

# **Overview of Current TRB Research in Transit SGR**

**prepared for the  
FTA Transit SGR Workshop  
Stephen Andrie**

**Adapted from a presentation originally developed by  
Bill Robert, Spy Pond Partners, LLC and chair of the TRB  
Subcommittee on SGR**

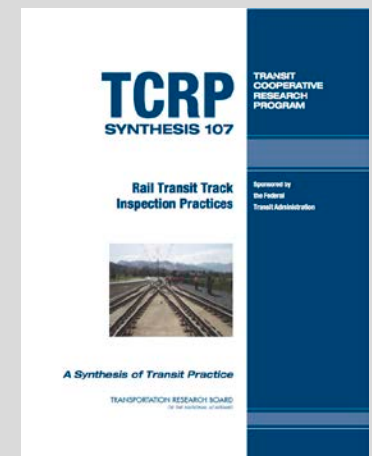
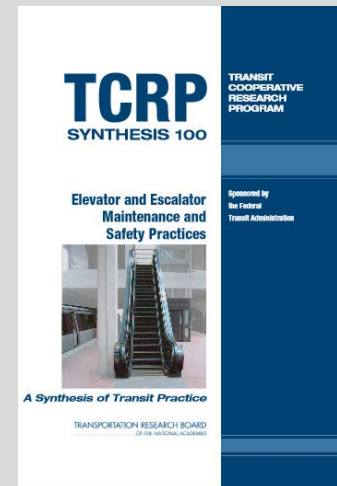
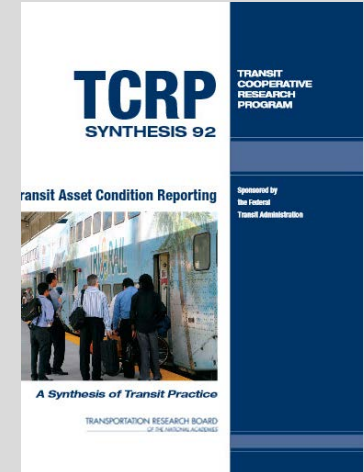
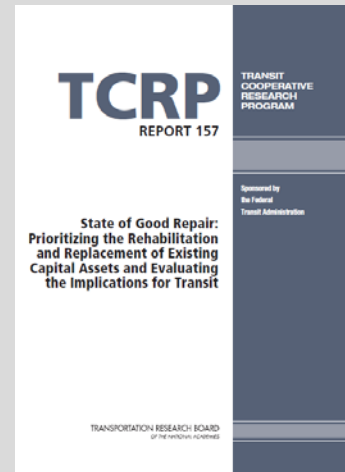
June 3, 2015

# Outline

- SGR-related research summary
  - TCRP projects and syntheses
  - Other efforts
- Brief Overview of the TCRP Reports
  - 157, SGR framework
  - 172, Asset management plan guidance
    - Transit Asset Prioritization Tool (TAPT)

# TCRP SGR-Related Research Recent Publications

- Report 157 (2012)
  - SGR Framework,
- Report 172 (2014)
  - TAMP Guidance and Tool
- Synthesis 92 (2011)
  - Transit Asset Condition Reporting
- Synthesis 100 (2012)
  - Elevator and Escalator Maintenance and Safety Practices
- Synthesis 107 (2013)
  - Track Inspection Practices

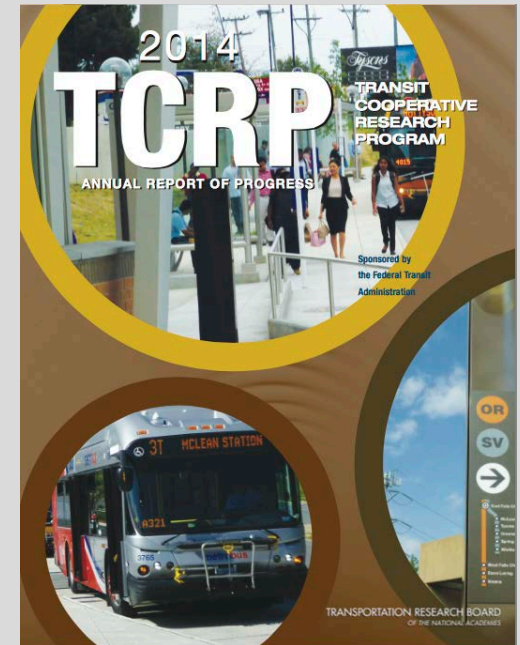


# Specialty Topics

- Training
  - TCRP 170, Establishing a National Transit Industry Rail Vehicle Technician Qualification Program (2014)
  - TCRP 178, A National Training and Certification Program for Transit Vehicle Maintenance Instructors (2015)
- TCRP Web 65: Wheel profile Maintenance Guidelines (2014)
- TCRP Web 64: Performance Based Track Geometry, Phase 2 (2014)
- TCRP Web 52: Performance Based Track Geometry, Phase 1 (2012)

# TCRP Research Projects Now Underway

- Active synthesis projects
  - <http://www.trb.org/SynthesisPrograms/TCRPSynthesisCurrentStudies.aspx>
  - None specifically SGR related
- Active research projects (SGR-related)
  - A-41 - Improving the Resiliency of Transit Systems Threatened by Natural Disasters
  - E-10 - Maintenance Technician Staffing Levels for Modern Public Transit Fleets
  - E-11: The Relationship Between Transit Asset Condition and Service Quality (RFP stage)
  - G-08 - A Guidebook for the Evaluation of Project Delivery Methods
- For more information on see the TCRP Annual Report of Progress
  - <http://onlinepubs.trb.org/onlinepubs/tcrp/TCRPAnnual2014.pdf>



# Other SGR-Related Efforts

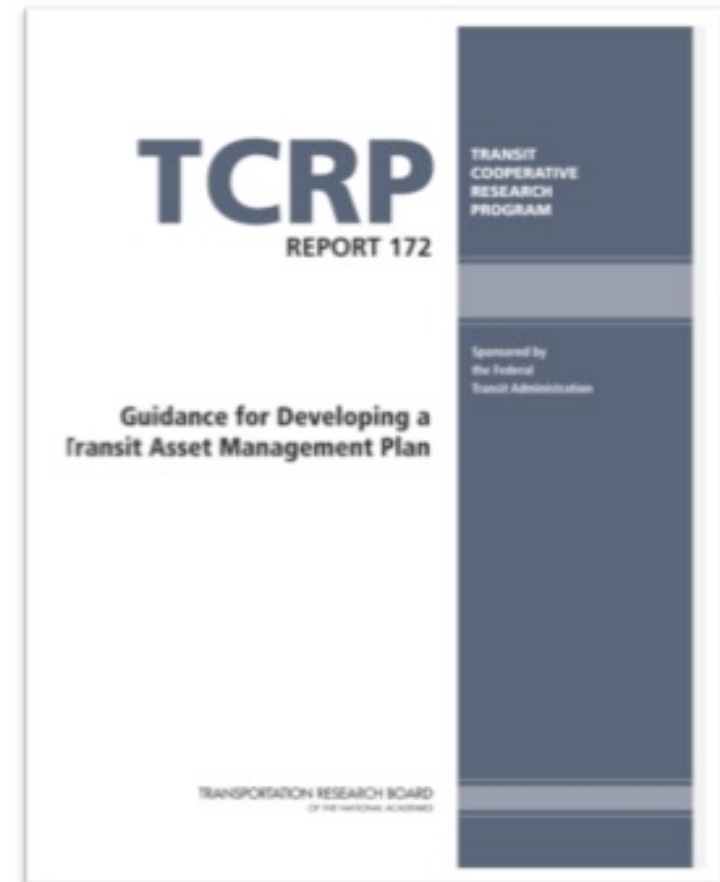
- FTA SGR Pilots and other research
  - Addressed in other conference presentations
- APTA SGR Working Group
  - Completed white papers/guidelines
    - Creating a Transit Asset Management Program
    - Defining a Transit Asset Management Framework to Achieve a State of Good Repair
    - Capital Asset Inventory and Condition Assessment
  - Topics under development
    - Asset Inventory Templates
    - Asset Management Plan Checklist
    - Asset management System Procurement Process
    - Transit Asset Management Software Specifications

# Highlights of TCRP Reports 157 and 172

- TCRP Report 157: SGR framework and analysis/prioritization tools
  - Completed in 2012
- TCRP Report 172: Pilots, guidance, revised tools
  - Completed in 2014

# TCRP Report 172 Contents

- Introduction
- Steps in Developing an Asset Management Plan
  - Provides step-by-step instructions for developing a MAP-21-compliant TAMP
  - Intended to be tool-agnostic
- Using the Transit Asset Prioritization Tool (TAPT)
- TAPT Tutorials
- Additional Resources





# TAPT Functionality

## Asset Life Cycle Models

- Predict conditions and costs, including agency, user and external costs
- Three basic asset model types
  - Revenue vehicles
  - Condition-based model
  - Time-based model
- Leverages defaults from TERM

## Prioritization

- Life cycle policies detailing increased cost of deferring rehab/replacement developed by asset type
- By default the tool prioritizes with an objective of minimizing life cycle costs
- Priorities can be revised based on non-economic factors

## Predicting Conditions and Performance

- Financial measures
  - Needs
  - Backlog
  - Agency costs
  - User costs of delay
  - Emissions costs
- Other measures
  - Mean Distance Between Failure
  - Average TERM condition
  - Hours of delay
  - Tons of CO2

# Recommended TAMP Performance Measures - Core

Measure	Use for	How to Measure
<b>Backlog of investment needs</b>	All assets	Sum of costs for unmet needs for achieving SGR
<b>Average asset age</b>	Guideway, stations, facilities, systems	Year of manufacture for vehicles; year of construction or installation for other assets. Weight by asset value when combining assets.
<b>Mean distance between failures (MDBF)</b>	Vehicles	Vehicle-miles traveled/number of road calls or failures
<b>Average accumulated mileage</b>	Vehicles	Total lifetime mileage averaged among all vehicles in the subfleet

# Recommended TAMP Measures - Comprehensive

Measure	Use for	How to Measure
Percent of assets in good/fair/poor condition	Guideway, stations, facilities, systems	TERM condition ratings (good $\geq$ 4, fair = 3, poor $\leq$ 2)
Asset availability	Elevators and escalators	Percentage of total operating time asset is available
Hours of delay	Vehicles, guideway	Passenger hours of delay caused by mechanical failures of vehicles or fixed assets
Greenhouse gas (GHG) emissions	Vehicles	Tons of CO <sub>2</sub> emitted by the vehicle fleet per year

# Transit Asset Prioritization Tool (TAPT)

- Spreadsheet tool included with TCRP Report 172
- Incorporates the framework and models described in TCRP Report 157
- Can be used to
  - Prioritize SGR investments
  - Predict future asset condition given a budget
  - Review the models from the TCRP reports

Transit Cooperative Research Program - Transit Asset Prioritization Tool Version 1.00

### Start Screen

#### MODEL PARAMETERS

##### ASSET GROUP ADMINISTRATION

Opens worksheet to enter or edit information for a new asset group. You will be asked for an Asset Group ID Code and model type (vehicle, age-based, or condition-based).

Create Asset Group

Edit Asset Group

Delete Asset Group

##### BUDGETS AND PARAMETERS INPUT

Opens worksheet to input budget amounts for each year and review (and, if desired, override) default economic analysis parameters.

Budgets & Parameters

#### PRIORITIZATION MODEL

##### PRIORITIZATION MODEL ADMINISTRATION

Runs the prioritization model using current budgets, parameters, and asset groups. You will be asked to specify a Run ID Code.

Run Prioritization Model

Delete Previous Run

##### PRIORITIZATION MODEL RESULTS

Displays a summary table showing prioritization model results by year for a selected run. You will be asked to select a Run ID Code.

Display Summary Table

##### ASSET REPLACEMENT PROGRAM

Displays a listing of the asset replacement program from a prioritization model run. You will be asked to select the Run ID Code.

Display Program List

#### SUMMARY STATISTICS

##### ASSET GROUPS

Vehicle	2
Non-Vehicle	10
Total	12

##### INITIAL CONDITIONS

Replacement Value (\$ 000)	1,796,260
Initial Needs (\$ 000)	45,023
Avg. Age (years)	11.5
Mean Distance Between Failures (miles)	32,553
Avg. Condition (non-vehicle)	4.7
CO2 Emissions (tons)	139,353

##### CHARTS

###### ONE AND TWO RUN CHARTS

Displays a chart showing prioritization model results by year for one model run or two. You will be asked to select a Run ID Code(s) and the output variable to be charted.

Display Chart - One Run

Display Chart - Two Runs

Replacement Value	Vehicle 30%
Initial Needs	Vehicle 0%

# Conclusions

- **TCRP Report 172 may be of particular relevance for agencies developing MAP-21-compliant asset management plans**
  - **TAMP development guidance**
  - **Transit Asset Prioritization Tool**