

Transit Asset Management: Asset-to-Project Mapping for Prioritization

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ch2m.SM

The FTA released proposed rules for MAP-21 asset management requirements in September 2015

- All recipients and subrecipients of FTA funds must develop a TAM plan
 - Plan development should be completed no more than two years after the final rule
 - At minimum, the plan should cover a 4 year time horizon
- Agencies of all sizes and modes must complete the first four elements
 - Tier 1 agencies must complete the remaining five elements

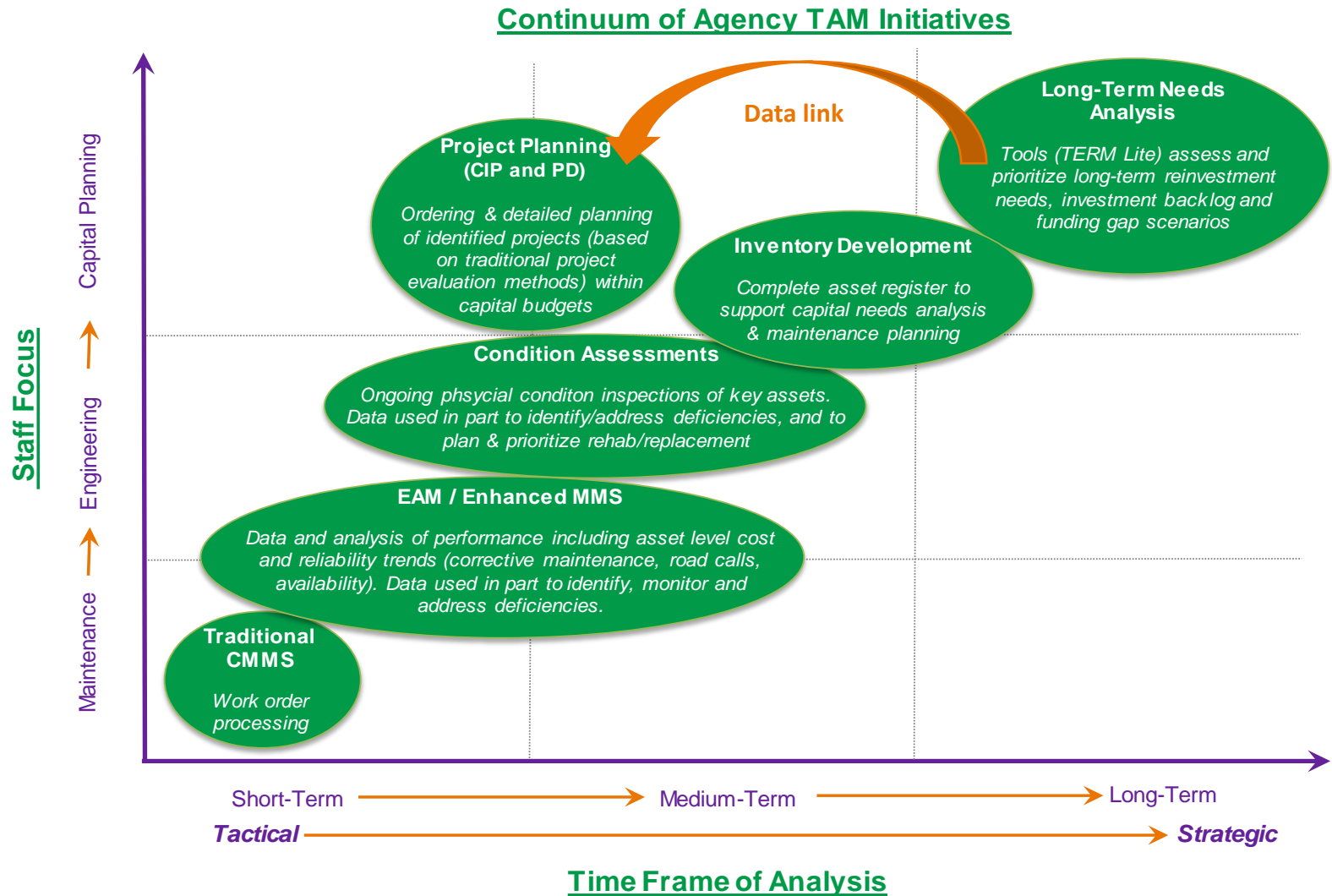
TAM Plan Required Elements:

1. Inventory of Capital Assets
2. Condition Assessment
3. Decision Support Tools
4. Investment Prioritization
5. TAM and SGR Policy
6. Implementation Strategy
7. List of Key Annual Activities
8. Identification of Resources
9. Evaluation Plan

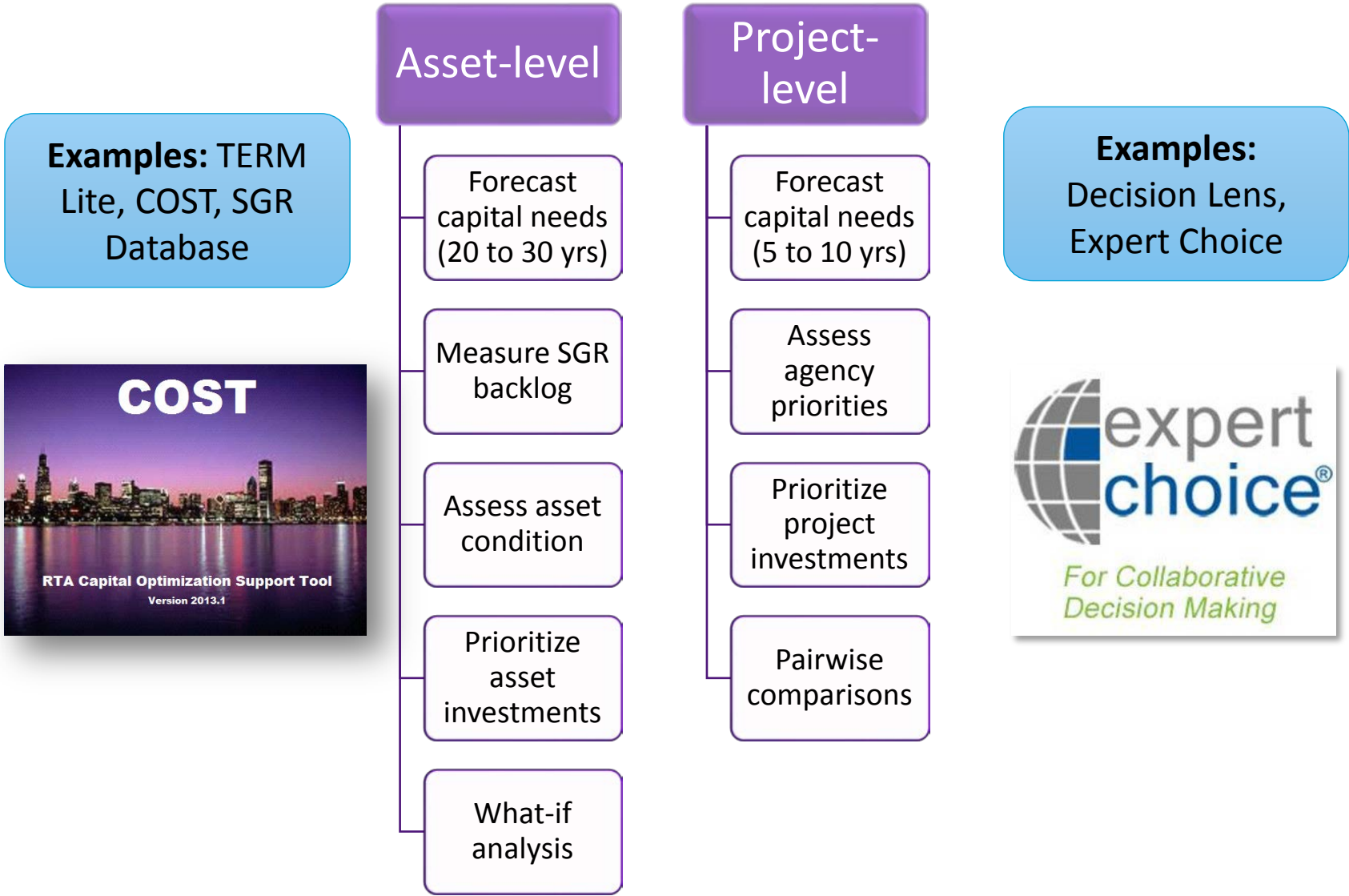
The challenge for transit agencies

- Capital asset inventories (Element #1) are required to support a variety of TAM activities – maintenance management through to performance management
- Inventories also provide the basis for predicting long-term reinvestment needs using decision support tools (Element #3)
- At the same time, capital planning tends to focus on near-term needs and project-level investment prioritization (Element #4)
- *How do we link the individual records in an asset inventory to near-term capital programming and project prioritization?*

The continuum of tools and activities in TAM programs



What decision support tools are used in TAM?



What is TERM “Lite”?

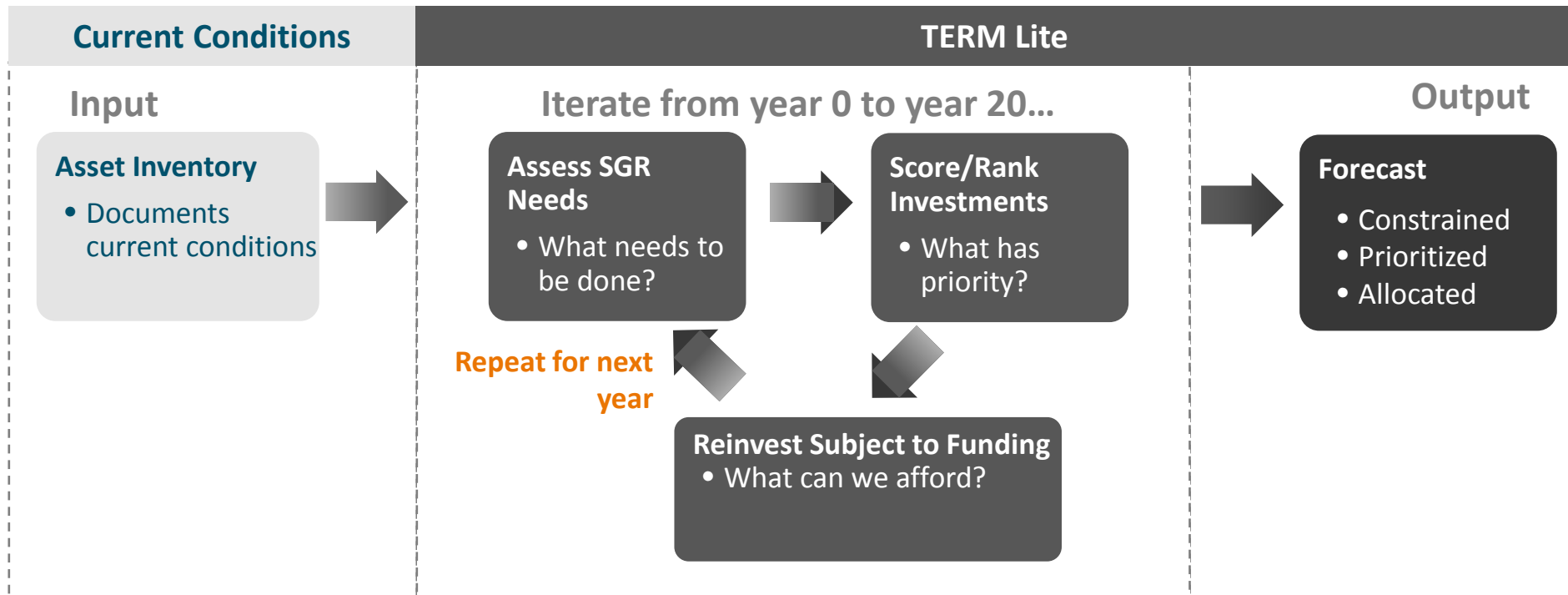
- Local/State Version of FTA’s Transit Economic Requirements Model
 - Designed for local long-term SGR needs analysis
 - MS Access Application
 - Provided by FTA to encourage good TAM practices
 - Download from FTA website



TERM vs. TERM Lite		
Capability	TERM	TERM Lite
Level of Analysis	National	Local / State
Intended User Group	FTA	Local agencies / State DOT
Life Cycle Driver	Condition (estimated)	Age
Prioritization	Benefit-cost analysis	User defined criteria
Output Format	Access Tables	Excel, Reports
Output (current and forecast)	<ul style="list-style-type: none"> ▶ SGR backlog ▶ Asset conditions ▶ 20 & 30 year reinvestment needs 	

How does asset-level prioritization work?

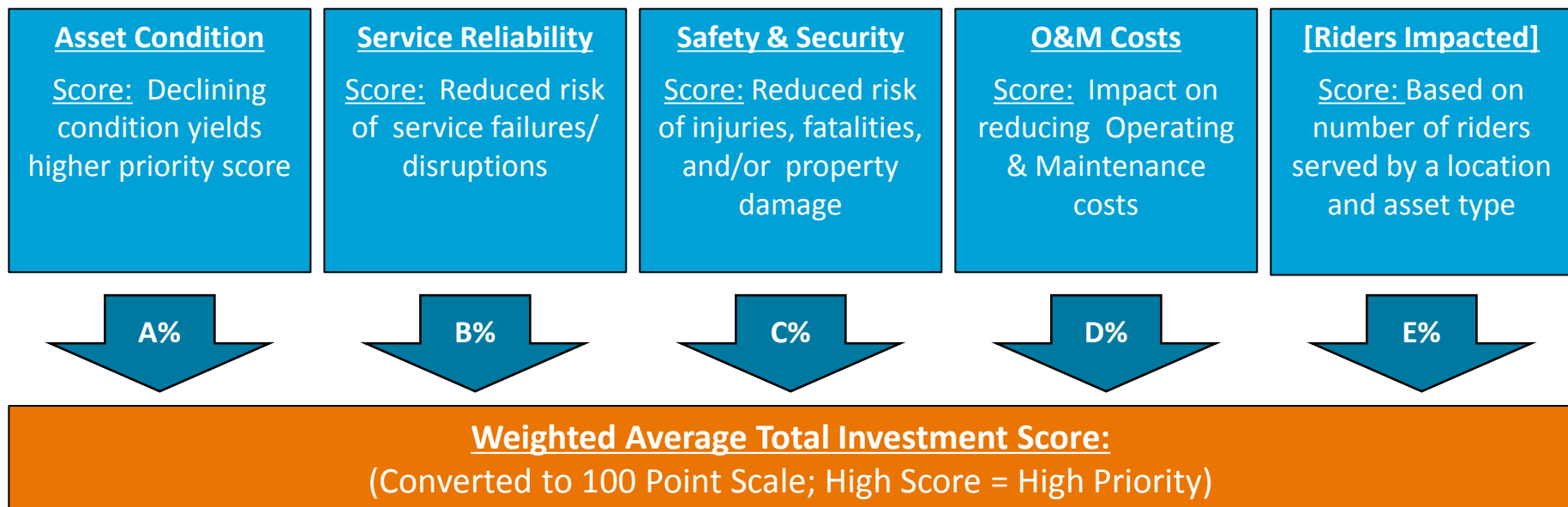
- Prioritization Routine repeated for each projection year of model run
 - Individual assets scored each projection year based on prioritization criteria: Asset condition, Service reliability, Safety & Security, O&M Cost impact and [Riders impacted]
 - Highest prioritization score assets funded first



Multi-Criteria Prioritization

- All assets scored on five criteria
 - Each criteria scored on 1 to 5 scale (5 highest priority)
 - Scores weighted, summed, & converted to 100 point scale

Multi-Criteria Decision Analysis (MCDA) Based Approach



Prioritization is done at three levels in TERM Lite

All Assets

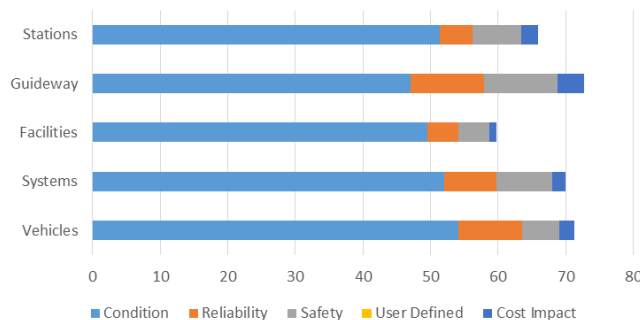
- Weights apply universally

Prioritization Criteria Weights	
Asset Condition:	80.0%
Safety & Security:	2.5%
Reliability:	5.0%
O&M Cost Impact:	2.5%
Ridership Impact:	60.00%
User Defined Criterion:	0.00%
Weights must sum to 100%: 100.0%	

Asset Types

- Criteria ranked by asset type

Average Priority Score by Asset Type



Individual Assets

- Asset age (or condition)
- Overrides to scoring: *Funded, Deficient or Exclude*

5,000-35,000 Records

Modifying the prioritization settings allows for “what if” analysis of priority

Modify Criteria Weights:

- Reweighting will favor investments that score well with the highest weighted criteria
- Example: Safety & Security favors vehicles

Prioritization Settings Expenditure Constraints Ba

Prioritization Criteria Settings

Prioritization Criteria Weights

Asset Condition:

Safety & Security:

Reliability:

O&M Cost Impact:

Ridership Impact:

User Defined Criterion:

Weights must sum to 100%: 100.0%

Modify Static Scoring:

- Asset types should be scored on an integer basis from 1 to 5
- Higher scoring assets are favored for investment
- Example: Bus fareboxes (3) score higher for Service Reliability than Office Computers (1)

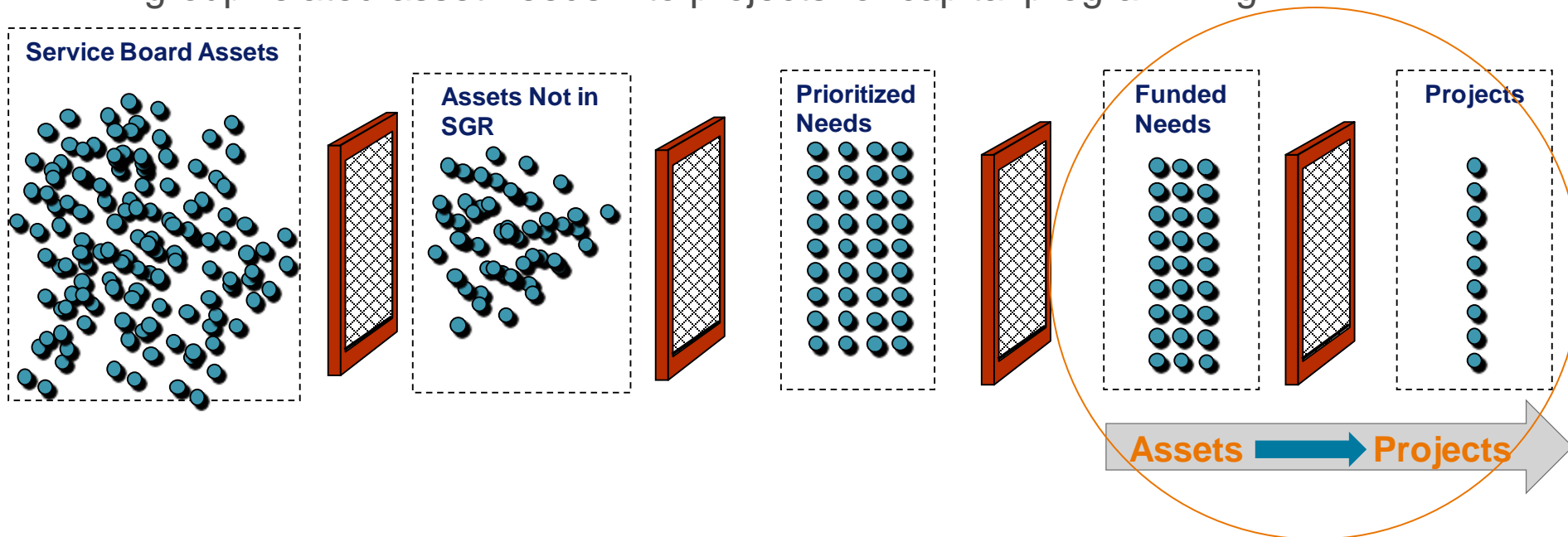
Fixed Criteria Ratings: User can only edit Safety & Security, Reliability, O&M Cost Impact and Ridership Factor fields.

Type	Category	Sub-Category	Element	Sub-Element	Safety & Security	O&M Cost Impact	Reliability	User Defined	Ri
10000	Guideway Elements	Guideway	-	-	4	3	4	1	100
10001	Guideway Elements	Guideway	-	CR	4	3	4	1	100
10002	Guideway Elements	Guideway	-	HR	4	3	4	1	100
10003	Guideway Elements	Guideway	-	LR	4	3	4	1	100
10110	Guideway Elements	Guideway	At Grade Ballast	-	2	3	4	1	100
10111	Guideway Elements	Guideway	At Grade Ballast	CR	2	3	4	1	100
10112	Guideway Elements	Guideway	At Grade Ballast	HR	2	3	4	1	100
10113	Guideway Elements	Guideway	At Grade Ballast	LR	2	3	4	1	100
10120	Guideway Elements	Guideway	At Grade Ballast	-	2	3	4	1	100
10121	Guideway Elements	Guideway	At Grade Ballast	Expressway CR	2	3	4	1	100
10122	Guideway Elements	Guideway	At Grade Ballast	Expressway HR	2	3	4	1	100
10123	Guideway Elements	Guideway	At Grade Ballast	Expressway LR	2	3	4	1	100

Record: 1 of 560 No Filter Search

How does asset-to-project mapping (APM) bridge the gap?

- Customized Models: Baltimore MTA's and WMATA's TERM Lite models use this module to group needs for individual assets into 'projects' (Chicago RTA's COST model has a similar module)
 - Used to inform decision making, not drive programming
- Real World: Transit agency maintenance and engineering departments group related asset needs into projects for capital programming

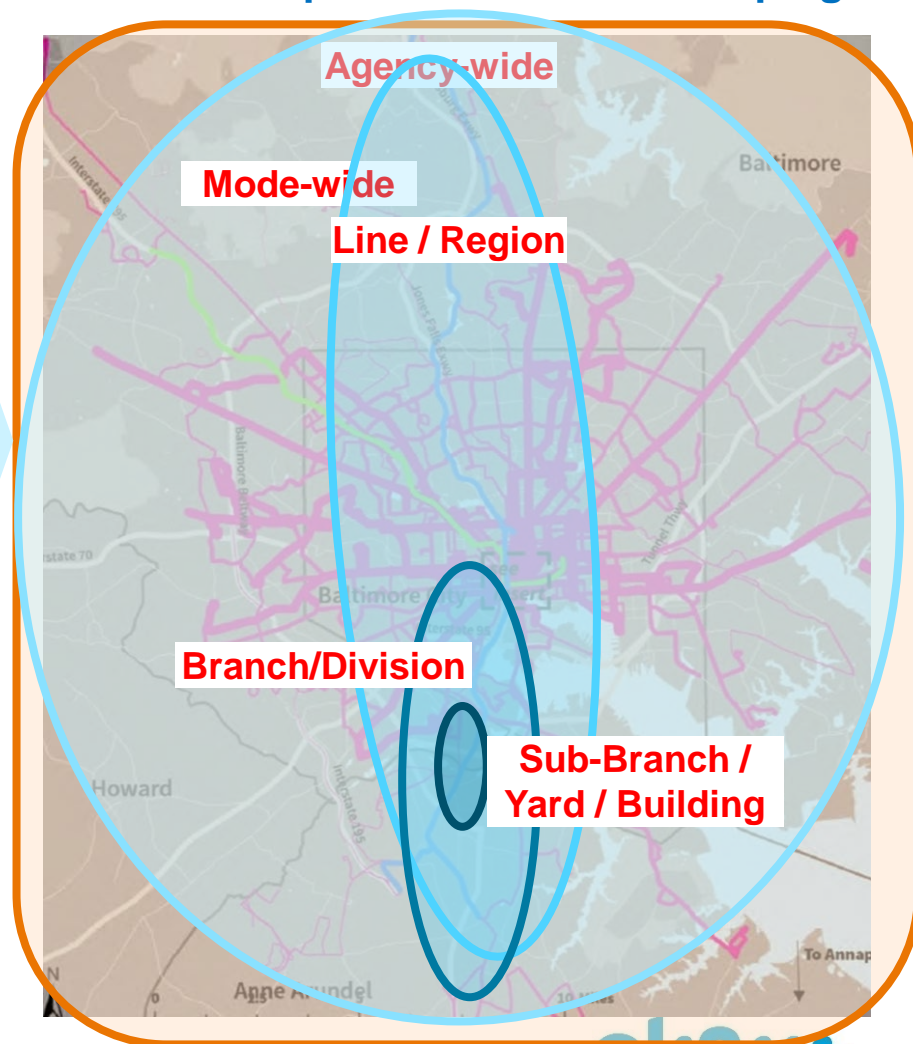


Projects defined based on (1) Types of Assets Grouped Together and (2) Geographic Scope

Define Types of Assets Grouped into Project

Illustrative Asset Type Groupings
On-Vehicle Revenue Collection
Passenger Communications Systems
Radio
Retained Cut
Revenue Vehicles
Roadway Traffic Signals
Safety and Security
SCADA
Signal Bridge
Signals/Interlockings
Station Access
Station Platform
Station Signage & Graphics
Stations
Storage Yards
Trackwork/Special Trackwork

Define Scope / Area for that Grouping



APM Approach: Data Table Extracts from TERM Lite

Project Names Table

Project Name	Project Scope
Office Furniture & Equipment	Modewide
On-Vehicle Revenue Collection	Modewide
Passenger Communications Systems	Modewide
Phone System	Modewide
Radio	Modewide
Retained Cut	Line/Region
Revenue Vehicles	Modewide
Roadway Traffic Signals	Line/Region
Safety and Security	Modewide
SCADA	Modewide
Signal Bridge	Line/Region
Signals/Interlockings	Sub-Branch/Building
Special Structures	Line/Region
Station Access	Line/Region
Station Platform	Line/Region
Station Signage & Graphics	Line/Region
Stations	Line/Region
Storage Yards	Modewide
Systems	Line/Region
Trackwork	Sub-Branch/Building
Underground	Branch/Division

Asset Types Table

Type	Project Name	Category	Sub-Category	Element	Sub-Element
45000	Station Platform	Stations	Platform	-	-
45400	Station Platform	Stations	Platform	-	-
45410	Station Platform	Stations	Platform	Surface	-
45411	Station Platform	Stations	Platform	Surface	Concrete, asphalt, tile
45412	Station Platform	Stations	Platform	Surface	Wood
45413	Station Platform	Stations	Platform	Ferry Dock	-
45420	Station Platform	Stations	Platform	Shelters	-
45430	Station Platform	Stations	Platform	Canopy	-
45440	Station Signage & Graphics	Stations	Platform	Signage & Graphics	-
45441	Station Signage & Graphics	Stations	Platform	Signage & Graphics	Electronic
45442	Station Signage & Graphics	Stations	Platform	Signage & Graphics	Static
45450	Station Platform	Stations	Platform	Lighting	-
46000	Station Access	Stations	Access	-	-
46100	Station Access	Stations	Access	Roadway	-
46110	Station Access	Stations	Access	Roadway	Auto
46120	Station Access	Stations	Access	Roadway	Bus
46200	Station Access	Stations	Access	Parking	-
46210	Station Access	Stations	Access	Parking	Garage
46220	Station Access	Stations	Access	Parking	Lot
46230	Station Access	Stations	Access	Parking & Equipment	-
46300	Station Access	Stations	Access	Pedestrian	-

AMP Builder: User Interface

Asset to Project Builder Creat New Project Name, Assign Assets to Project, Edit Scope or Primary Asset Category

Select Action:

Select Existing Project to Edit:

Current Project Name, Scope and Primary Asset Category: Help

Project Name:

Scope (group assets by):

Primary Asset Category:

Assets Currently Assigned to Project (read-only)

Code	Project	Category	Sub-Category	Element	Sub-Element
21100	Administrative Buildings	Facilities	Buildings	Administration	-
21101	Administrative Buildings	Facilities	Buildings	Administration	Leased
21120	Administrative Buildings	Facilities	Buildings	Administration	Police

Record: 1 of 3 No Filter Search

Select Additional Assets to Assign to this Project Grouping (read-only except for select field) Assign Selected Assets to Project

Select	Code	Project	Category	Sub-Category	Element	Sub-Element
<input type="checkbox"/>	10000	General Guideway and Trackwork	Guideway Elements	Guideway	-	-
<input type="checkbox"/>	10001	General Guideway and Trackwork	Guideway Elements	Guideway	-	Commuter Rail
<input type="checkbox"/>	10002	General Guideway and Trackwork	Guideway Elements	Guideway	-	Heavy Rail
<input type="checkbox"/>	10003	General Guideway and Trackwork	Guideway Elements	Guideway	-	Light Rail
<input type="checkbox"/>	10110	At Grade Ballast	Guideway Elements	Guideway	At Grade Ballast	-
<input type="checkbox"/>	10111	At Grade Ballast	Guideway Elements	Guideway	At Grade Ballast	Commuter Rail
<input type="checkbox"/>	10112	At Grade Ballast	Guideway Elements	Guideway	At Grade Ballast	Heavy Rail

Record: No Filter Search

Defining projects with agency staff input

Users can view/modify existing project groupings using the drop down menu in the top left corner of the form – there are 58 current “Project Names” for Baltimore MTA

Asset Inventory | Life Cycle Costs | Inflation | Ridership by Location | Total Ridership | Asset-to-Project Builder

Asset to Project Builder

Great New Project Name, Assign Assets to Project, Edit Scope or Pr

Select Action: Current Project Name, Scope and Primary Asset Category:

Select Existing Project to Edit: Project Name: Administrative Buildings

Scope (group assets by): Modewide

ID	Category	Sub-Category	Project
27	Facilities	-	Maintenance Buildings
1	Facilities	Buildings	Administrative Buildings
4	Facilities	Buildings	Building Components
6	Facilities	Buildings	Bus Turnarounds
16	Facilities	Buildings	Elevators
27	Facilities	Buildings	Maintenance Buildings
51	Facilities	Buildings	Parking
52	Facilities	Buildings	Drainage
53	Facilities	Buildings	Roofs
9	Facilities	Central Control	Centralized Train Control
28	Facilities	Equipment	Maintenance Equipment
30	Facilities	Equipment	Office Furniture & Equipment
56	Facilities	Equipment	Maintenance Lifts
27	Facilities	Major Shops	Maintenance Buildings
47	Facilities	Storage Yard	Storage Yards

Assign Select
Element

Modifying project groupings: “It’s Google not Apple”

Asset Types Assigned to Project:

Lists the asset types currently grouped together under this Project Name; User can add asset types to any Project Name

Project Name:

Name assigned to this type of project in reports and asset types table. Can be edited/changed here.

Scope: Assigned geographic grouping of this project type; Users can pick from drop down list to change scope: Agency-wide, Mode-wide, Line/Division, Branch/Garage, Segment/Route/Building

Create New Project Name, Assign Assets to Project, Edit Scope or Primary Asset Category

Select Existing Project to Edit:

Project Name: Administrative Buildings

Scope (group assets by): Modewide

Primary Asset Category: Facilities

Assets Currently Assigned to Project (read-only)

Code	Project	Category	Sub-Category	Element	Sub-Element
21100	Administrative Buildings	Facilities	Buildings	Administration	-
21101	Administrative Buildings	Facilities	Buildings	Administration	Leased
21120	Administrative Buildings	Facilities	Buildings	Administration	Police

Record: 1 of 3

Select Additional Assets to Assign to this Project Grouping (read-only except for select field)

Select	Code	Project	Category	Sub-Category	Element	Sub-Element
<input type="checkbox"/>	10000	General Guideway and Trackwork	Guideway Elements	Guideway	-	-
<input type="checkbox"/>	10001	General Guideway and Trackwork	Guideway Elements	Guideway	-	Commuter Rail
<input type="checkbox"/>	10002	General Guideway and Trackwork	Guideway Elements	Guideway	-	Heavy Rail

APM reports provide link between inventory analysis and capital programming

- Expenditures Forecast reports show
 - 10 year total and annual needs by “project” and by project type
 - Prioritization score for each “project” (separate report puts in rank order)
 - Location of projects by geographic scope

Constrained Needs-- 10 Year, Project Level: 2014 - 2024

Summary Report

Note: Results presented by Mode, then Category. Project Names are sorted alphabetically under Primary Asset Category.

02-Dec-15

Asset to Project Grouping	Scope	Rail: Line / Branch / Sub-Branch Bus: Region / Division / Building	Avg.		Annual Needs (\$M)											
			Detail	Score	10 Yr Total	Backlog*	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
MTA - Agencywide																
Agencywide																
Facilities																
Parking					64.7	\$7.4						\$7.4				
Parking					58.4	\$17.7		\$7.5	\$2.3		\$3.0		\$4.1		\$0.8	
Parking					56.7	\$36.5		\$33.0	\$3.3						\$0.2	
Parking						\$61.7		\$40.5	\$5.7		\$3.0		\$11.6		\$0.9	
Roofs					5.2	\$2.1		\$2.1								
Roofs					1.1	\$1.9		\$1.9								
Roofs						\$4.0		\$4.0								
Systems																
Radio					59.2	\$30.1		\$28.8	\$0.1	\$0.6				\$0.2	\$0.2	
Radio					58.1	\$1.1					\$0.8		\$0.3			
Radio					60.5	\$5.5			\$0.1	\$0.2	\$1.7	\$0.2		\$0.2	\$0.3	\$2.8
Radio						\$36.7		\$28.8	\$0.2	\$0.8	\$1.8	\$0.2	\$0.8	\$0.2	\$0.8	\$3.0
Total: MTA - Agencywide						\$102.5		\$73.4	\$5.9	\$0.8	\$4.8	\$0.2	\$0.8	\$11.8	\$0.8	\$4.0
Total: MTA - Agencywide						\$102.5		\$73.4	\$5.9	\$0.8	\$4.8	\$0.2	\$0.8	\$11.8	\$0.8	\$4.0

Detail Button embedded:
 Opens data table for each project showing individual assets included in “project” and each asset’s:

- Location information
- Priority score
- Investment need in each year
- Backlog value in each year



In Summary...

- The APM module is not meant to replace project scoping at agencies
- APM groupings allow for
 - Greater transparency between proposed capital projects and asset-level needs (linking data between the two)
 - A basis for incorporating actual project development information into decision support tools
- Using APM in TERM Lite or similar tools provides a “one-stop shop” for multiple MAP-21 requirements

Thank You

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