Ottawa Light Rail Commission

Derek Wynne
on Wednesday, May 11, 2022

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OTTAWA LIGHT RAIL COMMISSION

SEMP LTD. - DEREK WYNNE

May 11, 2022

--- Held via Zoom Videoconferencing, with all participants attending remotely, on the 11th day of May, 2022, 1:00 p.m. to 4:23 p.m.

COMMISSION COUNSEL:

Christine Mainville, Co-Lead Counsel Member
Fraser Harland, Commission Counsel Member

PARTICIPANTS:

Derek Wynne - SEMP Ltd.

ALSO PRESENT:

Carissa Stabbler, Stenographer/Transcriptionist
Chandani Joshi, Virtual Technician

I N D E X

WITNESS: DEREK WYNNE

INDEX OF EXHIBITS

-- Upon commencing at 1:00 p.m. --

DEREK WYNNE: AFFIRMED.

CHRISTINE MAINVILLE: Mr. Wynne, the purpose of today's interview is to obtain your evidence under oath or solemn declaration for use at the Commission's public hearings.

This will be a collaborative interview such that my co-counsel, Mr. Harland, may intervene to ask certain questions.

The interview is being transcribed, and the Commission intends to enter this transcript into evidence at the Commission's public hearings, either at the hearings or by way of procedural order before the hearings commence.

The transcript will be posted to the Commission's public website, along with any corrections made to it after it is entered into evidence. The transcript, along with any corrections, will be shared with the Commission's participants and their counsel on a confidential basis before it's entered into evidence.

You'll be given the opportunity to review your transcript and correct any typos or other errors before the transcript is shared with the participants or entered into evidence. Any

non-typographical corrections made will be appended to the transcript.

Finally, pursuant to Section 33(6) of the Public Inquiries Act, 2009, a witness at an inquiry shall be deemed to have objected to answer any question asked of him upon the ground that his answer may tend to incriminate the witness or may tend to establish his liability to civil proceedings at the instance of the Crown or of any person, and no answer given by a witness at an inquiry shall be used or be receivable in evidence against him in any trial or other proceedings against him thereafter taking place, other than a prosecution for perjury in giving such evidence.

And as required by Section 33(7) of that act, you're advised that you have the right to object to answer any question under Section 5 of the Canada Evidence Act.

So you are employed by a company called SEMP; correct?

DEREK WYNNE: Yes, yeah.

CHRISTINE MAINVILLE: S-E-M-P?

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: What does SEMP do?

DEREK WYNNE: We are a systems engineering, systems assurance consultant.

CHRISTINE MAINVILLE: Could you explain what "systems assurance" means?

DEREK WYNNE: Okay. That's unpacking the box straight out of the door. So systems engineering is a complex amalgam of many specialists, engineering disciplines, requirements management, verification, validation, safety RAM, human factors and so on.

In -- well, 20, 30 years ago within the rail sector, assurance would look at the output from design activities and write an assurance case which said that that solution is fit for purpose.

In modern day systems engineering, systems assurance, because verification, validation addresses that fitness for purpose, assurance is now about have you followed the right process? Have you used competent persons? Have you followed a risk-based approach? How much of the product's evidence do you need to support the process evidence?

And that needs to be commensurate with the level of mission or safety, critical nature of the asset that you're concerned with, and it's also

by assuring that a progressive approach is taken so that you effectively don't try and do it all at the end of the day. You progress thinking about the end in mind and the level of assurance that will be required.

CHRISTINE MAINVILLE: Okay. And so does -- is SEMP focused on the rail sector?

DEREK WYNNE: A lot of our work is rail sector, but -- so at SEMP itself, I'm one of the two founders of SEMP. Our origins go all the way back into the defence sector and then transitioning into rail infrastructure.

As a firm, at the moment, we do support projects in defence and avionics still, and also in nuclear sector, but predominantly rail infrastructure.

CHRISTINE MAINVILLE: This is a UK-based company; correct?

DEREK WYNNE: So we -- at the time of working for the railway in Ottawa, we were UK-based. Since then, we've created a Canadian subsidiary, and we've also got a dormant U.S. subsidiary at this moment.

CHRISTINE MAINVILLE: Okay. And aside from being a founder, what is your role at the

company?

DEREK WYNNE: When time permits, I try to be a director managing the firm, but most of the time I'm engaged with customers actually acting as a systems engineer, systems assurance expert, and in that regard, I'm currently in Vancouver doing just that.

CHRISTINE MAINVILLE: Okay. So what is your background and experience? I take it you're an engineer?

DEREK WYNNE: I am. So I graduated in applied physics. Went into a graduate apprenticeship with BA Systems, whereupon I worked on safety integrity Level 4 systems, got involved in systems engineering process research.

Around about 1996, I got involved in rail sector, Northern Line program update in London, which whet my appetite for working in the rail sector.

Since that point in time, I would say 85 percent of my time since has been spent in the rail sector.

CHRISTINE MAINVILLE: And do you usually come in at the end of a project to do some verifications, or is it through -- are you involved

throughout?

DEREK WYNNE: Well, there's a really interesting question as well. Frustratingly, it's rare that we're involved at the start of a program. I've got examples where we're involved at the start.

So in the UK, the multi-billion pound Transpennine Route Upgrade, we've been involved almost since the beginning. And in that program, we are setting requirements, V&V, and engineering safety best practice nationally for network realm.

Other programs, we get involved somewhere in the middle where loss of progress has been -- has occurred, but not necessarily progress in the right way, and then there's a realization that things need to be done differently. So we get called in, and we have to make the best of what's gone before and get the program back on track.

And doing that towards the tail end of a program is more challenging because more and more time has been eroded, but at the same time, we've still got a responsibility to ensure the integrity of the solution, and it's how you go about proving that when you're not doing things in the normal sequence.

So the very tail end since I was just, like, running into the burning building to go and recover a program, but that doesn't mean to say it's not possible.

CHRISTINE MAINVILLE: Is the Ottawa LRT project an example of one of the ones where you had to come in --

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: -- and fix it?

DEREK WYNNE: Very late. Yeah, very late.

CHRISTINE MAINVILLE: Okay. So tell us first of all about your -- well, were people other than you involved in the project at SEMP?

DEREK WYNNE: Yeah, very much so. So our involvement changed over time. In -- I believe it was October 2017, myself and the other co-founder of the company, we came to Ottawa to do a health check of the project from a systems engineering, systems assurance viewpoint.

We created a report looking at all of the different disciplines, referring it back to the recognized standards, the standards that are actually in the project agreement for Confederation Line Stage 1, and quoted all of the -- the maturity

level.

We were invited back for a workshop regarding the health check in November. When we came back for that workshop, there were seven of us in total, the two founders of SEMP, and we brought experts on safety, an expert on configuration management, expert on systems assurance. Trying to think who else came with us. Actually three safety, three RAM and safety experts came with us, plus the configuration management and the system assurance.

We held a workshop for a week, and then there was lots of discussion about who would undertake what aspects of delivery going forward.

In late January, we were asked to write some systems engineering management plans because these were a requisite of the project agreement, and we duly did so.

The concern with writing plans at that stage where project is -- in many ways, these are talking a good story that should have happened but are actually what did happen.

There was then further discussion, and in March we were asked to start actually doing some of the deliverables rather than the management

plans, and we made quite significant progress on those until May of that year when we were asked to take over all of the system engineering and system assurance and help the project go all the way through to entry into service.

And through that period of time, our contractual relationship was at points fixed price. At other points, it was a pain-gain arrangement with an upset limit.

In terms of our overall team size, I think at peak load, we were somewhere in the mid 40s in terms of an overall team, so quite a significant team to try and get on top of all of the asks.

CHRISTINE MAINVILLE: Sorry, you were retained by RTG or OLRTC?

DEREK WYNNE: It was OLRTC.

CHRISTINE MAINVILLE: Were you ever retained for any work by the City?

DEREK WYNNE: No, at no time.

CHRISTINE MAINVILLE: Okay. When did the work end for SEMP?

DEREK WYNNE: The work for SEMP ended October 2019 or November. I struggle with the dates. It was -- it was broadly end of October,

beginning of November.

CHRISTINE MAINVILLE: Okay. After the trains went into service?

DEREK WYNNE: Yes. Yes.

CHRISTINE MAINVILLE: When you talk about the systems engineering, do you -- are you referencing all of the systems broadly, or is there more of a focus on the rolling stock --

DEREK WYNNE: All railway.

CHRISTINE MAINVILLE: -- in terms of the overall system? Sorry?

DEREK WYNNE: All railway.

CHRISTINE MAINVILLE: Okay. So overall systems integration and --

DEREK WYNNE: Yes, I think we need to -- we need to address -- funnily enough, I've spent the morning doing this. Railway systems can be considered signalling, comms, et cetera.

To system engineer a railway, a railway system, it comprises the infrastructure, the rolling stock, the people that operate and maintain it and their processes because that is what -- that is an ecosystem, as it were, for that major infrastructure capability.

CHRISTINE MAINVILLE: Okay. Would it

have included the rolling stock and signalling system as well?

DEREK WYNNE: Yes. Yes.

CHRISTINE MAINVILLE: Okay. So let's perhaps go back to the beginning. You're called in in or around October 2017 for a health check.

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: And first of all, what were you told about, you know, whether -- what you were to look at, whether there were any gaps identified at that point?

DEREK WYNNE: So the -- a former colleague, someone that I had encountered in London Underground days part of my career, had got involved with the projectco. His view was that systems engineering, systems assurance wasn't being addressed, so we were invited in to ask questions.

We set the agenda and the topics we wanted to cover in the workshops. We were given access to various OLRTC resources in order to establish our understanding of their position.

Notably, though, at that time, one person who didn't want to come in and engage with us was the technical director.

CHRISTINE MAINVILLE: So who was that?

DEREK WYNNE: That was Roger Schmidt.

CHRISTINE MAINVILLE: In terms of your colleague who approached you, as I understand it, who was that?

DEREK WYNNE: That was Sean Derry. At the time, he worked with SNC-Lavalin.

CHRISTINE MAINVILLE: Okay. Was he directly involved in the project?

DEREK WYNNE: He was, yes.

CHRISTINE MAINVILLE: Okay. So you -- the information you had was that it -- the systems engineering or integration was not being properly addressed?

DEREK WYNNE: Correct.

CHRISTINE MAINVILLE: Okay. And who did you understand was supposed to be overseeing this piece of the work, if anybody?

DEREK WYNNE: Well, that should ultimately go to Roger Schmidt, the technical director.

CHRISTINE MAINVILLE: And did you have an understanding of why he didn't want to engage?

DEREK WYNNE: So I believe the way the project had been set up, there was a -- a designer

had been engaged, which was SNC Engineering, predominantly based in Vancouver.

The program layer, the OLRTC layer, their client, they were a consortia, and there was a -- well, an expectation that responsibility had been passed to the designer, which was specifically SNC; however, the misunderstanding immediately occurs that that did not involve passing the responsibility to integrate the signalling and the vehicle into the rest of the infrastructure design.

Pretty much the best way of describing the actions that had occurred is someone puts this through the project agreement, pass the signalling scope to Thales, the vehicle scope to Alstom, and the rest of it was passed over to SNC-Lavalin design to create a design.

The issue with that is that most effort is focused on the primary systems that make up a railway rather than actually designing the whole railway and then apportioning requirements to the major building blocks. So straight away, we -- the design effort is about pieces of the railway rather than the whole railway.

And this, in actual fact, is a -- is a -- is a behaviour I encounter quite a lot within

major rail infrastructure programs. This is why in the rail sector you'll see the predominant term is to do systems integration rather than to do systems engineering.

The term originally starts when you do a major upgrade to an existing railway. You integrate the new solution into the existing whole. And whilst that works for major upgrades, it is a defective practice when you're building brand new infrastructure, and that is a -- it's a capability gap within the market generally. It's not well understood and addressed.

CHRISTINE MAINVILLE: So I just want to understand the distinction you're making between systems integration and systems engineering.

DEREK WYNNE: Mm-hm. Probably the best way to explain this is to -- when you go to the car dealership, you're buying the whole product. You wouldn't go and buy the wheels and the engine and the transmission separately and then assemble it yourself.

But that is effectively what was happening with OLRTC. They were buying all the blocks without the individuals for each of those, having the overall design solution. There's a

layer above which apportions responsibility down to the lower components.

CHRISTINE MAINVILLE: And so when it's a new system, are you saying that it's -- the preferred terminology is to say systems engineering, or you would still talk about integration?

DEREK WYNNE: So system engineering includes designing for future systems integration.

CHRISTINE MAINVILLE: Okay. I guess I could ask it another way. Is it -- were there gaps on this project when you came in from both an integration perspective and an engineering perspective?

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: Okay. And you talked about SNC as the designer. Had you heard of the entity called RTG Engineering Joint Venture, EJV?

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: Is that effectively who was -- who you understood was supposed to be in charge of --

DEREK WYNNE: The engineering joint venture is effectively the designer. The work in

that level was being undertaken by SNC Engineering, and I think occasionally they brought in a couple of consultants.

CHRISTINE MAINVILLE: And Mr. Schmidt was leading that to --

DEREK WYNNE: Mr. Schmidt was OLRTC level, so above the procurement of the JV, Alstom, Thales contributions.

CHRISTINE MAINVILLE: I see. Okay.

DEREK WYNNE: The level that you're referring to had various managers involved. I came across Dave Ellis. He was the design manager, but all of the resources that were provided and managed were by a chap by the name of Keith Brown.

CHRISTINE MAINVILLE: Did you interact with Roger Woodhead?

DEREK WYNNE: I heard the name, but I never actually interacted with Roger Woodhead.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: I think that might be -- predate our involvement.

CHRISTINE MAINVILLE: Okay. And were members of the EJV helpful to you, or were they -- did you engage with them at all in terms of obtaining information and other resources?

DEREK WYNNE: Very interesting sort of interaction and quite complex because lots of the resource were responsible for their part of -- so within the solution that wasn't the vehicle or the signalling, that itself then breaks down into lots of systems, be that stations, traction power, comms, fire life safety system and so on.

So within that, lots of different engineer of record under the Professional Engineers Act of Ontario, the PEOs. We had to interact with lots of those, and the way that worked was an interesting relationship because on one hand, they were grateful for the assistance, but on the other hand, our assistance demonstrated the gaps, which is not something that many people wanted to hear. So it was kind of a complex interaction that occurred.

Over time, before we finished, there started to be more of an understanding that we were there to help, and we were actually referred to and asked for help rather than we were inflicting our help on those people.

CHRISTINE MAINVILLE: Okay. And so were you also engaging with engineers or others from Thales or Alstom?

DEREK WYNNE: Yeah, I led an audit team. I audited both Thales and Alstom with a general instruction and thinking, two external companies, both with significant quality and safety regimes in place.

Our concern wasn't specifically about their product. It was more the integration of their product into our solution, and that was still an OLRTC responsibility.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: Although at audit, on both of those firms, we generated an audit report, and it was accepted by both parties. Thales were very cooperative during the audit. Alstom were somewhat talking a good story but not actually able to evidence it.

CHRISTINE MAINVILLE: To evidence it?

DEREK WYNNE: So Thales were pretty good. Alstom were -- as it were, systems engineering, systems assurance was that paperwork that gets in the way of doing trains, rather than with Thales, it was instrumental in how they develop their product. So there was a different embracing of what system engineering is and how it drives your solution.

So Alstom were -- they were trying to do the right things, but it was being done in a less-than-efficient and suitable way.

CHRISTINE MAINVILLE: So in terms of their approach to -- is it to integration with the signalling system or --

DEREK WYNNE: No. So this -- just if we discuss the train on its own, lots of requirements for the train. So fire retardation properties, the fire test, et cetera, so you can create all the requirements and the apportionment of those requirements into their product and all of its components and design.

The management of that requirements process, the V&V aspect of it was not particularly great, but at the same time, the Alstom Citadis as a vehicle type operates in many places. It's got proven information, so there's an amount of assurance confidence effectively in their product.

The challenge for me with Alstom specifically was this one was the Alstom Citadis Spirit, greater North American-sourced components within the overall solution, so there is a need to do an element of reassurance of the -- of the product.

And the other aspect which was a bit different as well is a lot of these vehicles were actually assembled in Ottawa rather than manufactured at Alstom's site and brought to the railway.

CHRISTINE MAINVILLE: And so in terms of the vehicle type, did you -- you've spoken about the Citadis Spirit. Did you understand that this was not a service-proven vehicle, or how would you qualify that?

DEREK WYNNE: So, again, if I was just to draw a comparison back to, say, defence and avionics, Boeing 747, the old lady that's being retired now, that aircraft's been in service as an overall type for over 40 years, but there have been numerous derivatives of it when it's gone through various upgrades and sort of range extensions, capacity increases and so on.

Alstom Citadis to Alstom Citadis Spirit is similar in that it's gone through a -- not necessarily an upgrade but a change, this time for North American componentry content.

The way that safety risk was going to be handled, and therefore a City requirement, they wanted to know that the -- because this is a -- the

way the train works, this was what's called a GOA2 signalling system.

The train also drives, but the driver's got to be there to provide vigilance. Whereas if you came to Vancouver, it's a GOA4 system. The trains are driveless. There is no operator on board.

Different safety cases are required because of the different signalling types. In Ottawa, it's a driver on the train, but they were concerned about the driver vigilance. So I can't remember if it's every 15 or 20 seconds, that driver has to press a button to show that he's awake. So this is a feature that was put into the Citadis Spirit, which is specific to Ottawa.

The normal way you implement that is called a dead man's switch. So the driver rests his hand on the -- if he was going to manually drive the train, which you might do if you're in the depot, and basically you've got to have the hand apply pressure on the dead man's switch, otherwise the train would stop.

The City decided that the driver could suffer a cardiac arrest or whatever with his hand still on that; therefore, we have a different

solution and he's got to forcibly press a button.

In many ways I think it was an awful lot of attention focused in on the wrong thing, but, you know, it's a -- can a system be too safe? Not in my opinion. So whilst I wouldn't have gone to those extremes, I didn't see a problem with having that as the solution.

CHRISTINE MAINVILLE: With the button?

DEREK WYNNE: With the button, yeah.

CHRISTINE MAINVILLE: So when you say the focus may have been on the wrong thing, what aspect was maybe overly focused on, or what was -- perhaps more importantly, what -- where should the focus have been?

DEREK WYNNE: Well, again, so it depends at what point you think systems integration or the design for systems integration starts. So if I was to look at the project agreement that was issued by the City and accepted by the projectco, it specifies a light rail vehicle, but it also specifies following AREMA for the standard for the permanent-way track.

AREMA -- the softest rail type that's prescribed in AREMA has a Brinell factor, which is suitable for heavy rail.

A light rail vehicle running consistently on heavy rail gives you problems. The light rail vehicle can't condition the railhead, and because it's not being conditioned by that vehicle, you have to do more frequent rail grinding, and if you don't, you run the risk of suffering from rail breaks.

These are natural occurrences on a railway. We obviously want to avoid them, but they cause maintenance overhead, you know, so we were concerned for the availability of the infrastructure that has significant investments made into.

Rail breaks are obviously undesirable. And then on the severity of a rail break, it can cause a vehicle to derail. Although the line speed and the check rails used on this one would suggest that that was going to be fairly unlikely, but there is that misalignment in terms of we want a railway that gets maintained at X period, but we have to now do it on Y period because we've misaligned or misintegrated the track and the vehicle type.

The other concern with that particular rail type is that it's a very hard rail, so it's

not absorbing the vibration from the train because the train is not heavy enough to actually push the vibration in. So effectively all that vibration stays back with the rail vehicle.

Now, the interesting aspect of this -- and I'll link it back to you asked me about interacting with the designers. So engineer of record has signed to say that that track asset is fit for purpose for public use, system that is at a design-certificate level, construction-certificate level, and ultimately a testing/commissioning level.

But for me, the rub of this is, as a stand-alone asset, yes, it's fit to be used. Has he met the requirements of the project agreement? Yes. But the full ask from the Professional Engineers Act is that you sign it fit for service in its intended use.

And I think that bit hasn't actually -- it wasn't properly understood because the intended use was for a light rail vehicle exclusively, and heavy rail was never going to go over it.

CHRISTINE MAINVILLE: So --

DEREK WYNNE: Sorry, if I may, there are similar issues to that in terms of the way

design and procurement were done. Tunnel ventilation system, SIL floor system, it's there in case there is an incident, train afire.

I can never remember which standard number it is, but they're -- one of the standards that we have to comply with states that if a life safety system is managed through a SCADA, a software control data acquisition-type system, the SCADA system is a minimum of SIL-2, safety integrity Level 2.

Well, given the safety integrity level determination work hadn't been done, a SCADA system of no SIL rating was procured, and that caused us to have to do a work-around to ensure the integrity of the command and control given to tunnel ventilation system.

So that's another example of engineers designing or procuring their solution in isolation to the rest of the railway. So this is all of the issues that my team and I came in to resolve.

CHRISTINE MAINVILLE: Okay. So just before we move on from that, you were saying the track that was put in place is meant for heavy rail as opposed to light rail?

DEREK WYNNE: Yeah. We wrote a report

on it back in 2018.

CHRISTINE MAINVILLE: Did you ever gain any understanding of why that was the case?

DEREK WYNNE: Well, so the behaviour was the City had asked for -- to follow the AREMA standard, which is a North American standard, but North American track is generally about supporting heavy rail.

Even for the mass transits, if you went to Toronto and you went on Line 1, it's a much heavier vehicle than the one that's used in Ottawa, which is specifically known as an LRV because it's a light rail vehicle.

So the use of AREMA or specifying AREMA within the project agreement was probably not the right thing to do. The specification should have been to have a -- it should have been objective-based and said a rail-type appropriate or suitable for a light rail vehicle system.

So I think the -- what you find with the project agreement for Ottawa, and it's the first in a series of many, is understanding how to client a major infrastructure program.

It's 11,000 technical requirements strewn through that document. It's a very heavy

way for procuring a railway system that doesn't -- if you're clienting, do you want to tell the designer how to do his design, or do you want to tell him what the outcome of the design should be?

And so the way you write a project agreement can have a direct influence on the behaviour of the designer, or in other words, if you procure a design that's wrong based on your overbearing and restrictive requirements, who is responsible for the solution not meeting the ask? And I would say it's a shared responsibility, not specifically the designer or the customer.

I think the designer or the projectco has got a duty of care back to its customer, but at the same time, the customer is also getting what he asked for. And that relationship is then kind of key to back certain requirements off so that the right solution can be provided.

CHRISTINE MAINVILLE: Okay. When you say "rail breaks," what is that?

DEREK WYNNE: A rail break is -- so if you imagine -- if you went to look at track, track will -- is usually joined together. Special plates and bolts used to join track together if you're having a continuous rail.

But a rail break is basically where the metal literally breaks into two. You get a separation at some point, not on one of the expansion joints but somewhere else.

CHRISTINE MAINVILLE: I see. Okay. So you don't mean braking. Well, you mean not as the opposite of acceleration, but you mean actually, like, cracking or snapping?

DEREK WYNNE: Yeah, absolutely, yeah.

CHRISTINE MAINVILLE: Do you have any awareness of the derailments that occurred on Ottawa's LRT?

DEREK WYNNE: Yeah, well, I was involved -- I've since been, and I've spoken with the City. I've spoken with the maintainer. In fact, some of the characters that were involved in the projectco had moved over and are now working with the maintainer, RTM.

From my conversations there, I found that either people were keeping cards close to chest or were just generally unaware.

I authored the safety certificate for Stage 1, so if you see that, that is -- those are my words. It's supported by an Operational Restrictions Document, which is full of

instructions on how to operate and how to maintain that railway given the asset that was created.

The fact that the maintainer wasn't aware of the Operational Restrictions Document I find quite intriguing because it set out special provisions, particularly in relation to track, and to do with the condition assessment being monthly rather than quarterly and the provision for railhead grinding and this action on a much more frequent basis than you would normally do.

So that seemed to be missed. But, yes, I'm aware of the derailments. I am -- I've heard, rather than I actually know, but I could -- but what I've heard I could believe in terms of probably the most severe derailment that occurred where the train went through one of the stations in contact with the platform edge.

But if the mentality of the operator is to take all retrained bus drivers, is to get the vehicle back to the depot so we can fix it, then I've got to say your customer practice is that of a road vehicle, not a rail vehicle.

Why the derailment? Well, again, if vibration has not been absorbed by the track and it's being reflected back into the vehicle, you can

see why the vehicle would be having problems, because it's sat on the wrong type of track and eventually it takes its toll.

So nonoptimal solution, but if the maintenance regime is not addressing these emergent proxies because of the solution, then you've got a problem. And, of course, they weren't addressing it because they didn't read the Operational Restrictions Document.

Of concern to me now, I also laid out considerations for the Ottawa Stage 2 for Confederation Line, east-west connectors, and I set out a whole series of provisions about how they were able to extend the railway and the assurance they must provide before they tapped into the current command and control structure.

I have no visibility of whether people are watching the operational restrictions that I laid out, but I would suspect that possibly not.

CHRISTINE MAINVILLE: Okay. I'll ask you more questions about this, but in terms of the AREMA and rail -- or heavy rail track issue, do you understand that that may have contributed to the derailments that occurred, whether in the yard or subsequently on the main line?

DEREK WYNNE: So on the main line with the training running at normal -- at its intended speed, very much. That to me is a combination -- it's an inappropriate solution, an inappropriate matching of vehicle to track type, and onwards after that, inappropriate approach to the maintenance of both.

In the yard -- this is a different topic. Train speed in the yard is insufficient to create that level of vibration, and you may well in the yard have heavier-type vehicles on the track.

The issue in the yard was how the yard was signalled. The yard is eventually going to be UTO, unattended train operation, so effectively there's no supervision on the -- on certain of the tracks.

This is for the -- where trains are stabled and then bringing them to a hand-over platform when the operator who provides vigilance along the main line actually boards the train and takes the train out into revenue service.

But UTO in the depot was not going to be ready in time. I'm not sure if it's still available at this point, and it certainly fell outside of the provisions of my safety analysis and

safety case.

So where do you effect yard control from -- to control the yard, because there are lots of lanes for trains to go on. If you move the switch whilst the train is going over that switch, then of course the front of the train is going one way, the back of the train is going another way, and that is what has created certain of the derailments in the yard, to the best of my knowledge.

So the control, the interlockings, you know, as it were, the track circuits, do I know the train has got beyond the switch before I move the switch? That is all of that signalling that's in there.

And, again, operational restrictions around how you operate and maintain that yard, it's all supposed to be in the maintainer safety case because it's the maintainer's area.

So just to speak to maintainer safety case, two of my colleagues helped RTM write their safety case in the final two weeks before entering into service because they had failed to understand that they needed to write one, but I would also make the same statement about the City as well.

The City also needed the operator safety case, and ultimately they're responsible for the overarching safety case of all three. They are the duty holder.

CHRISTINE MAINVILLE: The City?

DEREK WYNNE: Yeah, yeah, or on their behalf, OC Transpo.

CHRISTINE MAINVILLE: Okay. And you, I take it, then, despite your -- SEMP ending its involvement in the fall of 2019, you were consulted following some of the breakdowns and derailments, as I understand it?

DEREK WYNNE: So the first -- so the -- relating to Ottawa, a couple of individuals contacted us regarding information to assist with the east-west connectors, which is the new infrastructure development there.

And other than that, I was invited to conversations with RTM and actually visited Belfast Yard in late October last year. I had a long conversation with RTM. That's the point at which I discovered some of the projectco test and commissioning individuals were now working with RTM on the maintenance side.

This was a period of time after the

most recent and significant derailment where service stopped, and there were question marks over the maintainer's safety management and so on.

But, again, in this -- in this space, yes, I had conversations with RTM. This is why I know they haven't read the Operational Restrictions Document because we literally discussed it when we met.

There was the suggestion of asking myself and colleagues to help write and improve safety management system for the maintainer, but therein lies the rub.

As the duty holder, it is the City and their operator, OC Transpo, that are responsible for a safety management system. I advised before this railway went into service and I will advise now, if it's not been rewritten, it is not fit for purpose.

It's about operating buses with an ode to -- we pass out responsibility to all of our suppliers. Unfortunately, whoever sits above all of the suppliers procuring it all has a duty of care to make sure he's procured sufficient service to make sure that the railway is safe, especially if he's procuring new whilst maintaining existing

rail, because it all has to work in a collegiate fashion. That responsibility falls to the top of the pyramid, and that is OC Transpo on behalf of the City.

CHRISTINE MAINVILLE: Okay. So what was missing in terms of this safety management system? What is that supposed to look like and --

DEREK WYNNE: Ooh, okay, so big topic. We can get into the process of how you design and develop railway upgrades, railway -- new railway infrastructure generally centered around -- either it was called the -- referred to as a CENELEC process. But that's all about the change you're making to the railway.

You've got the other side, which is your safe operational procedures, SOPs, for the railway, how you operate it, how you maintain it.

But when you've got both activities occurring at the same time, how do you stitch the two processes together? And that is the safety management system. That's where it sits. It sits right above all of it.

So if you look at the railway that's now in service, we're discussing Stage 1 that had the derailment, but I've mentioned east-west

connectors which is already extending that railway, which will cause the control centre to be expanded and so on.

So we've got design and development work running in parallel to an operational infrastructure. The safety management system that gels them together to keep the whole thing safe was not fit for purpose when I looked at it.

CHRISTINE MAINVILLE: And when did you look at it?

DEREK WYNNE: I looked at that through the summer of 2019 getting ready for the first -- the first infrastructure to go into service.

CHRISTINE MAINVILLE: And are you aware of whether there were any subsequent changes?

DEREK WYNNE: I've not seen any.

CHRISTINE MAINVILLE: Did you work with the independent safety advisor?

DEREK WYNNE: Yes, TUV Rheinland, yes.

CHRISTINE MAINVILLE: Yes. And were there any discussions about this with them?

DEREK WYNNE: Yeah, absolutely. We had the same conversation.

CHRISTINE MAINVILLE: And do you know if they had the same concerns?

DEREK WYNNE: They certainly did.

CHRISTINE MAINVILLE: And ultimately, I take it, SEMP doesn't -- in terms of the safety case it's put forward, but SEMP doesn't do any certification on the safety front; is that fair to say?

DEREK WYNNE: Okay, so let's go into this then. The safety analysis process, starting with hazard identification through hazardous operation assessment, interface hazard analysis assessment, failure modes, effects and criticality, fault tree analysis, safety integrity level allocation, all of which culminating in an operational and supportability hazard analysis, the final step before you operate.

All of that culminating in a safety case of the whole railway, supported by safety justification reports for each of the major asset types, and underpinned by the same safety justifications provided through from Thales for signalling, Alstom for the vehicle. All of that was assembled by my colleagues and I.

In conjunction with that, we also looked at all the derived safety requirements that came out of that safety process. My team tracked

every single one of those requirements to its demonstration through the test and commissioning process.

In conjunction with all of that is the authoring of the Operational Restrictions Document because of the remaining issues, misalignments with the approach that had been taken. And that Operational Restrictions Document is referred to by the safety certificate, so it's repeated as many places as possible so it can't be avoided.

There are safety justifications on which the safety certificate is predicated, but the safety cert is only valid as long as you respect the operational restrictions.

In terms of that safety cert, I signed that. It was countersigned by Sean Derry that we mentioned earlier, and it was from a PEO, Professional Engineer Ontario, Jacques Bergeron, who had a better understanding of systems engineering integration approach. He sealed it as a Professional Engineer Ontario on behalf of OLRTC.

CHRISTINE MAINVILLE: Okay. And then does the independent safety advisor have to sign off on this?

DEREK WYNNE: He provides the

statements, and no objection to each of the safety justifications, each of the overarching safety case, the operational restrictions, et cetera.

So he had full visibility of all of that and very much -- and also was able to witness us conducting the hazard identification, hazardous operation workshops that drove the safety analysis that was being conducted.

CHRISTINE MAINVILLE: So if I'm understanding correctly, you -- if I'm -- I'm going to try to paraphrase.

DEREK WYNNE: That's okay.

CHRISTINE MAINVILLE: Is it the case that at the end of the day in terms of reaching revenue service availability, SEMP's view was that, you know, the system was safe, but that is predicated on the operational restrictions --

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: -- and that needs to be complied with?

DEREK WYNNE: Yeah.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: Yeah. So to really -- to take it away from railways for a minute and maybe describe it in a way that we're all familiar with,

so you've bought a new car from the garage. It comes with a warranty. The warranty has provisions in it, and if you fail to honour them, your warranty is no longer valid.

If you also think then -- so brake linings to make sure the thing stops, it'll talk to you about tire pressures and so on. They're all standard maintenance things that you should do so that you can operate that vehicle safely.

If you're driving a BMW -- I have one -- it even tells you about safe driving styles because it's more fuel-efficient and so on. It's all in the user manual.

So let's take a look at some of the features of a car. So when I learned to drive, cruise control was your right foot on the accelerator, and you controlled cruise control.

Later cars that I had, there was a stock on the side of the steering column. You could press the buttons, and you set the speed. And the car would hold the speed, but you had to regulate the distance between you and the car in front because the car wouldn't automatically do that for you. The latest cars, they also regulate the distance for you.

Cruise control, as I've just described it, is manual. It's semi-auto; it's fully auto. The function is the same. The way we achieve it is different. The human involvement is different. Okay?

So I can write a safety case for each one of those based on how well the operator is trained, the standard operating procedure he follows, and also how well that asset is maintained.

CHRISTINE MAINVILLE: In this case, did the operational restrictions have more to do with maintenance than the way it was to be operated or both?

DEREK WYNNE: It was to do with operation, to do with maintenance, and also restrictions I placed on the City and their future projectco of how they would deliver the extension. It covered all aspects.

CHRISTINE MAINVILLE: Okay. And are you able to speak to some of the key aspects of those operational restrictions and perhaps anything atypical or things that were required above and beyond in this case that you may not find on other projects like this?

DEREK WYNNE: So the provisions in some regards, particularly in relation to moving forward with the extension piece, I made the provisions about having appropriate assurance before you connect the new extension into the commander control system, for starter, for signalling, et cetera.

I wanted the assurance that it was -- that it was appropriate to be able to do that, someone was taking responsibility for it rather than we were -- we were working on a plug-and-play basis.

Normally, for instance, if I went back to the UK, the safety culture, the safety regime, the understanding of the need for assurance, no one would ever attempt to do such a thing without the assurance being in place.

The level of understanding and behaviours that I've seen, exclude the ISA in this, but from projectcos and their engineers through to the City through to the operators and the maintainers, I felt the need to expressly write that in the Operational Restrictions Document.

I think that speaks to the overall culture and ability level, everyone, whether you're

clienting, operating, maintaining, or designing the building. I just was not comfortable to leave those words unsaid.

Thereafter, if we're looking into the restrictions of the -- of the actual system that was delivered, tunnel ventilation system, it's a SIL-4. It's a life safety system.

I don't know if you're familiar with how big the tunnel ventilation system fans are, but I'm 6 foot 4, so I'm roughly 2 metres, and I can stand up in these things.

The stations have got three or four of these, and there are jet fans as well. So they don't operate all the time. They are a passive provision called upon once in a blue moon.

Unfortunately, we can't leave it to chance for an event in ten years' time and then trust that these things will work. So there's operational instructions about exercising the fans on a monthly basis to prove that they're working.

There are restrictions in there with regard to -- and this is the end-to-end system and it's expanded. Emergency telephone provisions for passengers on stations to make sure that the bandwidth exist in the comm systems and make sure

that you don't affect the current in-service stations because we're expanding, and provisions to do with track maintenance, et cetera.

We also have to deal with another interesting topic in terms of restrictions because the -- effectively the front of the train for Ottawa is quite rounded. The driver sits in the middle. CCTV cameras on the platform, they observe the passenger train interface.

Driver closes the doors when passengers are no longer going through the doors. We don't want an entrapment. And at that point, the driver presses "go." The train moves, then automatically controlled movement.

The CCTV is meant to show you the side of the train until the back of the train has left the platform, and the reason for that is whilst the doors have got a contact strip and if a back strap gets caught, it won't detect a back strap. Someone with a rucksack can get dragged along with the train if a strap is caught. So the driver is meant to observe the side of the train.

However, because of certain integration issues, sometimes the cameras were displaying images from the adjacent platform, not the one the

train was at, so rewire required.

So initially entry into service, there was an operative placed on the platform, and he had a button he will press to illuminate in the cab to say, The passenger train interface is clear; you can now proceed.

So it was a work-around, a temporary operational restriction, which is quite a common thing in railways when you're dealing with this sort of infrastructure. Should it have been there at day one? No. But was it an acceptable work-around and safe? Yes.

CHRISTINE MAINVILLE: So it was an acceptable work-around?

DEREK WYNNE: Yes. Yeah, yeah, absolutely, yeah. Yeah, so if you -- if you -- if you go to -- many railways -- if I took you on a tour of the UK, I could show you many, many stations where there is an operative on the platform. You just even press a button, and then something will light up in the cab.

Main line, you'll see the guy hanging out on the side, and the guy is waving a flag saying you can go. It's in the old movies. You see the guy blows the whistle and waves the flag.

It's that same principle. It's how railways have operated for over a century.

So it was just stepping back. It was removing automation. So if I look at my cruise control example, we were stepping back to -- cruise control was with your right foot, not because the system does something for you.

CHRISTINE MAINVILLE: So would you say that there's a heavy reliance here on standard operating procedures in order to address various hazards?

DEREK WYNNE: Okay, so this is a really interesting question. So the way safety analysis works, we identify a hazard, and then for each hazard, there are causes, and there are consequences.

So the first action should be to mitigate causes, i.e., prevent the hazard occurring. If we're unfortunate enough for the hazard to occur, we then have to do something to minimize the consequence.

So on one side, it's about the probability and reducing the probability to a tolerable level, and on the other side, it's about reducing the severity of the hazard should it

actually occur.

So there is no ability to create a 100 percent safe system. You're not safe if you walk down the pavement outside now. You know, a car can come on the pavement. There is no way that we can get it completely down to zero.

So the terminology is a tolerable residual risk. What does tolerable risk look like? The way you work that out is normally Heinrich's principle, and the way that works is X number of near misses, add together, that is effectively a minor injury. X minor injuries, add together, that's a major injury. X major injuries, add together, that's equivalent of a fatality.

So if you monitor all safety occurrences, even if it's what's called a near miss, as it were, where the hazard nearly occurred but didn't through luck rather than design, we record it because this is the -- this is the wealth of information that helps drive safety improvement and understanding of hazard tolerability.

So this is a brand new infrastructure. It's not got that ability yet, so it's about designing -- well, doing the safety analysis, finding the hazards, preventing their occurrence or

mitigating the consequence should they occur.

In order to do that for Ottawa, my team also looked at the Rail Safety and Standards Board which assesses this sort of data from railways around the world over the last 30 years and queues up a whole series of hazards.

It's possible to look at the top-ten hazards of a railway. Passenger train interface is a classic risk area. When passengers interact with the moving bits of vehicles, that tends to be where you get problems, but it's not the only one. So all of that work was done.

Now, the rub is anything that you can't mitigate in terms of prevention or mitigation in terms of consequence, you have to create a hazard transfer. You transfer the residual risk for the operator to manage.

And, yes, there were hazard transfers done. Hazard transfers to -- the principle that we employ, a hazard transfer form is created. It has to be signed off by the City, and it had to be signed off and accepted by OC Transpo, the operator, at which point that also then has to be baked into their standard operating procedures. And that was the process that we went through.

CHRISTINE MAINVILLE: Would you have reviewed the standard operating procedures to see whether everything was incorporated?

DEREK WYNNE: No, that is OC Transpo's scope and their safety case. They've accepted the hazards transfer to them. It's now with them to manage. Yeah, and hence the formality of the hazard transfer form.

CHRISTINE MAINVILLE: And you did say you eventually reviewed RTM's?

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: Was that document, I take it it is, lacking?

DEREK WYNNE: So the safety case for RTM was actually authored by my colleagues very last minute to get them their basic safety case in place. Their actions are -- again, obviously follow the operational restrictions, but a lot of their safety case is about the maintain of being safe whilst you undertake certain actions, whilst he's responsible for delivering the maintenance that's required as part of all of the maintenance instructions for the railway that came from the designer and the equipments that were procured.

CHRISTINE MAINVILLE: Did you have the

opportunity to review the independent safety advisor's final report, which was issued just prior to revenue service?

DEREK WYNNE: I think I had a brief look at it, but I must confess, I didn't really read it in much detail. I did one of his earlier reports, but not that very final one.

CHRISTINE MAINVILLE: I take it he would sign off on the operator -- or the standard operating procedures or at least the operational safety --

DEREK WYNNE: Okay, this is kind of a challenge. The ISA's remit, my involvement with the ISA's remit was in terms of the output from the projectco. I'm not sure whether he was engaged also to check OC Transpo and RTM, the maintainer, because those are effectively entities that continue beyond the delivery of OLRTC, the builder.

Now, knowing the character involved, I'm sure he would have wanted to be involved and was probably consulted on those. Whether that was formally or informally, I honestly can't tell you.

CHRISTINE MAINVILLE: And by "the character," you mean it would have been prudent?

DEREK WYNNE: No. I know the

individual. He's very diligent and very committed to this sort of work, lives and breathes it, and would always want everyone to do their absolute best.

So if he was involved in the city and having these conversations and a hazard transfer is made, Sergio would have been the character that would want to see that it's gone all the way through to the other end.

And in fairness to the City, they did do some operational readiness testing. They did, like, emergency evacuation type, you know, full muster. Newly trained operators know what they're doing, interact with Blue Light Services and so on.

So there was a lot of trial run effectively for the operator as well as there was trial run of the -- of the system going back and forth.

So -- and a lot of that was possible for many of us to witness occurring, so I'm very sure that Sergio would have been observing a lot of that. Well, Sergio and his colleagues that were involved from TUV Rheinland.

CHRISTINE MAINVILLE: I'm not sure if we stated his full name, but you're referencing

Sergio Mammoliti?

DEREK WYNNE: Absolutely, yeah.

CHRISTINE MAINVILLE: You became aware through your later work or involvement on the project that RTM or the maintainers were not knowledgeable about the Operational Restrictions Document.

Do you have any awareness of how the operators ended up operating and whether there were any gaps there?

DEREK WYNNE: Only through hearsay. As I mentioned before, recovering a derailed train back to the depot is a behaviour you would take with a bus that's suffering a mechanical breakdown. It's not something you would do with a rail vehicle.

I've heard that the instruction to the operator was to limp the train back to the Belfast Yard, but I've heard rather than I know. So I wouldn't like to say that's actually what happened. But having said that, there should be a voice recording somewhere that can confirm that.

CHRISTINE MAINVILLE: Why do you say a voice recording?

DEREK WYNNE: It's the interaction

between control centre and the vehicle, so there should be -- there should be some form of record there.

CHRISTINE MAINVILLE: You had some involvement then or awareness of trial running that you referenced?

DEREK WYNNE: Yeah, yeah, absolutely. So all the way through test and commissioning which was culminated in -- at first there was the -- call it the round demonstration phase, OLRTC driving the vehicles back and forth for two weeks, continuous service simulation, and then the -- there was the test running and then trial running with the City's operator on board doing exactly the same for themselves.

So, yeah, I was involved all the way through that. The reason for involvement is certain aspects, certain requirements -- before I explain that, so the standard CENELEC 50126, Fig. 2 is a really interesting, simple diagram. RAMS is the subject: Reliability, availability, maintainability, and safety.

Safety and RAM are inextricably linked, and the reason being is safety features must be available, and available is driven by the

reliability, the maintainability but also how you operate and how you maintain. So it's all a complex, interwoven web.

So whilst exercising the reliability, the maintainability that the operators are satisfying themselves that they can operate, and the maintainers are satisfying themselves that they are now engaged in maintaining, the reliability, maintainability part, delivering those safety features and proving those safety features are functioning, all of that is requirements or derived safety requirements or derived RAM requirements which my team was seeking the verification evidence for, and we tracked all of that in a database that tracks all of the evidence for every single requirement.

So in the output that we created at the end of the project, we provided an engineering safety -- or engineering and safety assurance case, and within that, there is a map to every single document that provided evidence that the system would be able to meet its mission as well as the safe operation.

Specifically in there, there is the end-state integrated hazard log where every hazard

is considered and its mitigation, so you can see what was mitigated via a derived safety requirement, see how the transfer was pushed out to OC Transpo.

The derived safety requirements that chased into the requirement set and threw into the system integration tests and the evidence of those being exercised is all there.

CHRISTINE MAINVILLE: Okay. So the --

DEREK WYNNE: Sorry, I should say, the point is and the reason for being involved through test trial running is some end-to-end features and availabilities couldn't be proven until we got to that stage. So that's why we were still gathering evidence at that point.

CHRISTINE MAINVILLE: I see. Normally that would have been completed before?

DEREK WYNNE: Yeah. Yeah. Yeah. Obviously pressured time scale, you know, open the railway as soon as possible because it was so late, but we were still gathering evidence that enabled the safety certificate to be signed right up until the very end.

CHRISTINE MAINVILLE: And in terms of the safety certificate, is that OLRTC's

responsibility?

DEREK WYNNE: For the -- for the system provided, yes, but that is -- that is only -- a rail transportation system is the physical system procured, what you bought out of the box, plus the standard operating procedures, plus the manner in which you operate and maintain it. So it's all three elements.

The safety certificate that came from OLRTC is about the system that was unpacked out of the box. It's not about the procedures. It's not about the people. Those are separate safety cases.

And then you need -- OLRTC, the duty holder, they sit above all of that. That's theirs to manage.

CHRISTINE MAINVILLE: And was some only overseeing the safety certificate portion of it?

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: Yeah. Yeah. OLRTC's contribution, not OC Transpo's. Yeah, very out of scope.

CHRISTINE MAINVILLE: Sorry?

DEREK WYNNE: Everything to do with OC Transpo was distinctly outside of our scope.

CHRISTINE MAINVILLE: Do you know who was responsible for those other aspects?

DEREK WYNNE: It would have fallen under Jim Hopkins, the head of operations. Who he had prepare the safety case for him, I'm not sure. That might well have been an activity undertaken by one of their owners, engineer-type people that the City had procured. That could well have been done by Parsons. If it was, then that would be a gentleman by the name of John Hulse (ph).

That's where I would have gone if I was them. Whether they did, I can't tell you, so I can't confirm that John was actually the person who has to write that.

CHRISTINE MAINVILLE: Fair enough. So I take it you -- following trial running or at least as you gather the data you needed during trial running, you were prepared to conclude that it was safe to operate and to issue a safety certificate?

DEREK WYNNE: Yeah, it was quite a painful process to get to that stage, but yes.

CHRISTINE MAINVILLE: Yeah, so let's talk about that and what, if any, concerns you did have despite that being met.

DEREK WYNNE: So I can take you on this journey right back to design, design certificate letter which says from a Professional Engineer Ontario, the engineer of record and says, My design is okay because it's in general conformance.

Okay, well, what does general conformance mean? You know, is general 50 percent? 60 percent? Whereabouts are we?

So the first stage of design verification that my team got involved in, we asked for -- we packaged up the requirements for each of the building blocks, sent out those requirements, and asked for a compliance statement against every requirement, and not just tell me that you satisfy it, but please provide me where I can find the evidence so we can link it together.

Interestingly, 100 percent design compliance fell away quite significantly initially until a lot more evidence was generated to demonstrate that level of compliance.

Similar process going through construction compliance letters and getting the rigor that's required in there to get the appropriate assurance evidence in place.

And then we get to system integration

tests. So we actually did an exercise to look at system integration test coverage. Are the tests sufficient to exercise the extent of the railway? The answer was no. We only had about two-thirds of the tests.

So a further integration test to exercise the additional -- or the features that had been -- not been exercised by the initial set of system integration tests were created.

Then speak to testing behaviour. So lots of outstanding snags and so on. For instance, if it was about intruder access control into an equipment room, maybe the contact plate wasn't there, so that door wasn't working. You can't test that door in that situation, but we could at other stations.

So, yes, we know that requirement is partially satisfied, but you can't pass the system integration test until you've proven every location.

So we used to get these scripts going back saying, yes, it's passed, which was, yeah, when I fixed all the snags, this thing works, but that wasn't acceptable.

So in our database, we tracked 39,000

snags that were getting in the way of dealing with all of the system integration tests, and we mapped all of that through to the end until such time as all integration tests could be conducted.

So very, very -- well, extraordinary level of scrutiny, but it's required. This is -- this is the scale of putting these railways together.

CHRISTINE MAINVILLE: Okay. And leaving aside safety, did you have concerns about reliability and performance after trial running?

DEREK WYNNE: So in accordance with CENELEC, safety is only safe if it's available, and available means how you -- not just how you operate and maintain it, but the reliability and maintainability features of your solution.

So the fact of the matter is, you can buy a cheap railway and put a man every 50 yards with a bag of spanners and every time a train goes past, adjust the nuts and bolts.

You can build one you don't have to maintain for ten years and which will do exactly the same job. There's a different cost of acquisition, a different cost of ownership associated with the two ends of -- the two extremes

I've just quoted.

Both would need regular inspection and intrusive maintenance, dependent on the condition assessment you find when you do that inspection.

So where am I going with this? In terms of reliability, availability, and maintainability, found the level of activity quite shocking really in terms of availability of components, was what was being procured.

Where was the requirement to specify the ask? In other words, as an off-the-shelf solution, as a candidate solution, I've got a requirement. Is that candidate solution going to meet my requirement? That bit wasn't done.

So this was more about bringing together all of the standard off-the-shelf available components and making them work as one.

So we looked at the emergent RAM properties, reliability, availability, maintainability, and how they would support the safety features, and that's what then gives rise to the maintenance aspects of the Operational Restrictions Document where I wasn't confident that the RAM -- the required RAM support safety features would be met without continually monitoring the

track for instance, a monthly inspection rather than quarterly.

CHRISTINE MAINVILLE: Do you know whether those additional or enhanced maintenance requirements were reflected in the maintenance procedures?

DEREK WYNNE: No, and I don't think they were because of the lack of understanding of the Operational Restrictions Document.

CHRISTINE MAINVILLE: Right. Who were you dealing with at RTM on these issues?

DEREK WYNNE: I'm trying to think of the former head of RTM.

CHRISTINE MAINVILLE: So I think at RSA, would it have been Claude Jacob?

DEREK WYNNE: Yeah, Claude sounds familiar, yeah.

CHRISTINE MAINVILLE: Would he have been your main counterpart, do you think?

DEREK WYNNE: No, they had another character who since moved on. I'm trying to think who that would be now. There was another character who was more concerned with sort of creating their procedures and their safety undertaking, but I can't think of the chap's name, sorry.

CHRISTINE MAINVILLE: I'll have a look at the break because I think I know who you're referencing, but I also don't have it.

DEREK WYNNE: Yeah. I could find it if we need. I can certainly let you know later.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: I'll do an email search and find his name.

CHRISTINE MAINVILLE: Thank you. And I take it more fundamentally, and this goes back to your earlier evidence, there was insufficient planning in the design for maintaining the system; is that fair to say?

DEREK WYNNE: No, I think -- so the challenge here is -- it's all a balance. So, again, give you the car example. Early cars required a service -- my first car required a service every 6,000 miles. In between those services, we do the oil change, et cetera. You will do standard weekly maintenance, tire pressures, et cetera.

Move later on, my BMW, it tells me when it wants to service. It monitors itself for a condition assessment. You've used me hard, therefore I need a service, or you've used me

light, I need a different service.

But none of those remove the obligation to do the regular check, tire pressures, screen wash, et cetera. So there's all different levels of maintenance to be undertaken.

Maintenance is in support of availability. So what's the service pattern you want? For instance, if you want to operate your railway 20 hours a day, 7 days week, you've got 4 hours of engineering hours to take possession to do maintenance, mobilize, actually achieve the maintenance, and then sign back into revenue service. That's a fairly short window.

So if that's what you're aspiring to, you need readily, easily maintainable assets, and they need to be very reliable so you don't have much in the way of maintenance to actually do to them.

So that's about achieving an availability of the service, as well as that availability will speak to how it enables the safety features.

The other side about maintenance is its cost. You can buy cheap and spend heavy on maintenance, or you can buy expensive and spend

little. It's a trade-off between the engineering hours available, the intended usage, and the intended cost of ownership. And this will -- I'll say it again, will come back down to concept of operations, concept of maintenance. How is all of that conceived.

So -- and this is -- this is kind of the problem in railways. There are railways of many different standards. I can say it's networks where all of these different things are occurring and different standards, all different points on the network.

The fact of the matter is it all sits underneath the same safety management system. The duty holder is aware of his responsibility, and everyone complies with the overall process, and it's that that's not mature enough in the Canadian marketplace at this time.

I did mention before, by the way, that the project agreement for Ottawa is the first of a series, so the same agreement with changes trying to fix commercial issues was rolled out for Eglinton Crosstown. Same agreement again with yet further changes for the Finch West. Same agreement again for the Hurontario LRT that's going on right

now.

Interestingly, Eglinton Crosstown, late being delivered. Same projectco consortia. Finch is going late. Watch the headlines over the next few months; you'll see that's going late. That is only one of the projectco consortia.

Or go and watch Hurontario. Entirely different projectco, same behaviours. That one is going to go late as well. And the reason I know is because we keep getting asked to go in and bail these projects out. Same behaviours, same project agreement, basic construct.

Very heavily specifying the solution. That gets the behaviour. We've been told what the answer is. We'll just draw it. And that's not the case. It doesn't -- there's still analysis to be done, and it just -- it builds pressure towards the back end of the development cycle.

So for me, objective base requirements is a far better approach to that procurement because it places the responsibility down successfully then to the projectco. They have to provide the right solution rather than a solution that met the contract. City, you now own the solution you bought.

And I think there's a trade-off between the two because I don't think it's exclusively one side or the other. Railways are a team sport if we do it properly.

CHRISTINE MAINVILLE: Okay. We'll chat about this a bit more, but let's take a break. If we could go off record.

-- RECESSED AT 2:33 P.M. --

-- RESUMED AT 2:50 P.M. --

CHRISTINE MAINVILLE: On the concept of operations and concept of maintenance, were these documents you saw?

DEREK WYNNE: I did see a concept of operations, but it wasn't the -- it wasn't what I would consider a mature document. Normally what you do with a concept of operations is inform the design solution required so that you have a solution that can be operated the way the intended operations will occur.

Given the lateness of our involvement, we were pretty much past the point where a concept of operations and analyzing it and understanding it would have helped.

This was more an ask of this is the solution that's now going to -- going into being;

how do we confirm and ensure that this is safe and suitable to be operated.

And therefore, each of the equipments, each of the different aspects of solution came with a standard operating procedure which the designers were set to provide over to OC Transpo, which they reviewed, and then we amended through the hazard transfers.

CHRISTINE MAINVILLE: And the concept of operations normally, I take it, would have been OC Transpo's responsibility?

DEREK WYNNE: Yes. Yeah.

CHRISTINE MAINVILLE: And then that concept of maintenance, is that something you would expect to see?

DEREK WYNNE: So the maintenance one is an interesting position because the City procured the services of the maintainer but retained the rights to change the maintainer to any point they desired, and it was for a fixed term of providing maintenance.

So whilst she could get RTM to provide the concept of maintenance, I think it was also incumbent on the City to be certain that that's the maintenance regime that they would like if they had

to select someone else.

But I think that's -- whether the City did that or not, I personally would have thought it would be wise because that's the asset you're going to live with; that's the maintenance you have to ensure occurs. Not everyone might be comfortable to maintain it in the way that RTM were engaged to do so.

So I would have provided that oversight. I'm not sure if the City did or whether the way it's maintained was set by RTM. I must confess, I'm not sure where the influence was there.

CHRISTINE MAINVILLE: Okay. In terms of the hazard logs, I take it different entities will identify hazards, for instance, Alstom, Thales, and others?

DEREK WYNNE: Yeah.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: Okay, so the normal way is to have an integrated hazard log where all hazards come together, and my team manage that integrated hazard log.

Now, signalling system, the hazards around signalling are pretty well known, and the

purpose of it is to mitigate some hazards of train movement.

So a GOA2 system which has got driver vigilance, the system does an amount; the operator does the rest. That solution was a known quantity, so we were able to factor that into the integrated hazard log. Similarly so with the vehicle itself.

The majority of the integrated hazard log and the hazard identification and analysis over and above that done by my team relates to everything outside of those two major systems, but also worked in conjunction with them.

So the overall safety case that was produced was predicated on the back of safety justifications for all of the major assets including -- and the safety justifications including the equivalent provided by both Thales and Alstom.

CHRISTINE MAINVILLE: Are you aware during the -- well, that one of the derailments involved an axle bearing failure?

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: And there was some investigation by the TSB, the Transportation Safety Board, and there was some discussion about

there not being a heat monitor --

DEREK WYNNE: Mm-hm.

CHRISTINE MAINVILLE: -- on the wheels?

Did this -- do you have a view on this, and do you have any -- did this feature in any of the hazard logs, or was this considered at any point?

DEREK WYNNE: No. Alstom -- so the wheel bearing on the Citadis Spirit in Alstom is the same wheel bearing that's used in Lusail in Qatar, which is a considerably different and warmer environment than you've got in Ottawa.

The one in Lusail doesn't have the heat sensors, and the wheel bearings don't fail, but it does have a track that's designed for light rail vehicles, not for heavy rail.

CHRISTINE MAINVILLE: So you think that factored in -- again, even in the axle bearing failure, the track?

DEREK WYNNE: My opinion on this matter is as is follows: Firstly, you can't always get a component failure, okay, so it could have just been a particularly bad wheel race that failed.

These things go through a significant amount of quality testing, random sampling and so

on, so you remove the probability to the maximum extent possible.

And despite the changing of the -- some of the internals of the train to increase North American content, the wheel bearing wasn't one of those components. It's still the same wheel bearing.

So what we have to do is look for the factor that's different, and the factor that is different for me is the track. It's designed for heavy rail. So rather than absorbing vibration, it's reflecting it back. And I think that speaks to the additional pressure placed on the bearing.

Now, that might have caused it to overheat, it might have caused it to fail, but the fact of the matter is, do we want to address the symptom or the cause? And to me, the cause is down to the unsuitability of that track with this vehicle.

Yeah, so I personally don't think -- what the heat monitor would have done is identify there was an issue occurring. I don't actually think it would have been -- and therefore, we might have prevented the actual failure. It might have changed the bearing, but had we done so, we still

would be having this ongoing issue, which would be creating a maintenance issue and other bearings fail at other points in time.

But it -- a heat monitor like that, yes, you can use it in extreme circumstances, but would you do that on a system that's proven and doesn't cause you any problems in other areas? There is a wealth of assurance evidence for an Alstom Citadis that suggests it doesn't need that.

CHRISTINE MAINVILLE: Okay. And did -- the location of these bearings, which I understand are not necessarily visible or difficult to visualize, did that require any kind of enhanced maintenance or more frequent inspections?

DEREK WYNNE: No. So what you'll find with a lot of systems is all the way through, you get emergent properties. So there's two aspects here: There's emergent properties and latent defects. So let's unpack both of those for a moment.

So an emergent property: Emergent properties are both desirable and undesirable. The emergent property is the -- what we're actually writing requirements for, this is what we want to achieve, but in so doing, we can also create other

emergent properties we didn't expect that are less than desirable, and we manage those.

Speaking to capturing information about near misses through Heinrich's principle and how we aggregate all of that so that we make changes, we improve the way that the rail system works through how we operate, maintain, or even do an asset modification. That's when we address undesirable emergent properties.

Latent defect is something different. It can be a dormant fault that was there from day one, and then at some point in the future, you exercise part of the system that you don't normally utilize.

I gave the case of an exercise in tunnel ventilation system fans. I wouldn't want a dormant failure to be sat there for two, three years and then find that when I call upon that fan, it doesn't work. So there's two aspects to this.

So special maintenance frequencies, et cetera, I wouldn't have expected to do so on this vehicle. This is what I would call an undesirable emergent property as a result of this incompatibility. It wasn't something that was considered at the time.

Most of the concern at the time was around the track and the need to focus on the increased maintenance on the track for its condition, avoiding rail breaks and so on. The long-term position on that is, in my opinion, this is what's caused the issue in the wheel bearing.

Now, have we -- if regular maintenance is undertaken, eventually you should notice there are issues going on with the bearing.

So the extreme heat that's given rise to this, if you do regular inspection, the lubrication in that bearing, you would expect it to be turning a funny colour (indiscernible) rather than grease and so on.

So there would have been tell-tale signs, but it depends on whether the maintenance period was reached, and you'd actually take the cover off that bearing and check the lubrication in there to whether you notice that or not.

I think what's happened here is all of the safety provisions -- I think a really nice way of explaining it is layers of Swiss cheese. You put layer after layer in place, and if you line them up and look through, you never want to see daylight from one end to the other, and this is one

of those rare occurrences where daylight has managed to get all the way through, and that's what we've seen here.

So now there needs to be -- if we're not going to replace the track, which is expensive to do, railway is out of service for a long time, yeah, we're going to have to have a difference on the maintenance regime. We're going to have to inspect the bearings on a regular basis and might even at some point change the bearings for something that's more robust and doesn't fail.

We might add heat sensors so we get an early indication that something is starting to fail. These are all provisions. But if you put the heat sensor there, then you can reduce the amount of inspection you're doing again. So, again, we're replacing process with product, effectively.

CHRISTINE MAINVILLE: Right.

DEREK WYNNE: Yeah.

CHRISTINE MAINVILLE: The AREMA standards, I take it those were specified in the PA, but there's no -- there was no requirement otherwise to use those or to -- they're not mandatory in North America; is that fair?

DEREK WYNNE: So let's look at standards for a minute. So if you're at home, wiring standards for your house, for electrical appliances in your home, standards are -- there are set ways of doing things, there are safe ways of doing things which have been proven time and again, and therefore, it becomes the standard way of mitigating a hazard or whatever and achieving consistency.

So what happens is if you build a solution, you work to a standard, and then you look at how you're applying that standard -- sorry, your solution to see whether, in addition to those standards, you need to make any further provisions. And that's what you're doing in the safety analysis.

So the AREMA standard, talking about the different standards of rail and a particular rail type, you've got different -- you've got different rail-heavy profiles that work with different wheel profiles, different hardness of rail.

Softer rail wears. Hard rail is brittle. You need hard rail for heavy vehicles. They condition it literally by pounding it or,

like, re-smelting it as the trains go over and so on.

So it's all about metallurgic properties of rail that is getting heavy abuse on an ongoing basis because of the trains going over it, and it's a matter of what is the optimum solution to go with the type of usage. AREMA creates a standard set of principles by which that can be done.

The track expert I brought in, one of my colleagues, Ben Venables, he works internationally around the world. He's a track expert. He was trained by the guy who wrote the textbook by which all track standards, et cetera, around the world are based.

He's worked on track in the Middle East, Australasia, UK extensively, but he's also an accredited appointed safety person, an AsBo under the common safety method, and the equivalent of that in North America is an ISA. And it's Ben who wrote the report on the unsuitability of the rail type that was used. He's our guy who wrote that report.

I must confess, he baffled me. He took me through what Brinell factors mean and how you

work it all out, and it got into some pretty complex math. So I just said, Thank you very much for explaining; I believe you.

But I was more interested in what's the consequence of having the wrong track type, and that's where we got into what was going on.

So in North America, is there a different track standard? Well, AREMA is the only place I'm aware of that actually specifies the track standard. If we would have gone outside of America and come over to more European, we probably would have found a standard that suggested track of a lesser type.

So the City specified AREMA. They wanted track to be of a standard, so I understand why they did that, but it wasn't suitable for the type of vehicle.

So there's a clienting of prime system integration that's gone wrong in the City. There's a delivery of prime system integration that's gone wrong in the DBFM; that was OLRTC.

CHRISTINE MAINVILLE: And the City ultimately is responsible for safety regulation on this project?

DEREK WYNNE: Yes.

CHRISTINE MAINVILLE: Yes. And so what do they have in terms of regulations or rules to be abided by?

DEREK WYNNE: So because the -- this railway is serving a locality -- it doesn't go across provincial boundaries -- the City were delegated to manage themselves, be self-regulating when it comes to safety.

So under those circumstances, I think just a straightforward duty of care, almost intelligence and professionalism states that you need to have an appropriate safety regime, and you will base that on similar railways that exist elsewhere in the world.

And there's lots of information available about safety. For instance, Rail Safety and Standards Board is accessible. It's not a difficult ask to get involved. Railway industry association, et cetera. And also you can go and procure the services of experts that can come and advise you.

So given that basis, the fact that we got entry into service without the City having an appropriate safety management system I think speaks to the level of understanding of the role as a duty

holder, but I don't think it was the only problem.

You know, safety is a culture. It's something that we should all be responsible for, not just certain individuals, and that's a very difficult ask when you're moving the operators that used to drive buses to now driving trains under a control centre element of it as well. That's a significant change management piece.

Under common safety method, there's the safety principles which are available if you do a Google search. One of the -- one of the things in there is about defining the change. What's the -- is it a major or a minor change?

And in a major change, which this clearly is -- even if it had been exactly the same railway somewhere else, and we say all the staff went off sick so we retrained the bus drivers to go and drive that, that is a significant change, even though the rail system they drive is exactly the same. And that significance is about new, non-familiar operators working that equipment.

If you think about the situation in Ottawa, unfamiliar operators run the infrastructure, et cetera. Every single aspect of creating a railway system was brand new, was a

significant change, all of it on all sides. That is quite an unusual situation.

If you went to Toronto, yes, Eglinton Crosstown, first major new rail piece in Toronto for quite some time, but it will be operated by Toronto transit corporation who have been operating Lines 1 through 4 for quite some time, and they're familiar with how to do it, so you don't get the same behaviours. That's part of the challenge here. Everything was brand new.

CHRISTINE MAINVILLE: Right. And so to be sure, the City did not have safety regulations?

DEREK WYNNE: They have a safety management system, but on my review, it was something that -- in my opinion, they did two things: Firstly, it seemed more appropriate for other transportation systems that they already have, such as bus rapid transit.

The update that it had received, because the LRV was coming, it was entirely about pushing responsibility to people they place on contract.

Now, there's a basic principle in my mind, especially when you deal with safety, and that is, yes, you can procure the services, you can

delegate people to support your activity, but it does not absolve you of your responsibility. You're delegated the work, not the responsibility.

You can share the responsibility, and this is one of the notion of duty holder versus designer. There are certain key roles involved in achieving that safety. Duty holder ultimately is still the person at the top of that pyramid. He was responsible for employing appropriately qualified and capable individuals to ensure that safety was realized.

CHRISTINE MAINVILLE: Do you understand that that role is held in this case by the City Manager?

DEREK WYNNE: Yeah. Yeah, absolutely, yeah. So, again, if you look at the way the railway operates, OC Transpo will be sensibly their duty holder. They interact with this railway system on a daily basis. They've got access to frontline information. Liken them to be the infrastructure owner/manager.

The City wants this thing right into service. The City are effectively the capital projects arm procuring the extensions. That's exactly the same situation we've got here in

Vancouver where I'm currently looking after SkyTrain.

We've got TransLink who do the capital projects. We've got BCRTC who are the operator and the duty holder. They ultimately say what's safe to run on that railway and deliver passenger service.

Now, if I was to look at the way that system works over here, we've got over 30 different projects all running at the moment, line extensions, new control sensors, new depots, upgrades to traction power, et cetera, all different major assets.

Some of them are akin to whole railway-type undertakings. All occurring all simultaneously, all underneath the safety regime because of a safety culture and an understanding of it being everyone's job, but ultimately someone is ultimately responsible.

And I'm afraid that's not the position I felt at Confederation Line and all those involved reached before they decided to go entry into service.

My opinion was that of course the projectco were pushing to get into service as

quickly as possible. My opinion is the City accepted it far too soon. It should never have gone into service when it did. It needed more time.

And I think that was influenced by a political decision, the statements made in the press about when we were going to operate -- when we were going to open rather than it was done based on system maturity. But that's my opinion from what I saw.

CHRISTINE MAINVILLE: Sure.

DEREK WYNNE: Having said that, had it opened three, six months later than it actually did, the safety management system still wouldn't have been updated --

CHRISTINE MAINVILLE: Right.

DEREK WYNNE: -- and would still have been a problem.

CHRISTINE MAINVILLE: And so that gap, wasn't that a concern from a safety perspective going into service?

DEREK WYNNE: So this is where the -- this, again, gets into the duty holder position. I expressed my concerns, so I did discuss the SMS with the ISA. I did discuss it with the City. I

certainly discussed it within the projectco.

But my remit was to confirm the safety of the product that was being delivered for the operator and the maintainer, so I was not the duty holder.

In my opinion, I don't think there is an understanding of what it means to be a duty holder, and the safety management system I reviewed tried to push that responsibility down to the supply base incorrectly.

CHRISTINE MAINVILLE: So you mean from the City to the --

DEREK WYNNE: Yeah, to RTM, to whatever external firms that they engaged with.

CHRISTINE MAINVILLE: Where would that be reflected?

DEREK WYNNE: It is in the City's safety management system. I'm trying to think of the specific title for it, but it -- whether it -- I think -- I'm sure it wears an OC Transpo badge because OC Transpo do all of the different transport modes in the city.

CHRISTINE MAINVILLE: When you -- and when I say "you," SEMP came back later in 2021, were you asked for or did you provide input on gaps

at that point in time and improvements to be made?

DEREK WYNNE: No. So our visit at that point was to discuss the challenge that RTM were having, to discuss with them maybe writing their subordinate safety management system where the City had expressed a need for them to improve their safety management system, and to help them with effectively putting the service back into revenue service.

We were never engaged to do that. It was through those conversations that I highlighted the Operational Restrictions Document, which seemed to be during those meetings. The people that I dealt with were unaware that it existed.

CHRISTINE MAINVILLE: Was that at that point Mario Guerra or anyone else you were dealing with at RTM?

DEREK WYNNE: Yeah, Mario Guerra, and there's a few other names that I can probably go back to the emails and find for you, but, yes, those were the individuals, yeah.

CHRISTINE MAINVILLE: Okay. Yes, if you could, that would be great.

And so are you able to express a view today on -- or at least from when you were last

involved in 2021 about the system's safety and reliability currently going forward?

DEREK WYNNE: Well, I think this railway company operated safely and reliably. We could have a better maintenance regime, a better safety culture, better methods of working, better respect of the Operational Restrictions Document. We could even undertake retrospective upgrade to the assets that are there at this moment in time.

Most railways around the world operate on condition assessment based on where they are and the maintenance you need to do to them to keep them in safe revenue service. This railway is no different.

And this is a concept that was never understood by the City whilst the railway was being developed. In fact, the suggestion to them of opening with operational restrictions at one point was something -- they didn't expect a single operational restriction, which is utterly naive. Railways will always have them.

The fact of the matter is, when you undertake maintenance on condition assessment, you might put temporary operational restriction in place, temporary speed restriction, TSRs or TORs,

operational restrictions, they're temporary, to support maintenance and reengineering works.

So railways will always operate with operational restrictions. The City didn't seem to think that that was a thing, and I think that speaks to the newness in being a rail system owner and operator.

CHRISTINE MAINVILLE: So the operational restrictions were not atypical, but were they more extensive than they normally ought to be?

DEREK WYNNE: No, not at all.

CHRISTINE MAINVILLE: You just need to follow through on them?

DEREK WYNNE: You just need to do it. Absolutely. No, I mean, you know, challenging environments, for instance, the heat of the desert in Lusail, I mentioned the light rail system in Qatar.

Given metallurgic properties of rail laid on the ground and exposed to the 45-degree midday heat over there, I would be concerned to do a frequent rail inspection there because rail will twist. It expands in that heat, and then it contracts when you get to a cold night. So there

are different behaviours going on in the metal because of the environment it's in. It's a similar situation in Ottawa.

So, again, set the conditions for maintenance based on its implementation and its usage, and that includes its location around the planet.

So, no, I don't think there is a need for overburdensome maintenance in Ottawa. I think there's just a need to do the maintenance that was laid out, but I think that maintenance is only part of the challenge because the system integration, the system solution as an integrated whole is not optimized because we've got this mixed bag of light rail vehicle running on heavy rail track. It adds maintenance burden.

And clearly, from the incident, the wheel bearing, so now we need to raise an additional operational restriction which speaks to inspecting the maintenance of all the bearings until such time as we maybe come back with a stronger one that's recertified that can stand the hammer that it's taking. So maybe that's the solution.

CHRISTINE MAINVILLE: Did you interact

with Alstom maintenance or make any observations about their work?

DEREK WYNNE: No. We were -- we were kept well away from Alstom maintenance. They were a sub to RTM. Our interaction was with RTM.

CHRISTINE MAINVILLE: Okay. In terms of City counterparts, did you interact there with their advisors or other people from the City?

DEREK WYNNE: Yeah, so I interacted with the -- mainly Richard Holder, but he had consultants, individual consultants such as Gareth Wood. The City also had Parsons as the firm there. The main person there, John Hulse, managing the engagement. Every single assurance deliverable provided was reviewed by the City and the City's representatives, their owner's engineer service.

Frankly, having been through the scores of comments they raised on every single deliverable, we honoured about 5 percent of the comments, and the rest of it were rejected because it was complete nonsense.

And the 5 percent was effectively reword a sentence so that you can understand it more clearly. It was adding no value, but it was a gesture to help them through.

And frankly, it annoys me in the industry, but you do see consultancy services where people enjoy riding the gravy train and generating fees.

CHRISTINE MAINVILLE: And whose comments are you referencing?

DEREK WYNNE: Those were the ones from Parsons.

CHRISTINE MAINVILLE: Parsons?

DEREK WYNNE: Yeah.

CHRISTINE MAINVILLE: And those were provided, you said, in which document?

DEREK WYNNE: They came back on all safety justifications, on the requirement sets, the V&V evidence. They came back on lots of different things, even the engineering management parts.

CHRISTINE MAINVILLE: Did you interact with STV?

DEREK WYNNE: I interacted with STV twice. Once in relation to the Confederation Line. That was in May 2018. On behalf of OLRTC, I attended a meeting at the OC Transpo building at the far end of Belfast Yard.

OLRTC were present. OC Transpo were present. Numerous of the owner's engineer

characters were there, as was STV, as was the ISA, and also some of the City staff as well that were doing -- looking after certain of the asset types from an owner's engineer point of view.

My role at that presentation was to present a route to completion, and interestingly, as I finished that -- and I withstood about 90 minutes of grilling by the entire audience. I answered every single question satisfactorily to the room's satisfaction.

The person who leaned across and said "well done" to me was John Manconi. I didn't realize who he was at the time, but that's who was in the room as well. So there was that audience, and that's why I got to meet STV. Specifically STV, Tom Prendergast is the name that sticks in my mind.

CHRISTINE MAINVILLE: Okay. And --

DEREK WYNNE: He's since moved on, by the way. I don't think he's with STV anymore.

CHRISTINE MAINVILLE: Yes.

DEREK WYNNE: I think he's with AECOM.

CHRISTINE MAINVILLE: AECOM, yes.

DEREK WYNNE: Yeah.

CHRISTINE MAINVILLE: Okay. And did

you have concerns about those interactions?

DEREK WYNNE: No, not at all. I think it was a good healthy debate in the route-to-completion presentation I gave. I presented the strategy for making it happen.

Late end of the project, running in to fix it, get it over the line, you can't go back to day one and do the whole project again, so you've got to -- you've got to take a risk-based approach and understand how best to deliver with integrity, but at the same time with a mind to time scale of delivery.

So it's good to put a proposal there. It's good to get a room full of people to challenge that, people that are knowledgeable and can challenge that, and that was that process. And that was the 90-minute Q&A that we went through and every question answered and accepted successfully.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: But that -- but that speaks to the robustness, the independence of checking not just process but outcome from that following that process, which is everything that was happening.

CHRISTINE MAINVILLE: Did you come to

see the term sheet that was agreed to and signed in order to achieve revenue service availability? This is between the City and RTG basically agreeing to deferring certain items that were otherwise required by the project agreement to meet RSA. Do you have any knowledge of that?

DEREK WYNNE: I didn't actually see the agreement that was reached. Certainly one of those items was UTO in the Belfast Yard.

CHRISTINE MAINVILLE: The automated yard, you mean?

DEREK WYNNE: Yeah. Yeah.

CHRISTINE MAINVILLE: Yeah.

DEREK WYNNE: Yeah. So that's certainly one of those that I was aware of. I presume it got extended because of the CCTV, the one-person operation feature of the vehicle, because of the issues over the CCTV integration.

I presume there was an agreement to allow it to go forward with that as a -- have we -- have we bought something that's incorrect. No, it could work.

So it was a work-around. The City weren't happy with that, I'm sure, because it wasn't what they intended to buy. OLRTC -- I

should say RTG, somewhere in that group provided operatives to stand on the platform, so I'm sure the City accepted that in the short-term.

But I never actually saw the terms of that agreement, what fee payment was withheld until the scope was fully delivered, et cetera. I'm not aware of any of that. That's very much out of my wheelhouse.

CHRISTINE MAINVILLE: Okay. Did you have any concerns at least in respect of what you were aware of, such as the automated yard being deferred?

DEREK WYNNE: No. The yard -- there are yards that are entirely manually operated and can be done so safely, so no. In fact, I'll be frank. I would much rather the yard was operated without the unmanned train operation than with.

Railway yards are again a top-ten safety hazard. Someone controlling the train movement when there are persons accessing other trains that need to go in and out of maintenance sheds, someone driving another train remotely is a -- for me is a more significant hazard than when there's a driver driving manually. So personally, I think it's safer as it is without doing that

extra scope.

CHRISTINE MAINVILLE: Okay. And what about the Minor Deficiencies List? Would you have been aware of the items that made it there?

DEREK WYNNE: Oh, absolutely. So every single one of those, from the multiple different versions of lists that were tracked by multiple different parties, were all captured into our requirements database. So we -- if we added them all together, we had something approaching 39,000 different snags that we were tracking.

The ones that were of specific interest to us are those that were stopping the mission and safety critical features of this railway.

So for instance, snags telling me that the paint is scuffed on a door I'm not interested in. If something is telling me I've got intruder access control that's malfunctioning, we can get around that. We can use standard key and lock until such time a swipe card is working. So there are ways around many of these things.

Obviously my focus is on those that you can't do an easy solution with like that because they're what create operational restrictions.

But good progress was made on all the

properly critical snags because they were stopping us being able to deliver a system integration test to see that the features, the functions were able to be exercised.

CHRISTINE MAINVILLE: So at the end of the day, I take it you would have signed off on that list, and it didn't create --

DEREK WYNNE: No, I didn't sign off on that list. I tracked that list to show that there were no more snags against the derived safety requirements and those requirements that underpin safety, but I was not involved in or even concerned with quality of finish, of esthetics and so on. It's kind of irrelevant.

Over time, the doorways and so on, they get worn through. You see it on floor tiles. You see it on paint finishes and so on. It's irrelevant to the safe function of a railway, so I didn't waste my time on that.

CHRISTINE MAINVILLE: Fair enough. Okay. But from a safety perspective, at the end of the day --

DEREK WYNNE: Yeah, all of it.

CHRISTINE MAINVILLE: -- it didn't cause you concern?

DEREK WYNNE: So certainly where there were snags that were stopping safety features and so on, yeah, very much a concern, and all of those were mapped against the derived safety requirements.

We tracked every one of those to its closure so that the system integration tests could be conducted in their fullness because that's the information we wanted back. That's showing me that the safe -- the derived safety requirement has actually been implemented, the safety feature exists.

CHRISTINE MAINVILLE: So there were items there that could impact the systems integration test, but I take it those were resolved --

DEREK WYNNE: Yeah. Yeah.

CHRISTINE MAINVILLE: -- ultimately to do --

DEREK WYNNE: Yeah, apart from things that go into the Operational Restrictions Document, and if you ran the operational restrictions effectively, that's the system that you realized is no longer a snag; it's a permanent restriction.

CHRISTINE MAINVILLE: Okay. And were

there -- other than the operational restrictions, were there retrofits that resulted or other changes to the system that resulted from SEMP's work?

DEREK WYNNE: If there was retrofits -- so I was aware of something happening with a leaky window on one of the trains which I'm sure was getting retrofit after entry into service, but away from that, any further retrofits and so on, no, we weren't involved at that point. We finished by then.

So I was conscious of the fact that there were certain items to do with Alstom, that there was a fit and retrofit, but the scope of those -- so what's happening, every vehicle has its own build book. Each one of those has got a safety case according to the type of safety case, and then you have the conditions associated with that particular rail vehicle.

Any change to that rail vehicle needs to be done in conjunction with the safety case and safety assurance and also be updated in the build book to make sure there's a full audit trail of it there.

So not something I would have been concerned with. I would have expected that to be

done in accordance with the procedure and the safety assurance maintained. To my knowledge, I wasn't aware of stuff that was wrong with the vehicle entering into service that would have given us any safety concerns.

CHRISTINE MAINVILLE: So would your work involve assessing whether there are defects, or you would look at the design and consider that the system was built according to the design?

DEREK WYNNE: So I want to see a system -- first of all, I'm interested in the very start of the process, what are the requirements. That in itself is a big piece because there's the -- what's the objective? What are the outcomes you're looking for? What are the restrictions on achieving those outcomes? What are the instructions? I want a solution that looks like X, Y, Z and so on.

But requirements have to be embellished. That's why we elicit, derive, capture, et cetera, all the other requirements that are required in order to have a requirement set of the solution we must design.

I'm interested in the design meeting all of that because within the derived part is the

derived safety requirements and derived RAM, et cetera. I'm interested in seeing that all the way through to the far end and entry into service. So I'm involved -- well, I want to be involved at all stages of that process.

My responsibility stops at the point we reach entry into service and are satisfied that at that moment in time, subject to following the operational restrictions and the maintenance regime, that that railway -- and operating it correctly, that railway was safe to operate.

CHRISTINE MAINVILLE: Okay.

DEREK WYNNE: So I want to say in this regard, whilst that's my interest, the way assurance works is if you've got a competent person signing and taking responsibility through a design certificate, construction certification, test certificate, which is exactly what you get from Alstom and Thales as well, then I want to see an amount of evidence, but my evidence start point is their certificates.

Alstom and Thales, I was more than happy to have faith in them. It was, for me, the EJV and the designer there where engineers of record weren't certain about signing things, or if

they had, they hadn't provided the evidence to substantiate it.

And that's where a lot of our focus was spent, is extracting that information to bring that to a level because we weren't seeing the appropriate levels of competence and rigor that was required.

CHRISTINE MAINVILLE: And that was -- you said mostly your interactions were with Keith Brown and you said Dave Valens; is that --

DEREK WYNNE: David Ellis, yeah.

CHRISTINE MAINVILLE: David Ellis.

DEREK WYNNE: Yeah. And, of course, they were -- what's the best word I can say? Their ability to undertake work was, in my opinion, hampered by Roger Schmidt who was controlling their funding.

CHRISTINE MAINVILLE: Who was what, sorry? Controlling their funding?

DEREK WYNNE: Funding. The budget they had.

CHRISTINE MAINVILLE: Okay. How did you ultimately assess the level of integration of the systems? I don't know if that's too broad a question.

DEREK WYNNE: Okay. So each of the primary building blocks of the railway, track or traction power, signalling, et cetera, they all have to work together in an integrated fashion, and the way you prove that is through integration test.

So probably one of the best end-to-end descriptions of this is the fire life safety system. So if a train suffered an incident, a fire incident, there is what's referred to as a fire wire, bit of a mouth full, that runs around the train.

If the fire wire breaks, the train management system knows that the fire wire is broken, and it knows where it's broken. So this is the first part of the system doing something. That level of integration is all within Alstom.

The train management system then provides that notification to the vehicle onboard controller, which is a signalling solution which sits within each vehicle. The reason for that is this is now a safety critical event, and we need to notify the control centre.

So the route for that notification is through the vehicle onboard controller. It goes up the system, the SIL-4 system from -- for

signalling, and it's displayed to an operator. And that is telling him which train, where's the train going, and which end of the train. He can then respond by instructing the tunnel ventilation system to basically switch up.

So let's explain why there's a bit of importance about where on the train the fire is. If the fire is at the back of the train, you want the fans at the back end of the platform to pull, to pull fumes away. You want the fans at the front of the train to push, to push clean air over the escaping passengers.

The end to end of this response has gone through the train, the signalling, through the SCADA, down to the tunnel ventilation system PLCs.

If you've got a failure of a fan, that TVSPLC then notifies the next station along, and that station switches its fan on to provide pull through the tunnel to try and compensate for a failed fan.

All of that is integration testing, to demonstrate an exercise of that system from end to end, and that was certainly undertaken in Ottawa. And not only just the safety functions, but with Ottawa fire service present and other emergency

services. There was actually smoke bombs set and a live witness demonstration of it actually removing fumes from the station tunnel space.

CHRISTINE MAINVILLE: Did you consider more specifically the systems integration between the rolling stock and the signalling system? Was that a focus at all of the work?

DEREK WYNNE: Yeah, so within that space, this desire to rush to put scissors through the project agreement, a solution had been brought from Thales, a solution was brought from Alstom.

In the Alstom contract, there was the expression of this interface to instruct in a fire life safety event to notify the signalling system, but they didn't put the reciprocal requirement in the signalling contract, so at which point this became an operator's restriction.

Notification to the control centre would have to be made by the operator. This is less than ideal because it's a pressured situation. You've got a vehicle that's on fire, potentially suffering traction issues. The operator's job is to get it to the nearest platform. That's the best way of getting passengers to escape the vicinity and so on.

It just adds to the workload at a critical time, so it's not the ideal solution, but it is still an acceptable solution. If you run all the trains, that's exactly what you'd be doing anyway.

CHRISTINE MAINVILLE: Were there other integration issues that -- at that level that you --

DEREK WYNNE: So another one that relates to this was the feature of autocoupling. So autocoupling, the way the LRVs are constructed, they are currently four carriages, and there is the ability to couple two of these together to run as an eight-car set.

Now, each of those four-car consists, each LVR has got a vehicle onboard controller. So when you couple the train together, you need to know which end of the train the active vehicle onboard controller is at because that then determines, when you're going through, which end of the train will the fire be on. So it's all contextual about where the incident might be.

And there were also a couple issues around, well, firstly, selecting that and actually getting the also coupled trains to actually confirm

and register onto the system as an extra-length unit, but I believe those got resolved before it went into service.

CHRISTINE MAINVILLE: Are they two one-car consists? Double, two --

DEREK WYNNE: No. If you look at the way it -- effectively it's -- whilst it looks like it's one car, that is actually one consist, and then you can double up the consist to make two.

It's like a coupled pair, but each consist has actually got four carriages in it at entry into service, and you can actually split it and add a fifth carriage in and make it a longer one.

So each consist is then five carriages. Coupled, ten carriages, if you couple two trains together, and that's the length of the platforms that were created for Ottawa.

CHRISTINE MAINVILLE: Did you understand that there were challenges in the integration of the rolling stock and the signalling system during the project?

DEREK WYNNE: So the challenges that I was party to were around the coupling, as I was just mentioning, and also around the notification

of an incident like a fire event which you would notify back through the signalling system.

And all of that stems back to lack of prime system integration by OLRTC and rushing in to place contracts out. And missing the interface requirements that should have been specified into both contracts. So I'm aware of those issues.

CHRISTINE MAINVILLE: Would you have a way to know or tell whether the interface control documents, the ICDs, for each of Thales and Alstom were fully integrated or not? Is that something that can be assessed?

DEREK WYNNE: Yeah, absolutely. So as I -- in OLRTC's position, you would have put an interface requirement on both parties. So the requirement is normally followed by an agreed interface definition, and an agreed interface definition is then followed by an ICD.

For an ICD or an agreed interface definition, both of those are -- they effectively describe the conduit between two parties; therefore, they have to be accepted by two parties.

Where this falls over is what precedes that, and it's in the requirements. Requirements in the Alstom contract and the reciprocating ones

not placed in the Thales contract. So you can already see where the integration issue started.

CHRISTINE MAINVILLE: Do you understand that this had any implications on the performance of the system ultimately, on the reliability of it? I'm not necessarily speaking about safety.

DEREK WYNNE: No. To my knowledge, at entry into service, the signalling was working well. The issue seemed to be about vehicle availability and how the vehicle was performing when they were going through test and trial running.

But, no, as far as I knew, the -- that interface, apart from not having all the features it was supposed to have, as far as I know, that feature was working well by the time we got to the end of test of trial running.

CHRISTINE MAINVILLE: And in terms of -- is it possible that -- you know, you don't know what you don't know, so if there are train behaviours that one system is not aware of for the other system to respond to, is it possible that things could have been overlooked if some things were simply not known as between the Thales and Alstom systems?

DEREK WYNNE: Sorry, I might need to ask you, is there something particular you're looking for in there maybe as an example?

The reason I ask is because the vehicle can be driven manually by the operator, and that is normally done to a speed restriction so the vehicle -- if the vehicle onboard controller is disengaged, the train will only allow you to drive at a certain speed, usually about 30 kilometres per hour max speed. I have a feeling it's lower than that for Ottawa.

If the vehicle onboard controller is functioning, then the train is in GOA2 automatic mode, and the train is then accelerated and decelerated using the signalling system.

So the command comes from the signalling system, and that was proven to be working. It had to be, otherwise we couldn't have done test and trial running.

CHRISTINE MAINVILLE: I'm not suggesting that by this time any such issues remain because I understand there would be a lot of reliability growth over time, but for instance, there was a point in time where emergency braking issues arose?

DEREK WYNNE: Okay, so the challenge on the emergency braking -- if this is -- so I'll describe the one I was aware of. You tell me if this is the one that you're thinking of.

So within a certain distance of each train station, if you have a guideway intrusion detection system failed where a passenger is in the guideway running from one platform to the other, instruction was sent in order to emergency brake the train.

It's a pretty harsh reaction to an intrusion in the guideway. So the City were asking for emergency brake, and I was asking for disengagement of the traction power so the train could coast and then, under driver vigilance, which is the whole point of the system -- if the driver can witness the obstacle, the person or whatever might have fallen in the guideway, then the driver would actually do the braking, including using the emergency brake, and I think that's the more appropriate and proportionate response.

So that's what was happening. The challenge around EB was twofold: So first of all, the alignment to the station, the field of view of the operator, what's the approach speed, some of

that can be set as part of the configuration of the signalling system. What's the speed profile that you also drive a train to.

The other is about sensitivity of the guideway intrusion detection system. If a piece of litter flies in front of it, then would you want it to emergency brake the train, because it can be made that sensitive. And at one point, it was that sensitive. So you have to desensitize it. The challenge of desensitizing it then is so what purpose does it serve.

But moreover, guideway intrusion detection system is about stopping people heading along the guideway rather than stepping off the platform edge.

For instance, if someone steps off a platform to retrieve a mobile phone that had been dropped, guideway intrusion detection system would not pick them up. It wouldn't be known. The train is still coming, also driving. It was only about people running around the central barrier and tripping the gids (ph).

So for me, this was a partial solution that was implemented. The City didn't want the full solution which is available.

By the way, that's the full solution that you find here in Vancouver. The City didn't want the full solution, and therefore, they've got a partial solution.

And then there was a lot of complaints around how sensitive the system is and how it keeps emergency braking. Well, the system is doing what it was intended to do because you wanted to specify something that you're now not happy with the consequences of your ask.

So, yes, there were issues, but I do think that is a particular red herring in terms of integration challenge. That's more configuration challenge.

CHRISTINE MAINVILLE: Okay. And then you mentioned the goal availability being the bigger concern, and I just want to be clear -- and I know we touched on this a bit -- about what you mean by that.

DEREK WYNNE: Yeah. Okay, so build of vehicles was running late, and I think there were numerous issues as the first vehicles were being shaken down. It wasn't a design issue; it's more of a manufacture and quality issue concerned with doing appropriate sort of factory inspection,

factory acceptance test, which you would do of each vehicle.

I did mention the fact that trains were assembled in Ottawa at the Belfast Yard. This was supposedly to do with a cost savings and so on. I can't tell you whether that started with the City instructing the OLRTC that it's going to be this LRV or whether it was -- that was driven by OLRTC looking to save money.

I certainly know that both parties were involved in selecting this particular vehicle, but this was a lateness to come to revenue service, and there were a few issues, things that caused breakdown, and where a vehicle would stop moving, maybe there was a braking issue. Or there were times where continuous test couldn't occur because there was a signal issue because of a non-deterministic switch.

Actually, in my opinion, that was driven by an earthing and bonding issue, because the signalling system is running at 110 volts to move the switches, and if you get to sort of 60 volts, you know, it's 110 volts plus or minus 5. Well, halfway point is 60. You're kind of creating a voltage where the switch doesn't know which way

to go, so it becomes non-deterministic.

So there were issues like that which stopped trial running from occurring. So there were various issues. Most of the issues with the vehicle was about the build quality rather than the actual design of the solution, and that was being worked through at the time.

CHRISTINE MAINVILLE: The quality part of some of the components?

DEREK WYNNE: No, no, the build quality. So imagine going to the garage and picking up your car. If the paint is scuffed, you would reject it. The wing mirrors are on, but they're loosely fitting; they're not tightened up properly.

That's build quality versus quality of the components. You can have good components, just not assembled correctly or sufficiently tight and checked and so on.

CHRISTINE MAINVILLE: And do you attribute that mostly to where the assembly took place, the MSFs, or the labour?

DEREK WYNNE: I think it was a combination of the labour and the location. If you had been working from Alstom's factory, then you

would have had their regular workforce who were familiar with doing this. I don't think there is one particular statement you can make as to why it's a problem. I think it's a combination of factors.

CHRISTINE MAINVILLE: Have you seen that much elsewhere, this assembly in a facility that's not -- well, whose purpose is not an assembly facility or a production facility?

DEREK WYNNE: I must confess, it surprised me to see that the vehicle was being assembled at the MSF. That's not what I was expecting at all.

Certainly if -- I'm familiar in London with digging a big hole in the road and lowering an entire train carriage through it when it's delivered from the factory to get it down into the railway, but that speaks to the fact that the trains are built at the factory.

Near the factory, you've also got the test track, so they do the shakedown remotely and then bring it to the line.

Creating the vehicles at the MSF, I've got to say, did seem -- it's there to maintain the trains. You can pull big bits on and off the

train, but how the whole thing is assembled there, it's not a facility that's set up to cater for that. So it's almost like a temporary manufacturing facility. I'm not sure why you would have chosen to do it, and I'm not sure it was the optimum solution, quite frankly.

CHRISTINE MAINVILLE: And from your perspective, would this system have benefitted from a longer trial running period or dry running period?

DEREK WYNNE: Very much from a longer burn-in period, yeah, through to test and trial ops. Because all the way through those periods of time, further snags are being addressed, further configuration is being undertaken to get a much better entry into service point. So, yeah, it would have benefitted.

CHRISTINE MAINVILLE: Are you aware of other breakdowns or the other derailments that this system encountered that we haven't spoken about yet that you have some understanding of what may have contributed to?

DEREK WYNNE: So I'm familiar with -- I know there's been numerous derailments in the yard. All seem to be going over switches, and I think

that's down to yard control and sensing where the train is.

On the main line, I'm conscious of two derailments that have occurred, the one where we came through the platform, damaging the side of the rail vehicle, moving the rail ties, and damaging some wayside equipment.

That's the incident I refer to when I've heard, not actually exactly got evidence but heard, that the operator on the vehicle was instructed to limp it back to the MSF.

I believe that that particular vehicle operator summoned a maintainer because of sensing a smell. I believe the brakes were freed on the adjacent axle to the one that's got the failed wheel bearing, but -- and then that train -- there was an attempt to drive that train back.

What concerns me is some of the mentality to recover a train that's at the end of the line rather than operating with a restriction until such time as you get past revenue service and you can recover the train that's misbehaving. You recover it during engineering hours.

So, yeah, I've got a reasonable amount of understanding of what's been going on. The

first derailment on the line, certainly there was a derailment, but it was not as impactful as the last one that I'm aware of from last year.

CHRISTINE MAINVILLE: Would you be able to provide us your résumé if you have it?

DEREK WYNNE: Yeah, absolutely.

CHRISTINE MAINVILLE: Okay. So we'll include that as an exhibit subsequently to your interview.

EXHIBIT NO. 1: CV of Derek Wynne.

CHRISTINE MAINVILLE: I know it's already -- yeah.

DEREK WYNNE: I was going to say, I'm very conscious of the fact that normally when I'm explaining to engineers that are involved in this process, I'm normally studying from a very large whiteboard and mapping out all of these concepts and how all of this works, the process of systems, engineering system assurance, and then run an example through this from end to end.

So it's very difficult to verbalize it, and I hope you've been able to understand and follow, but I will certainly offer this, that if you need to revisit and need me to be in a room and do that for you, then please let me know, and I'll

make myself available to do that as well.

CHRISTINE MAINVILLE: Thank you.

DEREK WYNNE: As for a résumé, yeah, I'll get that forwarded over to you. To the same email address that I put the confidentiality thing back to?

CHRISTINE MAINVILLE: Yes. Let's go off record.

-- OFF THE RECORD DISCUSSION --

FRASER HARLAND: Just two fairly brief questions: The first was, I mean, you've spoken a number of times about this mismatch, if we can put it that way, between the rail and the cars.

Was that issue, to your knowledge, identified by anyone else other than SEMP?

DEREK WYNNE: I identified it. The ISA was cognizant of it. The engineer of record for the designer was notified of it. It caused quite a deal of upset because the track had already been laid, and effectively he had signed off on it. And, in our opinion, he signed off against the project -- an agreement requirement rather than its suitability for its service life.

But, yes, we did -- more than one party knew about that, but it wasn't something that

anyone was willing to address. It would have to be dealt with through how you maintain and operate the railway, which clearly hasn't happened correctly.

FRASER HARLAND: And that would have been identified from you to OLRTC, I assume?

DEREK WYNNE: Yes. Yeah. Yeah.

FRASER HARLAND: In your experience, is that something that the constructor could have flagged despite the project agreement saying, you know, Are you sure you want to do this and --

DEREK WYNNE: Yeah, so this is -- this is where I think it's -- I don't think any particular parties covered themselves in glory. I think that the City specifying AREMA were tying the hands of the projectco, but I think any supplier has got a duty of care to its customer, and if it considered that the rail type was inappropriate, it should have flagged it rather than going and blindly ask for the constraint placed on it.

And therefore I think, you know, in view of the fact that this is a team sport, all levels and all stages of design and development, I do think the relationship between client and DBFM could have been a lot better, and the behaviours could have been a lot better all around to resolve

these sort of issues.

FRASER HARLAND: And then just one other category of question: You mentioned the operational restrictions on a number of occasions and particularly how it seemed to you that RTM had never reviewed this document.

I guess my question is do you have any sense of, you know, how that possibly could have happened? It seems to me that that's a fairly key thing, particularly, as you said, it's in the safety certificates and everything else.

DEREK WYNNE: One of the things that I would look for -- I produced -- my colleagues, we produced an engineering and safety assurance case. That was based on all of the aspects of the physical solution being provided.

It was out of our scope to consider the operator and the maintainer. If I was back in my London Underground days, I would have also included in the engineering and safety assurance case a statement of operational readiness.

Operational readiness was not our scope. Ours was about getting it to the point where it could be operated, expecting that the operator and maintainer would be operationally

ready.

This requires passing of information, and given the City is still searching for documents that OLRTC were producing, I'm going to guess that there was a communication issue and misfiling of information and things not being made available to OLRTC.

I -- also, if it helps, I've actually got the Operational Restrictions Document on my screen now if you guys would like to see.

CHRISTINE MAINVILLE: Which document did you say? This is the --

DEREK WYNNE: Operational Restrictions Document.

CHRISTINE MAINVILLE: Just perhaps so we can then identify it.

DEREK WYNNE: I'll share screen. There is the Operational Restrictions Document. Here is the Operational Restrictions Document specifically against Phase 1.

Mike Williamson, Steve Leonard, both part of the SEMP team. John Blowfield, give you a flavour of John Blowfield as RAM's lead: John has over 30 years' railway safety and RAM experience. Prior to working on Ottawa, he led safety and

assurance for a multibillion-pound upgrade to the Great Western route modernization program.

There's myself. There's Sean Derry that we mentioned before, SNC-Lavalin systems assurance director. Here is the seal of Jacques Bergeron, who was brought in as the professional engineer to sign and seal this document.

So this is the Operational Restrictions Document, and if we wander into this document, you'll see it gives an explanation of its provisions.

So we discussed what this document is for, the system description, the restrictions, conditions and limitations, all expressed through here, and recommendations as well against the railway in general, against stations, comms, track, energy, tunnel and so on, and a whole series of conclusions.

But in the introduction, we overview the safety case and what is provided in the various points. So we discuss the scope, all of the assets that are considered. We describe the document structure.

Here is an engineering safety assurance case sat in the middle. It's showing that this is

the Operational Restrictions Document that informs it. It sits alongside operational and supportability hazard analysis. It sits alongside interface hazard analysis.

It's all fed by the integrated hazard log and the integrated hazard log summary report, which is specifically talking to satisfaction of the derived safety requirements from there.

The other side of the ESAC, you'll see we manage the competencies of engineers of record who signed off design certificates, the overall system assurance approach, and the audits that were conducted.

The compliance matrix of every single requirement from the project agreement, plus requirements are listed derived, et cetera. The RAM analysis that was done which informs the case for safety and backup into here.

Here's the suite of safety justifications through the middle, and outside of our scope but very much contributing into the case for safety is the light rail vehicle safety case that was produced by Alstom rather than all of these produced by my team.

And there's the computer-based train

control, the signalling safety case that came up and was included as well. So that is the ESAC.

CHRISTINE MAINVILLE: I just want to say for the record, you're describing the figure at page 8 of the document, Figure 1 document, hierarchy.

DEREK WYNNE: Yeah. Okay, so if I now move forwards a little into this document, see if I can give you an example of certain restrictions that were placed. Here we go, restrictions. So I can set the scene for context. I talk about standards for railway applications, so this is restrictions about 50126.

And then we start to place some notion of restrictions, and what you'll see going forwards is I'm placing a restriction here, and you can see I've actually sourced this directly from the controlling standards, CENELEC, which is the internationally recognized way of dealing with railway RAM and safety.

We talk about policies and restrictions. So on the communication system: (As read)

"No equipment shall be physically or otherwise installed in

or connected to the existing Communications Primary System unless the appropriate Threat & Vulnerability Certification has been obtained."

That is a cybersecurity restriction.

(As read)

"No equipment shall be physically or otherwise installed in or connected to the existing comms primary system unless appropriate cyber is done.

No equipment shall be physically or otherwise installed in or connected again unless the system engineering and system assurance has been applied in accordance with the system engineering standard ISO 15288 and the CENELEC suite 5012628 and 29."

So these are restrictions against comms, against signalling, against the train service control centre and its backup control centre, against the stations, against the guideway, against the track, against the NG, which is said to

be a traction power, and your low voltage power. Against the maintenance service facility, against the vehicle itself. So those are restrictions.

These are conditions, and this is condition of operation. So when we get into a condition of operation -- and we mention this particular one. So signalling to tunnel ventilation system interface, so there's a description of what's going on. And we mentioned before, by the way, about the eight-car consist configuration and the VOBC in the front LRV or the rear one. So here's all the text and the explanation, and here's the condition: (As read)

> "When notified of a fire onboard train, the LRV operator must communicate verbally with the train service control centre operator to confirm LRV location, direction, train set configuration and whether the front or the rear VOBC is active.
>
> The train service control centre operator verifies the VOBC message by comparison with the driver status report and instructs the tunnel

ventilation system fans and dampers accordingly."

This is the work-around because of the interface that wasn't ordered.

So I also placed a restriction on the downtown tunnel, and the reason for this was quite simple. When you're in ATO mode, you can leave a platform even though the platform ahead is not clear.

If the platform ahead isn't clear and you then get your train trapped in a tunnel, you can effectively get a captive train that's caught up behind an incident train.

So this is a restriction about receiving permission to proceed to avoid creating captive trains because that puts more passengers at risk if there's an incident train.

Talk about the similar issues around the MSF connector. This is connecting the MSF with the main line. One train total permitted in TVZ -- TVZ is a signalling area -- at any given time. So what we're -- what we're talking about here is the safety provisions of the conduit between main line and depot.

I mentioned to you about testing of

TVS. The first six months of revenue service, an end-to-end train service control centre to fan actuation test, to be performed every month.

After the first six months of revenue service the following actions: Cycle each fan every month; end-to-end test to be performed every three months. These are all the restrictions of operation of this railway.

Now, how many of these have been conducted? It's not difficult to see because I've even -- I've even pulled up the text blocks to highlight the text as well as also setting the scene.

Track, we mentioned track. (As read)

"Due to the concerns about rail hardness and the lack of any technical methods of detecting rail breaks, it is a condition on the approval of the system that the ultrasonic testing regime was amended to once every three months for the first two years."

This has never happened. (As read)

"MSF connecter and yard should be tested every six months" --

because they're lower speed -- "for the initial two years. The frequency of all ultrasonic testing may then be changed based on findings and a risk-based approach."

So this is about a risk-based condition assessment. We talk about grinding rails and even placed one that said because of the settlement and the wear, you can see spooling (ph) on the railhead, but after two months of service, continuous service, don't grind the railhead. The railhead has never been ground in Ottawa since we went into service.

So station minimum operating standard, so we talk about what it is to actually operate a safe station remotely. (As read)

"Rideau station is the deepest Ottawa Confederation Line station. Escalators support safe evacuation in the event of emergency. Compliance with NFPA 130 can only be achieved if at least one of the escalators is operational. The station should be closed in the event of loss of all escalators."

And this is the level of detail I went into in the Operational Restrictions Document, and this is not unusual for a railway.

I mentioned to you before about emergency telephones, what you do with station CCTV. These stations are unmanned intentionally. Loads to -- and we mentioned about unattended train operation in the yard, so we've got some notice in there about: (As read)

> "Yard functionality being delivered in stages, from initial revenue service, until Alstom vehicle production is complete and the MSF is at its final configuration.
>
> All stages need to be identified and the configuration of each stage documented, analyzed and the impact of the safety case determined.
>
> In each case, attention should be paid to which parts of the yard are dedicated to vehicle production, which parts are dedicated to maintenance and to storage, the interfaces between these two

activities.

LRT train movements for the yard, in addition to that of the handover platforms, are not yet controlled by CBTC. Future upgrades are planned to introduce CBTC and unattended train operation. The impacts to safety of this transition shall be subject to hazard identification/hazardous operation workshops to identify new risks and associated mitigations."

So we can see we were unpacking all of these considerations that we've been talking about. It's all here all the way through.

CHRISTINE MAINVILLE: Okay, I just want to be clear. This last one, you were reading from page 23 of the document.

Okay. I think we probably have to stop given the time, but what we'll do is we'll file this -- if you could email it to us, we'll file it as an exhibit to this interview since we don't have a document number yet.

DEREK WYNNE: Yeah.

CHRISTINE MAINVILLE: So that will be

Exhibit 2, I believe.

DEREK WYNNE: Yeah.

EXHIBIT NO. 2: Ottawa Confederation Line Phase 1 - Operational Restrictions Document.

CHRISTINE MAINVILLE: Okay. We'll stop there. So we can go off record.

-- Adjourned at 4:23 p.m.

REPORTER'S CERTIFICATE

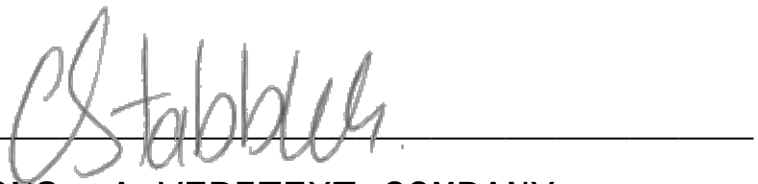
I, CARISSA STABBLER, Registered Professional Reporter, certify;

That the foregoing proceedings were held remotely via Zoom videoconference at the time therein set forth, at which time the witness was put under oath by me;

That the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me and were thereafter transcribed;

That the foregoing is a true and correct transcript of my shorthand notes so taken.

Dated this 12th day of May 2022.



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