



# Subway Restricted Speed Zones

Board Meeting: September 24, 2024

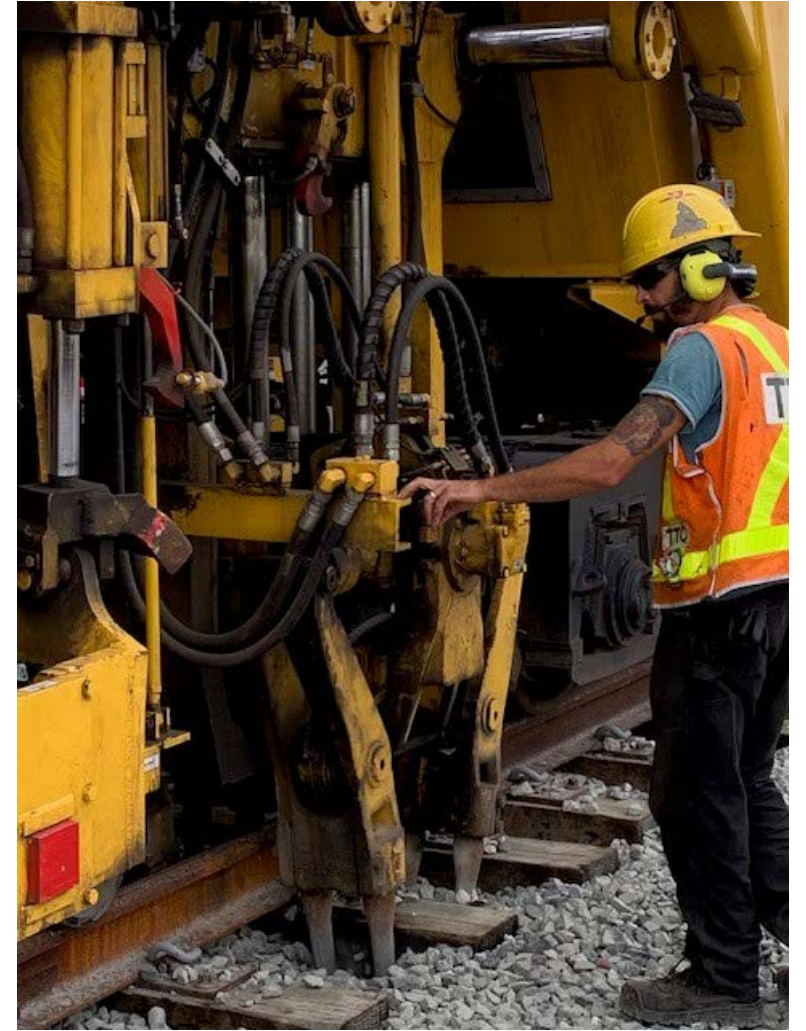
Presenter: Fort Monaco – Chief Operations and Infrastructure Officer





# | When and why are Restricted Speed Zones (RSZs) used?

- RSZs are a proactive strategy used to safely prolong the life of aging track infrastructure
- In these zones, train speeds are reduced to minimize wear and extend the life of the track in spots where certain defects have been documented
- They can be implemented for planned track projects or on an emergency basis
- An RSZ is a safety precaution, but does not indicate that a track is unsafe to operate on



# | What Are the Track Inspections Performed?

1. Geometric System Track Surveys
2. Track Patrol 72 hour Inspections
3. Non-Destructive Testing
4. Track Inspection Vehicle
5. Senior Track Network Inspections





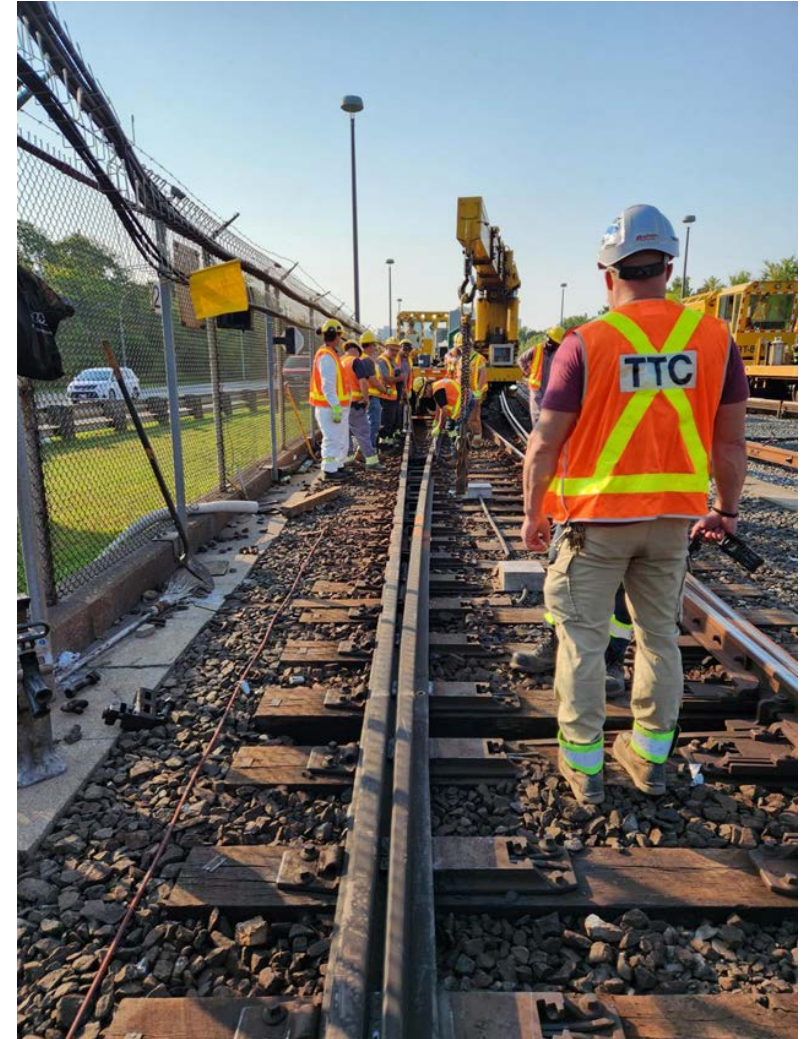
# | Why do RSZs take so long to address?

- With current TTC service hours, track maintenance workers have an average of **90 minutes per night** to complete repair work
- Larger defects often require more time to repair than can be done during a regular maintenance window
- Once repair work is completed, it still needs to be inspected before the RSZ can be removed and trains returned to regular speeds



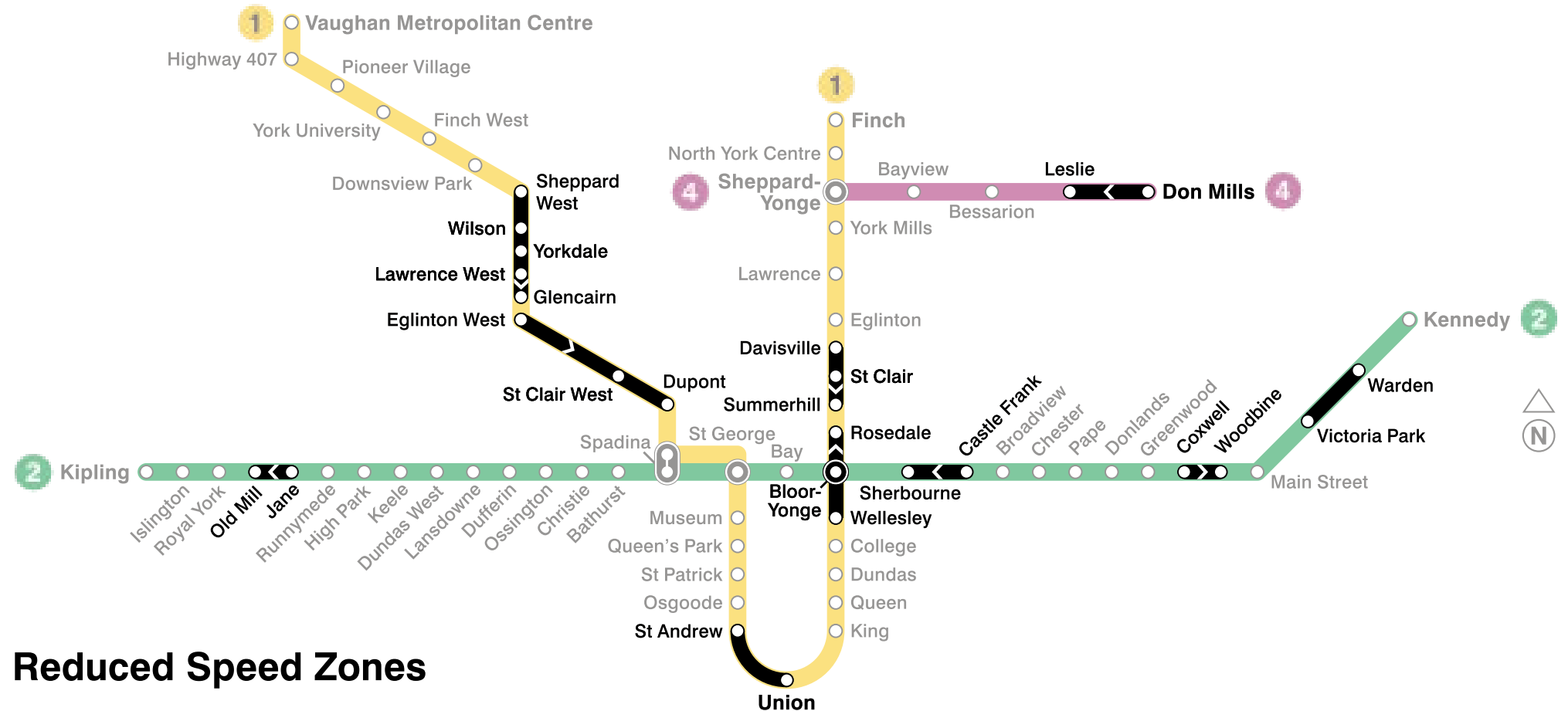
# | Why an Uptick in RSZs?

- Out of the May 2024 survey, 25 new defects were identified that required a RSZ:
  - Line 1: 18
  - Line 2: 7
  - Of those, 10 were in open cut areas
- Regular inspections continue to identify new or existing defects that require new RSZs.
- **Six** full weekend closures and **53** early closures have been scheduled since May to work on removing the RSZs.
- Since May, we have removed **65 of the 85 RSZs.**



# Travel times

- Most impacts southbound on Line 1 between Wilson and Union
- Extra two minutes travel time per zone





# | Action Plan: Short Term

- RSZs are part of our shift to a more proactive approach to asset maintenance
- A number of initiatives are already underway to improve track health management:
  - Continuing regular maintenance to meet or exceed all North American standards
  - Improving workcar fleet reliability
  - Increasing TTC staff skills and training
  - Exploring options to increase maintenance windows



# | Action Plan: Long Term

Other long-term plans are underway to improve track maintenance and track rehabilitation:

- Introducing additional track inspection technology
- Acquiring our own ultrasonic and geometry survey equipment
- Enterprise Asset Management investment in data and knowledge









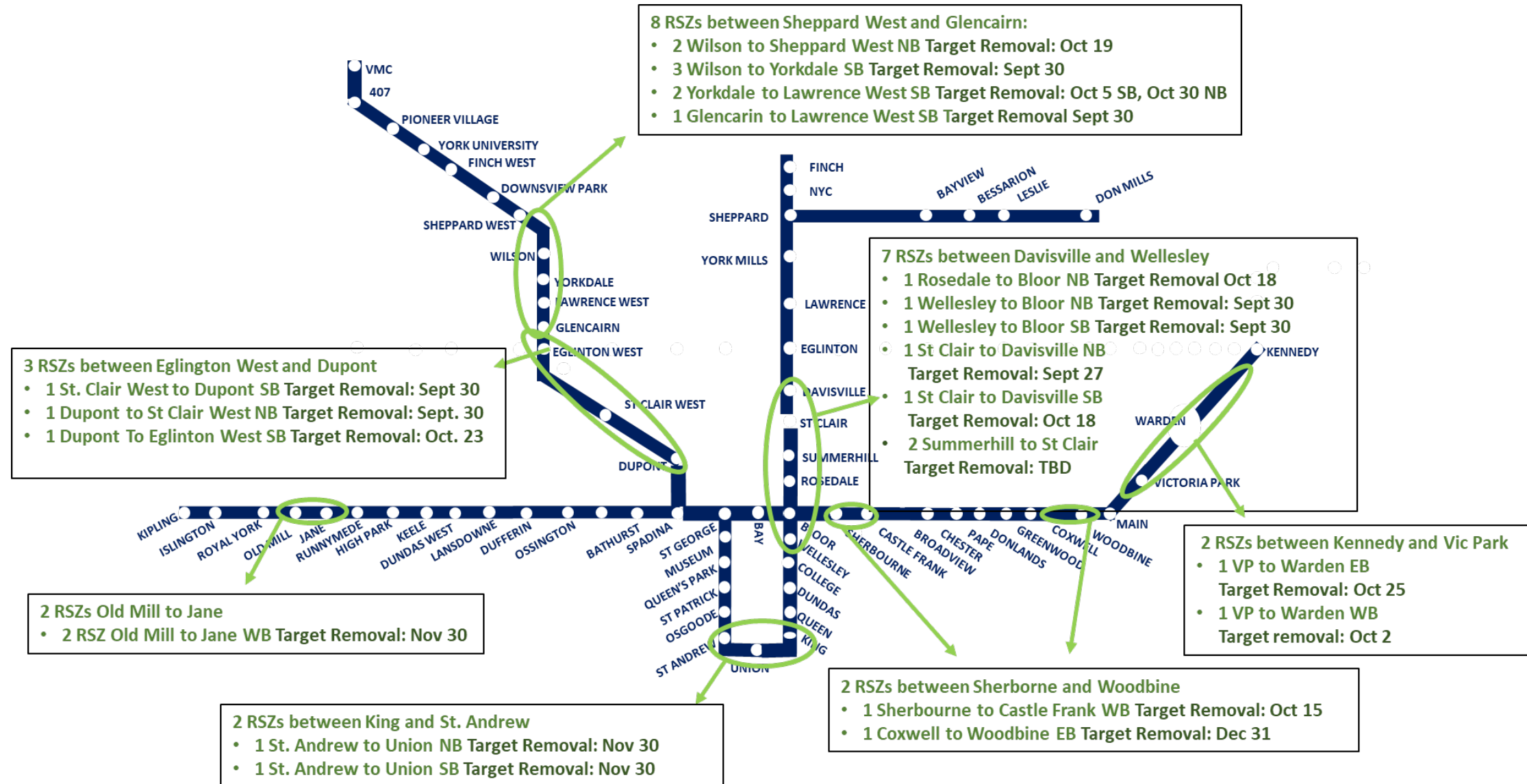
## Appendices:

- Map of current RSZs
- Track Inspection Technology Initiatives
- Track Geometry Survey Overview
- Ballast Conditions
- RSZ Statistics Jan 2023 – Sept 2024

September 23, 2024



# Map of Current 26 RSZs (as of Sept. 23, 2024)



# | Track Inspection Technology Initiatives

Some track inspection technology we are exploring to supplement walking inspections:

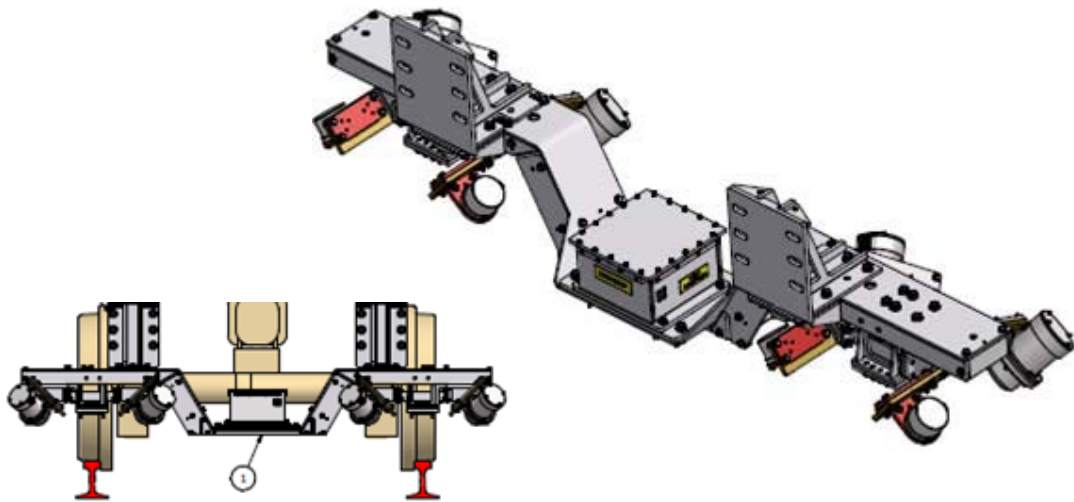
- **Noise Monitoring System** – Monitors sound levels and sends proactive alerts; under trial since 2020
- **Rail Lubricator Remote Monitoring** – Identifies lubricator issues that create noise
- **Vibration Monitoring Stations** – Identifies vibrations earlier so they can be repaired. Currently installed between Woodbine and Main St.
- **Delkor Fastening System** – Under trial since 2019; significantly reduces clip failures
- **Pandrol Verse** – Measures the internal stress in running rails
- **Ground Penetrating Radar (GPR)** – Helps identify and prioritize drainage issues that lead to the development of mud spots and pumping ties
- **Rail Milling** – Removes deep surface defects to lengthen the life of the rail. Also minimizes noise, smoke, and the risk of track-level fires. In use since 2018
- **Delkor/UIC33 Restraining Rail System** – Allows for faster and easier rail installation. Will be trialled in 2024
- **Holland Automated Manganese Refurbishment** – Reduces the need for repeated repairs on diamonds and frogs
- **Ultrasonic Phased Array Inspection** – Provides fast detection of weld defects. Track Component Imaging System – provides high-quality images of track, detects broken track components and ballast status
- **Workcar Mounted Inspection Technology** – Will allow more frequent geometry inspections and make us independent of an outside contractor to complete the work





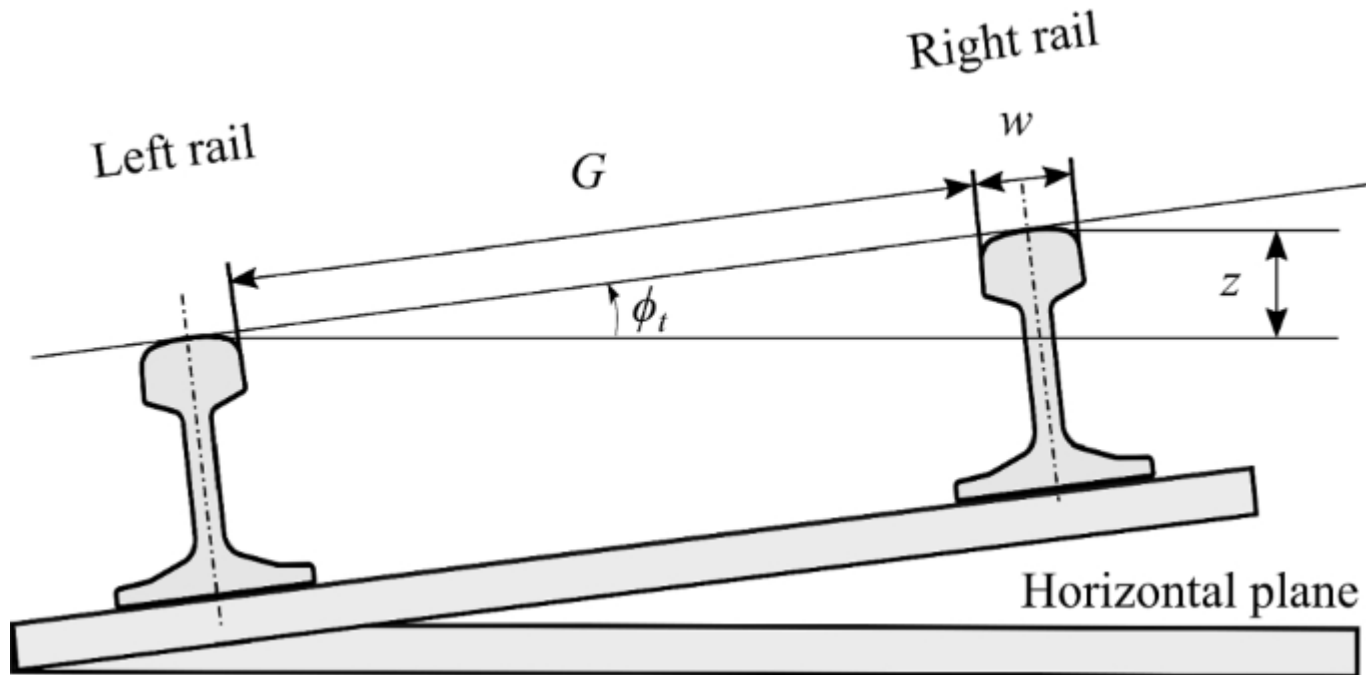
# Annual MERMEC Track Geometric Survey

- MERMEC geometric surveys have been conducted annually since 2015
- Their equipment is installed on a T1 revenue car (married pair 5330/5331) and are operated in a four-car consist to conduct the survey
- Inspection runs on Line 1 are performed during non-revenue hours, due to the lack of Automatic Train Control (ATC) equipment in our T1 vehicles
- Inspection runs on Line 2 and four are done during revenue hours as these are non-ATC territories



# Track Geometry

- The MERMAC survey collects data on the gauge, twist, curvature, alignment and wear of the tracks
- Track properties outside of set limits can warrant the implementation of RSZs to slow wear and ensure safe operations continue





# | Track Standards

- There are no government regulatory limits for the maintenance of light transit track in Canada, unlike the heavy rail industry. The TTC has to determine the limits to which it wants to maintain its track
- The TTC has over 400 different documents covering standards, standard operating procedures and work methods just for the subway tracks. These are currently being reviewed and updated
- In the absence of a TTC standard, the limits outlined by the American Public Transit Association (APTA) are used as a guideline



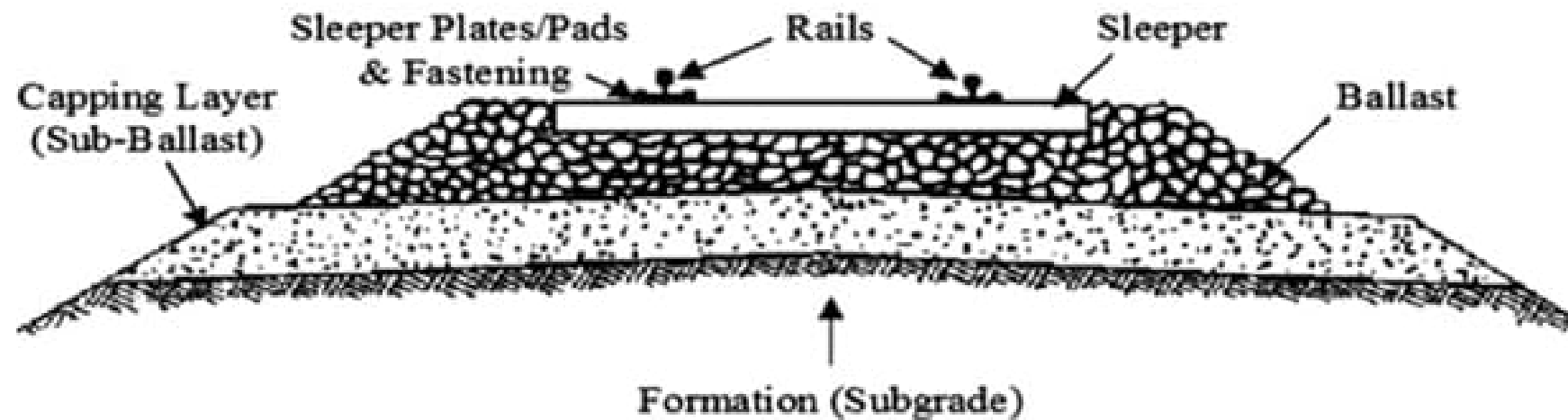
# | Ballast Conditions

- Poor drainage in areas throughout the system can create mud spots and cause contaminated ballast
- A slurry develops which will be soft in the spring and harden in the summer
- This impedes the ballast from properly supporting the tracks, leading to pumping, excessive wear and geometric issues



# Rehabilitating Contaminated Ballast

- Wet beds lead to track geometry faults, requiring the rehabilitation of contaminated ballast, ties, clips and rail
- A ballasted piece of track should be installed as pictured below:





# | RSZ Statistics: January 1, 2023 – September 10, 2024

- Between January 1, 2023 and September 10, 2024, **296** RSZs were implemented:
  - 30 were planned (11.3%)
  - 296 were unplanned (88.7%)
- The average Time to Resolve RSZs:
  - 22.1 days
- The median Time to Resolve RSZs:
  - 11.6 days



# RSZ Statistics

- RSZs are categorized into 12 different general reasons/causes:

Restricted Speed Zones by Reason/Category (2023-Present)		
Reason	Number of RSZs	% Breakdown
NDT Defects	102	34.46%
Track Geometry	44	14.86%
Broken/Cracked Frog	39	13.18%
Track Deflection	32	10.81%
Other Safety Issues	20	6.76%
Track Rehabilitation	17	5.74%
Track Fasteners	13	4.39%
Broken/Cracked Rail	11	3.72%
Switch Issues	9	3.04%
Power Rail	7	2.36%
Worn Rail	2	0.68%
Signal Issues	0	0.00%
Total	296	100%



# RSZ Statistics

YUS Restricted Speed Zones by Location (2023 - Sept. 10/24)	
Location	Number of RSZs
North York Centre to Finch	19
Wilson to Sheppard West	13
Yorkdale to Wilson	13
St. Andrew to Union	12
St. Clair to Davisville	11
Bloor Yonge to Rosedale	10
Union to King	10
Davisville to Eglinton	9
St. George to Museum	9
Glencairn to Lawrence West	7
York Mills to Sheppard Yonge	7
Dupont to St. Clair West	6
Lawrence to York Mills	6
Summerhill to St. Clair	6
Lawrence West to Yorkdale	5
Sheppard Yonge to North York Centre	4
St. Clair West to Eglinton West	3
St. George to Spadina	3

YUS Restricted Speed Zones by Location (2023 - Sept. 10/24)	
Location	Number of RSZs
College to Wellesley	2
Dundas to College	2
Eglinton West to Glencairn	2
Highway 407 to VMC	2
Spadina to Dupont	2
Wellesley to Bloor Yonge	2
York University to Pioneer Village	2
Downsview Park to Finch West	1
Dupont to Eglinton West	1
Eglinton to Lawrence	1
Finch West to Downsview Park	1
Finch West to York University	1
King to Queen	1
Lawrence West to Wilson	1
Rosedale to Summerhill	1
Sheppard West to Downsview Park	1
Spadina to St. George	1
St. Clair to Eglinton	1
<b>Line 1 Total</b>	<b>178</b>





# RSZ Statistics

**BD Restricted Speed Zones by Location  
(2023 – Sept. 10/24)**

Location	Number of RSZs
Victoria Park to Warden	18
Castlefrank to Broadview	14
Warden to Kennedy	10
Broadview to Chester	9
Donlands to Greenwood	6
Kipling to Islington	6
Keele to Dundas West	5
Bay to Bloor Yonge	4
St. George to Bay	4
Dundas West to Lansdowne	3
Old Mill to Jane	3
Woodbine to Main	3
Castlefrank to Chester	2

**BD Restricted Speed Zones by Location  
(2023 - Sept. 10/24)**

Location	Number of RSZs
Royal York to Jane	2
Sherbourne to Castlefrank	2
Bathurst to St. George	1
Bay Station	1
Bloor Yonge to Sherbourne	1
Coxwell to Main	1
Dufferin to Ossington	1
Jane to Runnymede	1
Main to Victoria Park	1
Runnymede to High Park	1
Runnymede to Runnymede	1
Spadina to Bay	1
Spadina to St. George	1
<b>Line 2 Total</b>	<b>102</b>



# | RSZ Statistics

SRT Restricted Speed Zones by Location (2023 - Close)	
Location	Number of RSZs
Kennedy (SRT) to Lawrence East	3
Lawrence East to Ellesmere	1
Midland to McCowan	1
<b>Line 3 Total</b>	<b>5</b>

Sheppard Restricted Speed Zones by Location (2023 – Sept. 10, 2024)	
Location	Number of RSZs
Sheppard Yonge to Bayview	5
Leslie to Don Mills	4
Bayview Station to Bessarion Station	2
<b>Line 4 Total</b>	<b>11</b>

