

Asset Management and Preventive Maintenance: Setting Priorities to Improve Efficiency (P09-0168)

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AECOM Transportation

Transportation Research Board Annual Meeting
Session 501

The State of Good Repair: Urban Transit Maintenance
and How to Pay for It

Agenda

- MBTA state-of-good-repair (SGR) database
- Definition of state-of-good-repair
- 4 SGR questions
- SGR database inputs
- Scoring candidate actions
- SGR database application process
- SGR database outputs
- Application of MBTA tool at another agency

MBTA SGR Database

- Supports long-range Capital Planning
 - Tracks existing assets for reference
 - Modeling capability to support capital planning
 - “What if” scenarios
- Objective analysis
 - Uniform criteria & process
 - Reports consequences
- Not a maintenance database
- Not a static database
 - Requires periodic data updates

Definition of State of Good Repair

- State of Good Repair (SGR) is the “condition where all assets perform their assigned functions without limitation”
- Assets are:
 - Renewed at critical midlife points
 - e.g., Engine replacements, bridge re-deckings, roof replacements, mid-life overhauls
 - Replaced at the end of their useful lives
 - e.g.,

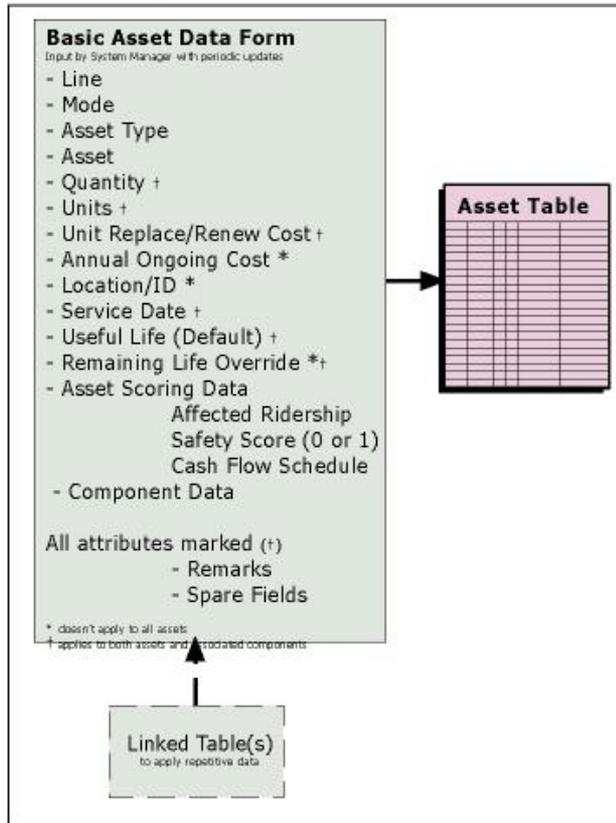
Buses	15 years
Rail cars	35 years
Bridges	50 years

4 SGR Questions

- SGR model allows MBTA to answer the following capital planning questions:
 - What are the system's current needs?
 - What would happen to the system if current funding levels remain the same?
 - What level of funding is needed to maintain a State of Good Repair?
 - What level of funding would be needed to eliminate backlog in 20 years?

SGR Database - Input

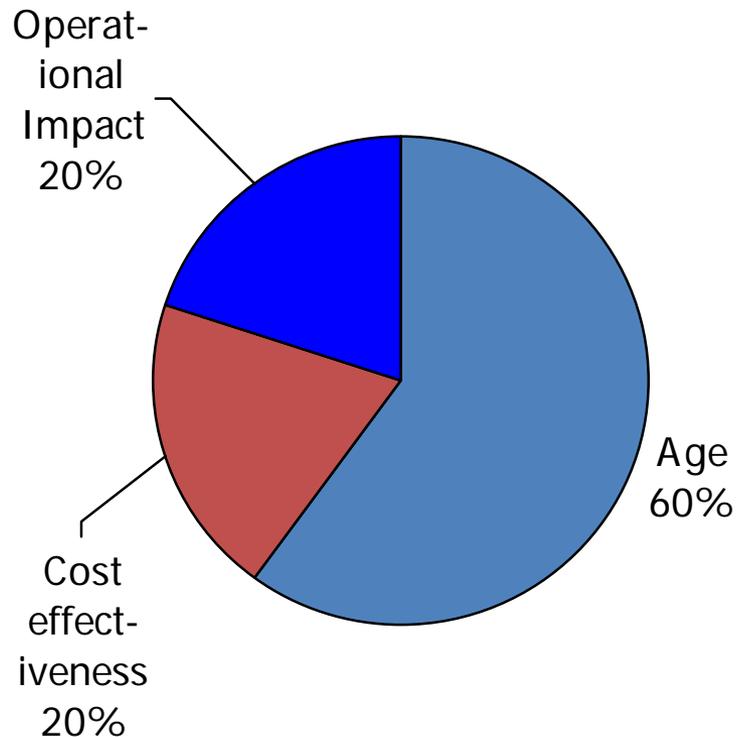
System Manager Activity



- Asset attributes
 - *Service Life*
 - *Age*
 - *Replacement/Rehab Cost*
 - *Operational Impacts*
 - *Affected Ridership*

Scoring Candidate Actions

Default Weighting

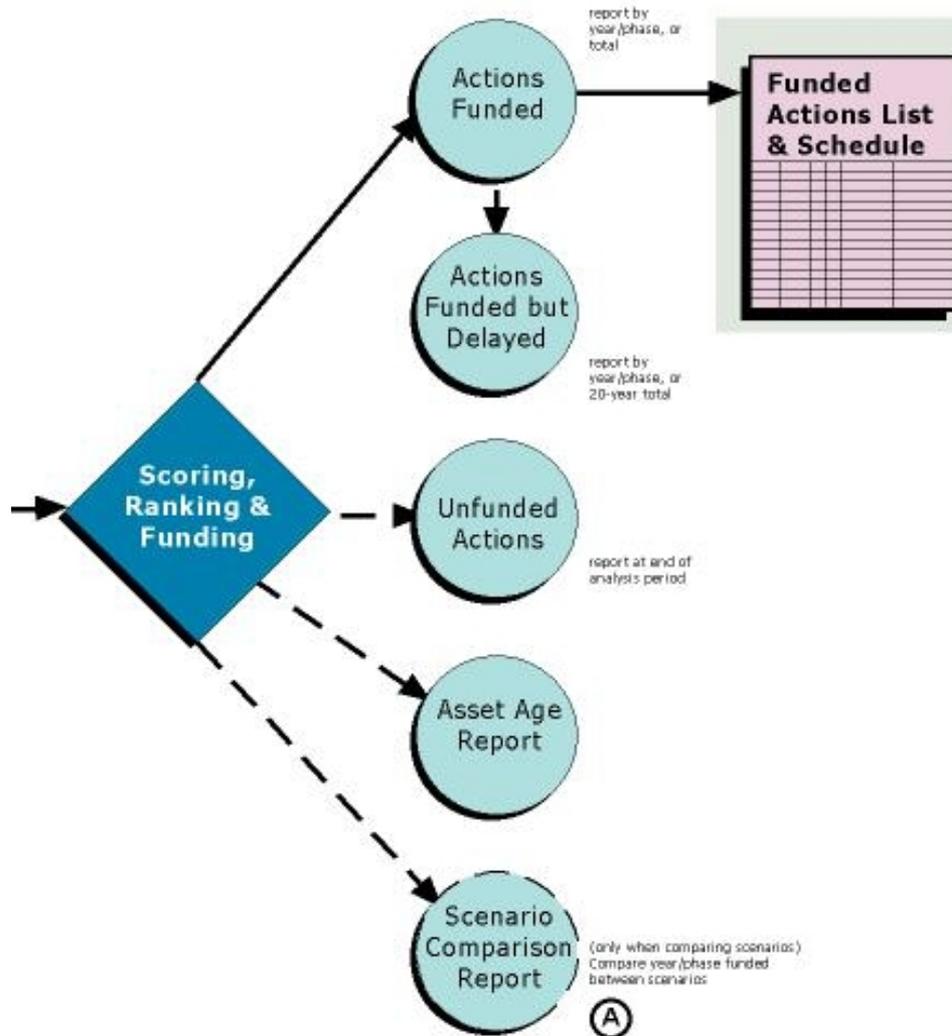


- Age
 - *Age as % of Service Life*
- Operational Impact
 - *Yes/No*
 - *Selected assets are essential to system operations*
- Cost-Effectiveness
 - *Ridership/Cost of Action*
 - *Reflects customer service impacts*

SGR Database Application Process

- Identify candidate projects
 - *Actions come due*
 - *Delayed projects from prior years*
- Score and rank projects
- Fund projects in rank order until:
 - Cost (project i) > Funds remaining*
- Mark unfunded projects as candidates for next year
- Carryover remaining funds to next year

SGR Database Outputs



- **Ranks** capital actions
- Develops **schedule** and **cash flow** based on ranking
- Determines **system impacts**

Application of MBTA SGR Database at Another Transit Agency

- **Context:** development of a long-range agency financial plan
- **Data source:** inventory of projects (not assets) identified by maintenance managers, including:
 - Year of initial action (ideal and latest possible)
 - Frequency of action (ideal and longest possible)
 - Cost of action (adjusted to 2008 \$ and addressing new vs rehab conditions)

As Funding Increases, Watch How ...

- SGR backlog declines
- Intensity of funding and mix in funding across asset classes changes by year
- % of cumulative needs funded on-time at end of CIP and in 2027 increases
- % of cumulative needs actually funded changes across asset classes

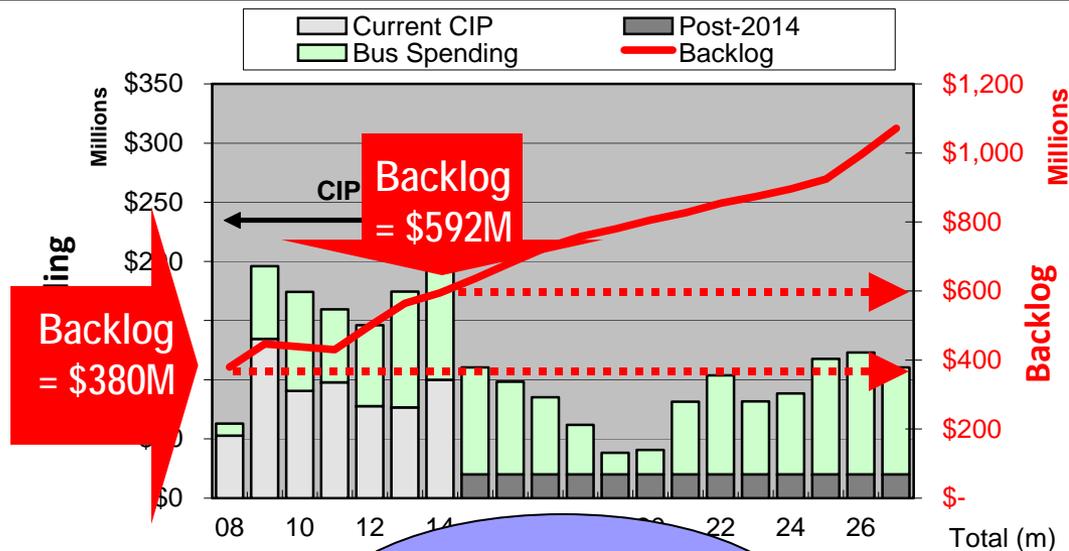
**Apply 2008-14 CIP Funding Level,
Force 12-Yr Bus Replacement
& 3-Yr Bus Overhaul Cycles**

Early First Cycle, Short Cycle Length

Early/Short Cycles

Non-Bus Post-2014 CIP @ \$20 Million/Year

ANNUAL SPENDING



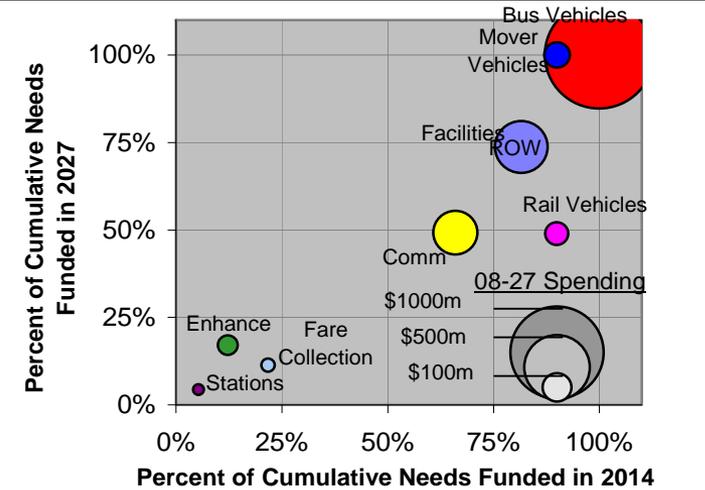
Category	Total (m)
Bus Vehicles	\$ 1,368
Communications	\$ 232
Enhancement	\$ 46
Facilities	\$ 109
Fare Collection	\$ 22
Mover	\$ 79
Rail Vehicles	\$ 63
ROW	\$ 325
Stations	\$ 15
Total	\$ 2,258

Track, structures, signals, power

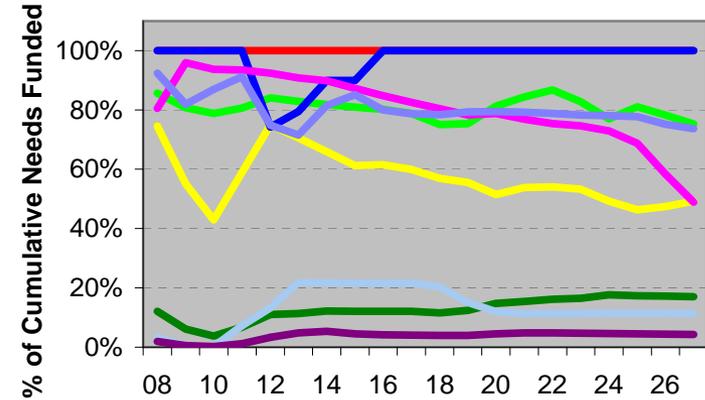
Includes elevators & escalators

- Legend**
- \$50m and above
 - \$20m - \$50m
 - \$10m - \$20m
 - Up to \$10m
 - No spending

ASSET CONDITION



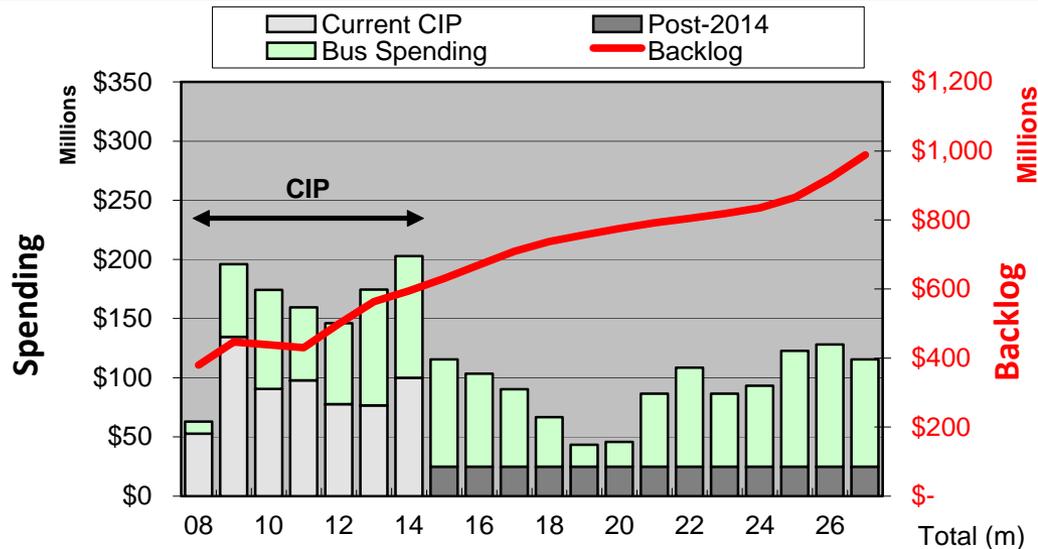
- Bus Vehicles
- Enhancement
- Fare Collection
- Rail Vehicles
- Stations
- Communications
- Facilities
- Mover Vehicles
- ROW



Early/Short Cycles

Non-Bus Post-2014 CIP @ \$25 Million/Year

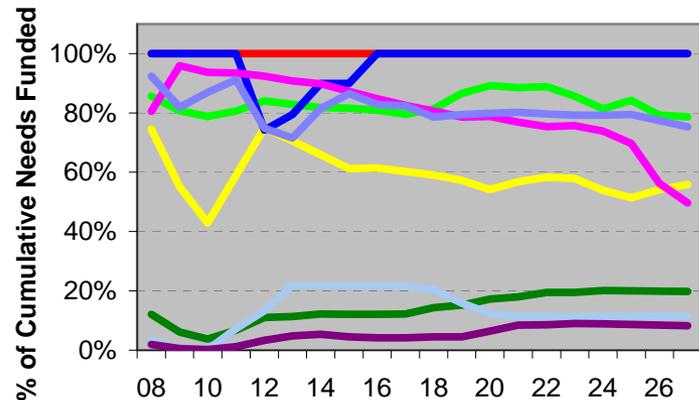
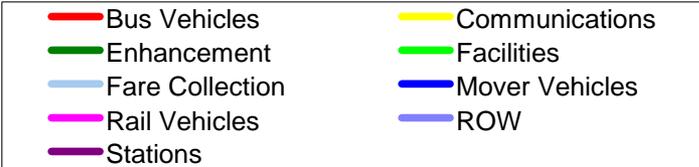
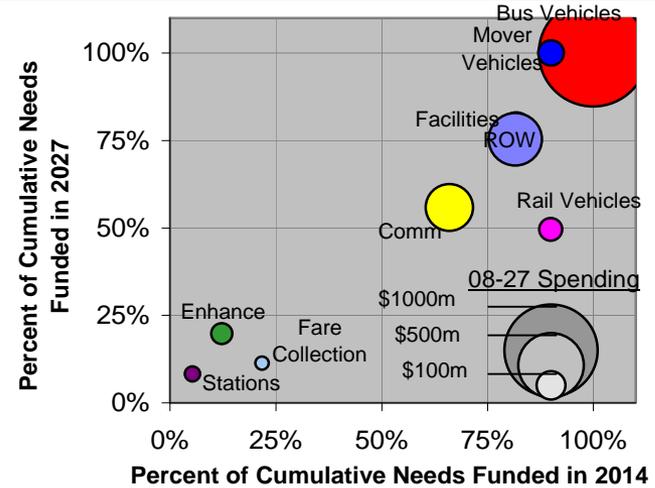
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 263
Enhancement	\$ 54
Facilities	\$ 114
Fare Collection	\$ 22
Mover	\$ 79
Rail Vehicles	\$ 63
ROW	\$ 332
Stations	\$ 28
Total	\$ 2,323



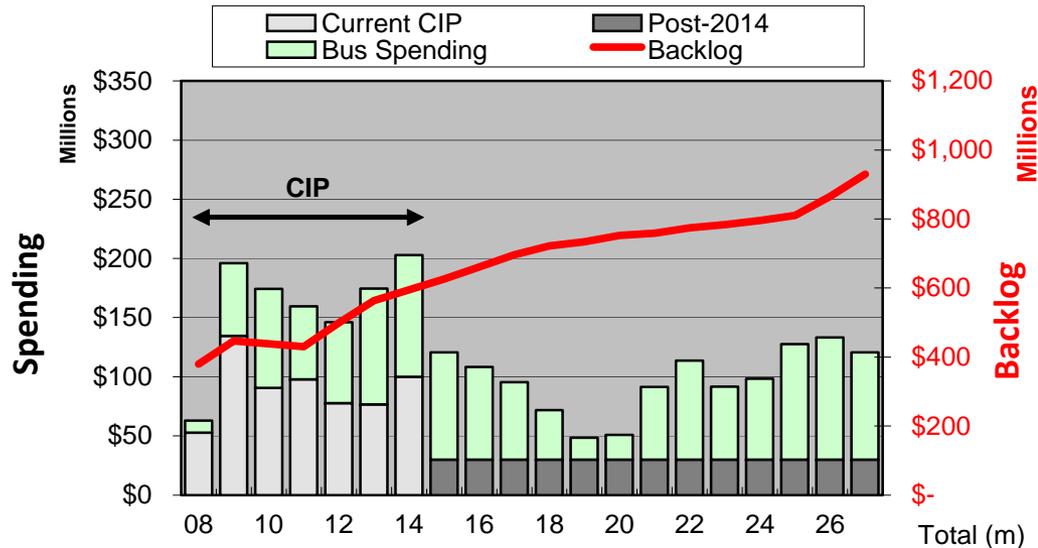
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Early/Short Cycles

Non-Bus Post-2014 CIP @ \$30 Million/Year

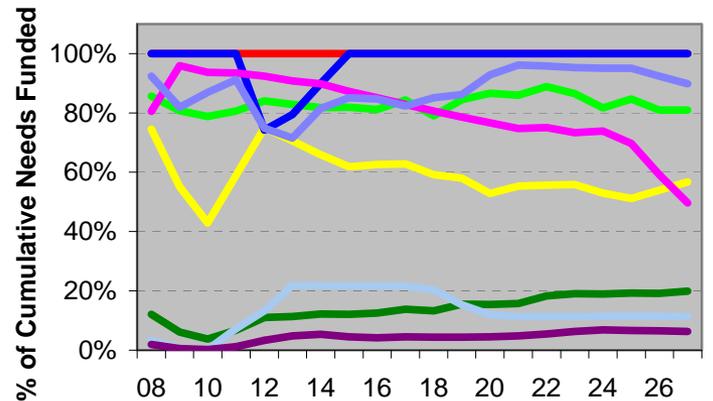
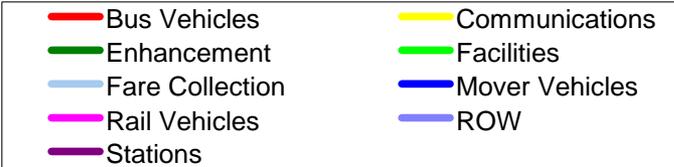
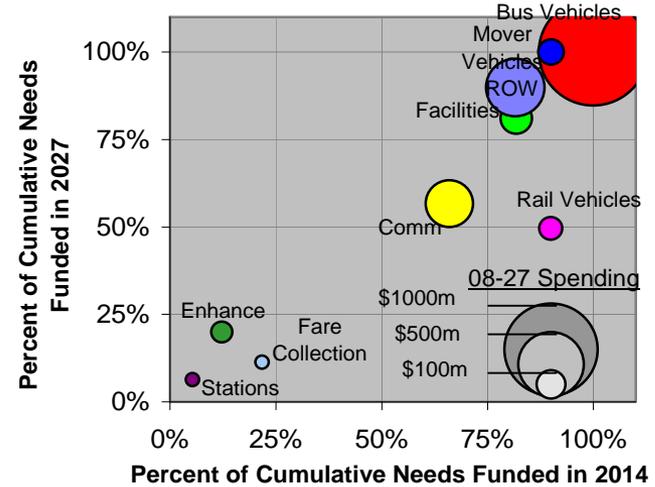
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 267
Enhancement	\$ 54
Facilities	\$ 117
Fare Collection	\$ 22
Mover	\$ 79
Rail Vehicles	\$ 63
ROW	\$ 396
Stations	\$ 21
Total	\$ 2,388



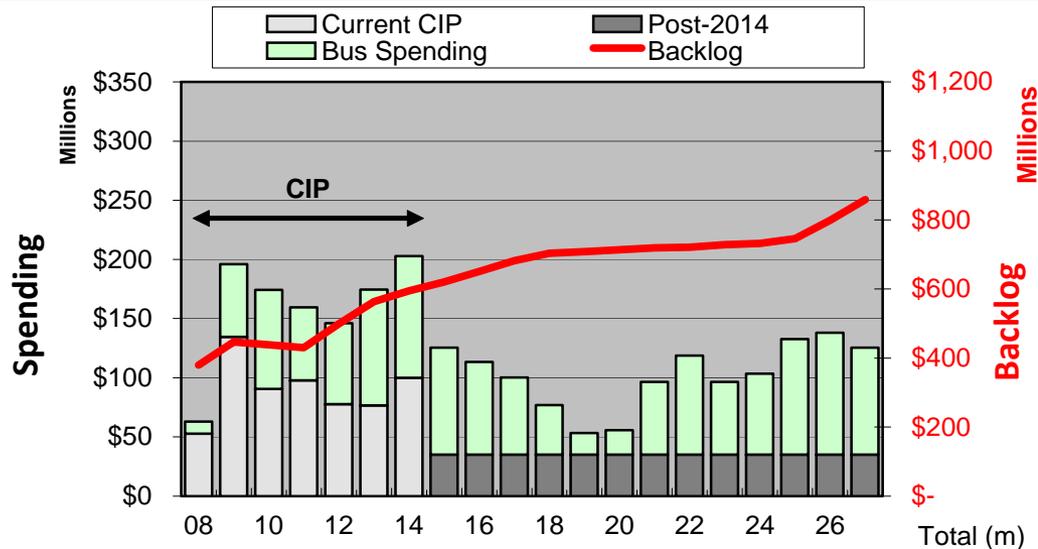
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Early/Short Cycles

Non-Bus Post-2014 CIP @ \$35 Million/Year

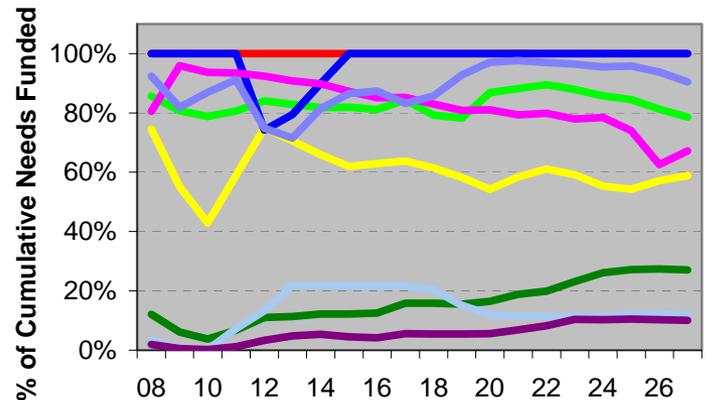
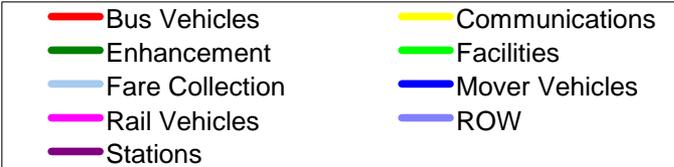
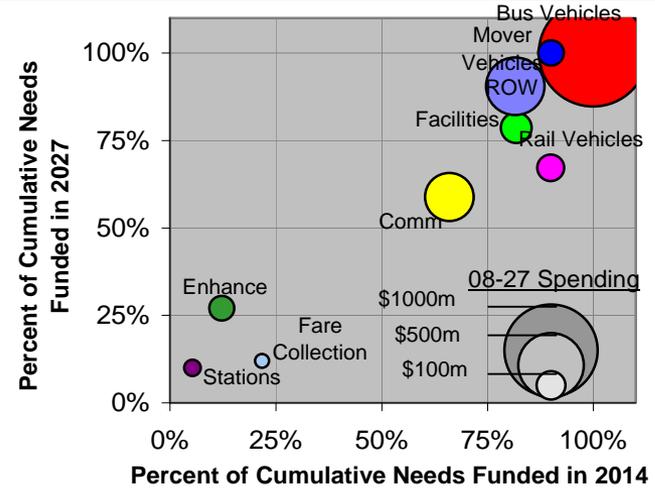
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 277
Enhancement	\$ 74
Facilities	\$ 114
Fare Collection	\$ 23
Mover	\$ 79
Rail Vehicles	\$ 86
ROW	\$ 399
Stations	\$ 34
Total	\$ 2,453



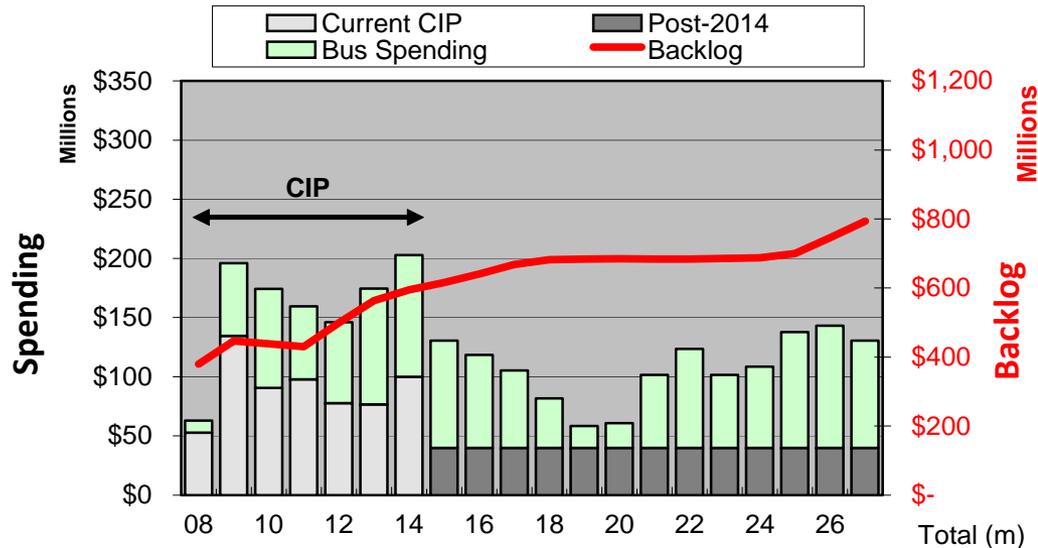
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Early/Short Cycles

Non-Bus Post-2014 CIP @ \$40 Million/Year

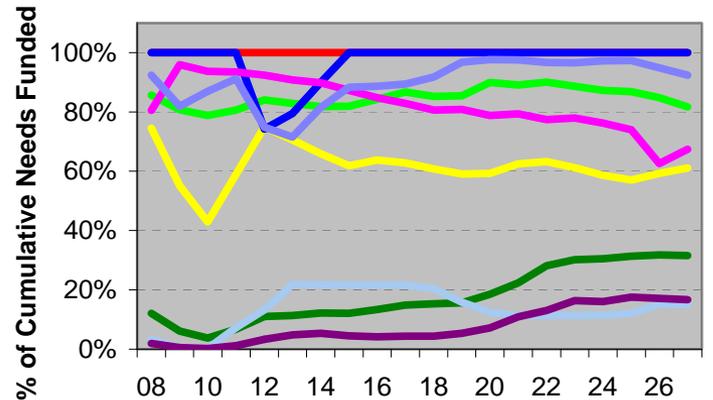
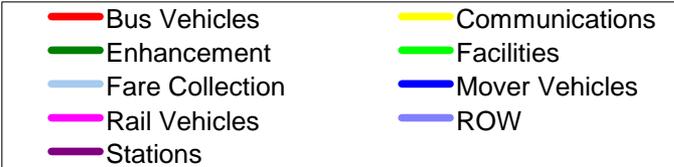
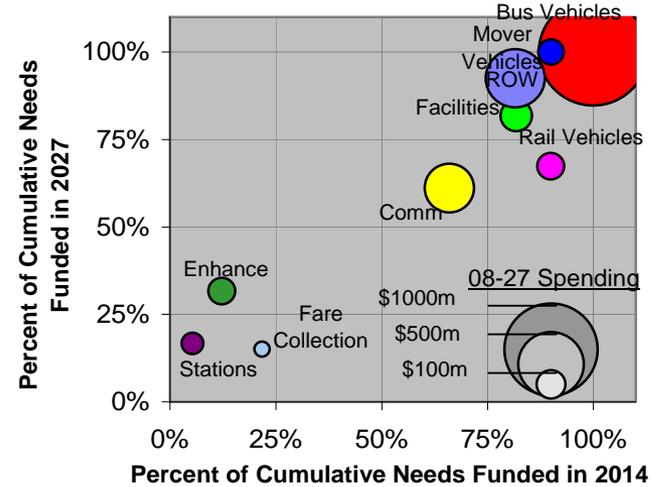
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 288
Enhancement	\$ 86
Facilities	\$ 118
Fare Collection	\$ 29
Mover	\$ 79
Rail Vehicles	\$ 86
ROW	\$ 407
Stations	\$ 56
Total	\$ 2,518



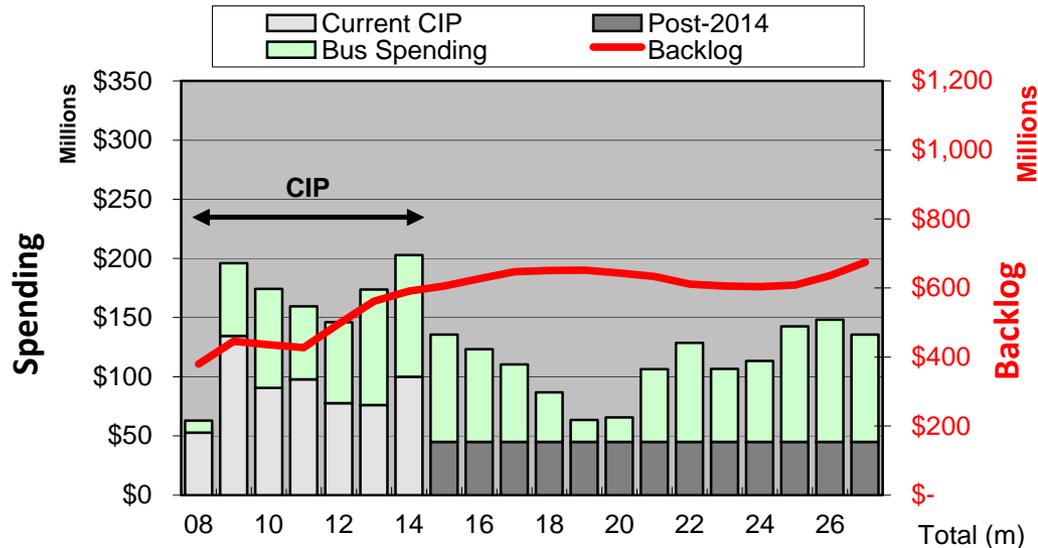
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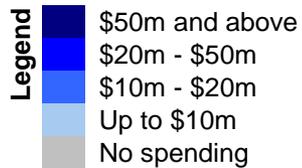
Early/Short Cycles

Non-Bus Post-2014 CIP @ \$45 Million/Year

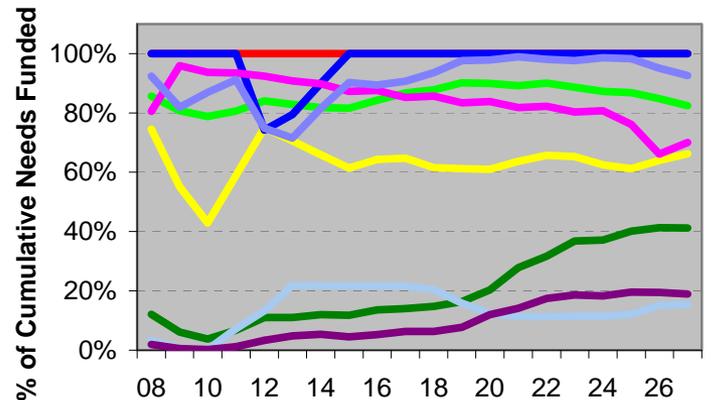
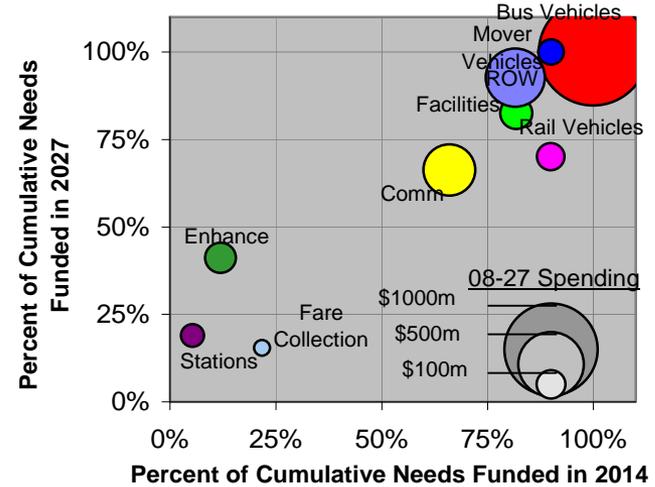
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 312
Enhancement	\$ 112
Facilities	\$ 119
Fare Collection	\$ 30
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 408
Stations	\$ 64
Total	\$ 2,582



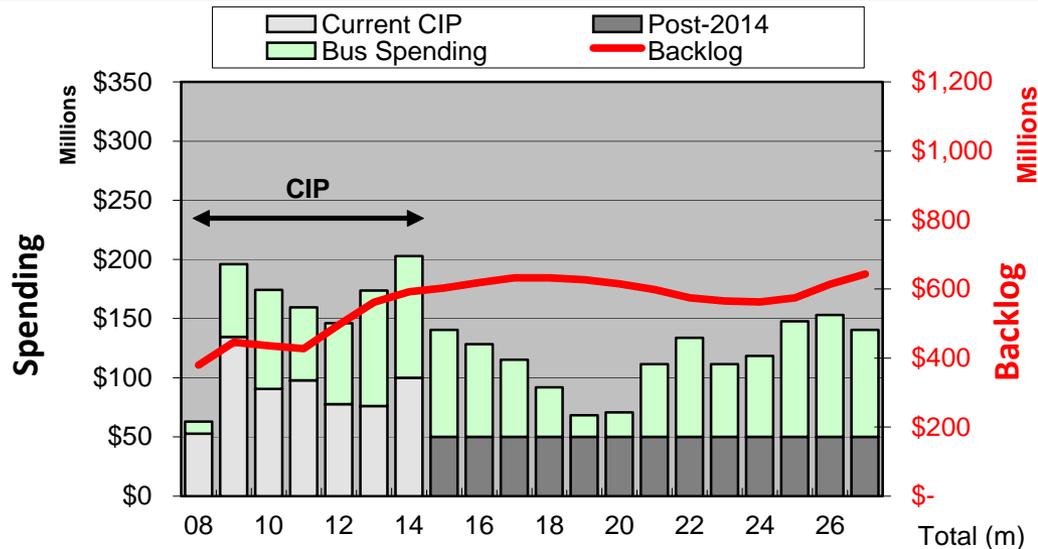
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Early/Short Cycles

Non-Bus Post-2014 CIP @ \$50 Million/Year

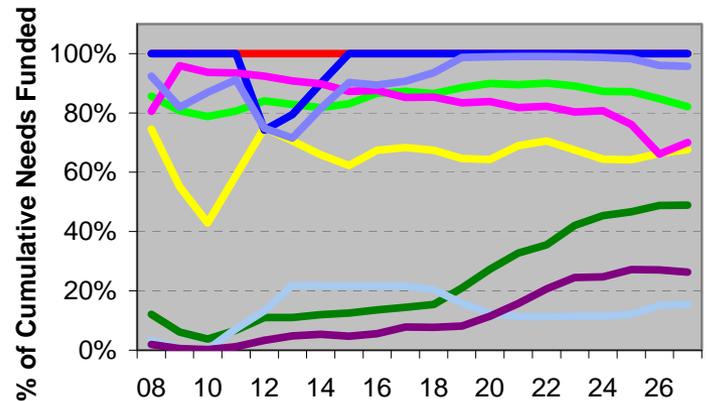
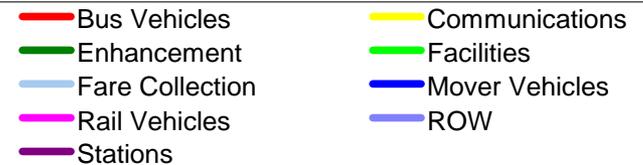
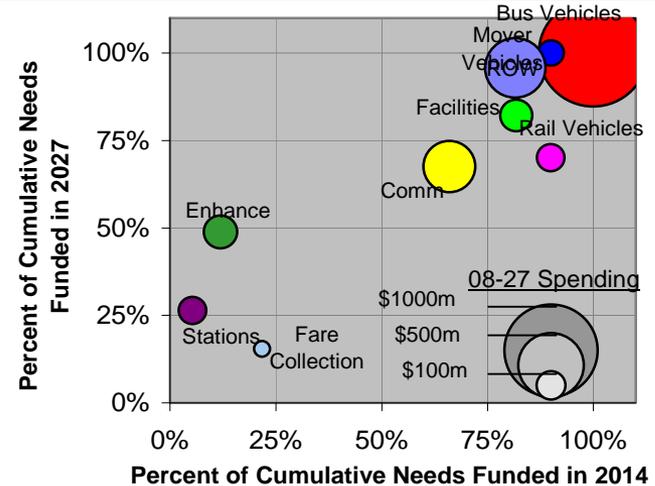
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 318
Enhancement	\$ 133
Facilities	\$ 119
Fare Collection	\$ 30
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 422
Stations	\$ 89
Total	\$ 2,647



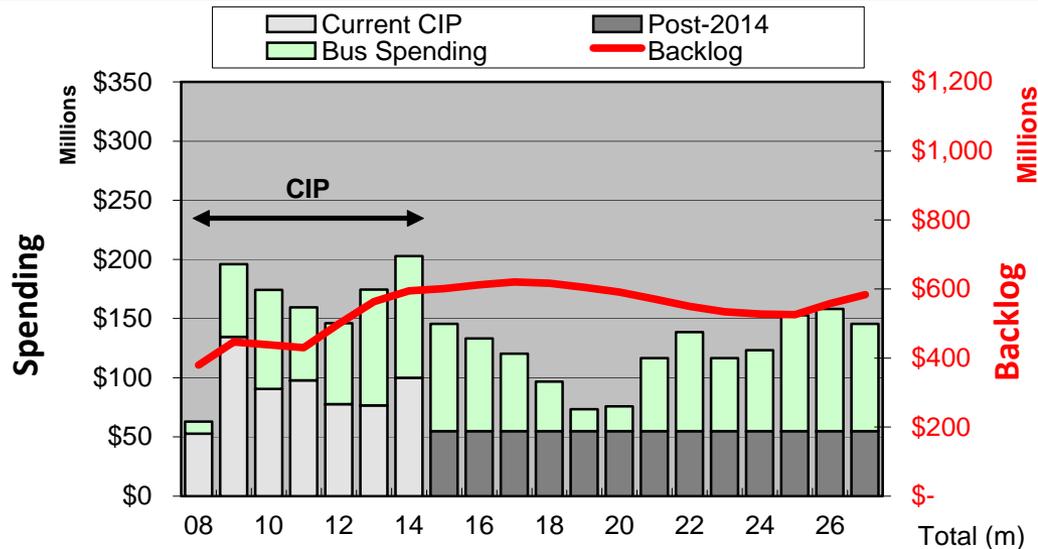
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Early/Short Cycles

Non-Bus Post-2014 CIP @ \$55 Million/Year

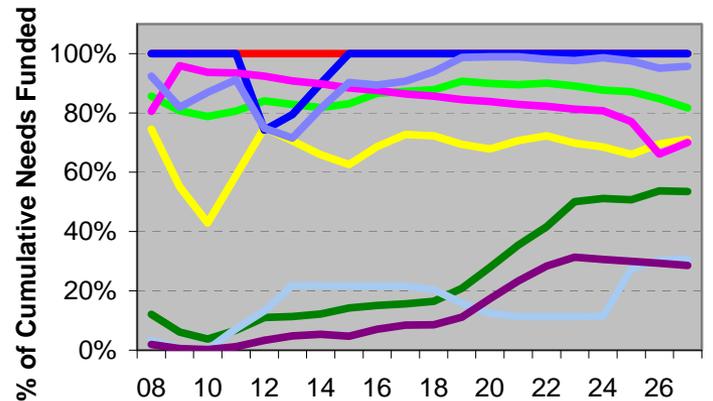
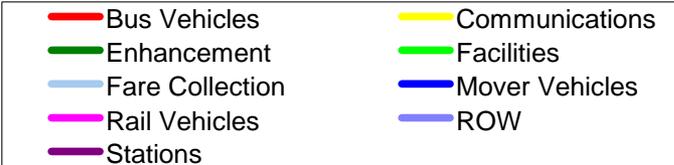
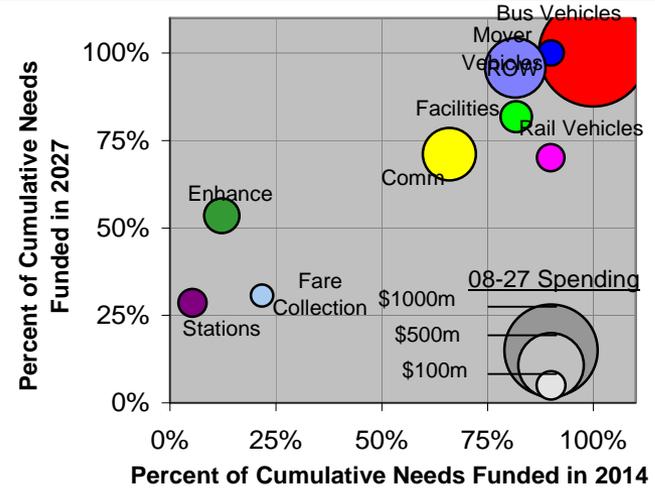
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 335
Enhancement	\$ 146
Facilities	\$ 118
Fare Collection	\$ 60
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 422
Stations	\$ 96
Total	\$ 2,713



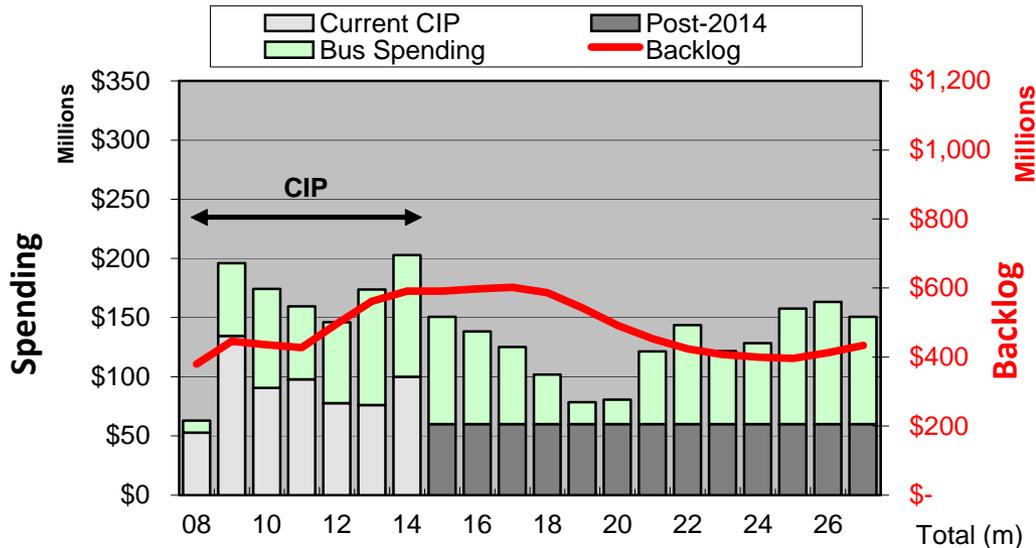
ASSET CONDITION



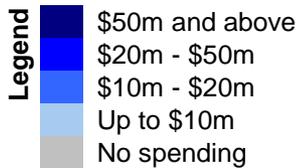
Early/Short Cycles

Non-Bus Post-2014 CIP @ \$60 Million/Year

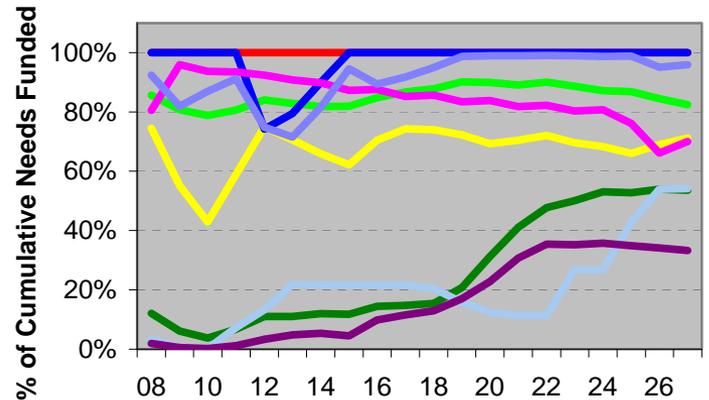
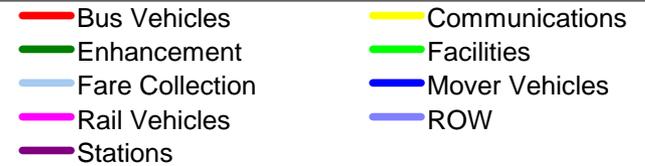
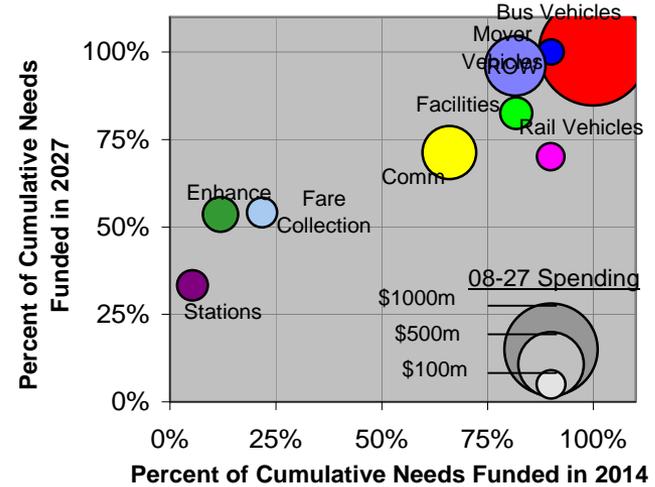
ANNUAL SPENDING



	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 335
Enhancement	\$ 146
Facilities	\$ 119
Fare Collection	\$ 105
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 423
Stations	\$ 112
	\$ 2,777



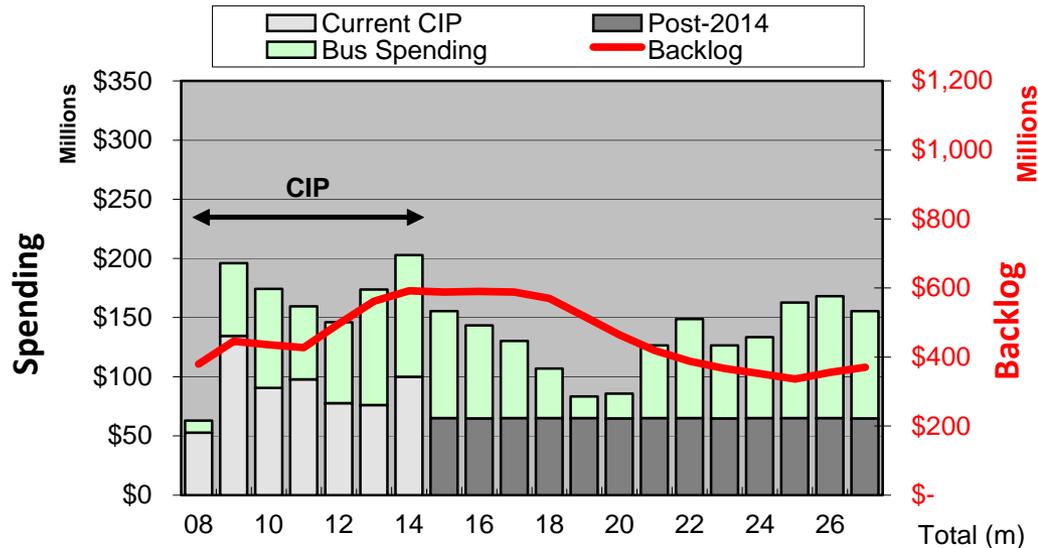
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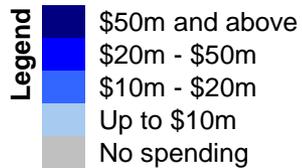
Early/Short Cycles

Non-Bus Post-2014 CIP @ \$65 Million/Year

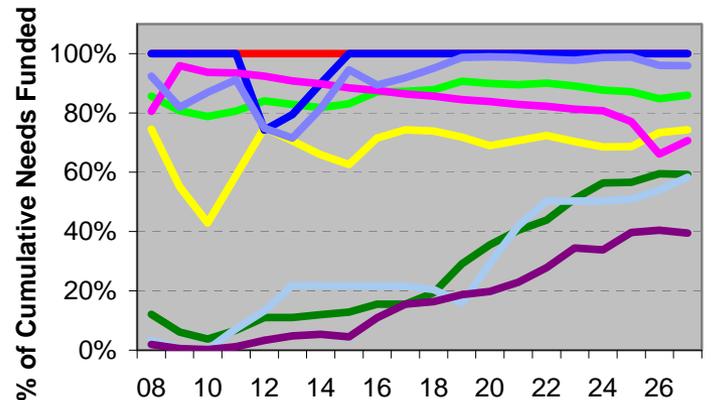
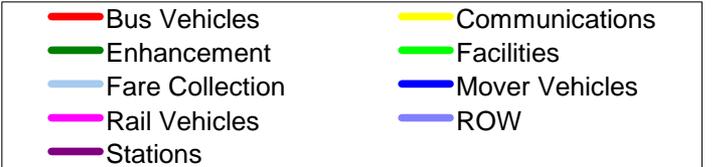
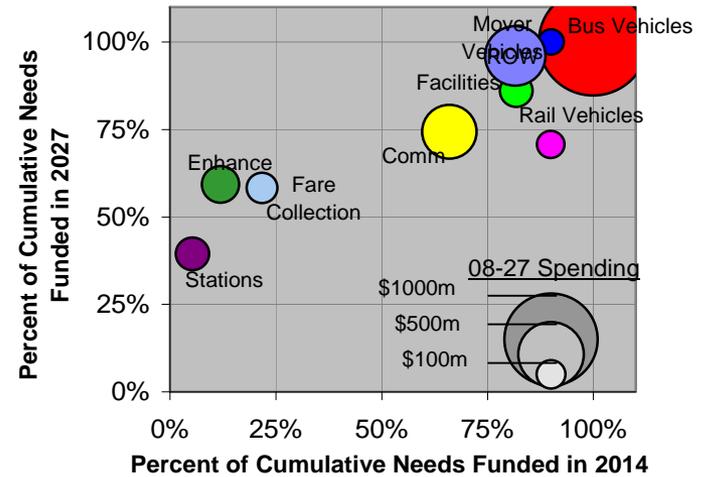
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 350
Enhancement	\$ 162
Facilities	\$ 125
Fare Collection	\$ 113
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 423
Stations	\$ 133
Total	\$ 2,842



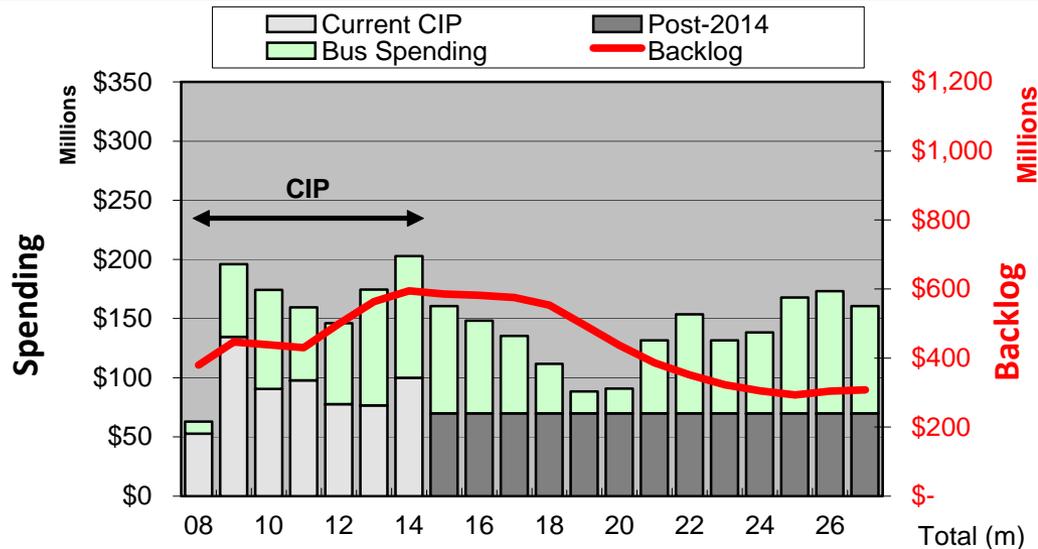
ASSET CONDITION



Early/Short Cycles

Non-Bus Post-2014 CIP @ \$70 Million/Year

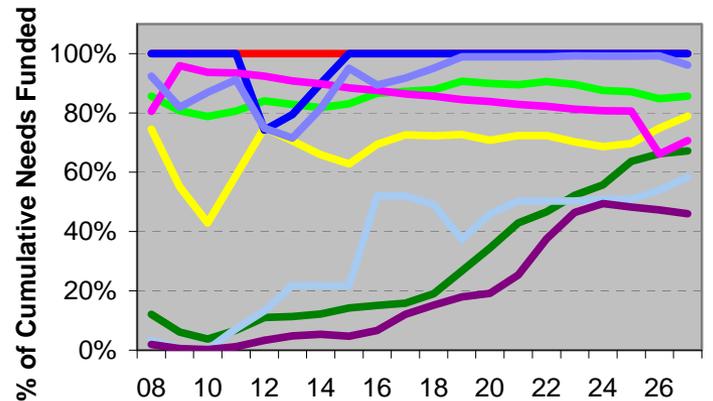
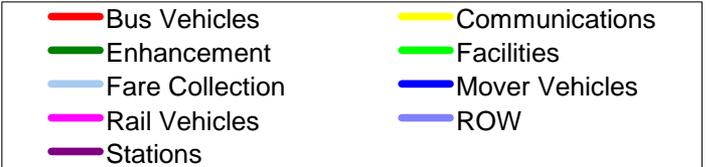
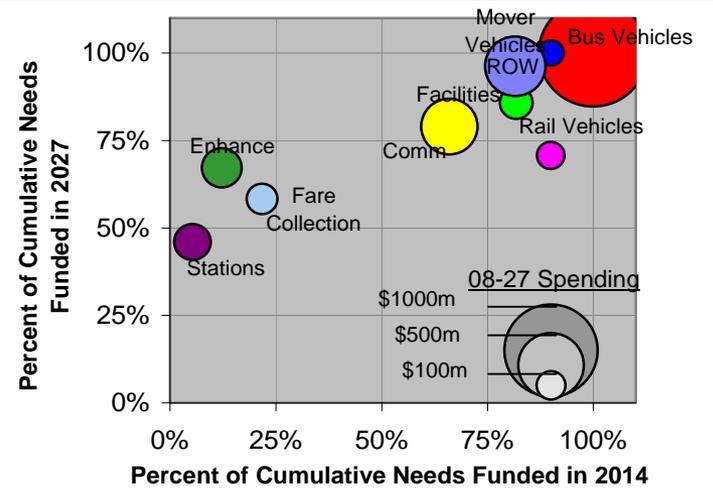
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 372
Enhancement	\$ 183
Facilities	\$ 124
Fare Collection	\$ 113
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 424
Stations	\$ 155
Total	\$ 2,908



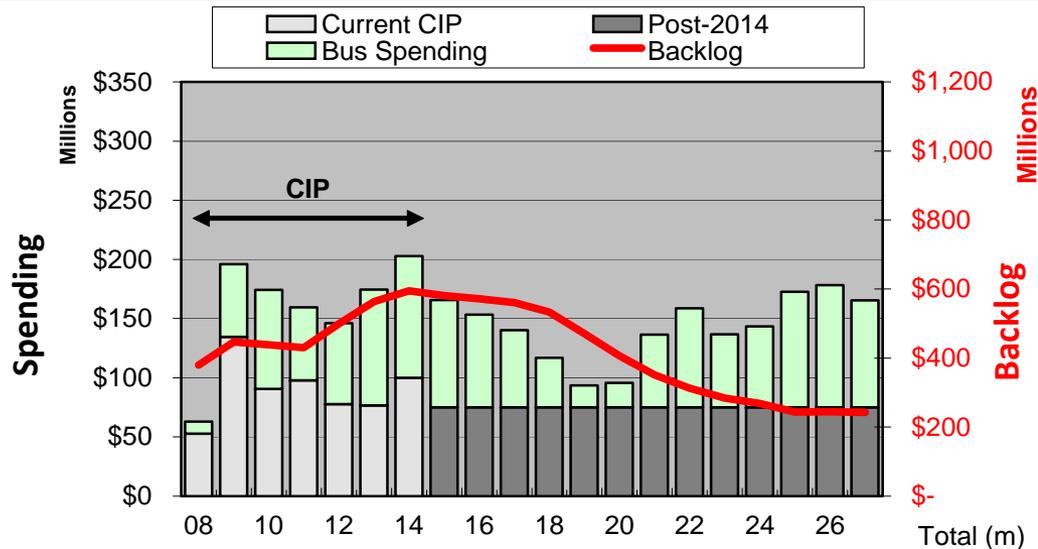
ASSET CONDITION



Early/Short Cycles

Non-Bus Post-2014 CIP @ \$75 Million/Year

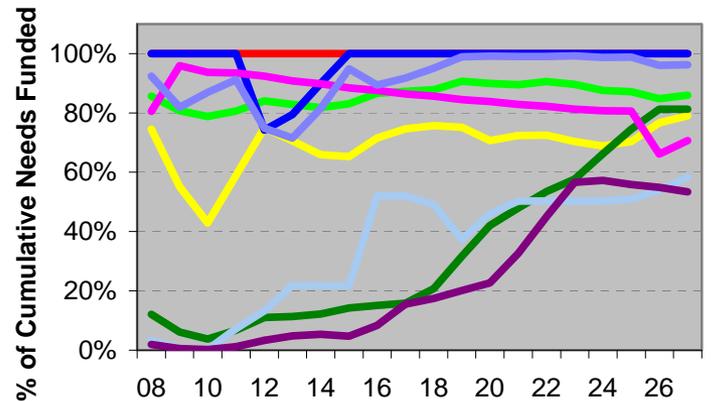
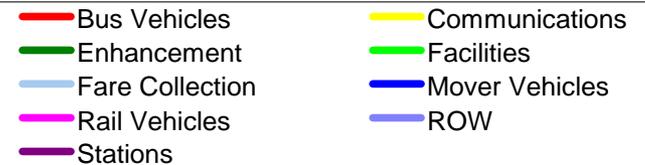
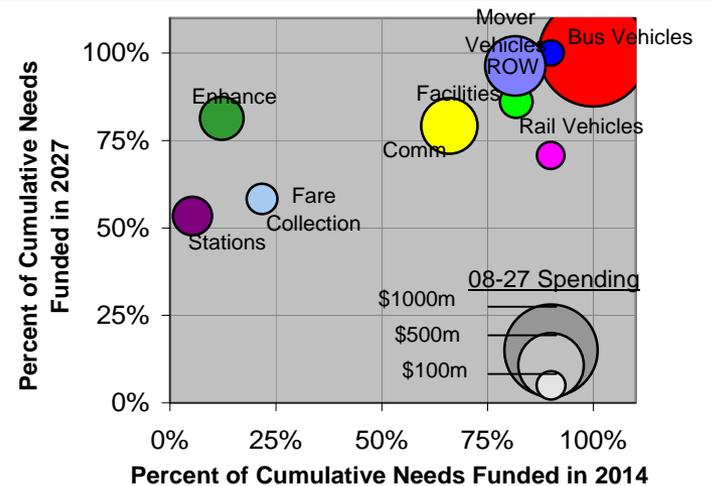
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 372
Enhancement	\$ 222
Facilities	\$ 125
Fare Collection	\$ 113
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 424
Stations	\$ 180
Total	\$ 2,973



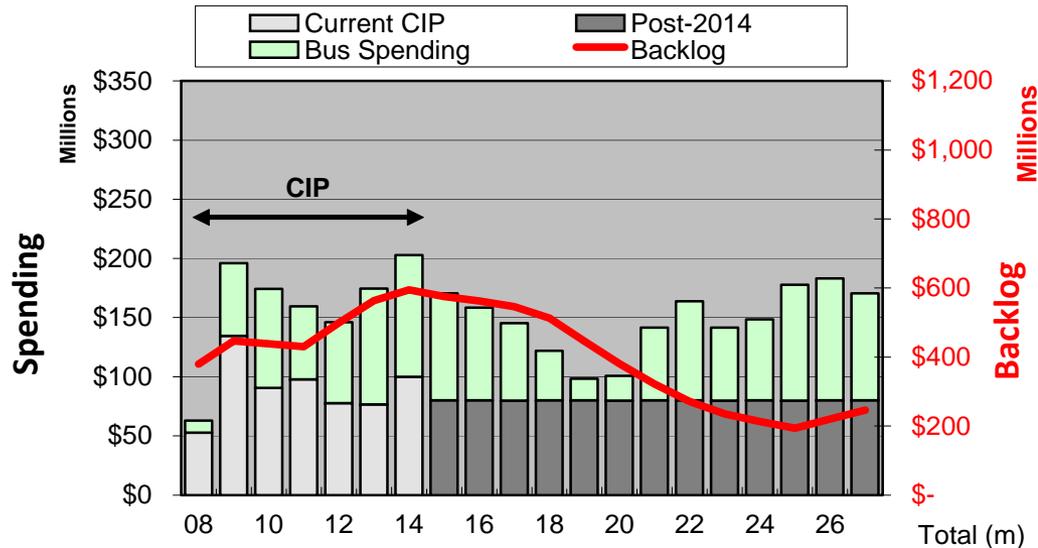
ASSET CONDITION



Early/Short Cycles

Non-Bus Post-2014 CIP @ \$80 Million/Year

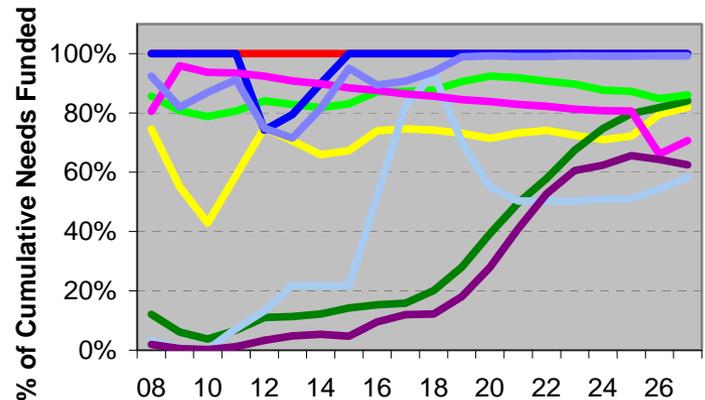
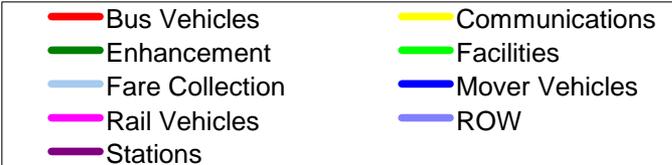
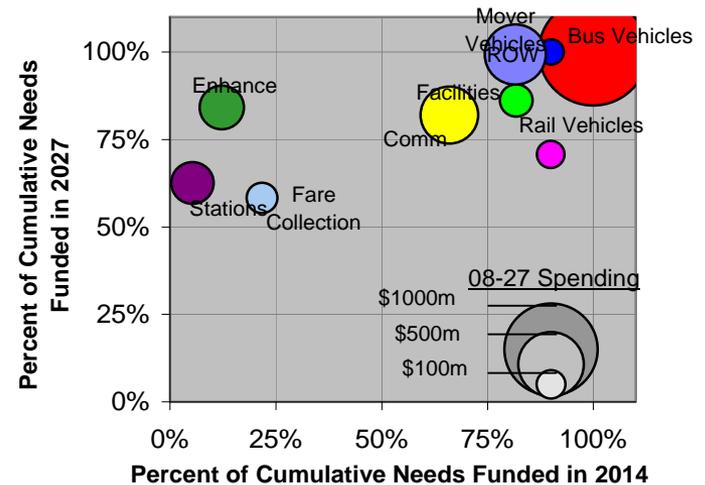
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 386
Enhancement	\$ 229
Facilities	\$ 125
Fare Collection	\$ 113
Mover	\$ 79
Rail Vehicles	\$ 90
ROW	\$ 437
Stations	\$ 210
Total	\$ 3,038



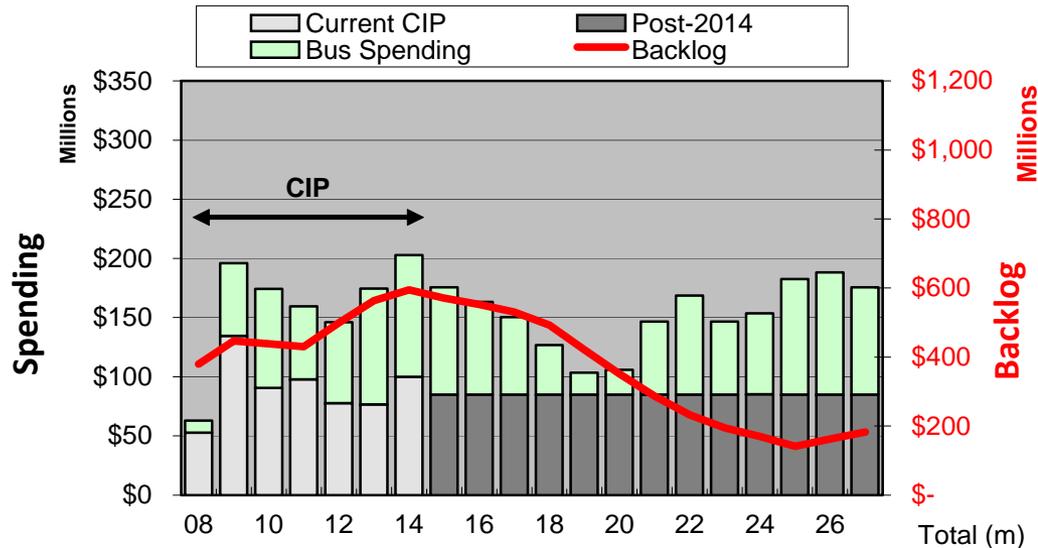
ASSET CONDITION



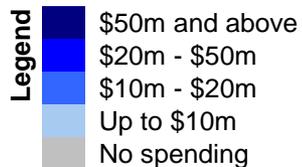
Early/Short Cycles

Non-Bus Post-2014 CIP @ \$85 Million/Year

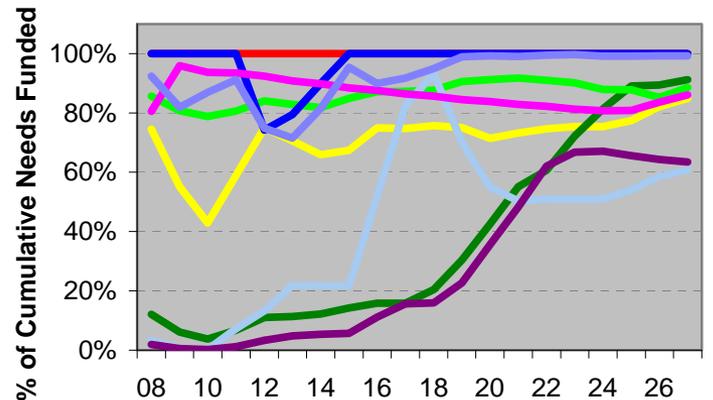
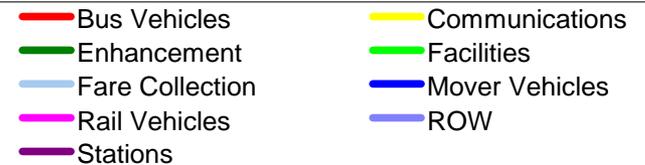
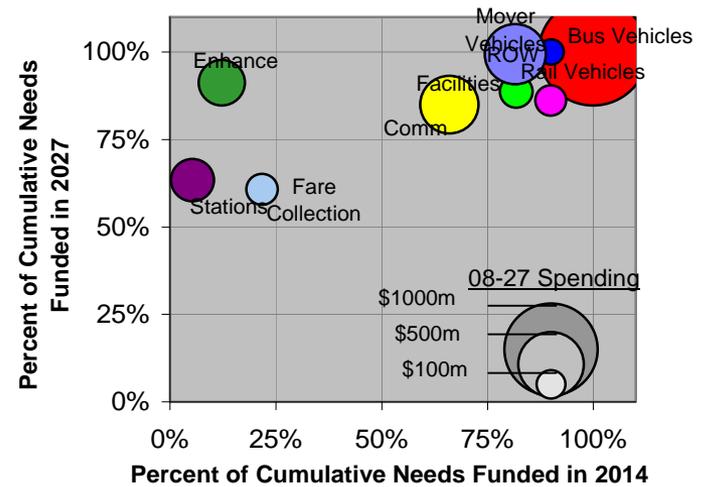
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 400
Enhancement	\$ 249
Facilities	\$ 128
Fare Collection	\$ 118
Mover	\$ 79
Rail Vehicles	\$ 110
ROW	\$ 438
Stations	\$ 213
Total	\$ 3,103



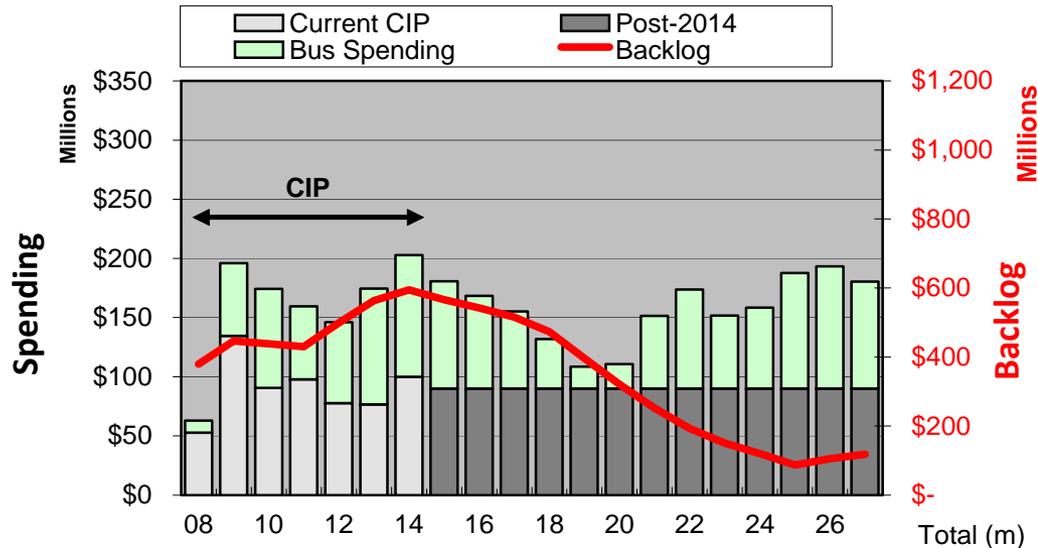
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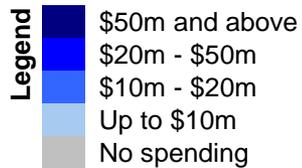
Early/Short Cycles

Non-Bus Post-2014 CIP @ \$90 Million/Year

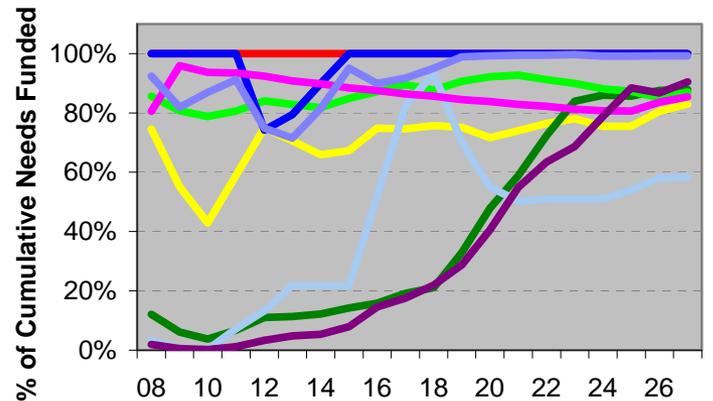
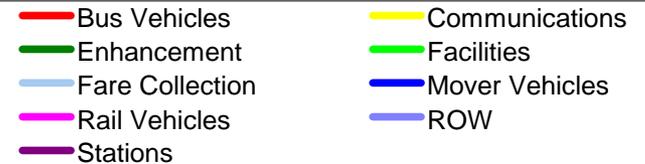
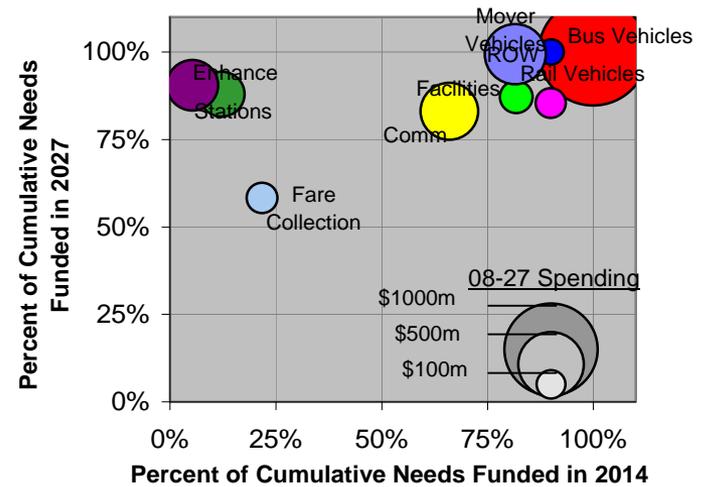
ANNUAL SPENDING



Bus Vehicles	\$ 1,368
Communicatio	\$ 391
Enhancement	\$ 240
Facilities	\$ 126
Fare Collection	\$ 113
Mover	\$ 79
Rail Vehicles	\$ 109
ROW	\$ 438
Stations	\$ 304
Total	\$ 3,168



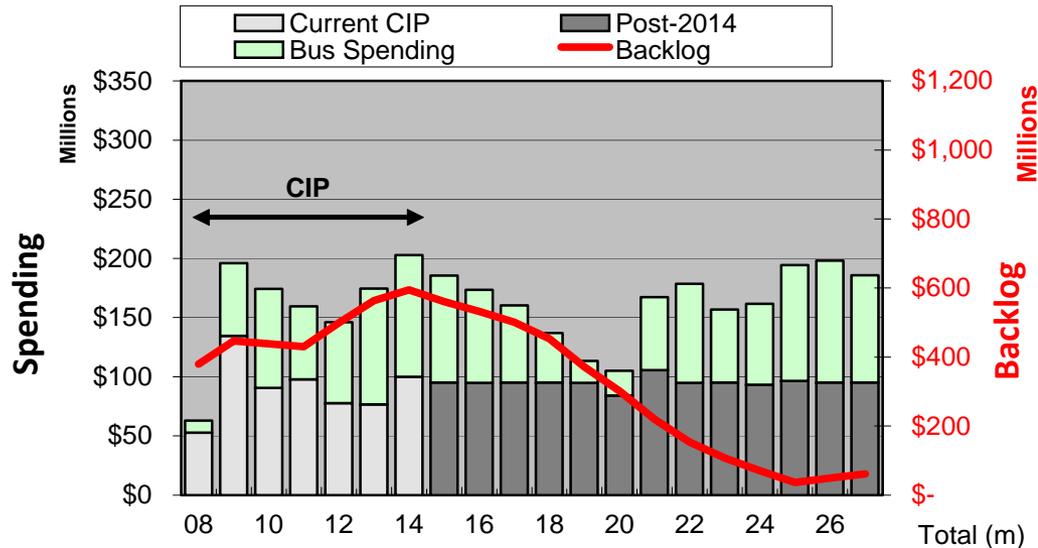
ASSET CONDITION



Early/Short Cycles

Non-Bus Post-2014 CIP @ \$95 Million/Year

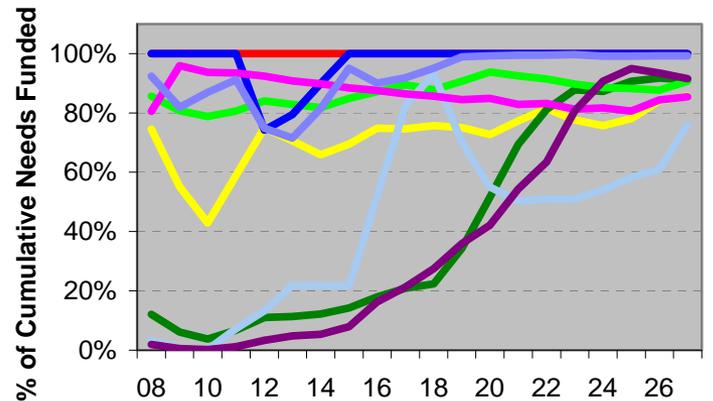
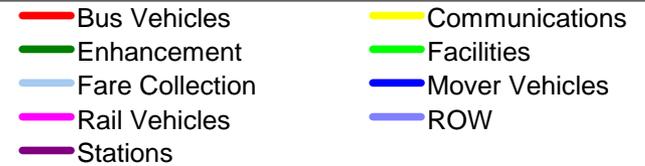
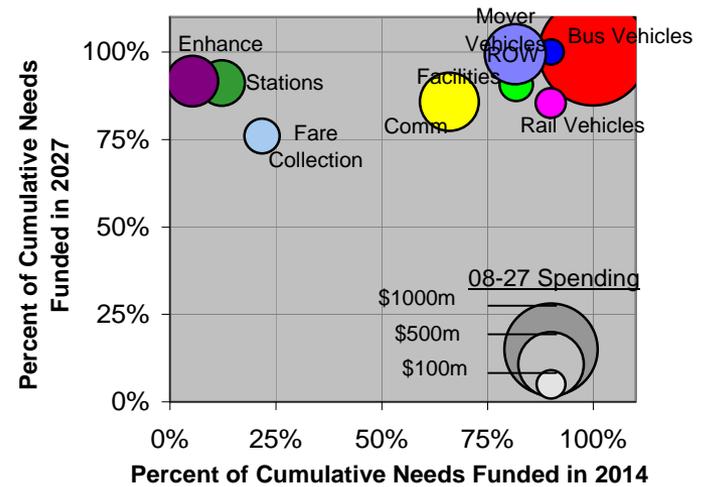
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 404
Enhancement	\$ 248
Facilities	\$ 131
Fare Collection	\$ 148
Mover	\$ 79
Rail Vehicles	\$ 109
ROW	\$ 438
Stations	\$ 308
Total	\$ 3,233



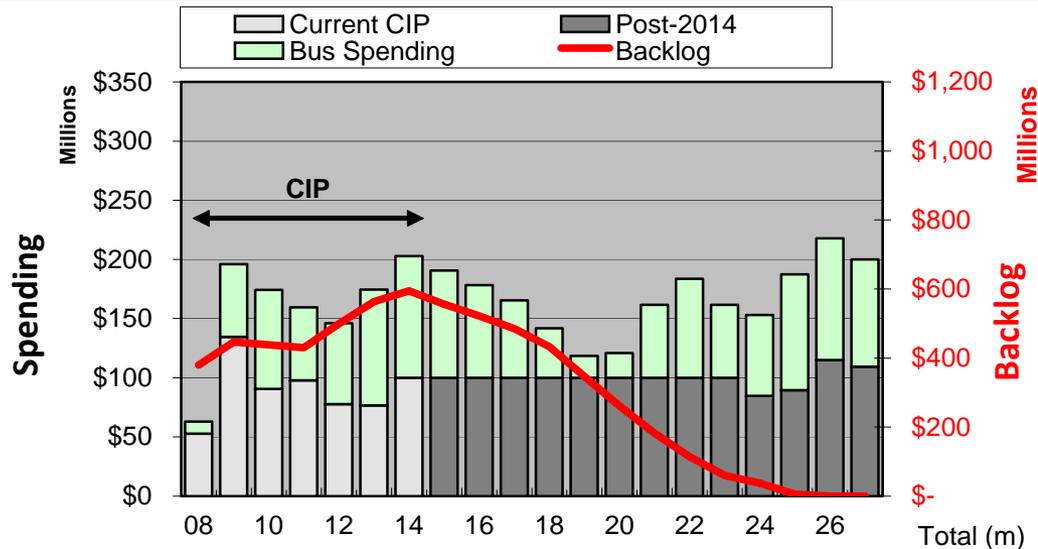
ASSET CONDITION



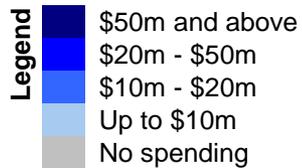
Early/Short Cycles

Non-Bus Post-2014 CIP @ \$100 Million/Year

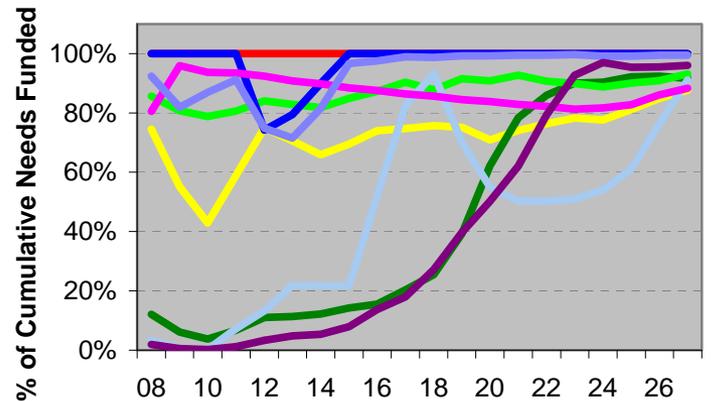
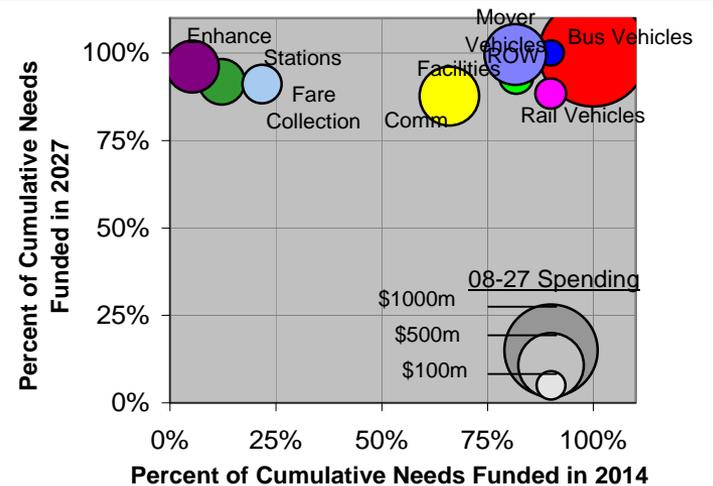
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 413
Enhancement	\$ 250
Facilities	\$ 135
Fare Collection	\$ 177
Mover	\$ 79
Rail Vehicles	\$ 113
ROW	\$ 438
Stations	\$ 323
Total	\$ 3,296



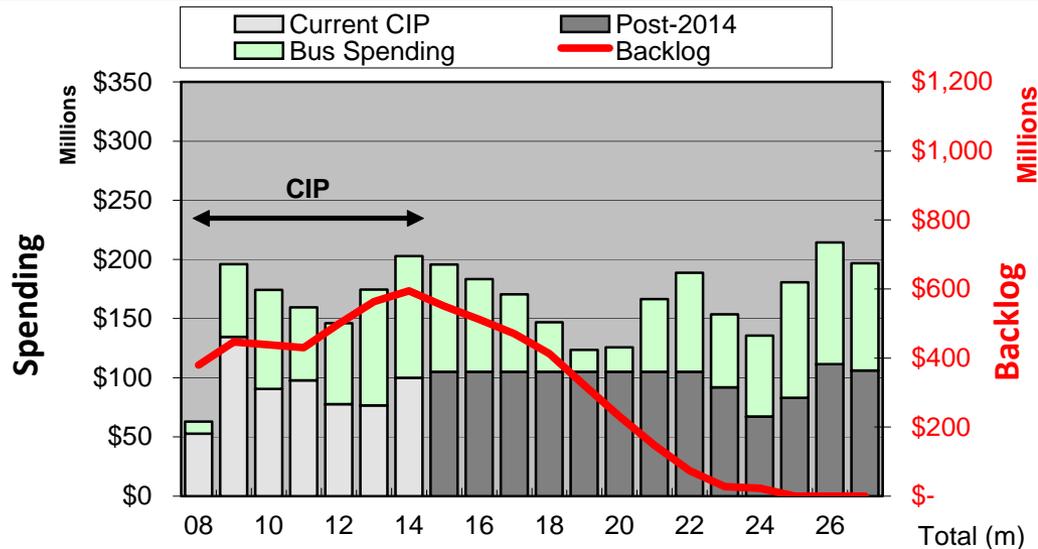
ASSET CONDITION



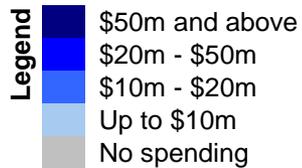
Early/Short Cycles

Non-Bus Post-2014 CIP @ \$105 Million/Year

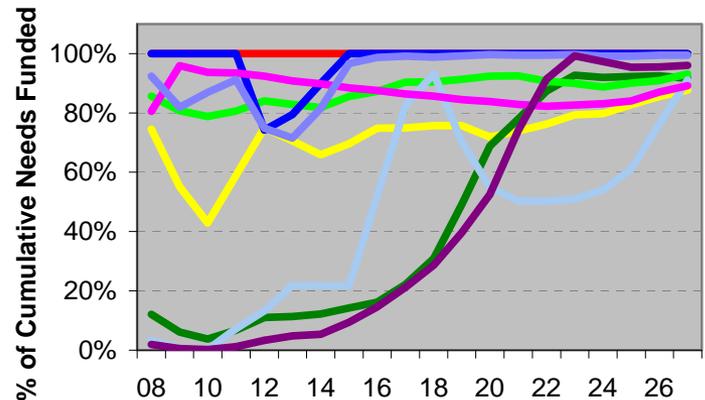
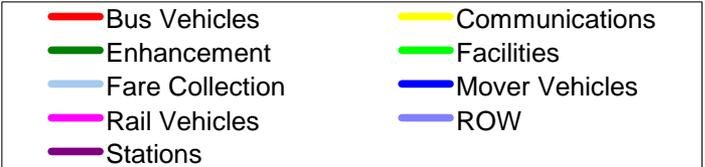
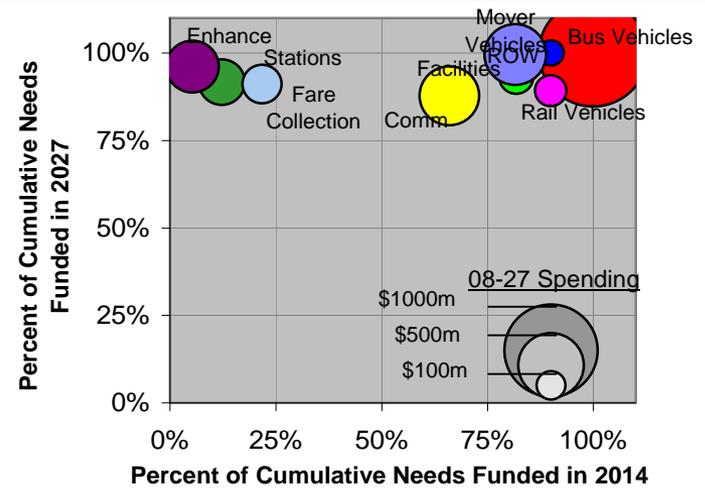
ANNUAL SPENDING



Category	Total (m)
Bus Vehicles	\$ 1,368
Communicatio	\$ 413
Enhancement	\$ 250
Facilities	\$ 135
Fare Collection	\$ 177
Mover	\$ 79
Rail Vehicles	\$ 114
ROW	\$ 438
Stations	\$ 323
Total	\$ 3,297



ASSET CONDITION





Questions?