12th National Conference on Transportation Asset Management

July 14 – 17, 2018

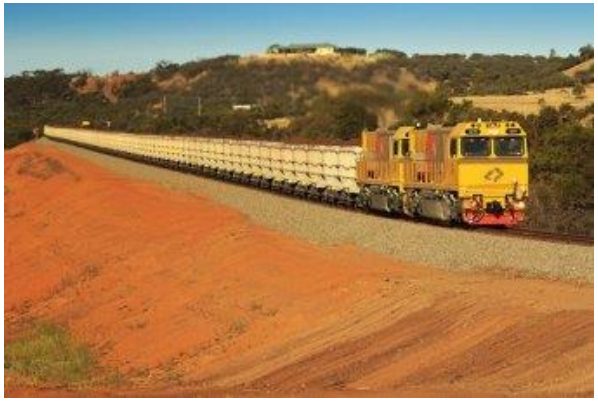
Practical Uses of Risk-Based Prioritization

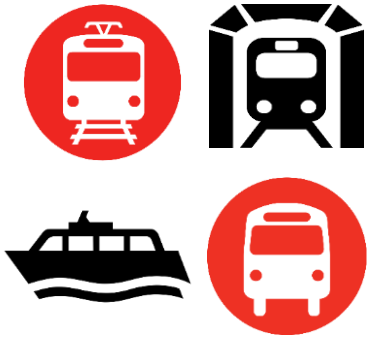
For Transit State of Good Repair Investments

Kimley»Horn

Introduction

- This is me…





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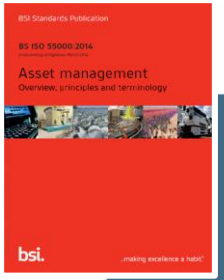
Expect More. Experience Better.

Asset Management Guidance and Standard



ISO 55000: International Asset Management Standard

The coordinated activity of an organization to realize value from assets.

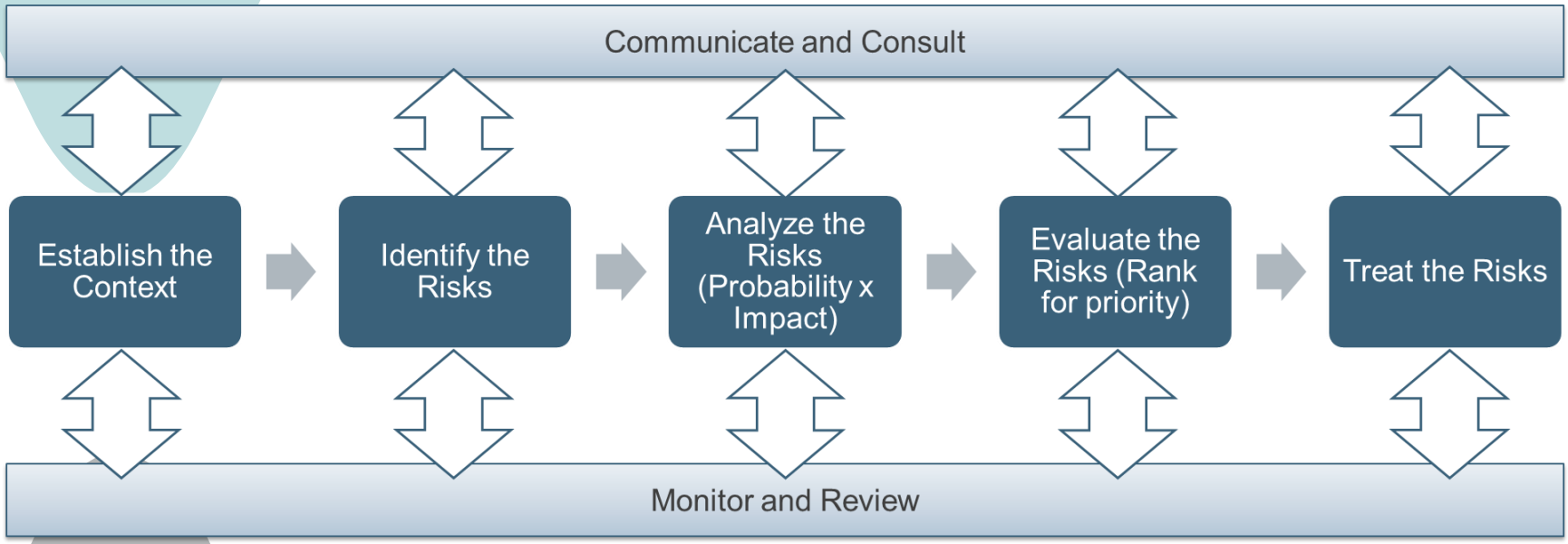
Asset management involves the balancing of costs, opportunities, and risks against the desired performance of assets to achieve organizational objectives.

FTA: Transit Asset Management Guide

The strategic and systematic practice of procuring, operating, inspecting, maintaining, rehabilitating, and replacing transit capital assets to manage their performance, risks, and costs over their life cycles to provide safe, cost-effective, and reliable public transportation.

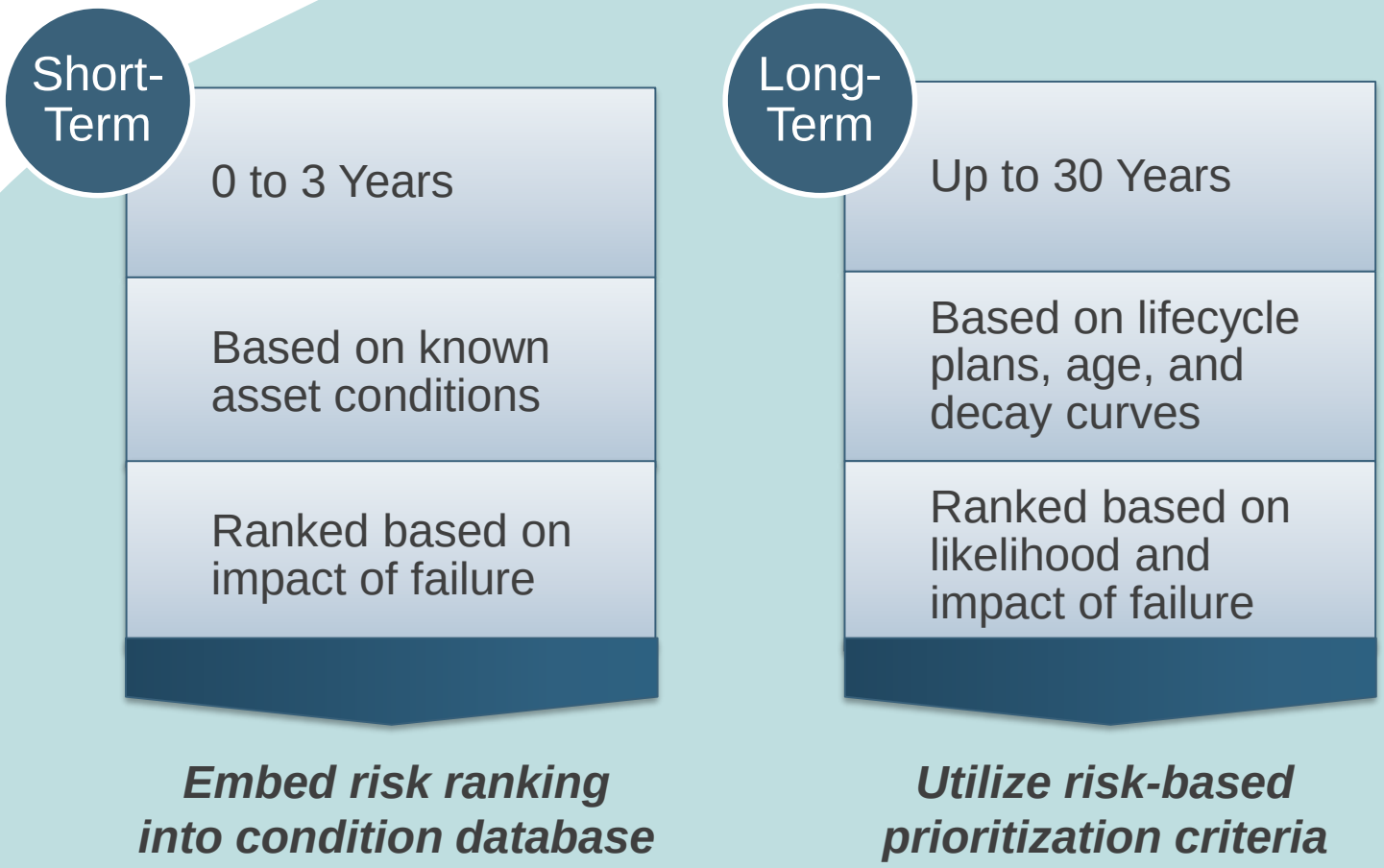
Basically: It's *all* the activities of an organization that **balance the cost, risk, and performance of assets** in order to deliver service to customers.

Determine Risk Management Approach



- Utilize ISO 31000 standards for risk management
- Develop asset type (or individual asset) risk registers
- Consider risk of asset failure across multiple impacts
  - Safety
  - Service reliability
  - Operating & maintenance costs (financial)
  - Environment

Leverage Decision Support Tools



Embed risk ranking into condition database

Utilize risk-based prioritization criteria

Short-Term Example: HRT Facility Condition Assessment

- Set condition threshold for re-investment
  - 3.0 or lower triggers exception report for all components requiring maintenance/ replacement
- Create risk scoring tables in database (ideally from risk registers)
- Rank immediate investment needs based on
  1. Condition – lowest first
  2. Risk – highest first

Condition

Risk

Ferry Dock Condition Distributions by Element

Inspection Period: 11/4/2015 to 8/23/2016

Group	Element	Inspection Count	Avg Condition	Avg Risk*	Condition Distribution				
					Excellent	Good	Adequate	Marginal	Worn
Channel	Embankment Erosion	4	4.0	1.60		100.0%			
	Overall	4	4.0	1.60		100.0%			
	Rip Rap/Slope Protection	1	4.0	1.60		100.0%			
	Vegetation	4	4.0	1.60		100.0%			
Decking	Deck Structure	4	3.5	2.00		50.0%	50.0%		
	Handrail	4	3.0	2.40			100.0%		
	Lighting	1	2.0	3.20				100.0%	
	Overall	4	4.0	1.60		100.0%			
Substructure	Entry Pier/Platform Bearing Seats	5	3.8	1.76		80.0%	20.0%		
	Entry Pier/Platform Bent Caps or Beams	3	3.7	1.87		66.7%	33.3%		
	Entry Pier/Platform Erosion/Scour/Undermining	4	4.0	1.60		100.0%			
	Entry Pier/Platform Piles	7	4.4	1.26	57.1%	28.6%	14.3%		
	Entry Pier/Platform Settlement	4	4.0	1.60		100.0%			
	Floating Dock	4	4.0	1.60	25.0%	50.0%	25.0%		
	Floating Dock Bouys/ Floats	4	3.3	2.20		25.0%	75.0%		
	Floating Dock Deck Framing	4	3.5	2.00		50.0%	50.0%		
	Floating Dock Dolphin Piles	8	3.6	1.90	12.5%	37.5%	50.0%		
	Floating Dock Fenders	4	3.8	0.90		75.0%	25.0%		
	Floating Dock Guide Piles	7	3.9	1.71	28.6%	28.6%	42.9%		
	Floating Dock Mooring Devices	1	4.0	1.60		100.0%			
	Gangway Bearing Devices	1	5.0	0.80	100.0%				
	Overall	4	3.8	1.80		75.0%	25.0%		
Superstructure	Entry Pier/Platform Bearing Device	2	3.0	2.40			100.0%		
	Entry Pier/Platform Girders/Beams	1	4.0	1.60		100.0%			
	Entry Pier/Platform Stringer	2	3.0	2.40			100.0%		

Thursday, July 5, 2018

* Note: Average Risk score may understate risk associated those assets in marginal or worn condition

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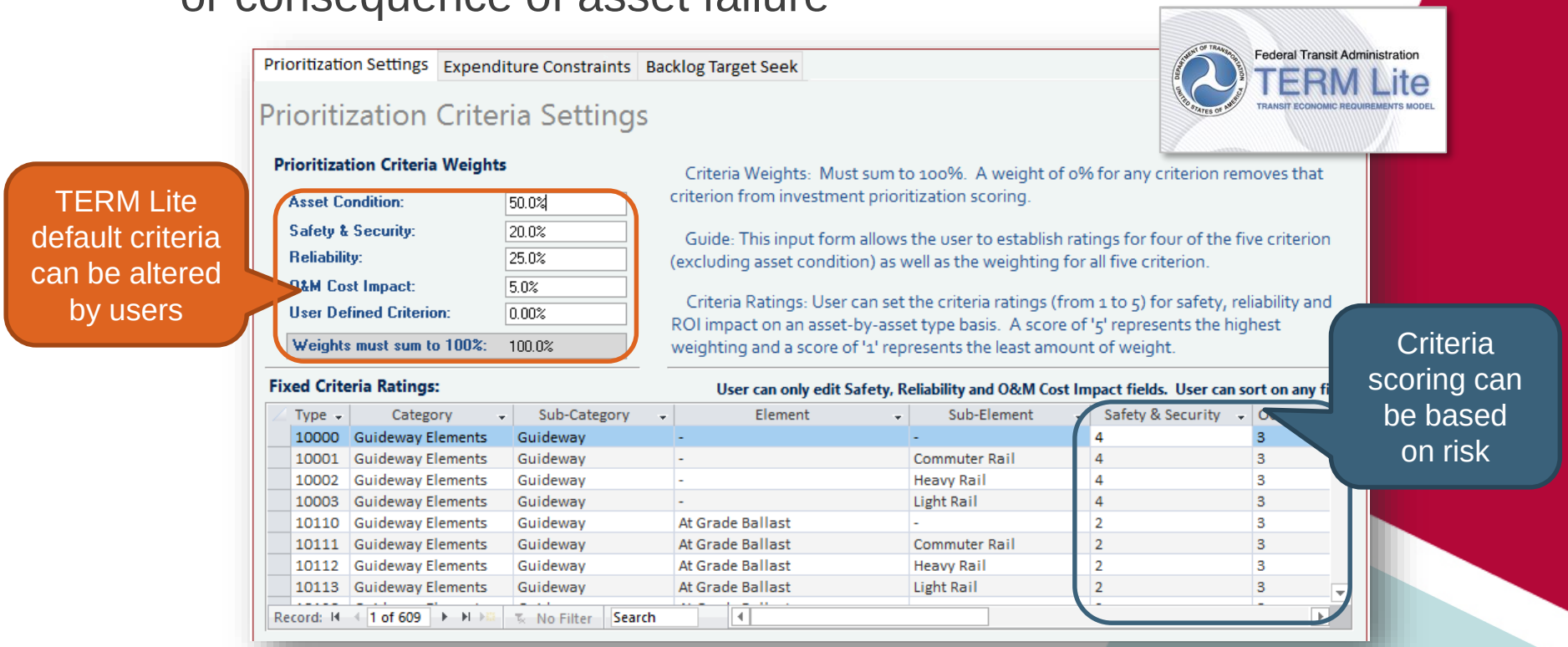
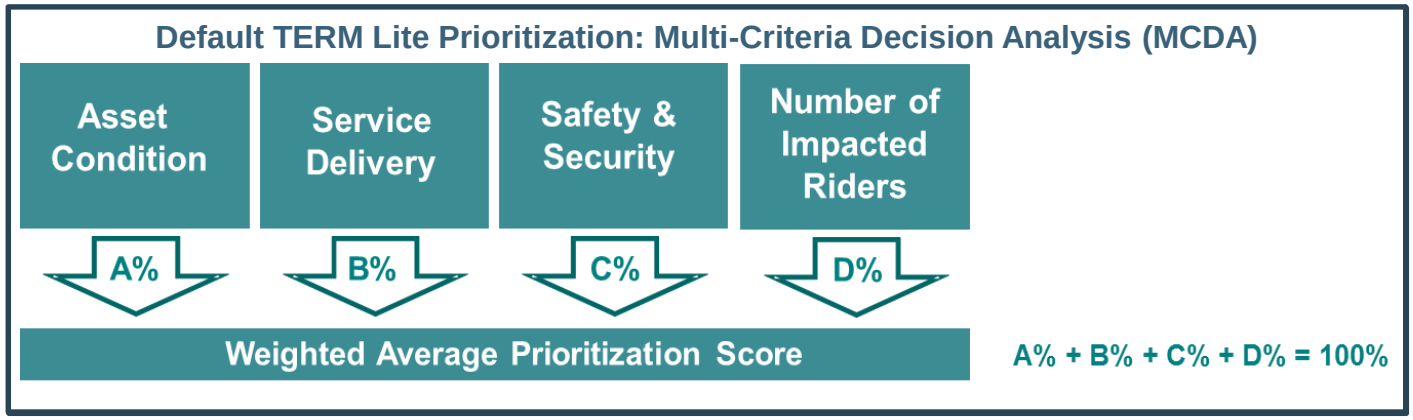
Long-Term Example

- FTA's Decision Support Tool – TERM Lite can be modified to support risk-based prioritization scoring
  - Uses prioritization criteria to represent either the likelihood or consequence of asset failure



Long-Term Example: WMATA Capital Needs Inventory (CNI)

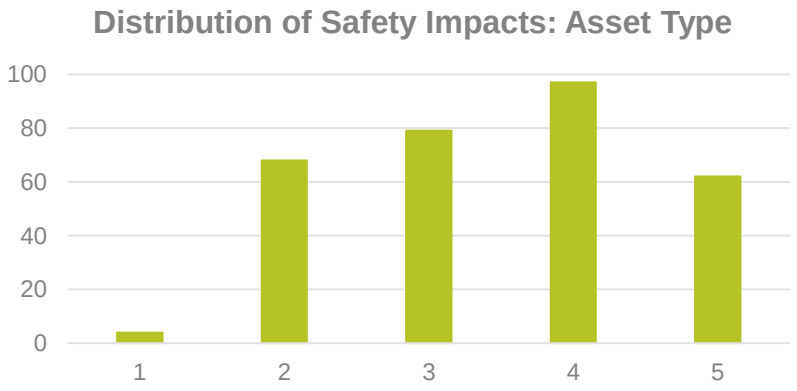
- Asset Condition used as proxy for likelihood of failure
- Weighted average of other criteria as consequence
  - TERM Lite modified to include Ridership Impact based on (1) Asset Type and (2) Location
  - O&M Cost Impact omitted from analysis due to lack of data-driven assessment



Example Risk Assessment for Asset Types: Safety & Security

- Mapped MIL-STD-882E risk matrix from the System Safety Program Plan to a one (1) to five (5) scale
- Assessed asset type safety impacts
  - Initial results provided for review by WMATA SAFE team based on historical incidents, current findings, etc.
  - Some items noted as contentious
- Verified impact scores with cross-functional stakeholder committee

RISK ASSESSMENT MATRIX					
		SEVERITY			
		1	*2*	*3*	*4*
PROBABILITY	A	5	5	3	2
	B	5	4	3	2
	C	4	3	2	1
	D	3	2	2	1
	E	2	2	2	1
	F	0			

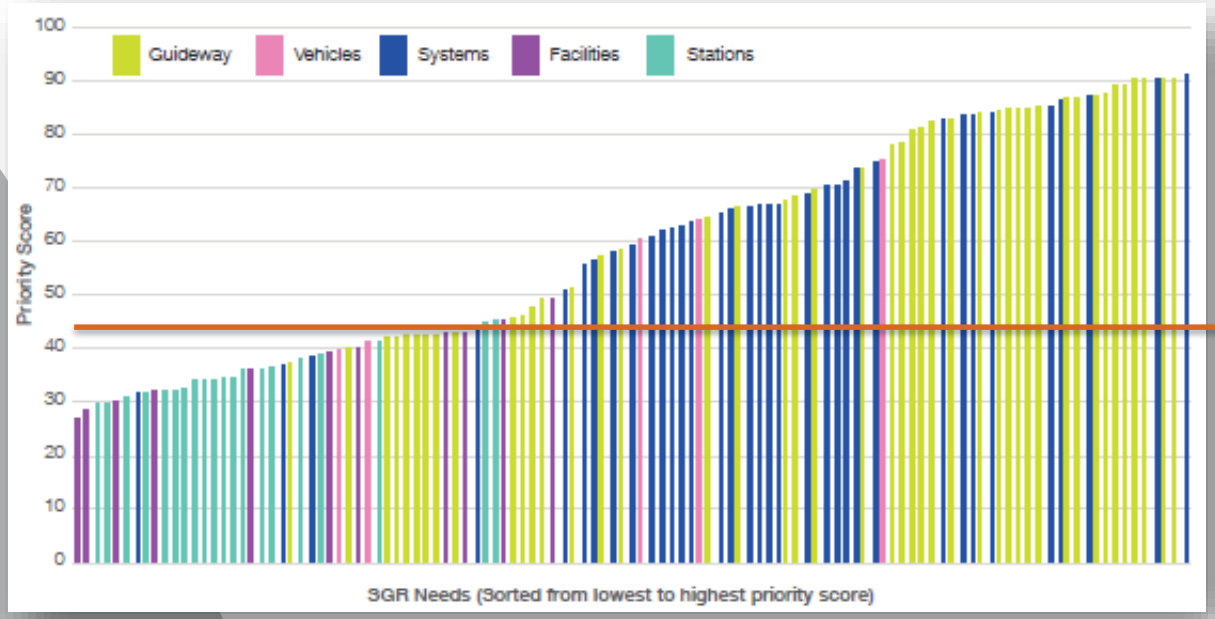


Example of Increased Individual Asset Risks: “Compliance”

- TERM Lite allows for individual assets in inventory to be tagged with four different levels of Priority Status, which adjust the underlying math
  - For WMATA “Compliance” status was identified as the highest priority
  - Compliance was assigned to asset in inventory based on
    - Compliance issues (e.g., a change in regulation or code or replacement required to be in compliance with standards)
    - Accidents or safety concerns (e.g., generally damaged or found to require replacement in an audit or investigation)
    - Technological obsolescence (e.g., replacing an asset that is no longer fit for service)

Example SGR Priority Results: WMATA CNI

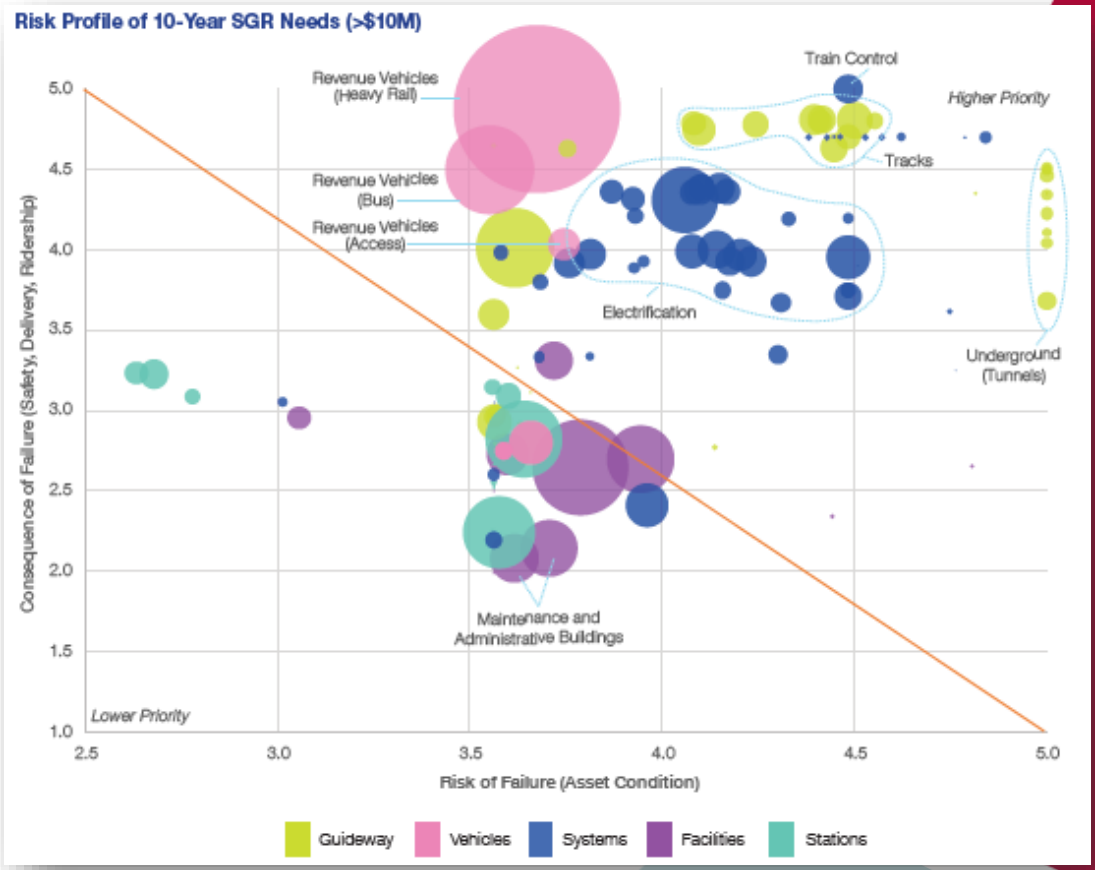
- Guideway elements (bridges, tunnels, and trackwork) and rail Systems (electrification and train control) score the highest
  - These asset types have the highest Safety & Security, Service Delivery, and Ridership Impacts
- Rail cars are the highest-scoring Vehicles (due to higher ridership)
- All Stations and Facilities needs score in the bottom half of SGR needs



Sample budget "cut-off" line

Example SGR Risk-Profile Results: WMATA CNI

- The profile of risk illustrates the relationship between likelihood and consequence of failure
- Tunnels have the worst condition (overall) and highest likelihood of failure due to ongoing water intrusion
- Whereas, rail revenue vehicles have the highest consequence of failure
- The size of each circle represents the total 10-year investment need



Questions?

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