their work will

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Page 50	12	MR. FOREMAN: This is in line with the ~~EPI.~~AP
Page 57	17	like, in the ~~tow (phonetic sp.)~~toe of the weld for, like, a D-saw
Page 58	2	going to say it's like this. If you've got a ~~tow~~ toe crack on the tow toe
Page 61	3	same indication from this ~~well~~ weldcap, from this side. This is where
	5	~~well~~ weld cap would be from the sensor, maybe. You can see it, as
Page 62	8	MR. GARTH: Exactly. So this ~~well~~ weld could also – this
	10	just getting -- all the energy ~~it's turning~~is returning -- trying to send it
Page 63	17	have been a reportable feature, say a ~~crack, like~~ crack like or a ~~cracked field~~crack field.
Page 66	3	feature is something that needs to be fed back to ~~-- at the~~ A
	10	A. They ~~really --~~ rarely misclassify
	16	tolerance on our sizing, it really depends on the unity ~~of~~ plot for the
Page 71	22	way of doing external ~~corrosion~~ cracking. Then there's all the ultrasonic
Page 73	7	the same process that Clint mentioned about the ~~missed~~ misclassification feature.
Page 76	3	algorithm, on crack~~ed~~ fields
	24	getting dig data over crack~~ed~~ fields and how to discriminate them
	25	between crack-likes and crack~~ed~~ fields. And then when that is
Page 77	2	Like Geoff says, we were underestimating crack~~ed~~ fields, and so
Page 79	8	little more understanding of if you have a crack~~ed~~ field that has
	10	would be obvious that it's a crack~~ed~~ field, but if it's – the
	22	a half an inch, this could still be a crack~~ed~~ field, as could
	25	challenge to discriminate between a crack-like and a crack~~ed~~
Page 80	4	an intermittent? You can have a crack~~ed~~ field of a single crack
	8	that's the hardest one. Is that a single crack or a ~~cracked~~ crack
	9	field? Because there's different types of SCC right?
	25	crack~~ed~~ field, and then, beside it, what kind of characteristics
Page 81	5	has this, this and this, it's a crack~~ed~~ field. But I don't know
	11	call this a crack~~ed~~ field over crack-like?
Page 82	21	difference how we would report the crack~~ed~~ field or a crack-like

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Page 83	1	crack~~ed~~ field or we could call it cracked field with ~~tool~~ toe cracks
	3	field with ~~tool~~ toe cracks in it. So we would probably call it a
	6	MR. FOREMAN: ~~Tool~~toe. Sorry, that's my accent.
	8	MR. FOREMAN: It's a ~~tool~~ toe crack. So it's a strong linear
Page 84	3	looked at the feature again and would call it a crack~~ed~~ field
Page 85/86	MAJOR CHANGES REQUIRED TO CLINT'S TESTAMONY – only the analyst and the QC Analyst were blind tested.	
Page 86	18	the statement that today it would be classified as a ~~cracked~~crack
Page 87	24	that it would now be classed as a crack~~ed~~ field, and my
	25	understanding is, it contained crack field indications, toe
Page 88	3	conservative call, so, therefore, it would be called a ~~cracked~~crack
	9	a crack~~ed~~ field rather than a crack-like. In 2005, there was no
	10	difference between a crack-like and a crack~~ed~~ field in the way we
Page 90	21	talked about the analyst now would call it a crack~~ed~~ field
Page 95	5	mentioned, to the engineering group or where we do the DQA (Data Quality Assessment), we have
Page 96	3	know, with water there's refraction, right? So we don't ~~fare~~fire
Page 97	10	DQA. We have a process, because if the angle had changed, then it
Page 105	5	finding a feature and classifying it as a crack-like or a ~~cracked~~crack
Page 107	14	crack-likes. So now, what they would do for crack~~ed~~ fields, which
	24	A. So for a crack~~ed~~ field, you're going to have these
Page 110	14	what could cause the deviation? So distortion of the ~~sensoring~~sensor ring
	16	getting a different standoff from the pipe when it's ~~faring~~ firing the
Page 111	11	individual -- these are ~~V~~B-scans? C-scans?
	12	MR. GARTH: No, these are ~~V~~ Bscans.
	13	MR. FOREMAN: These are ~~V~~B-scans. But in the C-scan
	22	within that, and then the ~~V~~B-scan, you know, the analyst would
	25	those ~~V~~B-scan analyses would be accumulated within whatever that
Page 112	11	crack~~ed~~-field feature, it takes just the strongest amplitude?
	14	between crack-likes and crack~~ed~~ fields. Crack~~ed~~ fields will not

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Page 113 5 MR. FOREMAN: So for the crack~~ed~~ fields, the highest
13 ~~conservatives~~ conservatism in the report and there was no difference in

2005,

18 calls, the conservative call is crack~~ed~~ field because then you
20 ~~(indiscernible).~~ algorithm
22 other key difference. If he said crack~~ed~~ field, you'd also get a

Page 114 3 crack~~ed~~ field. So a crack~~ed~~ field is a number of cracks, so it's
7 this is Matt here, Matt Fox. Another distinction with a crack~~ed~~
9 longest continuous crack within that crack~~ed~~ field. So could you
12 have a crack~~ed~~ field, you've got one big box around the whole
13 cracked field.
18 width dimensions. Then you go on the V-scan and then you have –
24 the V-scan as opposed to the C-scan?

Page 115 2 you can't see it in the V-scan. That's the point I was trying to
5 that can be determined from a ~~V~~B-scan?
13 at in a ~~V~~B-scan?
20 MR. FOX: So is that, basically, in the ~~V~~C-scan,
22 MR. GARTH: The ~~V~~ Bscan is one sensor it's reviewing at a

Page 122 16 MR. FOREMAN: That if we run over the ~~seam~~ same defect 100

Page 127 18 pipeline, as I mentioned before -- I'm going to ~~(indiscernible)~~look for ~~on~~

Page 128 1 MR. FOREMAN: That's part of the DQA. We have processes
25 pass through the data at the DQA end, they will -- they would go to

Page 129 2 something that ~~DQE~~DQA should have picked up, if they're not
16 what the ~~DQE~~ DQA- I've seen the ~~DQE~~ DQA documentation. I didn't see

Page 133 10 would apply, say, the ~~(indiscernible)~~CEPA (Canadian Energy Pipeline Association) interaction rules and then
12 would it take through this field. And there is a rule that ~~SEPA~~CEPA

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Page 134 10 MR. NICHOLSON: The ~~SEPA~~ CEPA report is like 2007.

Page 137 21 the NEB, whoever, to understand ~~that~~ what ~~would~~ could have caused ~~(indiscernible)~~ it and -what

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Page 141 level SCC, because it's less than 1 millimeter deep. It's less than –the minimum depth for reporting specification and

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