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**TO: BOARD OF DIRECTORS**

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**CHIEF RISK, SAFETY & ASSET MANAGEMENT OFFICER**

**SUBJECT: TRANSIT ASSET MANAGEMENT/STATE OF GOOD REPAIR  
PERFORMANCE AND PROGRAM UPDATE**

**ISSUE**

Transit Asset Management (TAM) involves activities related to procuring, operating, maintaining, rehabilitating and replacing existing assets, such as equipment, rolling stock, facilities and infrastructure to keep them in a State of Good Repair (SGR). The Federal Transit Administration (FTA) final TAM rule took effect October 1, 2016 and includes requirements for reporting performance measures. Metro is required to set targets and provide its first reporting on the FTA performance measures for equipment, rolling stock, infrastructure and facilities in October 2018 for fiscal year 2018.

This report provides the first semi-annual status on performance measures and TAM program activities for Metro. In 2017 there was an increased focus on maintaining the Metro system in a state of good repair, by initiating leading industry TAM practices, in anticipation of significant portions of assets approaching the end of their useful lifecycles.

**BACKGROUND**

**FTA TAM Requirements**

FTA established a National TAM System to improve transit asset management practices and to ensure that achieving and maintaining a state of good repair becomes, and remains, a top priority for transit providers. The final TAM rule was published on July 26, 2016 (Vol. 81 No. 143, 49 CFR Parts 625 and 63) and applies to all recipients of federal chapter 53 funds. Metro's previously developed 2015 TAM Plan met initial FTA requirements. To meet the next deadline, Metro set performance targets by January 1, 2017 and reported them to the Southern California Association of Governments (SCAG) for inclusion in SCAG's regional targets by June 30, 2017.

The performance measures for the preceding fiscal year along with the setting of new targets are to be reported into the FTA’s National Transit Database (NTD) every October. A narrative report on the progress towards targets will be due every October starting in 2019. Staff is in process of updating the TAM plan with current information to meet the FTA’s October 2018 reporting deadline.

**Performance Measures and Targets**

FTA established the Performance Measures and targets as one of the “five pillars” of the National TAM System; the other pillars are 1) the definition of “state of good repair,” 2) development of periodic TAM plans and asset inventory, 3) annual reporting requirements and 4) assistance from FTA.

FTA has established four top-level asset categories (rolling stock, facilities, infrastructure and equipment) and defined a Performance Measure for each of them. The Performance Measures for rolling stock and equipment are the percentage of assets in an asset class that have either met or exceeded their Useful Life Benchmark (ULB), which is defined as “the expected life cycle or the acceptable period of use in service for a capital asset, as determined by a transit provider.” Although there are other factors that Metro may use as part of the decision on when to retire an asset, such as mileage, only age is used for the rolling stock and equipment Performance Measures. The Performance Measure for the assets within the facilities category instead uses the asset condition as the determinant factor.

The TAM performance targets for rolling stock, equipment and facilities were based on the forecasted performance as of June 30, 2017. The infrastructure targets were set in consultation with the Metro Operations Department.

**SUMMARY OF METRO TAM PERFORMANCE**

The following provides the FTA defined four top level asset categories, summaries of performance measure data mid-year and FY 18 targets:

Equipment: Percentage of non-revenue vehicles within a particular asset class that have met or exceeded their Useful Life Benchmark (ULB). See Table 1 and Attachment A for further details.

**Table 1: Equipment TAM Performance Measures**

<b>FTA Asset Class</b>	<b>YTD Performance Measure</b>	<b>FY18 Target</b>
Automobiles and SUVs	4%	14%
Trucks and Other Rubber Tire Vehicles	26%	39%
Steel Wheel Vehicles	67%	22%

Rolling Stock: Percentage of revenue vehicles within a particular asset class that have met or exceeded their ULB. See Table 2 and Attachment B for further details.

**Table 2: Rolling Stock TAM Performance Measures**

<b>FTA Asset Class</b>	<b>YTD Performance Measure</b>	<b>FY18 Target</b>
Motorbus	22%	35%
Articulated Bus	22%	2%
Light Rail Vehicles	0%	0% <sup>1/</sup>
Heavy Rail Vehicles	0%	0% <sup>1/</sup>
<sup>1/</sup> Zero % railcars will be beyond 30 year design life by the end of FY18.		

Infrastructure: Percentage of guideway directional route miles with performance restrictions (slow zones) by Heavy Rail and Light Rail. See Table 3 and Attachment C for further details.

**Table 3: Guideway TAM Performance Measures**

<b>FTA Asset Class</b>	<b>YTD Performance Measure</b>	<b>FY18 Target</b>
Heavy Rail	1.22%	0% <sup>1/</sup>
Light Rail	2.04%	0% <sup>1/</sup>
<sup>1/</sup> Zero % slow-zone was chosen as Metro's goal.		

Facilities: Percentage of facilities with a condition rating below 3.0 on the FTA Transit Economic Requirements Model (TERM) scale (1=Poor to 5=Excellent). See Table 4 and Attachment D for further details.

**Table 4: Facilities TAM Performance Measures**

<b>FTA Asset Class</b>	<b>YTD Performance Measure</b>	<b>FY18 Target</b>
Passenger Facilities (stations & parking)	9%	0%
Administration & Maintenance Facilities	27%	33%

Facilities condition assessments are in process over the next three years with locations being assessed this year for those which Metro has capital responsibility (Metro owns or is responsible for maintaining). Interim estimates are based on FTA historical decay models and will be used until Metro condition assessments are completed.

This report presents the Performance Measures that will be reported to FTA through the National Transit Database (NTD) each October for the prior fiscal year. These performance measures are a starting point for prioritization of replacement and rehabilitation of Metro's assets. Actual prioritization is based on input from Operations

as there are many other considerations that are not represented in the FTA Performance Measures.

## **TAM PROGRAM UPDATE**

Metro's Enterprise Transit Asset Management (ETAM) department has begun developing the business processes to respond to the FTA by upgrading the asset inventory database and beginning the condition assessments on initial asset categories. Metro's ETAM Department worked with asset stakeholders across the agency including Operations, Countywide Planning, Construction, Finance and ITS to make progress implementing a comprehensive asset management program. Vendor and Contracts Management will be brought into the discussion once projects are defined. Accomplishments in calendar 2017 include:

### **Condition Assessments**

- Rail Fleets – assessments were conducted on the Light Rail Vehicles (LRV) series P865, P2020 and P2550 which were used on the Blue, Green, Expo and Foothill Lines, and the Heavy Rail Vehicles (HRV) A650 option cars which were used on the Red/Purple Lines. The study included development of procedures and standards which can be used for future assessments. The condition ratings will be added to the asset inventory database and used for trend analysis;
- Bridge, Tunnel inspections Phase I included inspections of 99 structures and facilities to assess and assign ratings to the existing structural conditions. 12 areas in the subway tunnel were found to be in need of restoration. Grouting was completed in February 2018 on those areas;
- Bridge, Tunnel inspections Phase II will include inspections of an additional 235 structures to assess and assign ratings to existing conditions. The notice of award was issued October 27, 2017;
- Rail Communications condition assessment was completed;
- Facilities (buildings, stations and parking) condition assessments Year 1, were initiated for 71 facilities. Years 2 and 3 includes the remaining 142 facilities. The study includes development of procedures and standards which can be used for future assessments. The condition ratings will be added to the asset inventory database and used for trend analysis. The results will be reported to the FTA through the National Transit Database;
- Fire Life Safety system assessment to review existing maintenance, condition, performance information, conduct inspections and assign ratings. A scope of work is currently in review.

### **Asset Inventory/Enterprise Asset Management (EAM) Update**

- A listing of Metro's linear assets representing 203 route miles with a \$5B replacement value has been defined in the asset inventory database and has substantially grown this year with the additions of Expo Phase II and Foothill extensions. This listing includes: track, guideway, retaining walls and fences. Defining attributes include exclusive/non-exclusive ROW, tangent, curve, ballasted, direct fixation, retained/non-retained fill, elevated, at-grade and subway;

- Updates were made to rolling stock (bus, rail) and equipment (non-revenue) assets;
- The asset inventory database now contains 24,000 records that contain 370,000 assets representing a replacement cost of \$16B.

#### TAM Plan

- Implementation is in progress of action plans identified that specifically target improvements that address the FTA TAM requirements and generally accepted good practices in key TAM areas including: condition assessments, inventory updates, SGR technical requirements for the new EAM (M3 replacement), lifecycle planning, and data management;
- Completed analysis of the asset inventory database to provide input on the 40 year horizon Long Range Transportation Plan update to include \$36B in year of expenditure SGR needs;
- Developed prioritized asset list for development of potential capital rehabilitation/replacement projects in the annual budget process;
- In-process development of scope to evaluate data availability and sufficiency in Metro's current maintenance, material and management system known as M3, to conduct root cause analysis and to determine requirements and data availability necessary to implement advanced maintenance techniques such as reliability centered maintenance (RCM), to improve reliability and reduce costs.

#### Metro Sponsored Group TAM Plan

- In-progress development of FTA required Group TAM Plan for small transit providers receiving pass-through of federal grants from Metro;
- Data from the Group Plan is used to report on performance targets to the FTA;
- Invitations to participate sent to 33 small transit operators eligible to participate.

#### Operations Control

- Completed Bus and Rail Operations Control (BOC/ROC) Risk Assessment and Future Implementation Study: Functional Obsolescence Study. The study addressed Operations Control needs for Measure M and Measure R expansion projects through year 2070, as well as the potential to include the facility within the new Emergency Services Operations Control campus.

#### **NEXT STEPS**

Upcoming TAM activities for 2018 include:

- Continuation of major asset category condition assessments;
- Update Metro TAM Plan for final FTA TAM regulation and coordinate implementation with operations, planning, construction, OMB and other departments;
- Coordinate with SCAG on updating regional TAM performance and targets;
- Continue providing input on SGR needs for the LRTP update and building linkages to the budget process; and
- Comply with FTA's October 2018 TAM reporting mandates.

**Attachment A  
Equipment Performance Measures / Targets**

FTA Asset Class	Sub-Class	Vehicle Count <sup>1/</sup>	ULB <sup>2/</sup> (years)	Exceeded ULB <sup>2/</sup>	YTD PM	FY18 Forecast <sup>3/</sup>	FY18 Target
Automobiles and SUVs	Sedan	1	10	0	0%	0%	14%
	Hybrid Sedan	439	10	10	2%	2% <sup>11/</sup>	
	Electric Sedan	10	10	0	0%	0% <sup>12/</sup>	
	SUV	121	10	13	11%	15%	
	Hybrid SUV	73	10	8	11%	11%	
	<b>Total</b>	<b>644</b>		<b>27</b>	<b>4%</b>	<b>6%</b>	
Trucks and Other Rubber Tire Vehicles	Minivan	1	10	0	0%	0% <sup>4/</sup>	39%
	Van	246	10	70	28%	30%	
	Mini Pickup Truck	7	12	7	100%	86% <sup>5/</sup>	
	Pickup Truck (gasoline)	99	12	22	22%	24% <sup>6/</sup>	
	Pickup Truck (diesel)	4	15	0	0%	0%	
	Truck, Large, Diesel	73	15	20	27%	45% <sup>13/</sup>	
	Truck, Large, Utility	207	15	46	22%	26% <sup>14/</sup>	
	Motorhome <sup>7/</sup>	1	20	0	0%	0%	
	Construction Equipment	17	20	5	29%	41% <sup>15/</sup>	
	Railcar Mover	1	20	1	100%	100%	
<b>Total</b>	<b>656</b>		<b>171</b>	<b>26%</b>	<b>30%</b>		
Steel Wheel Vehicles	Ballast Regulator <sup>8/</sup>	1	20	0	0%	0%	22%
	Ballast Tamper <sup>9/</sup>	1	20	1	100%	100%	
	Rail Grinder <sup>10/</sup>	4	20	3	75%	75%	
	<b>Total</b>	<b>6</b>		<b>4</b>	<b>67%</b>	<b>67%</b>	

<sup>1/</sup> Number of vehicles in-service on 12/31/2017.

<sup>2/</sup> ULB: Useful Life Benchmark. ULB assumes that any required mid-life overhauls are performed.

<sup>3/</sup> Forecast includes any vehicles expected to enter operation by 6/30/2018.

<sup>4/</sup> 1 minivan will meet its ULB by the end of FY18. Replacement unit is expected by end of FY18.

<sup>5/</sup> All 7 remaining mini pickup trucks have exceeded the estimated useful life of 12 years. One is planned to be replaced in FY18.

<sup>6/</sup> 22 gasoline pickup trucks have exceeded the estimated useful life of 12 years. 24 will have exceeded the estimated useful life by the end of FY18.

<sup>7/</sup> Metro has one mobile command post that is constructed from a motorhome. It was acquired in 2014. It will not exceed its 20 year estimated useful life until 2034.

<sup>8/</sup> A ballast regulator is used to shape and distribute the track ballast that supports the ties in rail tracks. Metro has one ballast regulator that was acquired in 2010. It will not exceed its estimated useful life of 20 years until 2030.

<sup>9/</sup> A ballast tamper is used to correct the alignment of the rails to make them parallel and level and to secure the ballast around the ties. Metro has one ballast tamper that was acquired in 1995. It has exceeded the estimated useful life of 20 years.

<sup>10/</sup> A rail grinder is used to re-profile the head of the running rail and remove irregularities from worn tracks to extend its life and to improve the ride of trains using the track. Metro has one Fairmont 3-unit rail grinder and one Harsco rail grinder. The Fairmont rail grinder was acquired in 1995. The Harsco rail grinder was acquired in 2015. The Fairmont rail grinder has exceeded the estimated useful life of 20 years.

<sup>11/</sup> 19 hybrid sedans will have exceeded the ULB by the end of FY18. However, 10 of those are expected to be replaced with electric sedans.

<sup>12/</sup> 10 new electric (battery-powered) sedans are expected to be received by the end of FY18, increasing the fleet size to 20.

<sup>13/</sup> 34 large diesel trucks will have exceeded the ULB by the end of FY18. However, 2 additional trucks are expected to be received, increasing the fleet size to 75.

<sup>14/</sup> 53 large utility trucks will have exceeded the ULB by the end of FY18.

<sup>15/</sup> 7 heavy construction vehicles will have exceeded the ULB by the end of FY18.

## **Equipment**

The Final TAM Rule defines the performance measure for equipment as the percentage of non-revenue, support-service and maintenance vehicles that have either met or exceeded their ULB. Further guidance issued by FTA defines the reportable asset classes as 1) automobiles and sport utility vehicles, 2) trucks and other rubber-tired equipment (self-powered and street legal only), including heavy construction equipment and 3) self-powered steel wheeled vehicles (i.e. railbound maintenance equipment).

The table lists the sub-classes within each FTA asset class. The vehicle count, the ULB and the number of vehicles with ages that exceed the ULB on 12/31/17 are listed. The YTD performance measure is calculated based on the number of vehicles that have met or exceeded the ULB and the count of each class. The FY18 Forecast is based on the number of vehicles that will have met or exceeded the ULB by the end of FY18, adjusted by the number of planned asset retirements and acquisitions by the end of the end of the fiscal year.

**Attachment B  
Rolling Stock Performance Measures/Targets**

FTA Asset Class	Sub-Class	Vehicle Count <sup>1/</sup>	Useful Life Bench Mark <sup>2/</sup> (ULB years)	Exceeded ULB <sup>2/</sup>	YTD PM	FY18 Forecast <sup>3/</sup>	FY18 Target
Motorbus	MB-3100	50	12	0	0%	0%	35%
	MB-3850	350	12	0	0%	0%	
	MB-4200 <sup>4/</sup>	6	12	0	0%	0%	
	MB-5300	195	12	195 <sup>5/</sup>	100%	100%	
	MB-5600	550	12	0	0%	0%	
	MB-7000	5	12	5 <sup>5/</sup>	100%	100%	
	MB-7300	24	12	24 <sup>5/</sup>	100%	100%	
	MB-7500	75	12	75	100%	100%	
	MB-7600	98	12	98 <sup>5/</sup>	100%	100%	
	MB-7980 <sup>6/</sup>	6	18 <sup>6/</sup>	0	0%	0%	
	MB-8000 <sup>6/</sup>	100	18 <sup>6/</sup>	0	0%	0%	
	MB-8100 <sup>6/</sup>	542	18 <sup>6/</sup>	0	0%	0%	
	MB-11000 <sup>7/</sup>	66	12	66	100%	100%	
<b>Total</b>	<b>2,067</b>		<b>463</b>	<b>22%</b>	<b>22%</b>		
Articulated Bus	MB-9200	200	12	87	44% <sup>5/</sup>	98% <sup>5/</sup>	2%
	MB-9400	95	12	0	0%	0%	
	MB-9495	1	12	0	0%	0%	
	MB-9500	95	12	0	0%	0%	
	<b>Total</b>	<b>391</b>		<b>87</b>	<b>22%</b>	<b>50%</b>	
Light Rail Vehicles	P865	31	30	0	0%	0%	0%
	P2020	15	30	0	0%	0%	
	P2000	52	30	0	0%	0%	
	P2550	50	30	0	0%	0%	
	P3010	102	30	0	0%	0%	
	<b>Total</b>	<b>250</b>		<b>0</b>	<b>0%</b>	<b>0%</b>	
Heavy Rail Vehicles	A650	104	30	0	0%	0%	0%
	<b>Total</b>	<b>104</b>		<b>0</b>	<b>0%</b>	<b>0%</b>	

<sup>1/</sup> Number of vehicles in-service on 12/31/2017.

<sup>2/</sup> ULB: Useful Life Benchmark. ULB assumes that any required mid-life overhauls are performed. FTA "Default ULB" for bus classes is 14 years and 31 years for railcar classes.

<sup>3/</sup> Forecast includes procurements of any vehicles expected to enter operation by 6/30/2018.

<sup>4/</sup> Hybrid gasoline buses.

<sup>5/</sup> The CNG tanks on the remaining buses have been replaced.

<sup>6/</sup> Composition buses.

<sup>7/</sup> Diesel fueled buses.

<sup>8/</sup> 87 buses past ULB on 12/31/17.

<sup>9/</sup> 195 buses will be past ULB on 6/30/18.



## Rolling Stock

The Final TAM Rule defines the performance measure for rolling stock as the percentage of revenue vehicles within a particular asset class that have either met or exceeded their ULB. The reportable asset classes in Metro's asset inventory are standard buses, articulated buses, light rail vehicles and heavy rail vehicles. FTA recognizes that age is not necessarily the most accurate performance measure available. However, age is a simple and widely-used performance measure for vehicles that can approximate the condition of rolling stock assets for capital investment planning. FTA noted that transit providers will be able to account for variations in maintenance practices and operating conditions by adjusting the useful life benchmark for particular fleets of vehicles.

The table presents the YTD performance measures for each of the four FTA rolling stock classes and the 19 sub-classes (i.e. fleets). The vehicle count, the ULB and the number of vehicles with ages that exceed the ULB on 12/31/17 are listed. The YTD performance measure is calculated based on the number of vehicles that have exceeded the ULB and the count of each class. The FY18 Forecast is based on the number of vehicles that will have exceeded the ULB by the end of FY18, adjusted by the number of planned asset retirements and acquisitions by the end of the end of the fiscal year.

There are six bus sub-classes that have exceeded the ULB entirely, and one articulated bus sub-class (MB-9200) that has partially exceeded the ULB. None of the railcars have reached the 30-year ULB.

By the end of FY18, nearly the entire 9200 series articulated bus fleet will have exceeded the ULB of 12 years. However, Metro has contracted for 65 CNG buses and 35 ZEB buses and deliveries are expected in FY19 and FY20. Metro will also receive 355 40' buses in FY19 and FY20 which will reduce the bus PM to approximately 5% by 2020.

Metro is in the process of acquiring new P3010 light rail vehicles (LRV) and retiring P865 LRVs that were acquired for the start-up of the Metro Blue Line in 1990. 23 P865 LRVs have been retired through 12/31/2017 with 31 of the original fleet of 54 railcars remaining. The average age of the remaining P865 fleet is 27.5 years. Except for 4 railcars to remain in service as a heritage fleet and 3 railcars to be used at Division 21 for training, the remaining P865 LRVs are planned to be retired by the end of FY18.

## Attachment C

### Guideway TAM Performance Measures (PM)

Asset Class	Jul	Aug	Sep	Oct	Nov	Dec	YTD PM on 12/31/17	FY18 Target
Heavy Rail (HR)	0.00%	0.00%	1.82%	1.82%	1.82%	1.82%	1.22%	0%
Light Rail (LR)	0.53%	1.06%	2.34%	1.81%	2.35%	4.17%	2.04%	0%

#### Infrastructure

The Final TAM Rule defines the performance measure for infrastructure (rail fixed guideway, track, signals, and systems) as the percentage of track segments with performance restrictions. Further guidance issued by FTA defines this performance measure as the average percentage of revenue track, by mode, under a performance restriction (i.e. slow order) at 9 am on the first Wednesday of each month. FTA specifically chose mid-week at 9 a.m. as the measurement time to avoid inclusion of slow zones that are due to normal mid-day maintenance. This Performance Measure is intended to encompass track, guideway, signals, traction power and any other systems that may impact service delivery. The performance measure does not include storage or connector tracks along or at the end of the revenue tracks. FTA specifically chose mid-week at 9 a.m. as the measurement time to avoid inclusion of slow zones that are due to normal mid-day maintenance.

The slow zone calculations take into consideration an additional zone preceding and after each slow zone due to the flagging rules. This adds 0.38 mile for heavy rail and Metro Green Line and 0.25 mile for all other light rail to each actual slow zone. The performance measures below are the calculated from the total monthly slow zone length divided by the total number of revenue track miles for each transit mode.

#### Combined Slow zone Length for each track segment

Track Segment	Jul	Aug	Sep	Oct	Nov	Dec	YTD Avg.
Long Beach (Blue)	-	-	2.20	2.20	2.20	5.33	1.99
Century/Torrance (Green)	-	-	-	-	-	-	0.00
Pasadena (Gold)	-	0.90	0.90	-	-	-	0.30
East Los Angeles (Gold)	-	-	-	-	-	-	0.00
Santa Monica (Expo)	0.91	0.91	0.91	0.91	1.82	1.82	1.21
A Tunnel (Red)	-	-	0.58	0.58	0.58	0.58	0.39
B Tunnel (Purple)	-	-	-	-	-	-	0.00

This table presents the total amount of slow-zones in place each month on each segment of Metro Rail.

## Attachment D

### Facilities TAM Performance Measures (PM)

Asset Class	YTD PM on 12/31/2017	FY18 Forecast	FY18 Target
Passenger Facilities (stations & parking)	9%	9%	0%
Administration & Maintenance Facilities	27%	27%	33%

#### Facilities

The Final TAM Rule defines the performance measure for facilities as the percentage of facilities within an asset class rated below condition 3 on the TERM scale. The Final TAM Rule defines the asset classes as 1) Maintenance and Administrative facilities for which Metro has direct capital responsibility and 2) Passenger stations (buildings) and Parking facilities for which Metro has direct capital responsibility. Further guidance issued by FTA allows for the facility condition assessments to be conducted over a 4 year span to match a TAM plan horizon period.

Metro currently has engaged a contractor to conduct a multi-year facility inspection and condition assessment program in accordance with FTA guidance. Approximately 1/3 of Metro locations will be complete by the end of FY18. No final condition assessment ratings are available at this time, but age-based analysis using deterioration schedules provided by FTA suggest that 9% of the Passenger Facilities and 27% of the Maintenance and Administrative facilities will be below a condition 3 on the TERM scale.