



▶ Sizing Trains for Safety and Efficiency

Engineering & Operations Committee
August 24, 2023



Topline Reasons To Shorten Some Trains

- Multiple safety benefits (for riders, BPD, and Train Operators)
- Quicker phase-out of legacy cars (almost all FOTF; fewer delays)
- Cleaner train cars in service (crews have fewer cars to focus on at the end of the line)
- Power and labor cost savings
- Increases ready reserve trains (fewer delays)
- Responsive to calls for BART to be more efficient

Safety & Environment

- Active spaces are safer spaces
 - Empty spaces encourage anti-social behavior, harassment, and targeted crimes
- Responsive to feedback from the *Not One More Girl* initiative
 - Many people request a “women only” car; but it isn’t enforceable
 - We recommend people sit in the first car near the operator, but this requires waiting at the very end of the platform, a place riders deem as unsafe, dark, and often scary

Police & Security

- We can significantly increase police visibility on trains and platforms using the same number of staff
- During calls for service, officers can clear shorter trains much quicker
- BPD train teams will be able to walk more of the in-service train cars
 - More eyes on each train car
- Safety in numbers
- New cars have higher-quality surveillance footage



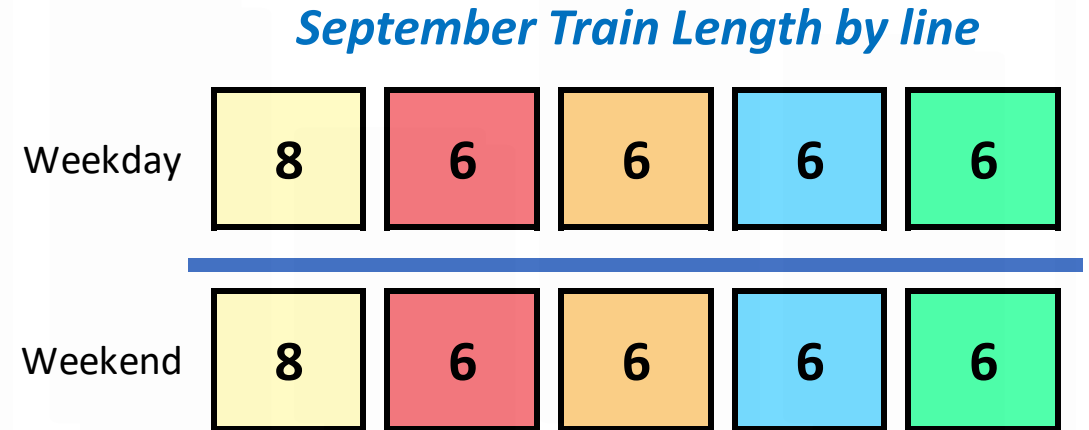
Comms/Customer Experience



- Messaging: "BART will shorten its least crowded trains to enhance safety, save costs, and provide cleaner, more reliable service"
- Long trains will run systemwide during special events
- Crowded lines will still have long trains; BART will constantly monitor data and adjust to avoid overcrowding
- With this change, only Fleet of the Future trains will be in service beginning September 11th. Old trains will run only when needed
- Eliminating empty and sparse train cars will create a safer, more welcoming environment for women, girls, gender non-conforming people, senior citizens, families, and all riders
- Announce as part of *Not One More Girl* initiative on August 31
 - We are bringing the first car closer to all riders
- Courtesy announcements will be increased about priority seating, removing backpacks, and no bikes on crowded cars

Train Length Sizing

- Start by sizing trains to match current demand
- We'll monitor return-to-work trends after Labor Day and scale up with ridership growth
- Liberal use of long trains for events



Expect train lengths to change as ridership grows and patterns change

Load modeling

- Performed load analysis of current and proposed September train lengths
- Used busiest weekday (May 17) and busiest Saturday (April 22) from 2023

Busy Weekday
May 17, 2023

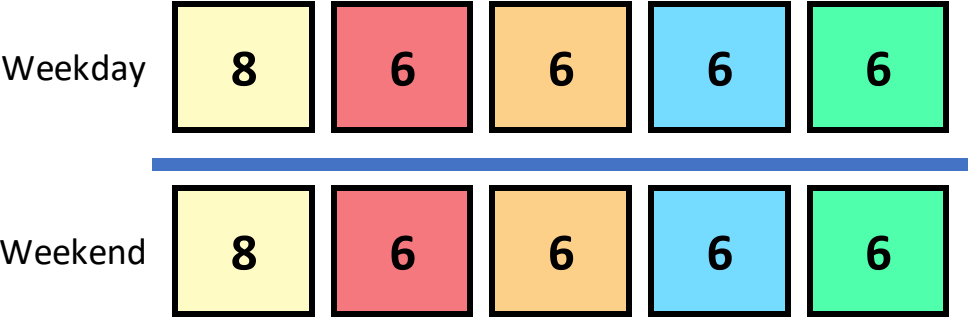
SCHEDULE	WEEKDAY		WEEKDAY		WEEKDAY		WEEKDAY		WEEKDAY	
	Yellow Line		Red Line		Orange Line		Blue Line		Green Line	
	Current	September	Current	September	Current	September	Current	September	Current	September
Train Length	10	8	10	6	8	6	10	6	10	6
Max Avg Hourly Load	93	96	60	88	35	54	53	117	53	109
~6:00	24	0	13		6		15		14	0
	13	2	10		4		11		5	1
	35	16	15		9	1	14		10	1
	34	12	18		8	7	16	7	14	3
	36	19	20	1	9	8	21	10	13	6
	52	11	25	20	8	11	26	32	16	7
	42	42	26	17	14	18	6	24	22	8
	59	24	66	24	15	20	42	39	25	12
	67	41	48	32	27	23	68	57	32	23
	78	27	49	40	25	38	42	58	33	25
	83	67	50	40	28	39	59	87	6	32
	104	23	70	71	24	47	38	109	57	43
	89	63	59	69	25	54	45	101	42	58
	93	50	61	75	27	45	42	115	13	68
	86	76	51	92	19	40	29	130	58	78
	77	52	44	92	20	36	33	103	53	86
	85	111	27	71	22	27	26	86	50	90
	40	51								
	43	103								
	33	82								
	29	118								
	33	82								
	30	129								
	18	62								
	32	106								
	22	68								
	27	76								
	18	48								
	19	75								
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~20:45	38	26								
	51	30								
	34	44								
	27	8								
	29	30								
	27	29								
	14	27								
	6	18								
	21									
	26									
	16									
	14									

Busy Saturday
April 22, 2023

SCHEDULE	SATURDAY		SATURDAY		SATURDAY		SATURDAY		SATURDAY	
	Yellow Line		Red Line		Orange Line		Blue Line		Green Line	
	Current	September	Current	September	Current	September	Current	September	Current	September
Length	10	8	10	6	8	6	10	6	10	6
Max Avg Hourly Load	39	47	35	47	26	20	31	35	27	29
~6:00	8								9	
	7		6		5		10		10	
	6		8		6		9		11	
	5		7		10	3	12	1	15	
	12		13		14	4	16	11	16	1
	7	10	13	3	13	6	18	7	16	0
~7:00	17	9	16	11	14	11	18	8	17	2
	8	12	16	9	16	10	18	12	20	5
	16	15	19	11	15	8	20	11	20	5
	8	15	18	15	14	14	27	15	7	4
	17	17	27	14	17	13	24	19	28	7
	10	23	24	22	20	12	10	15	21	9
	24	19	19	22	19	13	36	21	20	13
	12	20	19	22	17	12	24	24	20	13
	22	28	27	14	17	14	17	13	13	
	20	25	25	13			21	15		
	23	28	25	11			26	17		
	18	39	34	15			19	19		
	29	32	27	17			17	17		
	18	36	34	13			15	15		
	28	45	39							
	7									
	53									
	25									
	22									
~12:00	38	38	0	35	28	13	21	24	18	19
	26	43	36	35	14	15	17	27	16	23
	24	37	20	50	20	19	18	30	16	23
	15	36	27	36	20	12	14	32	14	21
	26	29	22	33	18	18	16	32	16	20
	14	32	22	37	18	17	12	36	15	21
	23	25	20	33	13	13	27	23	23	
	8	21	32		15	15	24	22	22	
	21	26	36		17	17	17	21	21	
	11				23				16	
	14				14					
~15:00	31	23	23	25	20	17	19	17	13	18
	19	24	34	27	26	16	25	15	22	18
	35	29	35	34	26	15	37	17	21	18
	19	31	26	28	26	18	27	15	27	17
	52	37	29	31	22	20	23	16	26	20
	21	45	32	53	26	22	34	14	23	19
	50	49	22	47	20	20	16	25	20	27
	15	45	26	41	20	21	18	23	26	28
	37	37	20	44	18	17	26	29	18	33
	15	39	0	40			39		27	
	23	32	16	41			19		37	
	14	31		48			48		26	
	44	36		36			27		24	
	10			33			16		24	
	29			37			26		21	
	30								21	
	10								8	
	28									
~19:45	50	26			20	14	16	19		
	43	32	23		22	29	19	20		
	37	21	27		21	16	13	18		
	43	25	25		20	13	14	20		
	41	21	20		20	15	33			
	41	19	17		17	17	15	25		
	29	33	18		20	14	23			
	23	22	11		20	11	22			
	13	33	10		10	12	8	29		
			8		8	5	5			
			20		20		17			
			29		29		10			
			35		35		7			
			19		19		5			
			16		16		6			
									24	
									22	
									13	

Peak hour analysis

Train Length by line



Estimated average passengers/car

Busy Weekday
May 17, 2023

SCHEDULE	WEEKDAY Yellow Line		WEEKDAY Red Line		WEEKDAY Orange Line		WEEKDAY Blue Line		WEEKDAY Green Line	
	Current	September	Current	September	Current	September	Current	September	Current	September
	Length									
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	Current	September	Current	September	Current	September	Current	September	Current	September
	Length	10	8	10	6	8	6	10	6	10
Max Avg Hourly Load	39	47	35	47	26	20	31	35	27	29

We expect manageable crowding during the peak, and improved safety nights and weekends

FOTF Implications

Fleet: Current Service level

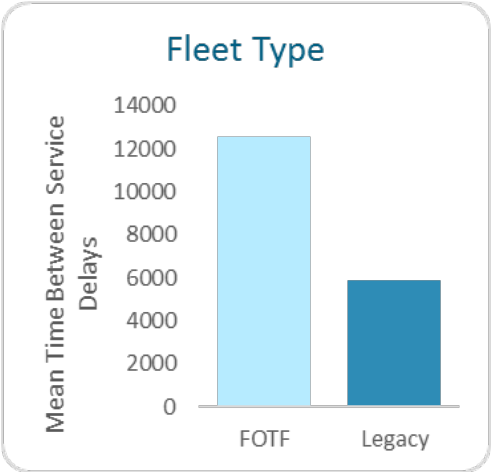
- Gradual cutover to FOTF in late FY24

Fleet: Recommended Service level

- **FOTF**: All base service
- **Legacy**: events, contingency

	Current Weekday					Recommended Weekday				
	10	10	8	10	10	8	6	6	6	6
Revenue Car Requirement	530					368				
Peak Car Requirement	590					411				
w/ Spares	738					514				
Sep 11 FOTF Forecast	596									

With Recommended Service level, September peak car requirement can be met with FOTF



From QPR FY2023 Q4



Operational Flexibility

Improved responsiveness and delay recovery

- Reduced peak car count enables adding several Ready-Reserve trains
- Reduced peak power demand provides improved power system contingency operation
- Fewer cars for mainline techs to trouble shoot

Power/Infrastructure

- Reduced power consumption and strain on power infrastructure
 - Direct correlations between the number of cars and power consumption
 - Shorter trains means lower power draw and reduced stress on legacy systems
- Lower power demand results in improved efficiency and resilience
 - Improved energy savings
 - Ability to support train service even with suboptimal power system configurations



Expense Reduction

Forecast plan annual savings: 750,000 car-hours

Likely annual savings: 600,000 car-hours

- RS&S operating budget savings of approximately \$2M/year
- Power/Energy savings of approximately \$10M/year



Conclusion

- Improved safety
- Moves quickly to FOTF
- Cleaner train cars in service
- Power and labor cost savings
- More ready reserve trains means fewer delays
- Responsive to calls for BART to be more efficient



BART will implement new train lengths on September 11th

