



Safety and Operations Committee

Information Item III-B

January 24, 2019

Overnight Maintenance Window and Work Hours

Washington Metropolitan Area Transit Authority
Board Action/Information Summary

☐ Action ☒ Information

MEAD Number:
202061

Resolution:
☐ Yes ☒ No

TITLE:

Overnight Maintenance Work Window & Service Hours

PRESENTATION SUMMARY:

As requested by the Safety & Operations Committee at the December 13, 2018, meeting, staff has prepared an analysis of the work completed when the Metrorail system is closed and developed multiple service hour scenarios for the Board's consideration.

PURPOSE:

To present several options for the Board's consideration for FY20 Metrorail service hours, with consideration of impacts to ridership, net jurisdictional costs and ability to complete maintenance work.

DESCRIPTION:

This presentation will provide further explanation of the maintenance work completed in the Metrorail system during the overnight hours; highlight efforts to improve productivity, efficiency and effectiveness of wayside work; and review the impact that different service hours, including reverting to FY16 service hours, would have on ridership, net jurisdictional costs and maintenance work.

Key Highlights:

- Significant progress has been made to shift from reactive to proactive maintenance work in the Metrorail system, including investments in new technology and processes that will reduce the amount of work required and increase efficiency of track access. These investments will ultimately reduce demand for track time and enable Metro to expand service hours without impacting safety or service reliability.
- The current service hours were adopted in FY18, before dedicated funding was achieved and Metro's aggressive 10-year, \$15.5 billion capital program was fully developed. The capital program currently accounts for approximately half the overnight work, so changes to the service hours must also consider the impact on delivery of Metro's growing capital program.
- Four scenarios for service hours have been developed for the Board's consideration, including the options to maintain existing hours, revert to the FY16 operating hours, and two new proposals for the Board's consideration.

Background and History:

In November 2016, the Board's Customer Service, Operations and Security Committee was briefed regarding the rationale for changing the Metrorail operating hours to launch the agency's first preventive maintenance program. The program is designed to sustain improvements for the reliability of the Metrorail infrastructure and improve service for customers by reducing track-related delays. In December 2016, the Board passed Resolution 2016-52 to implement a change to the service hours for FY18; require staff to provide a comprehensive progress report to the Board in May 2018; and unless the Board takes affirmative action, return the service hours to the FY16 levels on July 1, 2019.

Discussion:

The time that maintenance work is conducted when the Metrorail system is closed and trains are not running, known as the Overnight Maintenance Window, is critical to the delivery of safe and reliable rail service. This time is used for inspection, preventive maintenance and capital projects to replace aging assets and add new functionality and/or capacity. A significant portion of the time when the system is

closed cannot be used for work because trains must first be cleared from the system and work areas must be safely set up. Therefore, increasing the service hours without compromising safety and reliability will require increasing: (1) the productivity of crews, (2) the efficiency of accessing the work zones after trains have cleared and (3) the effectiveness of work by achieving State of Good Repair and right-sizing maintenance plans through Reliability Centered Maintenance.

The challenge is balancing all of the competing demands on track time, since the tracks cannot be maintained and many other critical maintenance and capital activities cannot be completed when trains are running. We are working to develop the technology and processes needed to reduce the amount of maintenance track time required, but more time is needed to further develop and implement new work efficiency programs. At this time, any increase in service hours will reduce time available for safety and reliability improvements, negatively impact capital program execution and increase net cost to jurisdictions.

In developing the four scenarios for Board consideration, we first looked at ridership demand by the half-hour to identify the least impactful time for track work. Knowing that maintenance programs require a minimum of a five hour work window, we calculated scenarios that limit the number of riders impacted while also providing time for effective work to be completed. We next evaluated the rail service adjustments (single tracking and shutdowns) required to continue to the Preventive Maintenance programs, some of which require more than a five-hour work window. Finally, the ability to regain work time through other single tracking events for the capital work was assessed.

The four scenarios for the Board's consideration are summarized in the table below:

Category	Revert to FY16 Hours	Alternative A Shift Hours	Alternative B Extend Weekend Hours	Alternative C Existing Hours
Hours	M-Th: 5am- mid F: 5am- 3am Sa: 7am- 3am Su: 7am-mid	M-Th: 5:30a-mid F: 5:30a-3am Sa: 9-3am Su: 10:30am-mid	M-Th: 5am-11:30pm F: 5am- 2am Sa: 7am- 2am Su: 7am-11:30pm	M-Th: 5am-11:30pm F: 5am-1am Sa: 7am-1am Su: 8am-11pm
Hrs Returned to Service (% increase in total service hours)	7.5 (6%)	0	3.5 (3%)	0
Work-Wrench Hours Lost (measured as % of FY19-Q1 WWH)	20,977 (44%)	1, 241 (3%)	4,508 (9%)	0
Rail Service Adjustments required to maintain PM programs	<ul style="list-style-type: none"> Late Night Bus Bridges @ 11p, in 2 locations, 5 nights/week Weekday Single-Tracking, 2-3 locations per day at 10 a-2p and 24+ min Headways after 10p Silver Turnback @ Ballston Yellow Turnback @ Mt. Vernon 	Limited additional weeknight single-tracking	Limited additional weekend single-tracking	None
Impact to Customer OTP Target	83%, Cancel Rush Hour Promise	88%	88%	88%
Ridership Impact	+0.6M trips in added hours	+0.6M trips in late night	+ 0.4M trips/year	0

	(11.1M) trips lost due to track work Net: (10.5M) reduction trips/year	-3.1M trips in morning Net: -2.5M trips/year		
Net Cost to Jurisdictions (FY20)	~ \$44 M (\$73/additional trip)	~ \$9 M (\$15/additional trip)	~ \$4 M (\$10/additional trip)	\$0 M
Other Risks	Significant Capital Program Delays NTSB and FTA CAPs at Risk	Public Hearing Required CBA/Union Negotiations	Some Capital Program Delays	None

FUNDING IMPACT:

There is no impact on funding for presenting these options. However, the Board's later decision will impact the FY20 budget and beyond.

Project Manager:	Laura Mason
Project Department/Office:	COO/RAIL

TIMELINE:

Previous Actions	December 2016 – Change to Service Hours for FY18
Anticipated actions after presentation	March 2019 – Action is required on service hours

Overnight Maintenance Work Window & Service Hour Discussion

Safety & Operations Committee
January 24, 2019



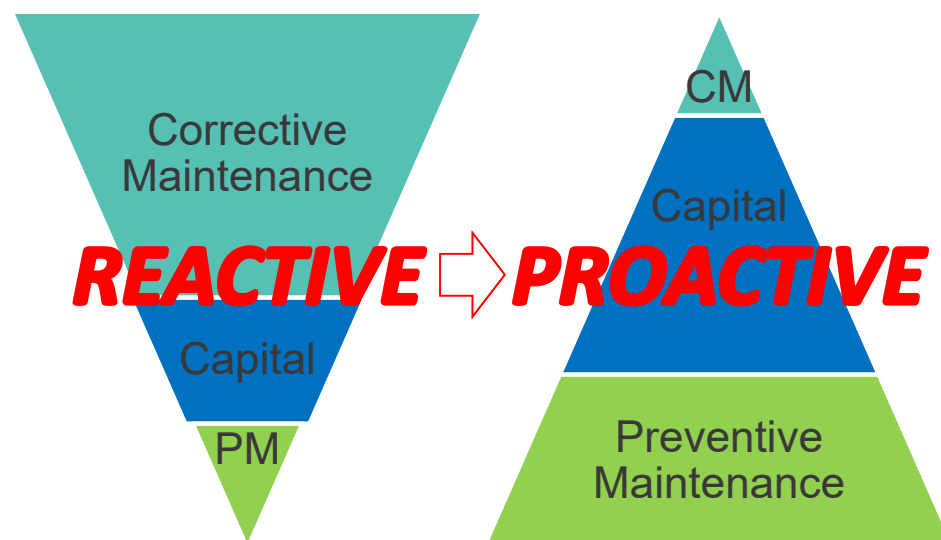
Purpose

- Provide further explanation of the **work done in the Overnight Maintenance Window**
- Highlight work underway to improve **productivity, efficiency** and **effectiveness** of wayside work
- Review impact of reverting to FY16 service hours and alternative Service Hours for FY20/21

Progress on Improving Rail Safety & Reliability

Continue shift from reactive to proactive work by increasing effectiveness of work done.

- Reducing corrective maintenance work required through:
 - Reliability Centered Maintenance analyses
 - Predictive Maintenance
 - Preventive Maintenance
- Investing in new technology to reduce work required and/or increase efficiency of track access:
 - Curtain Grouting
 - 3rd Rail Modernization
 - Tagging Relay (Red Tag Switching)



How is the Overnight Maintenance Window used?

Safe, reliable rail service requires sufficient time for maintenance & capital renewal

1) Inspections, Testing & Maintenance driven by:

- WMATA Engineering Standards
- NTSB Recommendations
- FTA Corrective Action Plans
- 2016 APTA Peer Reviews

2) PM Programs target specific safety & reliability issues:

- Traction Power Cable Meggering
- Stray Current Testing
- Trackbed Cleaning
- Tamping & Surfacing
- Torqueing
- Switch Maintenance

3) Capital Program projects to:

- Replace aging infrastructure/ State of Good Repair (SOGR)
- Add capacity/functionality

Preventive Maintenance Programs Initiated in FY18

Targeted Issue	PM Program	Purpose	% complete As of 11/30/18
Electrical Fires	Trackbed Cleaning	Reduces fire risk & deterioration caused by water by cleaning tunnel track bed annually for Red Line, every 2 years for other lines.	46%
	Cable Meggering	Reduce number of power cable faults by testing cables every 4 years.	35%
	Stray Current Testing	Improve electrical isolation of the track through testing and identifying weak points every 5 years.	23%
Track Defects	Torqueing	Reduce excessive strain and loading in Direct Fixation track by tightening fasteners & bolts annually.	95%
	Tamping	Stabilize ballasted track structure and correct alignment every 2 years.	53%
	Switch Maintenance	Inspect, weld & grind interlocking components, based on quarterly detailed inspections. [*Progress is measured as % rated "good"]	50%*

Capital Program Overnight Work

Many crews use the overnight window, including working on the capital program and closing FTA & NTSB Corrective Action Plans (CAPs)

Capital

- Radio Project (5 CAPs)
- 100% 8-car train Power Upgrades (2 CAPs)
- Tunnel Ventilation & Smoke Detection (7 CAPs)
- Tunnel Lighting

Power Infrastructure

- State of Good Repair Cable Replacement (4 CAPs)
- Emergency Trip Station PM (1 CAP)
- Heat Tape PM (2 CAPs)

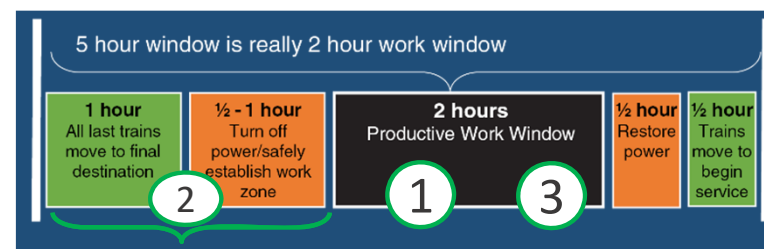
Track Infrastructure

- State of Good Repair Fastener & Rail renewals (1 CAP)
- Drain Rodding (2 CAPs)
- Rail Grinding (1 CAP)
- Joint Elimination (2 CAPs)
- Leak Mitigation (2 CAPs)

Track Time is Most Scarce Resource

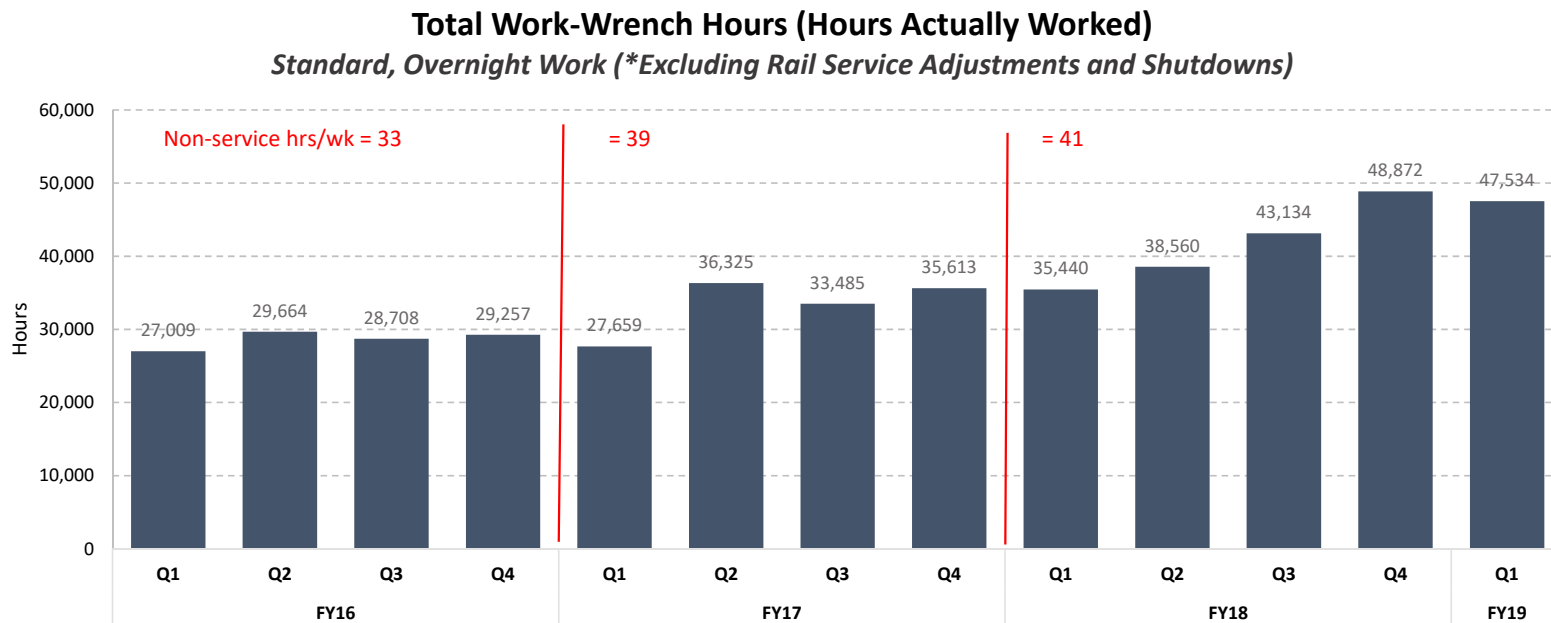
Safe, reliable and cost-effective Rail service requires maximizing value of track time

- Significant portion of non-passenger time is not able to be used for work
- Increasing service without compromising safety & reliability requires:
 1. Increasing **productivity** of crews
 2. Increasing **efficiency** of ROW access
 3. Increasing **effectiveness** of work:
Achieving SOGR & right-sizing maintenance plans through Reliability Centered Maintenance



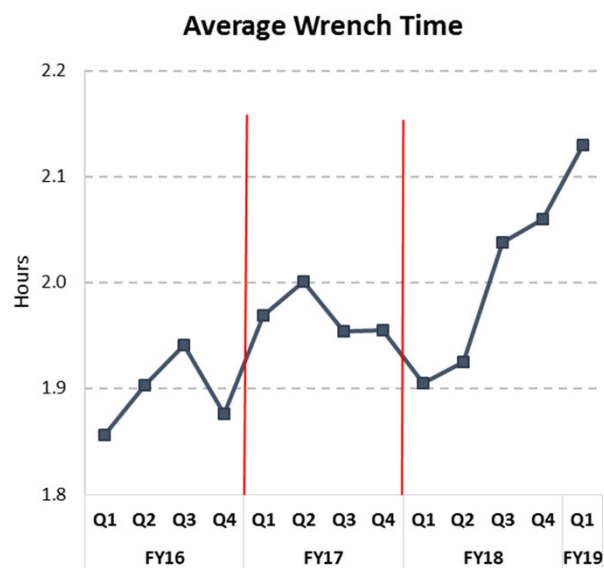
Progress is being made on Increasing Work Production

WMATA has almost doubled Work-Wrench Hours executed overnight since 2016

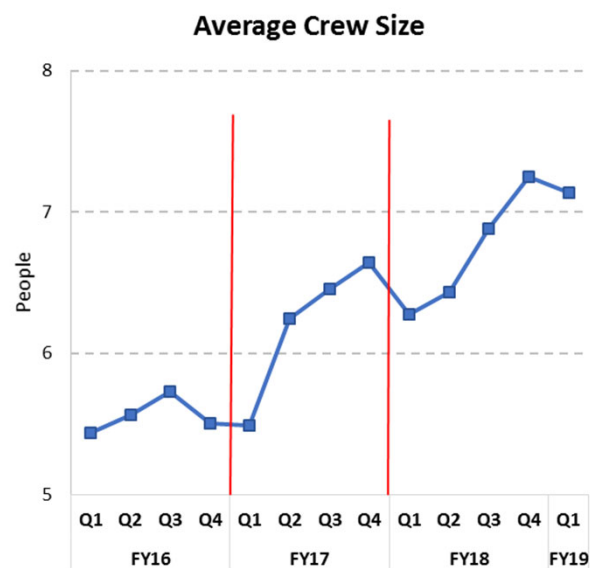


Progress is being made on Work Efficiency

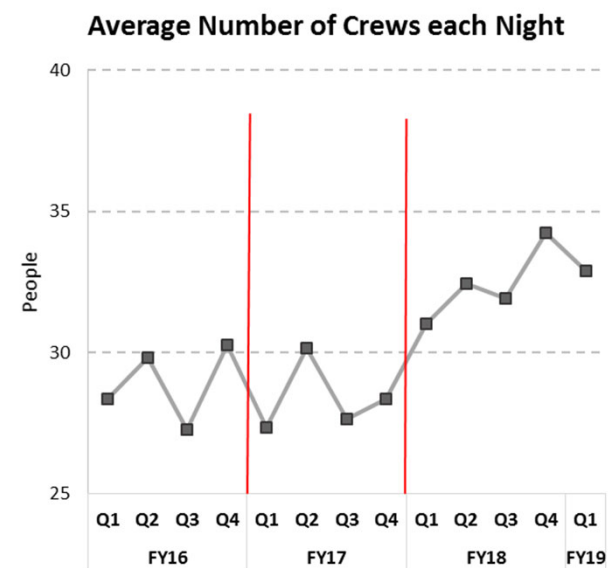
Longer Wrench Times



Larger Crews

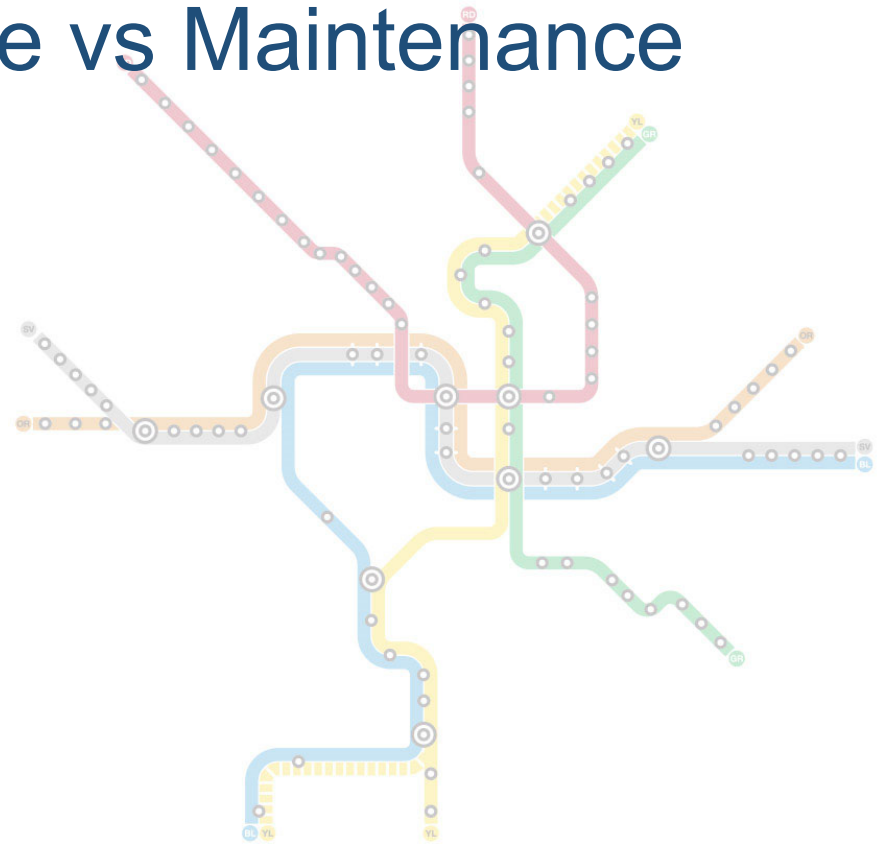


More Crews each Night



Challenge: Balancing Service vs Maintenance

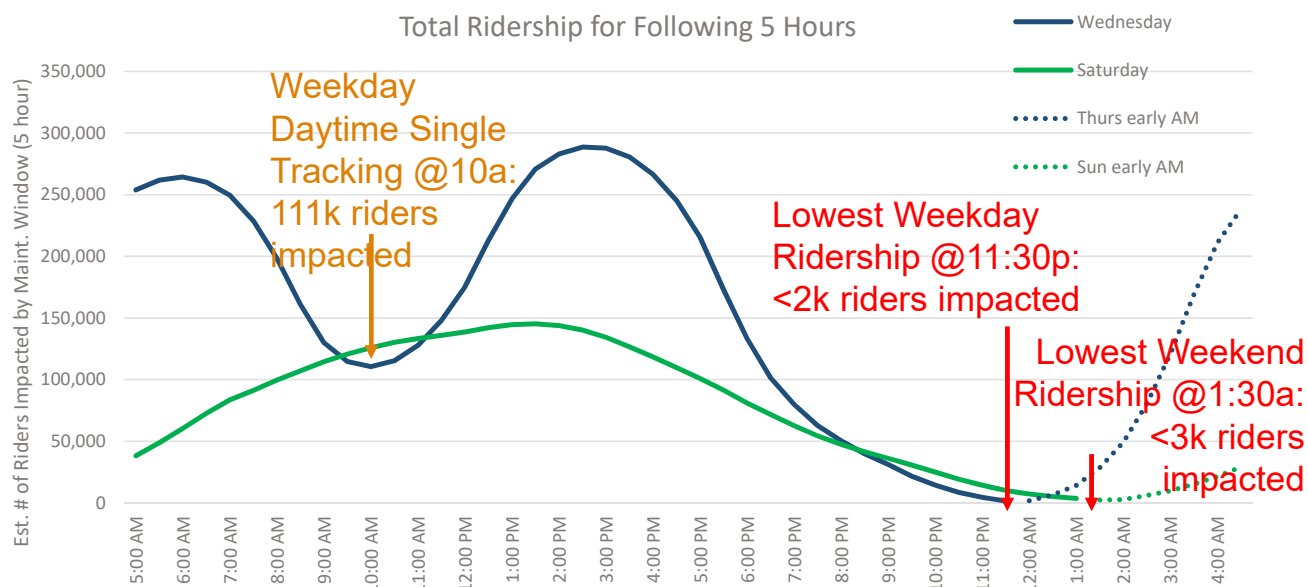
- Must maintain commitment to Safety and achieving a State of Good Repair
- Balance interest in late-night service with risks to recent progress on safety & reliability
 - Over the last three years, the Capital & PM programs have been able to drive down the number of incidents and disruptions
 - Capital program delivery has increased dramatically under current service hours
- Any increase in service hours will
 - Reduce time available for safety and reliability improvements
 - Negatively impact capital program execution
 - Increase net cost to jurisdictions



Timing Work Window vs Ridership

Current work hours already match lowest 5 hour ridership window

- Ridership is heavily peaked on weekdays but still high mid-day
- Modifying the overnight windows will impact more riders as windows currently match lowest demand



Preventive Maintenance Programs

Rail Service Adjustments will be needed to maintain PM Program schedule

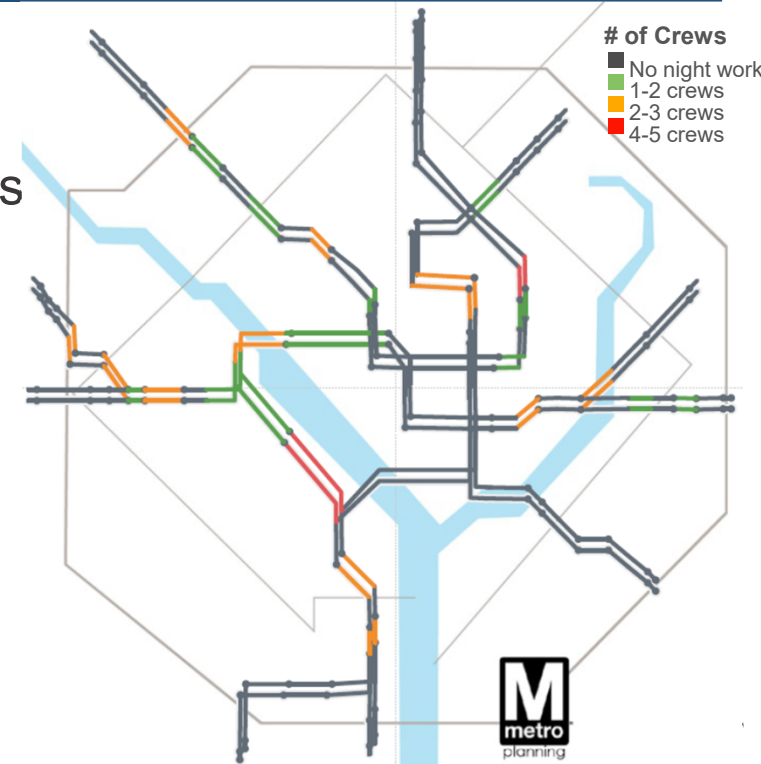
- If service hours revert to FY16 hours, PM programs will have to be done during passenger service
 - Some programs have minimum wrench windows that were not available under old service hours
 - Some programs require both tracks and would require late night bus bridging at affected stations
- Rail Service Adjustments (RSAs) would be required on daily basis, in multiple locations

Project	# years	Min. Wrench Window	Mid-day Single Tracking	Late Night Bus Bridging
Cable Meggering	4	2 hrs		✓
Stray Current	5	2.5 hrs		✓
Trackbed Cleaning	1	n/a	✓	
Torqueing	1	n/a	✓	
Tamping	2	2 hrs	✓	
Switch Maint.	3	>2.5 hrs		✓

Reverting to FY16 Hours Will Reduce Maintenance Time

No amount of single-tracking can make up for reduction in overnight maintenance window.

- Reverting to FY16 Service hours will cut productive track time in half
- Single tracking can not replace the work wrench hours lost due to shorter overnight window
 - Typical weeknight: 48 crews work system wide
 - 1 single track can safely and efficiently support ~3 crews, if their access needs line up
 - 3 RSAs per day X 3 crews each = 9 crews/day
- 75%+ of crews would lose hours and need to extend project schedules



Late Night Alternative Mobility Context

- Current Bus Service

- \$2M invested in increased late night Metrobus service, starting in 2017
- Supplemented existing service on 30 routes to provide:
 - A total of 89 routes with service at Midnight
 - 17 of those routes continue past 3AM

Service Hour Alternatives

Category	Revert to FY16 Hours	Alternative A: Shift Hours	Alternative B: Extend Weekend Hours	Alternative C: Existing Hours
Hours	M-Th: 5am-mid F: 5am-3am Sa: 7am-3am Su: 7am-mid	M-Th: 5:30a-mid F: 5:30a-3am Sa: 9-3am Su: 10:30am-mid	M-Th: 5am-11:30pm F: 5am-2am Sa: 7am-2am Su: 7am-11:30pm	M-Th: 5am-11:30pm F: 5am-1am Sa: 7am-1am Su: 8am-11pm
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Work-Wrench Hours Lost (measured as % of FY19-Q1 WWH)	20,977 (44%)	1, 241 (3%)	4,508 (9%)	0
Rail Service Adjustments required to maintain PM programs	<ul style="list-style-type: none"> Late Night Bus Bridges @ 11p <ul style="list-style-type: none"> 2 locations, 5 nights/week Weekday Single Tracking, <ul style="list-style-type: none"> 2-3 locations per day Daytime Single-tracking 10a-2p 24+ min Headways after 10p Short turn Silver @ Ballston Short turn Yellow @ Mt. Vernon 	Limited additional weeknight single-tracking	Limited additional weekend single-tracking	None
Impact to Customer OTP Target	83%, Cancel Rush Hour Promise	88%	88%	88%
Ridership Impact	+ 0.6M trips in added hours (11.6M) trips lost due to track work Net: (11.0M) reduction trips/year	+ 0.6M trips in late night (3.1M) trips in morning Net: (2.5M) trips/year	+ 0.4M trips/year	0

FY20 Budget Impacts of Service Hour Alternatives

- Reverting to FY16 entails significant additional costs:
 - Add \$10M for bus bridges & RSA support
 - Lose \$27M fare revenue, primarily due to daytime single-tracking
 - No savings anticipated from service reductions due to high variability & fixed labor agreement

- Any changes from current hours would put subsidy outside the 3% cap

(\$ in Millions)		Expense	Revenue	Net FY20 Cost
Revert to FY16 Hours				
	Added Rail Hours	\$8.0	\$1.6	\$6.4
	Other Rail Hours	\$10.0	(\$28.7)	\$37.4
	Net Change	\$18.0	(\$27.1)	\$45.1
Alternative A: Shift Hours				
	Added Rail Hours	\$1.6	\$1.6	(\$0.0)
	Cut Rail Hours	\$0.0	(\$9.2)	\$9.2
	Net Change	\$1.6	(\$7.6)	\$9.2
Alternative B: Extend Weekend				
	Added Rail Hours	\$4.5	\$0.9	\$3.6
	Other Rail Hours	\$0.0	\$0.0	\$0.0
	Net Change	\$4.5	\$1.0	\$3.5
Alternative C: Maintain Current Service Hours				
	Added Rail Hours	\$0.0	\$0.0	\$0.0
	Other Rail Hours	\$0.0	\$0.0	\$0.0
	Net Change	\$0.0	\$0.0	\$0.0

Note: Analysis does not account for Life line buses.

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

Summary of Service Hour Alternatives

Category	Revert to FY16 Hours		Alternative A: Shift Hours		Alternative B: Extend Weekend Hours		Alternative C: Existing Hours	
Hours	M-Th: 5am-mid F: 5am-3am Sa: 7am-3am Su: 7am-mid	Service: 135 Hrs % Lost WWH: 44%	M-Th: 5:30a-mid F: 5:30a-3am Sa: 9-3am Su: 10:30am-mid	Service: 127 Hrs % Lost WWH: 3%	M-Th: 5am-11:30pm F: 5am-2am Sa: 7am-2am Su: 7am-11:30pm	Service: 130.5 Hrs % Lost WWH: 9%	M-Th: 5am-11:30pm F: 5am-1am Sa: 7am-1am Su: 8am-11pm	Service: 127 Hrs % Lost WWH: n/a
Customer OTP Target & Rail Service Adjustments	83%, Cancel Rush Hour Promise <ul style="list-style-type: none"> Late Night Bus Bridges @ 11p Weekday Single Tracking, 10a-2p & after 10p, with Silver Turnback @ Ballston & Yellow Turnback @ Mt. Vernon 		Maintain 88% Limited additional weeknight single-tracking		Maintain 88% Limited additional weekend single-tracking		Maintain 88% None	
Ridership Impact	+ 0.6M trips in added hours (11.6M) trips lost due to track work Net: (11.0M) reduction trips/year		+ 0.6M trips in late night (3.1M) trips in morning Net: (2.5M) trips/year		+ 0.4M trips/year		None	
Net Cost to Jurisdictions (FY20)	~ \$45 M (\$72/additional trip)		~\$9 M (\$15/additional trip)		~ \$4 M (\$10/additional trip)		\$0 M	
Other Risks	Significant Capital Program Delays NTSB and FTA CAPs at Risk		Public Hearing Required CBA/Union Negotiations		Some Capital Program Delays		None	

Summary of Alternatives

Scenario	Late Night Ridership	Total Ridership	Net Cost to Jurisdictions	Impact to Track Work
Revert to FY16	~	✗	✗	✗
Alternative A <i>Shift Hours</i>	✓	✗	~	~
Alternative B <i>Extend Wknd Hours</i>	~	✓	~	~
Alternative C <i>Existing Hours</i>	✗	~	✓	✓