

# Report of the Ottawa Light Rail Transit Public Inquiry

## **Executive Summary and Recommendations**

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November 2022

The Honourable William Hourigan  
Commissioner

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# Executive Summary

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The Ottawa Light Rail Transit project was supposed to provide safe and reliable transportation for the residents of Ottawa. It was part of an integrated transit plan designed to operate with existing and future OC Transpo services to relieve traffic congestion in the downtown and beyond. The people of Ottawa were the intended beneficiaries of the project. Their tax dollars were being invested in a light rail transit (LRT) system that would make their commute a little easier, giving them more time with their family and friends instead of being stuck on a bus going nowhere in downtown traffic.

For the design, construction, and maintenance of Stage 1 of the Ottawa Light Rail Transit (OLRT1) system, the City of Ottawa (City) signed a contract (Project Agreement) with Rideau Transit Group (RTG). The project was to be operated by OC Transpo.

RTG signed a Construction Contract with Ottawa Light Rail Transit Constructors (OLRT-C), which then entered into several subcontracts, including with:

- Alstom for the supply of train vehicles,
- Thales Canada for the control system, and
- RTG Engineering Joint Venture for design and engineering services.

RTG also signed a contract with Rideau Transit Maintenance (RTM) for maintenance of the LRT system. RTM, in turn, contracted out the maintenance to Alstom and other companies.

The transit system that was ultimately handed over after a delay of approximately 16 months was unreliable, as members of the public repeatedly told the Commission during public meetings in Ottawa in May 2022. Trains derailed on the main line on two occasions and regularly had issues that harmed the system's reliability. Fortunately, the derailments caused no injuries. As problems developed on the OLRT1 project,

the relationship between the City and RTG became strained and the parties ultimately engaged in multi-million-dollar litigation, which the taxpayers of Ottawa will continue to fund for the foreseeable future.

The Ontario government established this Commission of Public Inquiry and gave it a broad mandate to investigate the commercial and technical circumstances that led to the breakdowns and derailments of the OLRT1. In doing so, the Commission was to examine each major aspect and component of the project from start to finish, and to identify ways to avoid similar problems in future projects. The Commission views its primary role as providing answers to the people of Ottawa about what happened and why, as well as recommendations for ways to avoid repeating the problems that plagued this project.

At a high level, it is clear that RTG failed to deliver a reliable system by the initial deadline of May 24, 2018, or indeed within the several new deadlines that RTG chose after that. It is not unreasonable to expect that a company consisting of some of the biggest players in the construction industry should be able to fulfill its obligations to the City, which was the purchaser of a product that RTG undertook to provide. However, a closer examination reveals that the reasons for the project's problems are multi-faceted, and include the following:

- The City chose an essentially new vehicle based on unproven technology. Thus, the City had to suffer the inevitable start-up problems with the introduction of new technology. This problem was exacerbated by the City's technical demands, which strained the limits of an LRT.
- The model chosen for delivery of the project, which relied on the private sector to build and maintain the OLRT1, resulted in the City avoiding significant financial liability during the construction phase, but it also led to a situation where the parties' attention was diverted to protecting their legal rights instead of opening a reliable LRT.
- The delivery model chosen by the City left the City with little control over RTG's work.
- RTG and OLRT-C failed to ensure the integration of roles, responsibilities, and deliverables through the construction of the OLRT1. Further, the arrangements for subcontractors on this project were complex and uncoordinated. At times subcontractors, which had overlapping ownership interests, were working at cross-purposes, which contributed to an overall lack of integration.
- The OLRT1 project was characterized by new relationships, new designs, new facilities and infrastructure, and new undertakings that affected nearly every aspect of the project. The parties failed to appreciate and plan for the resulting delays and reliability issues.



- A series of factors led to the project's construction delays, including a sinkhole, provincial rules requiring specified amounts of Canadian content, and a failure to integrate engineering systems. While some of these factors were outside the parties' control, it was unconscionable that RTG and OLRT-C would knowingly provide inaccurate information to the City about when the OLRT1 system would be ready for operation, which resulted in the City communicating unachievable dates to the public.
- Considerable political pressure to begin operation caused the City to rush the system into public service. It agreed to consider the system as having met the Project Agreement's definition of Substantial Completion, even though significant operating issues remained. The City also agreed to lower the trial running testing criteria, which were supposed to operate as an objective measurement of the system's readiness. It did so because the OLRT1 could not pass the testing criteria previously agreed to by the City and RTG. Further, it appears that the City negotiated passes and fails with RTG instead of sticking with an independent and objective measure of the system's readiness for operation.
- Generally, City staff properly shared information about the OLRT1 with the public and Ottawa City Council (Council) during the construction phase. However, this changed during the problematic trial running testing period when critical information was withheld and provided only to Mayor Jim Watson and his office, and the Chair of the Transit Commission. Most troubling was the deliberate effort by Steve Kanellakos, the City Manager, to mislead Council on the decision to lower the testing criteria and on the testing results. The Mayor had accurate information about trial running and the decision to change the testing criteria, but failed to provide that information to Council. Thus, the conduct of senior City staff and the Mayor irreparably compromised the statutory oversight function of Council.
- The City lessened the requirements for accepting the system at the stage called Revenue Service Availability, or RSA.
- The City failed to follow best practices by not implementing a soft start for the opening of the OLRT1 to the public. Instead, it opened with full service for the public from Day 1. This resulted in a situation where start-up issues were being worked out during the initial operations period.
- RTG and its subcontractors provided inadequate maintenance resources. Consequently, there were ongoing problems with the system that caused service delays and general system unreliability. The City contributed to this problem by filing hundreds of work orders in the first weeks of operation, many of which were categorized as urgent, to respond to minor issues that would have been largely resolved through regular maintenance.

- The OLRT1 experienced two main-line derailments. The Transportation Safety Board of Canada (TSB), a federal body that has exclusive legal jurisdiction to investigate and determine the causes of the derailments, determined that the first derailment was caused by the failure of an axle bearing. All parties agree the second derailment was a result of human error in servicing the vehicles. The City and RTG, along with its subcontractors, eventually worked together co-operatively and relatively effectively to respond to the derailments. The City brought in an outside safety expert to provide advice and guidance regarding the reduction of problems and to advise on a safe opening date for the system.
- Despite this co-operation in responding to the derailments, the Commission concludes that there is an ongoing issue with the wheel and track interface that is continuing to cause problems. Given the problems identified later in this summary regarding the failure of City Manager Kanellakos to properly update Council, it is recommended by this Commission that the City continue to retain outside safety advisors and that they report directly to Council or the Transit Commission.

What follows is a high-level summary of the events that led to the OLRT1's failure and the Commission's views on how to avoid similar issues in the future, as well as examples of where the parties got things right. These issues will be discussed in greater detail in this report, but are outlined here to give the reader the necessary context to understand the report and the Commission's recommendations.

# Project Delivery Model

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When governments are faced with constructing large infrastructure projects, they must determine the best method to ensure that the project is completed to their specifications and within the established budget and schedule. The various options to meet these needs are referred to as delivery models. For the OLRT1 project, the City did not have the necessary in-house expertise to select the appropriate delivery model. So it sought the assistance of the consulting firm Deloitte and Ontario Infrastructure and Lands Corporation (Infrastructure Ontario), a Crown corporation, to advise it on the best way to build a safe and reliable system.

Deloitte and Infrastructure Ontario recommended to the City that it enter into a contractual arrangement known as a public-private partnership (P3). P3s are partnerships between governments and the private sector to build infrastructure or deliver services where the private sector takes a leadership role in building the infrastructure. The specific P3 model selected was a design-build-finance-maintain (DBFM) model, which requires private-sector companies to design, construct, and finance the project, in addition to providing maintenance services after construction. This was one of the P3 models Infrastructure Ontario used to build vertical infrastructure projects like courthouses and hospitals. Under the Project Agreement, RTG was required to deliver a fully operational LRT system at a fixed price to the City and then maintain the system for 30 years.

That model was chosen in circumstances where there was heavy political pressure to deliver the project “on time and on budget,” a strong desire at the City to transfer the economic risks associated with the project onto a private partner, and a concern that Ontario’s contribution commitment was at risk if the City did not adopt a P3 model for the delivery of the OLRT1.

The significant involvement of the private sector in this project has been a point of controversy in this Inquiry. The City and Infrastructure Ontario take the position that the P3 DBFM model worked well and protected the financial position of the City. In contrast, the Amalgamated Transit Union Local 279 submits that the involvement of the private sector in this model created issues in the construction phase and has been an ongoing source of problems in the operational phase. In my view, the use of a P3 model had a mixed impact on the project.

One of the primary rationales underlying P3s is to transfer risk. In this case, the City was able to offload the geotechnical risk to RTG. The risk transfer was a significant benefit to the City because that risk materialized with the Rideau Street sinkhole. The financial impact of the sinkhole was substantial; the City saved costs of over \$100 million because it had transferred the geotechnical risk to RTG. It is unfair to dismiss this cost saving as a lucky benefit of the model. Because the downtown tunnel was included in the project and the City and its advisors identified the heightened geotechnical risk early in the project, they acted jointly to eliminate that risk. They deliberately chose the P3 model to reduce this risk. Thus, the P3 model worked precisely as it should have by transferring that risk. The people of Ottawa were the beneficiaries of this good planning.

Yet, in many ways, the P3 model caused or contributed to several of the ongoing difficulties on the project. For example, whereas the City traditionally had a hands-on, leading role in projects, given the lesser role it played under this model, the City was left in a position where it had limited insight or control over the OLRT1 project. Further, when problems developed, the City's insistence on enforcing its contractual rights was a significant contributor to the breakdown in the relationship between the parties. This adversarial relationship hurt the parties' ability to respond to problems. The ultimate result is that, despite some recent improvements in the relationship, the people of Ottawa face the spectre of a largely dysfunctional partnership operating and maintaining the OLRT1 for decades.

While it is important to weigh the relative merits of the P3 model in this project, this consideration regarding future projects has been largely overtaken by events. The Commission heard evidence that the assumption of risk required in P3 models is causing some major construction companies to decline to participate in P3 projects. This reluctance is understandable because, in the context of significant infrastructure projects, the potential financial risk can be almost unlimited. Thus, while the City was able to transfer risk in this case, it may not be able to do so in the future or the cost to do so may be significantly higher.

I do not suggest or claim that a single delivery model should be used for all infrastructure projects. However, it is essential that governments do not start projects with the mindset that there is only one acceptable delivery model. Instead, I recommend that government agencies procuring large and complex infrastructure projects critically analyze the full range of delivery model options using objective criteria appropriate to the project's circumstances and the public procurer's various priorities. I recognize that government agencies need to prioritize cost certainty and risk transfer. Still, decision makers should be cautious about assigning too much weight to these two priorities in assessing options.

Public procurers should also appreciate that it may not always be helpful to structure the relationship in a manner that creates a zero-sum game whereby one party bears all the risk and “loses” if that risk materializes. A true partnership may be more effective.

Finally, as an overarching consideration, a public agency must prioritize the protection of the public interest. The public has the right to safe, reliable infrastructure and to receive regular and honest communications from the government regarding its construction status and operations.

# Bidding Process

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The \$2.1 billion fixed price for the OLRT1 was based on an initial estimate that City staff provided to Council in 2009. This estimate included project components like land acquisition, project scope changes, and design refinements, but it did not account for inflation. It also had a variance of plus or minus 25 percent. Although the estimate was the product of considerable work by City employees and expert consultants, it was never intended to be an actual budget for the OLRT1 project. However, Mayor Watson made clear in his public statements during his run for the mayor's office in 2010 that he would ensure that the project was completed "on time and on budget." The budget he was referring to was the estimate provided by City staff.

It would have been preferable if the City had recognized the initial estimate for what it was and only committed to a budget later, after the preliminary engineering work was completed and the design was sufficiently advanced to have reasonable confidence that the budget could be maintained. While there is no evidence that the fixed price dissuaded qualified constructors from bidding on the project, the Commission did hear evidence that certain design choices were made based on the inflexibility of the budget. For example, platform doors were excluded from the design due to budgetary constraints. These platform doors would have prevented riders on the platform from interfering with the vehicle doors – activity that contributed to early reliability issues during public service.

The evidence considered by the Commission established that the actual bidding process was fair and reasonable and was consistent with best practices. The City attracted bids from major players in the construction industry, and two of the three bids were under the affordability cap set by the City. The RTG consortium was made up of world-class leaders in the construction industry that had completed significant infrastructure projects in Canada and around the world. Therefore, it was reasonable for the City to expect that RTG could deliver the LRT system it promised.

# Contractual Arrangements

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Under the Project Agreement, RTG was responsible for the construction and maintenance of the OLRT, and the City would be the operator of the system. The Project Agreement, which was based on Infrastructure Ontario's P3 template, gave the City limited control over the construction process or the subsequent maintenance of the system. Therefore, the City's ability to direct the project was generally limited to enforcing specific financial remedies under the Project Agreement. In essence, the City was in a position where it had to rely on RTG to fulfill its contractual obligations and could only attempt to ensure compliance by withholding funds or otherwise enforcing contractual remedies.

RTG's project plan required the various engineering systems that went into the OLRT1 to be carefully integrated. However, the subcontractors operated in silos. These decentralized arrangements made it essential that the parties integrate their efforts and engage in near-constant communication. They failed to do so, OLRT-C did not effectively coordinate their efforts, and the project suffered due to this lack of coordination.

# Unproven Design

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The City received advice at the start of the project that the best course in establishing its technical requirements for the system was to use proven vehicles. In other words, vehicles that had been used successfully in other cities with similar needs and climatic conditions should be used on this project. This would reduce the risk of design flaws, delays, and malfunctions, and would minimize the chances of service interruptions. Consistent with this advice, the City included a requirement in the Project Agreement that the vehicle for the OLRT1 be a “service-proven” vehicle.

Despite this advice and the requirements of the Project Agreement, the City chose to proceed with unproven technology. The vehicle used, Alstom’s Citadis Spirit model, included existing components from other train models but was actually a new custom-built vehicle for this project. Further, the City’s demands for the vehicle, including a low floor and performance requirements that made the use of an automatic train control system with aggressive acceleration and deceleration rates necessary, among other performance capabilities, pushed the limits of performance for an LRT. In effect, the City elected to gamble with unproven technology. As one of the City’s consultants stated, Ottawa “took one for the team” by being the first adopter of the new technology, because other cities would benefit from the City’s experience of living through the growing pains of a new vehicle. As will be discussed, this problem was compounded by the decision to make RTG solely responsible for the delivery of the vehicle. Given that the Project Agreement put the risk on RTG to supply a proven vehicle, and that RTG via OLRT-C subcontracted that task to Alstom, the City had no direct relationship with the key supplier.



# Inexperience

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The OLRT1 project was characterized by new relationships, new designs, new facilities and infrastructure, and new undertakings. These include: (1) the City had no experience with an LRT project of this complexity, or with using a P3 model to deliver a project like the OLRT1; (2) Infrastructure Ontario had never undertaken a light rail system or an infrastructure project involving a tunnel; (3) Alstom had never worked with the Canadian content requirement; and (4) OC Transpo had never previously operated a complex LRT system. Collectively, these “firsts” were at the core of nearly every aspect of the LRT system: procurement, the contract, the trains, systems integration, manufacturing and assembly, operations, and maintenance.

I do not criticize any of the parties involved in this project for attempting to do something they had not done before. However, the participants fell short in not appreciating the extent to which they were entering uncharted waters and anticipating the issues that would likely arise as a result. They should have planned better for lengthy delays (and informed the public accordingly), understood that reliability problems would arise (and staffed accordingly), and allowed sufficient time for testing and trial running in the context of an unproven vehicle, unproven relationships, and inexperience.

## Project Delays

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In a project of this size and complexity, construction delays are a strong possibility. They were not out of the parties' expectations. The OLRT1 project experienced several delays that led to RTG missing four dates that it had established for handing over the system to the City, dates known as RSA dates. As discussed below, construction problems were significant because they set the stage for handover problems. In other words, the delays during construction caused delays to the RSA date, which increased the pressure to open the system.

The most significant delay for the project was the Rideau Street sinkhole in 2016, which profoundly disrupted the construction timeline and caused an immediate delay in OLRT-C's sequencing of the work. While there were other delays at the same time – such as Alstom's delivery of the vehicles and OLRT-C's systems engineering and assurance failures – the sinkhole disrupted OLRT-C's progress at a critical stage of construction. This delay had knock-on effects throughout the project, most significantly in OLRT-C's ability to deliver the necessary track and other infrastructure to test the vehicles and the train control system. This resulted in a shortened testing schedule and a resequencing of this work to use the available infrastructure.

Another significant factor leading to delay was the impact of the Ontario government's rules established in 2008 that require specified amounts of Canadian content in the vehicles, including material and labour. Alstom had never manufactured or assembled its light rail vehicles (LRVs) in Canada and thus did not have a network of proven suppliers or experienced labour available in the area. Further, due to these rules, Alstom had to manufacture almost all of its vehicles in a new maintenance and storage facility in Ottawa that had a green workforce, was adapted from its original single function, and was not ready for production when it should have been.

The third delay factor was OLRT-C's failure to integrate its many components and systems. The OLRT1 was an untested system created through many new relationships. RTG and OLRT-C should have made integration a priority from the outset of the project. They failed to do so. The best example of the lack of integration on the project was that two critical subcontractors, Thales for the control system and Alstom for the vehicles, were working to conflicting schedules.

Ultimately, RTG failed to provide to the City a reliable system in a timely manner. While delays are understandable on any project, what is inexplicable was RTG's and OLRT-C's insistence on providing RSA dates to the City that they had no realistic hope of achieving. When the City announced these dates, it caused confusion and frustration for the residents of Ottawa, which, in turn, created pressure to open the system.

## The Relationship between RTG and the City

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After the Rideau Street sinkhole, the relationship between RTG and the City deteriorated and generally became adversarial. The City and RTG disagreed about which party was responsible for the sinkhole. According to the City, it was caused by RTG's tunnelling activities, which made the sinkhole the responsibility of RTG. In contrast, RTG took the position that the sinkhole was the responsibility of the City because it improperly installed a joint on a relocated fire hydrant. RTG argued that it should have relief because the sinkhole was a Delay Event and a Compensation Event according to the Project Agreement. RTG also sued the City for damages to recover the significant costs it incurred to address the consequences of the sinkhole. Further, it made a claim under its insurance policy related to the money spent on the sinkhole. Likewise, the City made an insurance claim. In the end, the City and RTG settled their legal actions on this issue. No relief was granted under the Project Agreement to RTG, and the City did not make any settlement payment to RTG. However, RTG's insurer paid a portion of its costs in response to its claim.

The sinkhole put OLRT-C in a position of knowing in mid-2017 that it was nearly impossible to meet its RSA date of May 2018. However, OLRT-C via RTG delayed telling the City that because it wanted the City to accept certain delay and other claims before it addressed the delay in the RSA date. For its part, the City was understandably frustrated by the project delays. While there were instances after mid-2017 where the City was prepared to work with RTG to make it easier to finish the project, the default position of the City was that it was entitled to enforce its rights under the Project Agreement, including requiring RTG to make payments relating to the delay.

The risk of the relationship between the City and RTG deteriorating was a risk inherent in the DBFM model, which can drive parties to assert their contractual rights when significant problems develop on a long-term project. However, the City had the option of taking a co-operative approach with RTG, working as partners to complete the project for the benefit of the people of Ottawa. Indeed, in October 2011 the City had prepared a Project Charter for the OLRT1, which established a framework for governance and for managing the relationship between the City and its future private partner. In the Project Charter, the City set out the guiding principles and committed itself to an approach that encouraged all stakeholders "to work together in a shared team approach."

That approach was important to the City because it recognized that an aggressive, adversarial, or uncooperative approach was more likely to lead to a poor outcome.

Despite the City's Project Charter and its explicit recognition that the project would benefit from a team approach, the City took a relatively rigid approach to its relationship with RTG that was based on enforcing the Project Agreement. For example, the City's conduct in enforcing the payment mechanism was often punitive toward RTG, and the City took aggressive positions in asserting contractual claims. The City evidently believed financial pressure was the best method to achieve its desired result.

Another example of this approach is what has been described as the "debt swap," a financial transaction through which the City stepped into the shoes of RTG's long-term lenders. The debt swap came about because of the failure of the Project Agreement to effectively provide for the next stage of the LRT project. There were legitimate financial reasons for the City to enter this transaction. However, it is also apparent that the City saw the debt swap as another way to exert financial pressure on RTG.

The bottom line is that the relationship between the City and RTG was adversarial at critical stages of the construction and maintenance of OLRT1, and this fact contributed to problems with the OLRT1 project.

## City Governance Prior to Trial Running Testing

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Trial running was the final stage of testing for the OLRT1. The evidence before the Commission establishes that from the beginning of the project up to the time of trial running, City staff were regularly updating Council and the public about the progress of the OLRT1 project. In addition to the full Council briefings, City staff routinely updated the Finance and Economic Development Committee (FEDCO) regarding the project. That committee's meetings were usually open to the general public. Thus, the people of Ottawa had access to high-level information about the project status regularly. For example, on one occasion, John Manconi, the General Manager of the Transportation Services Department, used his appearance at a FEDCO meeting to dispute an RSA date provided by RTG that he viewed as unachievable. It turned out that Manconi was correct, and that date was not met.

At his Council and FEDCO appearances, Manconi also frequently assured councillors and the public that the City would require strict compliance with provisions of the Project Agreement to ensure that the OLRT1 was safe and reliable. On at least one occasion, he advised Council explicitly that there would be no compromise on the trial running of the system.

# Testing and Commissioning

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In order to identify potential issues with the OLRT1, the parties agreed in the Project Agreement that the system would be subjected to various tests during the construction process and before it went into public service. The system would also undergo a commissioning process, which was designed to verify that the systems and components (such as vehicles) were complete and operational, subject only to minor deficiencies.

It is clear from the evidence that everyone knew or should have known that there would be significant reliability issues with the system. Therefore, a robust testing and commissioning process was required to ensure that reliability problems did not arise during public service.

By the summer of 2018, testing and commissioning had been significantly delayed. The vehicles had not been able to run on the full track because of construction delays, which delayed validation testing. As a result, the timeline for integration testing was reduced. Further, there was no winter-specific testing on the track; that testing was limited to a laboratory.

The delays meant that the final stages of testing and commissioning had to be reduced, or the timing for RSA had to be changed again. The parties did not want to change the RSA date, because there was pressure on all concerned to get the system up and running. There was public pressure on the City, as Mayor Watson had announced publicly that the system would be open to the public in mid-September. For RTG, it would continue to be responsible for extra contractual payments until the OLRT1 was open. In contrast, once the system achieved Substantial Completion and RSA, RTG would receive in excess of \$250 million and the significant maintenance payments it expected.

This is an example of the parties failing to put the interests of the people of Ottawa first. Instead of extending the time for testing and commissioning, they prioritized the swift completion of the project, thereby reducing the time scheduled for these critical activities because it was in their interests to do so. Unfortunately, as will be discussed in the next two sections, this was part of a pattern to get the system open regardless of the consequences.

# Substantial Completion

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In the spring of 2019, as the project continued to drag on, City staff changed their approach dramatically. They became willing to compromise to get the system into operation and agreed to defer work, waive requirements, and delay addressing known problems with the OLRT1. The Commission does not fault the City for trying to work co-operatively with RTG. However, it is evident that the decision to compromise was based on political pressure and not on the best interests of the people of Ottawa.

Before the system could be handed over to the City for operations and opened to the public, it needed to achieve Substantial Completion under the Project Agreement and then successfully complete trial running. When RTG first sent notice in April 2019 that Substantial Completion had been achieved, the City denied the claim. When RTG submitted a second notice in July 2019, the City decided to agree that Substantial Completion was achieved and to defer the resolution of ongoing, known problems with the system.

In my view, the City's decision to agree that Substantial Completion was achieved was made because the City was intent on moving the project into trial running, whether it was ready or not. The practical result was that the parties pushed out resolving known problems into the period of system operation.



# Trial Running Testing and Vehicle Reductions

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Trial running, the final testing phase, was designed to ensure that the system was safe and reliable and ready for operation. It was to be carried out after Substantial Completion was reached by OLRT-C. The Trial Running Review Team (TRRT), which included members of RTG and the City, oversaw trial running with testing performed daily. Each day's performance would be scored by the TRRT team members as a "pass," "fail," "repeat," or "restart."

There were no specific trial running testing standards in the Project Agreement (beyond the requirement of 12 consecutive days). However, the parties agreed to standards in 2017, which included achieving a 96 percent average dependability score (a ratio of kilometres actually travelled to those intended) for the best 9 out of 12 days of testing. In 2019, as trial running began, the parties agreed to new standards, which included a 98 percent average dependability score over 12 consecutive days of testing. This more rigorous standard was designed to mirror the performance levels that RTG was expected to meet during operations. It was intended to be applied to the level of service that would be required under the Project Agreement, including running 15 double-car trains (30 coupled LRVs) during peak usage periods.

The first three days of testing showed that there were significant reliability problems. The TRRT made a decision to "pause" or suspend trial running. This was a significant development in the process. Manconi recognized the importance of the suspension of testing and prepared a memorandum dated July 31, 2019 to inform Council. However, Manconi testified that Kanellakos directed him not to release that memorandum.

Evidence produced by RTG raises troubling concerns about Manconi's conduct during the trial running testing. In an email the CEO of RTG, Peter Lauch, sent to consortium partners and directors of RTG, OLRT-C, and RTM on August 7, 2019, Lauch reported on a meeting with Manconi and his team. Lauch stated that there was a discussion regarding the trial running scorecard and how Lauch anticipated that the scorecard for that day would be a failure necessitating "another favour from the client" for it to be considered a repeat as opposed to a restart. Later in the email, Lauch stated: "Manconi made it clear that he wants to know 'what's in it for me' to get you a PASS on Trial Running. We have been down that road before..."

Manconi has denied making that specific statement. Regardless, there can be no doubt that he was discussing specific daily testing results with Lauch and that Lauch appeared to believe that the interpretation of testing results could be the subject of negotiations between the parties. It is important to note that Manconi was not part of the TRRT, while Lauch was a team member. The assessment of test results by the TRRT involved judgment calls. But those judgment calls were supposed to be based on data and the judgment of TRRT members and should not have been influenced by outsiders like Manconi. The interpretation of trial running results certainly should not have been the result of trade-offs or bartering between the City and RTG. The Commission finds that Manconi created a situation where there is an appearance that he was interfering with test results.

Any doubt about whether Manconi was prepared to interfere in order to obtain favourable test results was removed when he and his staff negotiated an agreement with RTG (confirmed by a letter dated August 16, 2019) to lower testing standards to the 2017 criteria. The system was then able to pass the reduced testing standards, but even on some of the days of trial running that received a pass, the scores indicated that there would be significant disruptions for riders. Mayor Watson was in constant contact with Manconi during this period and was advised about the ongoing problems and the decision to lower the testing standards.

In addition to the foregoing, the City also agreed to reduce the minimum number of vehicles that had to be available for use. The City and RTG were both aware that they could not meet the Project Agreement requirement for RSA of having 17 double cars (34 LRVs) available for use, so they agreed to amend the Project Agreement to reduce the requirement to 13 double cars (26 LRVs).

Certain City witnesses testified that this decision was based on an analysis from September 2018 that showed that anticipated ridership levels did not require the full complement of trains called for in the Project Agreement. The Commission does not accept that the City's insistence on 17 double cars available for use changed because of a belief that suddenly formed in August 2019 that the September 2018 analysis had been correct. Other witnesses from both the City and RTG acknowledged that the change was made because RTG was struggling to get the full 15 trains (plus 2 spares, for a total of 17) on the line. The bottom line is that the City reduced the minimum number of double cars because it was intent on getting the system opened.

## City Governance during Trial Running Testing

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There is no dispute that the full information on the testing results and the City's decision to lower testing standards was not shared with Council. However, this critical information was provided on a regular basis to Mayor Watson, several members of his staff, and Councillor Allan Hubley (the Chair of the Transit Commission) through a WhatsApp chat group.

According to Manconi and Kanellakos, the July 31, 2019 memorandum prepared by Manconi for Council was not released because they had committed to *only* advise Council of the status of trial running testing once it was completed. In his testimony, Mayor Watson also adopted this explanation for *not* updating Council during the trial running period. This evidence from Mayor Watson, Manconi, and Kanellakos does not withstand scrutiny, and the Commission does not accept it as a truthful explanation of what motivated the failure to communicate with Council. On the contrary, the Commission finds that no such commitment was made.

The source of information about what, if any, commitment was made to Council are internal City documents that indicate, "once RTG has achieved all Trial Running requirements, staff will inform Council." Those words cannot reasonably be understood to mean that no updates would be provided for any reason during trial running. Councillor Diane Deans testified that she was "shocked" to learn of the changes to the trial running criteria and expected to be informed of such important matters as they happened.

The City's conduct is also inconsistent with this alleged commitment. Council received updates regarding the project (however brief and misleading) on August 7 and 16, 2019. Mayor Watson fairly acknowledged in his evidence to the Commission that sending the August 16 memo to Council was inconsistent with the alleged commitment not to communicate until the system has passed the trial running testing. Further, by drafting the July 31, 2019 memorandum, Manconi recognized that Council had a right to know what was going on with the trial running as it happened. The very notion that Manconi and Kanellakos would make a commitment to withhold information that was vital for councillors to fulfill their statutory obligations is nonsensical and smacks of an obvious attempt to justify the wrongful withholding of information retroactively and dishonestly.

The Commission finds that no commitment was made to not update Council during trial running. Instead, decision-making authority and information sharing were informally

restricted to the people on the WhatsApp Group. The Commission further finds that Manconi revealed, in a moment of candour, the real reason the July 31, 2019 memorandum was not sent. He testified that if he released it, he feared the Council would “ask too many questions.”

Manconi and Kanellakos, along with Mayor Watson, argue that there was nothing wrong in not providing Council with testing information during trial running because Council was eventually advised about the test results in a memorandum from Kanellakos dated August 23, 2019. This document is the linchpin of their position that the Council was advised of the testing results after the testing was complete. Yet even a cursory examination of the August 23 memorandum shows that it did not provide critical information that councillors had a right to receive in order to fulfill their statutory obligations. For example, nowhere in the memorandum is Council informed that early testing of the system resulted in repeated failures. Nor was Council told that the testing was paused and restarted. Nor was Council told that the trial running standards were lowered to obtain a pass. Council was also not told that the City and RTG had agreed to use the higher 2019 standards. Instead, Council was provided with this deliberate falsehood, “RTG, as part of their Trial Running test plans, indicated they wanted to not only meet these targets but exceed them. RTG targeted a figure of 98% for service availability and wanted to assess if they could reach 98% for the entire twelve (12) day period.”

In his testimony, Kanellakos conceded that this was not an accurate statement. The Commission finds that the August 23, 2019 memorandum from Kanellakos did not seek to provide information; it sought to disseminate misinformation and hide critical facts from Council so that councillors could not properly exercise their oversight function. The inescapable conclusion is that Kanellakos deliberately misled Council.

In summary, as public pressure grew to get the system open for public service, the City and RTG changed the testing criteria to make it easier to pass. That change was covered up when Kanellakos deliberately misled Council in his memorandum. This is not only a serious finding regarding OLRT1, but it also has broader significance for other projects undertaken by the City. Without changes to the information-sharing process and a fundamental shift in the approach of senior City staff, the statutory oversight function of Council will be irreparably compromised. It is also concerning that Mayor Watson, who testified that he believed in “over-communicating,” made no effort to correct Kanellakos’s misleading information provided to the Council. The Mayor’s failure to inform Council prevented Council from exercising effective oversight.

## System Opening and Problems

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The City rejected RTG's proposals to begin public service (also called revenue service) with a soft start that would have gradually opened the system to the public and allowed OC Transpo, RTG, and its subcontractors to increase reliability, get to know their roles, and "shake out" bugs in the system. Instead, it took the position that under the Project Agreement it was entitled to a fully functioning system on Day 1, so there was no need for a soft start. After opening, OC Transpo ran a parallel bus service for three weeks. The service then ended, in accordance with plans made before OLRT1 achieved Substantial Completion.

After the parallel bus service ended, the OLRT1 system was plagued by a variety of faults, failures, and breakdowns that undermined reliable public service and frustrated members of the public, OC Transpo staff, and City politicians. The City was repeatedly required to implement replacement (R1) bus service. Notably, the buses for R1 service were pulled from existing bus routes, inconveniencing riders who relied on those bus lines.

The repeated interruptions to public service should not have come as a surprise to RTG or to the City. Some of the problems that stopped trains in their tracks had been identified before public service began. While other failures may not have been foreseeable when the OLRT1 system went into service, the heightened risk that new, unknown issues would affect the system's reliability was well understood by the City and RTG. In these circumstances, the City's insistence on full service from the public launch and forward was misguided and unrealistic.

Given that maintenance was the responsibility of RTG under the Project Agreement, the City had no direct ability to respond to these issues in real time. For example, it could not deploy resources or make operational decisions to respond to problems. Instead, it flooded the maintainers (RTM and Alstom) with work orders. Moreover, RTM and Alstom witnesses gave evidence that City staff characterized certain work orders as requiring the fastest response, rectification, and/or remediation time from the maintainers, and that this practice interfered with effective maintenance.

The City became frustrated and publicly blamed RTG for the system's poor performance. It reverted back to an approach of requiring strict compliance with the Project Agreement. Councillors called for an end to the City's contract with RTG. City Manager Kanellakos delivered a memo to Council explaining the City's approach was to drastically reduce or eliminate monthly maintenance payments to RTG, including by carrying over deductions imposed in one month to reduce the maintenance payment in the following

month. In fact, the City did not make any maintenance payment to RTG for several months. This strategy did not help to resolve the ongoing maintenance problems. RTG's Lauch testified that eventually RTG had "no stick" to force Alstom to perform its maintenance obligations, because it had not received sufficient funds from the City to pay Alstom.

Considering all the problems with the OLRT1 during its first two years of public service, it is understandable that the relationship between the City and RTG/RTM suffered during that time, with increasing mistrust and discontent. However, eventually the parties improved their relationship to the extent that they were able to work together and focus on improving the reliability of the system. RTG, RTM, and Alstom later made changes to their leadership, staffing, and approach to the OLRT1 system. City staff worked with the maintainers to resolve technical issues on the line, create opportunities for dedicated rehabilitation and maintenance of the system, and improve responses to incidents that arose on the system. These efforts improved the maintenance and performance of the system.

# Derailments and Safety

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The first main-line derailment occurred on August 8, 2021 when a train was returning to the service yard from Tunney's Pasture Station. The train was travelling at approximately 30 kilometres per hour. There were no passengers on board. No injuries were reported from the incident. The fleet was immediately grounded while the issue was assessed. The TSB, an agency of the federal government, determined that an axle bearing failure caused a wheel falling off its axle. The entire fleet of vehicles was grounded so that Alstom could inspect it to determine whether any problems with other axle bearing assemblies existed. Following the inspection, the vehicles were put back in service. Alstom also implemented a plan to periodically inspect the axle bearing assemblies on each vehicle every 7,500 kilometres.

In May 2022, Alstom delivered its preliminary root-cause analysis for the first derailment. This report concluded that the axle bearing failure came about from excessive fretting (microscopic movement of two surfaces) under the axle bearing caused by excessive transversal loads on the axle assembly, particularly on the sharp curves in the track. The report refers to a combination of factors: the track alignment, the wheel/rail interface, and the operating profile. RTG has disputed the conclusions of Alstom's report but has not delivered its own root-cause analysis. The precise root causes of the first derailment are still under investigation by the TSB, which has asserted its exclusive legislative jurisdiction to make this determination.

On September 19, 2021, a second main-line derailment occurred when a train was proceeding on the westbound track from Tremblay Station. The train was travelling at approximately 35 kilometres per hour and had one operator and 12 passengers on board at the time of the derailment. Following the derailment, it continued travelling for approximately 427 metres before coming to a stop. The train destroyed a signal mast and switch heater and disturbed ballast underneath the track. No injuries were reported from the incident. Following this derailment, the entire fleet was grounded until November 12, 2021.

All parties agree that the second derailment was caused by a motor gearbox falling off the axle and wheel. It was subsequently determined that this was caused by Alstom employees failing to properly torque (or tighten) the bolts on the bogie assembly, following its disassembly to replace the cartridge bearing assembly as part of the remedial work after the first derailment.

The Commission finds that Alstom did not have a sufficiently robust quality control system in place at the time of the second derailment. There was a lack of proper checklists and record keeping for the assembly and repair of safety-critical parts. This work should be reviewed and approved by supervisory or quality control staff who are qualified to ensure that work has been completed to the proper standard. The second derailment shows that such a system is all the more important where maintenance and repair work is started by one shift of workers but continued or completed by another.

Following the August 2021 derailment, the parties implemented a plan to detect and prevent similar issues from occurring with the vehicles. After the two derailments, the parties implemented a more expansive return-to-service plan approved by an independent third party retained by the City, Transportation Resource Associates (TRA). There has been ongoing monitoring performed to ensure compliance with this plan. The parties have also been working together more collaboratively, and maintenance practices have improved. Provided the parties continue down this path, these efforts will continue to have a positive impact on the safety and reliability of the system going forward. However, there is more that needs to be done.

It is clear from the evidence that the misalignment in the wheel/rail profile is still a significant issue. This misalignment was identified prior to the start of public service. It was critical that the parties take the necessary steps to address this issue and its knock-on effects. However, the evidence established that the parties did not adequately address this problem. For example, a recommendation was made in the Track Safety Justification Report and the Operational Restrictions Document that a special working group be established to monitor wheel and rail wear data. The purpose of this working group was to identify remedial actions that could be taken to prevent the deterioration of the rail and wheel components. Unfortunately, a working group was never established to monitor the wheel/rail interface as recommended. Further, the need to study the wheel/rail interface has been consistently communicated by several parties, including OLRT-C and Alstom's grinding subcontractor. Unfortunately, it took too long for the parties to get serious in their efforts to address this issue.

The Commission has heard that because of the issues the system has experienced following the public launch, both Alstom and RTM have now placed greater focus on the wheel/rail interface to try to address the problem. This is important, as it has a myriad of potentially serious implications for the system. Several remedial actions have been suggested and undertaken to address the issues arising from the misalignment of the wheel/rail profile. These include reducing track corrugation through maintenance, reprofiling (grinding) the track, modifying the wheel profile, and adjusting the operating parameters of the system. To date, only temporary measures have been put in place to



address the issues arising from the August 2021 derailment. Additional measures have also been proposed but have not yet been implemented.

The Commission recommends that TRA or another competent, independent third party continue monitoring the safety issues and any remedial actions undertaken by the parties to ensure the continued safe operation of the system. This will provide a level of assurance that the necessary work is being performed in a proper and timely manner and will ensure an external level of oversight in respect of any safety issues. Given the previous failures of senior City staff to honestly communicate critical information to Council, it is recommended that the third party report directly to Council or the Ottawa Transit Commission. At this juncture, nothing less will suffice to regain the public's trust in the OLRT1 system.

# Conclusion

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As mentioned at the beginning of this summary, the Commission views its primary role as providing answers about what happened and why, and making recommendations to avoid a repetition of the project's problems. In doing so, I do not hold the project or its participants to a standard of perfection. That would be unrealistic and unfair. In any enterprise of this size and complexity, there are bound to be errors and misjudgments. What is essential in a review like this is to identify those missteps, determine their causes, and learn from them for future projects.

While human errors are understandable and expected, deliberate malfeasance is unacceptable in a public project. When participants deliberately mislead the public regarding the status of a public undertaking, they violate a fundamental obligation that underlies all public endeavours. The public rightly trusts both the government and private-sector entities to act in a manner that furthers the broader public interest. As a condition of their involvement, participants in a public project undertake to honour that obligation to the public. There are two instances in the OLRT1 project that stand out as egregious violations of the public trust.

First is the conduct of RTG and OLRT-C in providing RSA dates that they knew were entirely unrealistic. It is evident that this was done as part of a misconceived scheme to increase commercial pressure on the City. As a commercial tactic, it was a failure because the deliberate communication of unachievable dates did nothing to improve RTG's commercial position with the City. To the contrary, this gambit only served to increase and accelerate the mistrust that was developing between the parties. More fundamentally, it represented a troubling lack of concern for the public nature of the project and the interests of the people of Ottawa. The leadership at RTG and OLRT-C seemed to have given no thought to the fact that the provision of this misinformation adversely impacted the daily lives of hundreds of thousands of people. The people of Ottawa trusted RTG and OLRT-C to be straight with the City and tell them honestly when the system would be ready. The Commission finds that RTG and OLRT-C betrayed that trust.

Second is the conduct of senior City staff and Mayor Watson in not sharing information about trial running. This conduct prevented councillors from fulfilling their statutory duties to the people of Ottawa. Moreover, it is part of a concerning approach taken by senior City officials to control the narrative by the nondisclosure of vital information or outright misrepresentation. Worse, because the conduct was wilful and deliberate, it

leads to serious concerns about the good faith of senior City staff and raises questions about where their loyalties lie. It is difficult to imagine the successful completion of any significant project while these attitudes prevail within the municipal government.

Is there any reason to believe that their conduct regarding the trial running testing results was an aberration or that transparency has improved within the City? Unfortunately, based on the City's conduct during this Inquiry, there is not. By way of example, throughout the hearings, the City published, at taxpayers' expense, a summary of the proceedings that was a blatant attempt to spin the testimony in a way that was favourable to the City. This appears to be unprecedented in Canadian judicial history and is part of a troubling pattern of controlling and shaping information flow to Council and the public.

In the end, the problems with the OLRT1 were a consequence of myriad factors, including the reliance on new vehicles and new relationships, a lack of integration, decisions to rush the system into service, an inadequate investment in maintenance, and several other factors, some of which were beyond the control of the parties. The result was a flawed LRT that failed to meet the needs of the people of Ottawa.

Despite the foregoing, there is reason for optimism, as the parties have begun working together more co-operatively and the reliability of the system is showing some signs of improvement. This improvement demonstrates that, over time, structural problems can be resolved through good faith, communication, and co-operation. However, until such time as the private and public entities involved in the OLRT1 project understand that their first obligation is to the public, there is reason to be concerned that the project will continue to suffer problems.

# Recommendations

# Introduction

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This chapter includes all recommendations resulting from the work of the Commission and organizes them by topic. The chapters referred to with each topic point to the related chapters that provide context for the recommendations. In some cases, the recommendations are specific to transit systems, while others may be applied broadly.

# Planning Complex Infrastructure

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## Report Chapters 4, 5, 6, 8, 9, 10, and 12

As the OLRT1 project clearly demonstrated, early, effective planning sets the stage for the project that follows. Effective planning requires project-specific expertise and requires those involved to address unconscious biases that can lead to budget and schedule overruns. These recommendations focus on ensuring that the necessary skills are brought to bear in the early stages of a project, and on eliminating forces that work to undermine early planning efforts.

1. Public entities, and their representatives, should take care to ensure that the priorities they set for complex infrastructure projects are appropriately applied throughout the planning and implementation stages of the project.
2. Public entities should consider ways they can identify and address the root causes of cognitive biases. Optimism bias in project planning, for example, leads people to underestimate project costs and risks. Public entities should consider using established approaches such as reference class forecasting, which uses data about prior projects and their outcomes to account for unconscious biases and unanticipated risks.
3. Public entities should also strive to avoid “uniqueness bias” – the belief that the project being planned is unique and not comparable to others. Instead, public entities should identify similarities to established projects and learn from the outcomes of those projects.
4. Public entities should avoid, wherever possible, introducing complexity into the major components of the project. For example, if there are to be several stations on a rail line or similar project, keep the differences between the stations to a minimum.
5. Public entities should ensure, from the project outset, that they have access to the expertise that will be required throughout the project, in order to effectively engage in and oversee the project’s development from planning through to public launch.
6. A detailed Concept of Operations should be prepared before the preliminary design of the project, and where the operation of the system is not being contracted out, ideally before the project agreement is finalized.

7. The Province of Ontario should investigate how to develop the skills and capabilities at the municipal level required to lead large infrastructure projects. For example, the province may wish to consider:
  - a. Creating a training program like the Major Projects Leadership Academy at Oxford University in England, to instill and improve the project management skills required for complex infrastructure projects at the municipal level;
  - b. Creating career paths within government to encourage civil servants to develop and use the project management skills and experience they gained through training or on previous complex infrastructure projects; and
  - c. Ensuring that municipalities undertaking complex infrastructure projects have ongoing access to expert advice and guidance throughout the project, from procurement through to construction and operations, particularly with respect to managing the relationship with the private-sector partner.

# Preparing Project Estimates and Budgets

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## Report Chapters 4, 5, and 6

Responsible cost containment measures are necessary for the effective delivery of complex infrastructure projects. However, care must be taken to ensure that cost containment measures do not outweigh considerations of quality. These recommendations focus on the appropriate approach to cost estimates on complex projects.

8. Public entities should clearly communicate (to elected officials, the public, and other stakeholders, as appropriate) any restrictions, caveats, or limitations applicable to cost estimates developed during the planning of complex infrastructure projects. They should also clearly communicate that such estimates are subject to change as the project planning progresses. Particularly when communicating with the public, public entity representatives should not commit to an estimate as if it were a set budget for a project. The public should be accurately informed about the status of the estimate and, where the estimate is subject to change, that fact should be clearly communicated.
9. Public entities should avoid setting budgets too early, and remain flexible as project cost estimates evolve during the planning for such projects.
10. The Province of Ontario and the federal government should review the process for determining the size of funding contributions to municipal infrastructure projects and, where required, make changes to that process to ensure that such funding contributions are not based on preliminary estimates that do not end up accurately reflecting the true costs of the project.
11. Where the Province of Ontario and/or the federal government are contributing to the funding of a project, they should incorporate some flexibility to respond to the evolving project needs.
12. Where a senior level of government requires that a particular project delivery model, such as a public-private partnership (P3), be used by a municipality as a condition of senior government funding, that government should ensure that the costs associated with that model are eligible for coverage by the senior government funding. For example, where a P3 model is to be used, the financing costs of the P3 should qualify as eligible expenses.



# Selecting a Project Delivery Model

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## Report Chapters 4, 5, 6, and 10

The success of any complex infrastructure project depends in part on the project delivery model used. These recommendations provide guidance on how public entities should evaluate all options to ensure the delivery model most suitable to any given project is selected.

13. When selecting a delivery model for a complex infrastructure project, the public entity should use objective criteria appropriate to the project's circumstances to evaluate the available delivery models, including:
  - a. The model's comparative value from the perspective of quality, cost, and schedule as compared with other approaches;
  - b. Whether the model properly aligns the interests of the parties involved, and whether the project risks will be managed by the parties best positioned to handle them. Consideration should be given to whether the transfer of specific risks, in whole or in part, is likely to encourage or undermine collaborative behaviour between the parties working on the project;
  - c. The incentives and tools that each model offers to enforce contractual obligations;
  - d. The measures each model has in place to ensure public transparency, accountability, and oversight of major infrastructure projects;
  - e. The degree of control the government authority should retain, given the project's circumstances and the public authority's experience;
  - f. The degree of flexibility each model offers to the public entity to alter the infrastructure over the project's life without facing major contract change fees; and
  - g. The manner and extent to which each model prioritizes the public interest.
14. The public entity should ensure that the evaluation criteria used accurately reflect all the priorities set for the project.
15. The public entity should ensure that the potential benefits and drawbacks associated with each delivery model are identified and considered.

16. In considering a delivery model that requires the private sector to provide project financing, care must be taken to ensure that the rights accorded to private creditors do not create additional risks for the project. For example, where changes to the project require creditor consent, limits should be placed on the additional equity they can demand as a condition to their consent.

# Risk Reduction during Procurement

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## Report Chapters 6, 8, and 9

Complex infrastructure projects are inherently risky. Care must be taken to avoid introducing unnecessary additional risks to these endeavours. These recommendations focus on avoiding or minimizing project risks during the procurement process.

## Proven Project Elements Should Be Preferred

17. Introducing new or untested project elements (including technology and workforce) increases project risk. Where possible, public entities should give preference to using service-proven designs, components, labour markets, and supply chains. This is particularly so for key project components, components that present the most inherent risk, and components that cannot be quickly and cost-efficiently replaced in the event of a problem. For example, LRVs should be built in dedicated manufacturing facilities, and ideally in a pre-existing LRV production facility.

## Review of Canadian Content Requirements

18. Regarding the Province of Ontario's Canadian Content for Transit Vehicle Procurement Policy established in 2008, the province should study how to strike the right balance for the policy, so the goals of industrial and skills development can be addressed without requiring a single project to take on the costs and risks of creating new skilled manufacturing jobs. For instance, a price preference could be applied, or another advantage given, depending on the Canadian content a bidder includes in its bid. Any waivers or accommodations should be broad enough to account for the current limitations of the Canadian market and ensure transit operators are able to obtain a quality product produced by a qualified workforce and for the public interests.
19. The Province of Ontario should consider requiring that key project components be service proven. If this requirement is implemented, any applicable local content requirements should include waivers, exemptions, or other means to allow for such service-proven components to be used.

## **Providing Time to Incorporate New Elements during In-Market Period**

20. A public entity may include elements in its procurement process that could result in the introduction of new components to respondents' bids during the in-market period. For example, if the public entity includes a pre-qualification process for suppliers during the in-market period, a bidder whose proposed supplier is disqualified during that process must source and incorporate a different supplier into its bid. When the procurement process includes steps that may result in the introduction of new components to respondents' bids during the in-market period, the public entity should ensure that respondents are given adequate time to incorporate those new components into their bids. This should be accounted for in the procurement plans.

# Creating an Effective Contract Scheme

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## Report Chapters 6, 7, 8, 9, 10, 11, 12, 13, and 14

Project agreements are the backbone of project delivery – they define relationships, responsibilities, deliverables, and timelines, and they govern the conduct of the parties involved in the planning, design, construction, maintenance, and operation of the infrastructure. On the OLRT1 project, some of the terms and gaps within the Project Agreement created problems later on. These recommendations provide guidance on how to approach the contract for complex infrastructure projects.

## Contract Review

21. The public-sector entity should consider retaining (or empowering) an independent advisor with expertise in the type of project to be constructed to ensure that any draft project agreement used as a starting point for negotiations reflects best practices and does not include scope gaps.

## Public Communications about the Project

22. The project agreement should address responsibility for public communications to ensure timely and accurate information is provided during the life of the project.
23. The project agreement should provide for meaningful involvement from the public-sector and private-sector parties in all public communications about the project.
24. The project agreement should require that communications to the public be accurate and well founded. Uncertainty should be acknowledged.
25. The project agreement should require that communications to the public be focused at all times on furthering the public interest.

## Dispute Resolution

26. Within a given model, the early resolution of disputes should be incentivized in the project agreement, particularly where those disputes will affect the work going forward. Resolving operational problems and providing reliable public service must take precedence over all other priorities, including contract enforcement. The resources necessary to address a problem should be mobilized ahead of

contractual interpretation and dispute resolution. This could all be done without prejudice to the parties' claims against one another.

27. The provincial government should investigate how to better incentivize in P3 contracts the timely solution of infrastructure problems to avoid delay due to disputes between the parties. Positive and negative incentives should be considered. For example, positive incentives might include a break in payment mechanism deductions if significant problems are resolved before a Key Performance Indicator (KPI) deadline in the contract.

## **Independent Oversight**

28. Project partners must clearly define the roles of the safety auditor and the Independent Certifier, and agree upon the nature and degree of assurance each can provide.

## **Project Changes**

29. Where amendments to contracts are being considered, relevant and affected parties should be involved in those discussions, including relevant subcontractors.
30. Construction contracts should include mechanisms for calculating extensions of time and adjusting schedules if obstacles arise and delays are encountered.

## **Testing and Commissioning**

31. Specific testing and commissioning requirements should be clearly defined in the project agreement. In the case of large or complex LRT projects, these should account for a sufficient period of integration testing. In the case of an LRT system, the train manufacturer should also be involved.
32. In locations with unusual climatic conditions, or climates that vary dramatically, a provision should be made for climate-specific testing of the full system, including dynamic testing. For instance, there should be specific requirements for dynamic winter testing – not merely testing during the winter – in locations like Ottawa that have a severe winter climate.

## Trial Running

33. Trial running standards should be set out in detail in the relevant contracts. Minimum standards should be set at the outset of the project for both duration and scoring. The scoring should be based on the same performance specifications that the parties have agreed to apply to the system in operation.
34. As with testing, the circumstances imposed during the trial running period must mirror as closely as possible the actual public operation of the service. For example, the trial running for transit must mirror intended ridership, climatic conditions, and realistic rider use (e.g., holding, blocking, and pushing the doors). The trial running criteria must be established with a view to having the system *consistently* demonstrate that it can achieve those criteria based on anticipated ridership and service conditions.
35. An independent expert should be appointed, either individually or as part of a panel with representatives from key stakeholder groups, who must (i) assess trial running criteria and performance, and (ii) approve any material change to the trial running criteria or process.
36. There must be proper documentation of any material changes to the trial running criteria with an explanation, analysis, and approval of such changes to be clearly recorded in writing.
37. Maintenance work and systems should be meaningfully and objectively evaluated during trial running, and any failures that would impair public use of the asset if they occurred during public operation should be treated seriously in the evaluation process.

## Bedding-In Periods

38. The relevant project contracts should account for a bedding-in period prior to public service (revenue service) – a period of extensive running of the fully integrated system in real operating conditions prior to public launch. Such a bedding-in period gives operations and maintenance staff real-time experience of the system before the public is asked to rely on it. The length of the bedding-in period should:
  - a. Be appropriate to the project (including its technical complexity and inherent risk profile);
  - b. Account for any aspects of the project that increase the risk of hidden issues arising; and
  - c. Include a series of predetermined troubleshooting scenarios that mimic the kinds of incidents that could arise during public service. This will allow all involved in the operation and maintenance of the infrastructure to learn and foster a

collaborative relationship between those who will be directly involved once the asset begins serving the public.

39. Greater consideration should be given to a gradual or soft start to public service (revenue service), particularly when all systems and infrastructure on a project are new. This should be accounted for in the relevant project contracts.
40. On a new system or where the private sector is providing services after completion of construction, such as maintenance or operations, the relevant project contracts should provide for a bedding-in period in the payment mechanism following the start of revenue service – that is, a period of time following revenue service where deductions are not applied in full.

## Handover

41. The relevant project contracts should provide for the early involvement of anyone engaged in public service (revenue service), prior to handover, to ensure that they are fully informed about the infrastructure and its maintenance needs, and fully trained to perform their respective roles. This early involvement should include, where possible, shadowing workers during construction and manufacturing.
42. The handover process between entities responsible for the construction stage of the project and those responsible for the operations and maintenance stage needs to be organized and clearly and formally defined. Careful attention should be given to the transfer of responsibilities and information from the constructor to the maintainer, and the various criteria for handover should be explicitly set out, and cover both maintenance manuals and historical maintenance documentation.

## Operations

43. Project agreements should provide for different performance requirements for differing weather conditions. An LRT system cannot be expected to perform in the same way in any and all weather conditions.

## Project Additions or Expansions

44. Project agreements should be structured to account for potential expansions or additions to the project, and provide a reasonable and realistic process to make sure the expansion does not undermine the balance of power between the parties already involved in the contract. This may include provisions that set the lenders' consent to eventual system extensions.



# Fostering Successful Working Relationships

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## Report Chapters 4, 9, 10, 12, 13, 14, and 15

Collaborative relationships focused on serving the public interest in quality infrastructure are essential to the successful delivery of projects like the OLRT1. These recommendations address the relationship dynamics required to successfully deliver complex infrastructure projects.

45. Regardless of the project delivery model chosen, collaboration should be at the heart of the relationship between the public entity and private-sector partner(s).
46. All private-sector stakeholders should be required to acknowledge that they are working in the public interest. The public interest should be a core organizational principle that informs all steps taken on a project.
47. All stakeholders, including suppliers, operators, and maintainers, should be involved as early as is practicable in the project (including, where possible, procurement) with a view to aligning the parties' incentives to collaborate and to avoid conflicts in stakeholder objectives.

# Transparency and Effective Planning and Oversight during Construction

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## Report Chapters 8, 9, 10, and 12

The OLRT1 project suffered from failures in planning, oversight, and communication, both between RTG and some of its subcontractors, and between RTG and the City. These recommendations provide guidance on how to avoid these kinds of failures on future projects like the OLRT1.

## Subcontract Consistency and Completeness

48. The entity charged with overseeing a project must ensure that its various subcontracts align and are consistent with each other, and that no gaps in project obligations or deliverables are left unaddressed.
49. The contractor should involve or consult with the necessary experts to ensure that the plans, including timelines and scope of responsibilities for the subcontracted work, are logical and realistic.

## Systems Integration

50. The contractor needs to pay early attention to systems integration. A qualified systems integrator should be involved in the project from the design phase through to construction and manufacturing. In particular, a systems integrator should be a required member of the bid team and be involved in key contractual negotiations.
51. Systems integration should be overseen by a single entity, and not split between different subcontractors or entities. Responsibility for this work should be clearly defined.

## Validation Testing

52. For major infrastructure projects with complex components like LRVs, steps should be taken to ensure that prototypes and component designs are finalized early enough in the project to allow for best practices in confirming the prototype (for example, validation testing) before starting serial manufacturing.

## **Maintaining a Current Consolidated Project Schedule**

53. The contractor should maintain a consolidated program schedule incorporating all project activities. These scheduled activities need to align. All stakeholders should have access to this consolidated program schedule.
54. The consolidated program schedule incorporating everyone's activities should be updated to reflect changes to the schedule as the work progresses. The consolidated schedule should remain logical, realistic, and reasonable.

## **Communications regarding the Project Schedule**

55. Material changes in the construction or manufacturing plans should be communicated to those stakeholders who may be impacted by the change. Ideally, these partners will be consulted in advance of a material change being made to the project.
56. The contractor must keep its public-sector client apprised of realistic timelines for the completion of the project.

## **Changes to the Project Schedule**

57. The public-sector client must show leadership and approach the project with a view to delivering a quality end product. It must act co-operatively and flexibly in a manner consistent with the public interest. The client must also be reasonable and respond fairly if challenges arise that may result in project delays. This includes enabling the ability to pause and slowly replan the work as necessary. The public-sector client must also be realistic and not require the submission of schedule updates indicating on-time completion, unless on-time completion is realistic in all the circumstances.

## **Fostering Timely, Candid Communications about Project Issues**

58. Public entities and private-sector service providers working on complex infrastructure projects should continually foster a culture of early reporting of issues, challenges, and mistakes.
59. There must be an appropriate process to honestly identify and communicate reliability and safety issues, not only within the project stakeholder group, but also within the public entity and to the public.

# Accuracy, Transparency, and Public Entity Decision-Making

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## Report Chapter 12

The public must be able to trust that the government is making decisions based on complete, accurate, and timely information. Anything less risks undermining public trust. These recommendations seek to ensure that government decision makers have the information they require to oversee the delivery of complex infrastructure projects.

60. The decision-making and information sharing by city staff about project implementation must always accord with the terms of any delegation of authority and other governing council resolutions.
61. The participation of any elected officials in project decision-making must be done transparently, and in accordance with the governance mechanisms established by council, including any delegation of authority.
62. Council and any other person or entity (such as the City of Ottawa's Transit Commission) charged with project oversight must be able to exercise meaningful oversight of critical decisions made by city staff. This includes by receiving timely updates from staff relating to system performance, testing, and modifications to safety and reliability criteria. Where projects encounter serious difficulty and decisions must be made that will have a significant impact on the public interest, council must be kept fully informed so that it has the opportunity to act.
63. All relevant project agreements and subcontracts, as well as any modifications made to them, should be available for review by city council, unless there is a compelling reason that it should not be made available. The burden of establishing a "compelling reason" should be placed upon the party asserting that the contract should not be available.

# Safety Requirements

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## Report Chapter 11

Safety must be a central focus during the planning, construction, operation, and maintenance of complex infrastructure projects like the OLRT1. These recommendations focus on ensuring that safety is appropriately considered throughout the life of a project.

64. The system's safety requirements should be identified and detailed during the design phase of the project and referred to as the project evolves during construction. The contractor should design and build for safety from the outset to avoid a retroactive review of hazards and safety. It should aim to reduce the operational restrictions required to account for safety gaps upon completion of the project, to reduce risks of human error.
65. The safety management systems for those involved in various aspects of public service must be developed in collaboration with each other and must be aligned. This alignment should be confirmed prior to the start of public service. The safety management systems should also be updated as appropriate.
66. An independent safety auditor should be engaged early on in the construction of complex infrastructure projects.

# Preparing for and Achieving a Successful Handover and Start to Public Service

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## Report Chapters 12, 13, 14, and 15

The start of public service is a critical time for a new system. The system's performance will help determine the public's confidence in the system going forward. It is important that the entire system, including operations and maintenance, be ready and properly prepared for the beginning of operations. These recommendations set out what can be done to ensure that the start of public service goes smoothly.

## Ensuring a Skilled Workforce

67. Maintenance needs to be performed by a permanent, skilled, and local workforce. Where this workforce does not exist, extensive training is required. This training should take place prior to the handover of the infrastructure. Experienced workers should be brought in for an extended period before the start of public service to assist with training, to provide work-shadow opportunities for inexperienced staff members, and to assist with the effective maintenance of the system until the permanent staff can maintain the infrastructure on their own. This assistance should continue as required after the start of public service.
68. Operations needs to be performed by a permanent, skilled, and local workforce. Where this workforce does not exist, extensive training is required to prepare the new operators to handle public service. This training should take place prior to the handover of the infrastructure. Experienced operators should be brought in for an extended period of time before the start of public service to assist with training, to provide work-shadow opportunities for inexperienced staff members, and to assist with the effective operations of the system until the permanent staff can operate the system on their own. This assistance should continue as required after the start of public service. A new operator and maintainer must be provided with coordinated opportunities to work and train together on the full system during the pre-launch bedding-in period.

69. Train operators should be trained on situational awareness. With trains that are automatically controlled, the operator should be trained to have greater awareness of the various surroundings around the train. The training should also address the need to observe and report any issues that arise during their operation of the train.

## **Providing Adequate Operations and Maintenance Resources**

70. Upon the system entering public service, the maintenance contractor must have adequate resources to meet the actual needs of the system, including accommodating any outstanding retrofit work.

## **Supporting Success in Early Public Service**

71. On a new system or where the maintainers are new to the system, the public entity must allow for a learning curve and avoid putting undue pressure on the maintainers by, for example, generating unnecessary or overly voluminous work orders for the purpose of “testing” the system.

## **Clearly Defined Operations and Maintenance Responsibilities**

72. The public entity should consider putting maintenance and operations under the same “umbrella” – that is, have them be carried out by the same stakeholder – as this may allow for better coordination of the two functions and better co-operation between all parties. If maintenance and operations are delivered by two separate entities, they must devise processes that help ensure co-operation and coordination, as these are key to reliable service. These processes should be revisited and adjusted whenever necessary to respond to the realities of operating and maintaining the infrastructure.
73. Maintenance and operating procedures and protocols must clearly set out the scope of work and responsibilities for the maintainers and operators, and how their activities are to be coordinated. These procedures and protocols must be prepared in advance of system handover to allow adequate time for training the maintainers and operators on them, and must enable direct communication between the operators and the maintainers of the system.

## **Transparency between Operations and Maintenance**

74. There must be transparency between operators and maintainers regarding the state of the system, the work to be done, how that work will be approached, and what work has been completed. It is also imperative that there be transparency between the operator and maintainer when it comes to incidents on the system or infrastructure. For instance, the maintainer should be able to access operator records to investigate incidents on the line or to improve its processes and procedures.
75. Transit operations and maintenance plans require regular reviews / ongoing monitoring and forecasting of human resource needs, to ensure that requisite resources are available as needed.



# Public Service

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## Report Chapters 13, 14, and 15

The approach taken to operations and maintenance has implications for the proper running of a transit system or any infrastructure. These recommendations are aimed at creating an environment where the system performs well and avoids unnecessary breakdowns.

## Oversight during Public Service

76. Staff of the public entity and the private-sector service providers must ensure that council (or such persons or entity responsible for project oversight) is provided with timely, complete, and accurate information about the infrastructure to allow for effective and transparent oversight. In providing this information, stakeholders must be mindful that they are serving the public and strive to maintain and bolster the public's trust.

## Adopting a Partnership Approach between Owner, Operator, and Maintainer

77. Maintenance work orders should be fairly and appropriately classified to avoid disputes and ensure efficient operation of the system. Work order systems should clearly define different categories of work to avoid unnecessary disputes and overreach.
78. The public entity should not overload the maintainer with work orders and should avoid entering batch orders where response times need to be met, in particular at inconvenient hours of the day, where avoidable.
79. Deductions for poor maintenance performance must be fair and not overly punitive, and they must be applied fairly, reasonably, and with a view to the public interest in the long-term success of the project.
80. There should be timely and proper responses to problems related to maintenance and operations by all parties once they arise. The safety and needs of the public should be prioritized.

## Efficient and Effective Warranty Service

81. To minimize disputes and delays in resolving issues, it is important to clearly define the distinction between issues relating to maintenance and those that may be covered by the warranty of the constructor, as well as who bears responsibility for each.
82. The constructor should be required to make an objective assessment of the anticipated retrofit work and scale the resources that it will make available post-handover to match that assessment.

## Maintenance during Public Service

83. It is critical that the timely and proper completion of maintenance activities be prioritized, including proactive and preventive maintenance.
84. The party or parties involved in providing maintenance must have effective and robust quality control measures in place, including ensuring that work is performed in an orderly way, consistently documenting the completed steps, and having proper checklists and record keeping for the assembly and repair of safety-critical parts.
85. Where avoidable, safety-critical maintenance should not be performed over two different shifts. It should also require a supervisory or quality control sign-off to ensure that work has been completed to the proper standard.
86. There should be a process that enables individual maintainers and operators to raise issues they observe on the system that require improvement or fixes, to help identify issues early on and ensure the system is as good as it can be.
87. The province should implement a system for major infrastructure projects that gives legal protection to whistleblowers who bring forward concerns. Consideration should be given to extending legislation for whistleblower programs to municipalities more broadly.

# Recommendations for the OLRT1

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## Report Chapters 13, 14, and 15

While there have been many improvements made to the OLRT1 and measures have been taken to address various breakdowns and the derailments, additional steps could be taken. These recommendations provide guidance to the parties on what more can be done, and on how they can now run the OLRT1 in a manner that aligns with the best interest of transit users and the people of Ottawa.

88. Work undertaken to strengthen the City's oversight framework should continue, including assessing OC Transpo's oversight and monitoring programs and making any improvements identified to ensure safety and reliability of the system.
89. Following incidents on the system, OLRT1 parties should continue to hold debrief meetings with all stakeholders present, in order to identify lessons learned and make improvements going forward.
90. A partnership approach should be adopted during the operations and maintenance phase and to address issues that arise on the system.
91. Outstanding payment disputes between the City and RTG should be resolved at the earliest opportunity, in particular related to the City's approach to issuing and classifying work orders, and the City's administration of the payment mechanism (the City's carrying forward of deductions incurred in a previous month to the next payment period, and the City's interpretation of the impact of the delayed Revenue Service Availability date on the maintenance payment schedule).
92. If RTG continues to be responsible for maintenance during the remainder of the maintenance term, RTG and the City, as well as RTM and Alstom Maintenance, should make efforts to repair their relationships and work together better for the greater good of the OLRT1 project.

## Future Assessments and Preventive Maintenance

93. If not yet complete, an engineering assessment of the appropriate rail neutral temperature for the OLRT1 should be completed, and the rail neutral temperature adjusted accordingly, so that the track buckling issues can be mitigated for the long term.

94. Alstom should continue its preventive maintenance of the line inductors, including checking them before and after every winter for any buildup of contaminants, and cleaning them as required.
95. Alstom should continue its regular inspections of the overhead catenary system to clean the parafils as required, or repair/replace them as necessary.
96. The City, RTG and its subcontractors, and Alstom must follow through on the outstanding investigations regarding the root cause of the August 8, 2021 derailment, act on the findings, and ensure that any root cause of this derailment is addressed.
97. A permanent solution to the wheel/rail interface issues needs to be identified and implemented in a timely manner. This solution may involve using a different type of wheel, replacing the track or part of the track, additional track reprofiling, enhancing the axle design to withstand the forces coming from the track, or even modifying the track alignment to address the issue of sharp curves. A wheel/rail interaction study should be undertaken to determine the appropriate solution(s). All parties should work co-operatively to implement the solution(s).
98. Transportation Resource Associates or another independent third-party expert should continue to monitor safety issues and remedial actions undertaken by the parties to ensure the continued safe operation of the OLRT1 system, pending a final resolution of the issues relating to the wheel/rail interface and the first derailment. This independent safety expert should report directly to Council or to the Transit Commission.
99. Pending the implementation of a permanent solution to the wheel/rail interface, and any other issue that may later be found to have contributed to the August 8, 2021 derailment, the City and RTG should continue implementing the current remedial measures intended to ensure the safe and reliable operation of the system, including any new measures that are deemed advisable as more becomes known about the root cause of the derailment and the wheel/rail interface more generally. These should include:
  - a. Reducing rail corrugation through maintenance;
  - b. Increasing track lubrication (greasing);
  - c. Adjusting the speed profile (to lower the speed in some places, particularly along curves); and
  - d. Modifying the wheel profile to better sustain the transversal forces coming from the track.

100. RTM should implement the recommendation first made in the Track Safety Justification Report and the Operational Restrictions Document, and establish a wheel/rail working group to optimize the wheel and rail profiles, improve maintenance practices, monitor the wheel/rail interface, and minimize the impacts on the rail and vehicle components. In particular, the working group should focus on:
- a. Monitoring the rate of wear on the wheels through increased visual inspection or non-destructive testing;
  - b. Increasing visual inspections of wear on the rail at all sharp curves to measure side wear rates;
  - c. Using ultrasonic testing as well as visual inspections, and collecting related data;
  - d. Monitoring the effectiveness of LRV-mounted lubricators to address locations with rail wear, and evaluating the possibility of installing rail-mounted or trackside lubricators and friction modifiers;
  - e. Increasing the frequency of preventive rail grinding across the whole system to reduce the risk and growth of “rolling contact fatigue”;
  - f. Measuring corrugation throughout the system to help identify where corrugation is forming and the growth rates, to inform the required frequency of proactive rail grinding;
  - g. Reviewing the profile of the switch blade to reduce the rate of wear; and
  - h. Identifying remedial actions that can be taken to prevent the deterioration of the rail and wheel components.
101. The operating profile should be adjusted as necessary to ensure the safety and reliability of the OLRT1 system by reducing stress on the vehicle components and avoiding excessive wear. Consideration should be given to reducing vehicle speeds, particularly along curves and to account for different climatic conditions. The parties should work collaboratively over the long term to agree on changes in the best interests of the transit riders and taxpayers.
102. Alstom should follow through with its plans to replace the spline axles on the LRVs following the problems with excessive wear to the splines that were identified in its presentation dated June 30, 2021.
103. The parties should consider the use of a detection system as a potential remedial option for overheated roller bearings.



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