



Report: TES-RTS-18-08

Region of Waterloo
Transportation and Environmental Services
Rapid Transit

To: Chair Ken Seiling and Members of the Regional Council

Date: September 19, 2018

File Code: A02-30/PW

Subject: ION Vehicle and Testing Update

Recommendation:

For information.

Summary:

Good progress is being made in the installation of the specialized equipment on to the Bombardier vehicles and first vehicles are very close to achieving preliminary acceptance (a significant step in being ready to carry passengers). The first vehicle with the specialized equipment installed was shipped to the Region on September 17, 2018 and is expected to arrive late this week or early next week. This vehicle will allow GrandLinq to continue to test the integration of the tracks and controls systems with the train.

Staff, Bombardier and GrandLinq continue to work towards the goal of achieving start of service in December 2018.

To prepare for start of service the public outreach program to educate the public on the ION train system continues - in particular how to be safe around the trains. The fall will also see a number of events that will allow the public to see and board an ION train, in conjunction with various community events.

Report:

As requested by Council on April 18, 2018, Region staff are providing this update on ION LRT vehicles and testing status for the period July 19, 2018 to September 17, 2018.

This update provides a status on vehicles in Waterloo and Kingston, testing and training status on the Project and events that are scheduled for this fall.

Waterloo Vehicles

Eight vehicles are currently in Waterloo Region. Three vehicles are undergoing on-board equipment installation. Installation of this equipment is expected to be complete in late September/early October. Another five vehicles are being used for testing and training purposes in rotation. Installation of the specialized equipment for these vehicles will start following the initial three.

To begin service, vehicles must go through an acceptance process. This process has started with a demonstration burn-in starting in late August 2018.

Table 1 shows the current status of vehicles in Waterloo Region.

Kingston Vehicles

Six vehicles have remained in Kingston. These vehicles are not required to support the current testing or driver training in Waterloo and there has been no impact to the schedule from these vehicles remaining in Kingston. The Kingston facility was designed for vehicle assembly and is the best location for making the required modifications (upgrades) to the trains. The staff that assembled the train are best able to make modifications to the train.

Assembly of the six vehicles in Kingston, at Bombardier's production facility is complete. There are still modifications (upgrades) being made to the vehicles. The installation of the specialized equipment is a major modification. Of the remaining vehicles in Kingston Vehicle 501 requires the most modifications. Vehicle 501 was sent to Kingston facility to undergo major production upgrades in early 2018, and work on this vehicle has been rescheduled to allow Bombardier to focus on GrandLinq On-board Equipment Installations on other vehicles.

Vehicle 511 has completed on-board equipment installation and was shipped to the Region on September 17, 2018. It is expected to arrive late this week or early next week. Two other vehicles in Kingston are in the process of on-board equipment installation. Two other vehicles are being used for multi-vehicle testing.

Table 2 shows the current status of vehicles at Bombardier's Kingston Facility.

On-Board Equipment Installation

Prior to going into service it is necessary to install certain specialized on-board equipment on each of the vehicles. As part of the Project, GrandLinq is responsible for ensuring the finished vehicle integrates seamlessly with the built system. On-board equipment includes radios, antennas and on-board systems to control gates, crossings, and traffic signals. This also allows the vehicles to communicate with ION Control Centre. With this equipment, ION can run at service speeds and at consistent times throughout operations.

The Region has finalized an agreement with Bombardier to install GrandLinq's on-board equipment and to make the necessary onboard modifications to accommodate the equipment on each train. Some of the trains are in process of retrofit or will be retrofitted in Waterloo, with the remainder completed in Kingston. To expedite installation one train (Vehicle 510) will remain in Kingston for on-board installations, rather than complete installations in Waterloo as originally planned.

The first vehicle from Kingston (Vehicle 511) has been retrofitted, and was shipped on September 17, 2018 and will arrive in Waterloo late this week or early next week. The next vehicle in Kingston (Vehicle 512) is expected to be inspected the week of September 24, 2018, and ship shortly after. Bombardier is anticipating completing on-board equipment installation on four vehicles in the next five weeks.

On-board equipment installation is the next vital step to getting to service start. After the equipment is installed, extensive testing needs to be completed by GrandLinq to ensure the system is working correctly. Following installation of on-board equipment, the vehicles go through an acceptance process. The first step is to achieve a Preliminary Acceptance Certificate.

To achieve a Preliminary Acceptance Certificate on any vehicle, the following needs to be complete:

- Qualification Testing on Pilot Vehicles (in Kingston);
- Vehicles are fully assembled;
- Modifications are completed on the vehicles. Modifications are constantly being implemented to ensure reliability of the vehicle fleet; and
- Each vehicle is inspected and completes routine tests. Routine tests are done on every vehicle to make sure all the components of the vehicle work properly.

The next step following Preliminary Acceptance is to achieve Final Acceptance Certificate on the vehicle. Once this is complete, the vehicle is ready to carry passengers.

To achieve a Final Acceptance Certificate on any vehicle, the following needs to be complete after a Preliminary Acceptance:

- Check and Acceptance Tests;
- 600 kilometer "burn-in" test to make sure there are no reliability issues on the vehicle; and
- Finalization of documentation and safety certification

Testing Status

To get to revenue service, a significant amount of testing needs to be completed by Bombardier and GrandLinq.

Bombardier is completing qualification testing on pilot vehicles in Kingston. In addition, Bombardier is doing some additional qualification testing in the Region. These tests are to show the vehicle performs correctly to the specifications.

At the same time, GrandLinq is completing System Integration Testing in Waterloo Region. System Integration Testing is where both the built infrastructure and the vehicle are checked to make sure they work together. The next System Integration Tests involve on-board equipment. After Vehicle 511 is in Waterloo Region, extensive testing will be completed by GrandLinq. This is the last set of tests to confirm the built system infrastructure and the vehicle are working together. Successful completion of these tests is critical to achieving start of service in December 2018.

GrandLinq is also completing rework activities through this reporting period.

Bombardier has started dry run tests for burn-in on some vehicles. These dry run tests will not count to official burn in mileage, but will help identify any vehicle reliability issues as soon as possible. This will help ensure reliable service once ION light rail becomes operational.

On a typical day there are two vehicles being used for testing activities.

Table 3 shows the current status of testing.

Training Status

GrandLinq/Keolis continues training on the first of three sets of train operators. Once trained, drivers will be supporting the ongoing testing and burn in programme and system demonstration tests as well as ongoing driving to maintain skill levels. There are currently 10 drivers being trained. Four LRV's have been allocated specifically for the training and qualification of GrandLinq/Keolis Operators. Two to three of the vehicles are being used everyday for training these drivers and it has become commonplace for three vehicles to be operating on the right of way during the same time period throughout the day. A fourth LRV serves as a hot spare available for replacing one of the other training vehicles if required.

The Bombardier vehicles are complex vehicles that require routine maintenance as well as any necessary repairs or emergency repairs. Training of the staff that will be doing these repairs is continuing. These staff are currently helping to support the vehicles during the testing programme.

Events

An ION vehicle will be present at some upcoming community events. The vehicle will be parked at an ION station during these events, providing residents an opportunity to view and board a vehicle. ION staff will be on hand to provide safety information, service information and to answer any questions from residents. GRT staff will also be available to provide information on network changes and light rail integration.

These events include:

- September 6 – Waterloo Fest (Waterloo Public Square station)
- September 19 – University of Waterloo station (University of Waterloo station)
- October 4 – Oktoberfest (Waterloo Public Square station)
- October 26 – UW convocation (University of Waterloo station)
- TBD – ION staff are working on an additional event in Kitchener
- December 7 – Christkindl Market (Kitchener City Hall station)

These events have been reviewed, approved and timed to not impact any testing or training that could impact start of service.

Summary

Assembly is complete on all of the vehicles, good progress is being made in the installation of the specialized equipment, and first vehicles are very close to achieving preliminary acceptance (a significant step in being ready to carry passengers). The first vehicle with the specialized equipment installed was shipped to the Region on September 17, 2018 and is expected to arrive late this week or early next week. This vehicle will allow GrandLinq to continue to test the integration of the tracks and controls systems with the train.

Grandlinq / Keolis are actively working on driver and mechanic training, and system testing.

Staff, Bombardier and GrandLinq continue to work towards the goal of achieving start of service in December 2018. Staff continue to monitor Grandlinq and Bombardier's progress, with a focus on critical items that could impact this goal. Some of these issues include: delivery of ready for service vehicles; system integration and/or testing issues; driver and mechanic training; and safety certification.

To prepare for start of service the public outreach program to educate the public on the ION train system continues - in particular how to be safe around the trains. The fall will also see a number of events that will allow the public to see and board an ION train, in conjunction with various community events.

Corporate Strategic Plan:

The report supports Focus Area 3.1 of Council's Strategic Focus: Develop an implementation plan for light rail transit including corridor and station area planning.

Financial Implications:

The approved capital budget for the LRT project totals \$868 million, with funding provided by the Federal Government (\$265 million), Provincial government (\$325 million) with the balance funded by the Region including the repayment over the next 30 years of \$131 million of funding provided by GrandLinq.

Currently it is anticipated that the schedule changes and associated costs can all be accommodated within the approved project budget. As has been noted in previous reports the Region will seek to recover from Bombardier any additional costs incurred as a result of the delays in vehicle delivery.

Other Department Consultations/Concurrence:

This report was prepared with input from Corporate Services.

Attachments:

Table 1: Current Status of Vehicles in Waterloo Region

Table 2: Current Status of Vehicles in Kingston

Table 3: Testing Status

Prepared By: Thomas Schmidt, Commissioner, Transportation and Environmental Services

Approved By: Thomas Schmidt, Commissioner, Transportation and Environmental Services

Table 1: Current Status of Vehicles in Waterloo Region

Vehicle Number	Ownership	Status	GrandLinq On-board Equipment Installation
502	Bombardier owned vehicle	Vehicle undergoing GrandLinq On-board Equipment Retrofit, started on July 16, 2018	51% complete
503	Bombardier owned vehicle	Vehicle undergoing GrandLinq On-board Equipment Retrofit, started on July 16, 2018	51% complete
504	Bombardier owned vehicle	Vehicle undergoing GrandLinq On-board Equipment Retrofit, started on July 16, 2018	51% complete
505	Bombardier owned test and training vehicle	Vehicle is assembled. Propulsion and braking routine testing 100% complete. Modifications are ongoing. Vehicle used for system testing and driver training.	Not yet installed
506	Bombardier owned test and training vehicle	Vehicle is assembled. Propulsion and braking routine testing 100% complete. Modifications are ongoing. Vehicle used for system testing and driver training.	Not yet installed
507	Bombardier owned test and training vehicle	Vehicle is assembled. Propulsion and braking routine testing 100% complete. Modifications are ongoing. Vehicle used for system testing and driver training.	Not yet installed
508	Bombardier owned test and training vehicle	Vehicle is assembled. Propulsion and braking routine testing 100% complete. Modifications are ongoing. Vehicle used for system testing and driver training.	Not yet installed
509	Bombardier owned test and training vehicle	Vehicle is assembled. Propulsion and braking routine testing 100% complete. Modifications are ongoing. Vehicle used for system testing and driver training.	Not yet installed

Table 2: Current Status of Vehicles in Kingston

Vehicle Number	Vehicle Assembly	Routine Testing Status	Production Status and Notes	GrandLinq On-board Equipment Installation
501	Vehicle almost complete. Upgrades on hold.	Routine Testing paused	Vehicle modifications on hold - focus on GrandLinq On-board Equipment Installations on other vehicles.	Not yet installed
510	Complete and inspected	93%	Being used in vehicle Qualification Testing	Not yet installed
511	Complete and inspected	97%	On-board equipment is installed. Functional testing completed. Departure from Kingston: September 17, 2018	Installed
512	Complete and inspected	94%	Currently undergoing retrofits for On-board equipment	48%
513	Complete and inspected	94%	Currently undergoing retrofits for On-board equipment	27%
514	Complete and inspected	94%	Being used in vehicle Qualification Testing	Not yet installed

Table 3: Testing Status

Location	Test	Status	Notes
Kingston	Bombardier Qualification	On going	Multi (coupled) vehicle testing is ongoing.
Waterloo Region	Bombardier Qualification	On going	Vehicle communications and signage testing.
	GrandLinq System Integration	On going	Continue testing of grade crossing warning systems and start of ride quality testing. Preparations for on-board equipment testing.
	Vehicle Burn-in	Not started	Planned to be started once reliability modifications are completed on vehicles.
		Dry-run	Bombardier to advance "dry-run" burn-in on some vehicles to begin to identify any vehicle reliability issues as soon as possible. Planned now to start in September.
	Simulation / Demonstration	Not started	System is run as if it was in service, but will not be picking up passengers. Last step in test process, all other tests need to be completed first.