

Traffic Signal Asset Management

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Fundamental Objectives

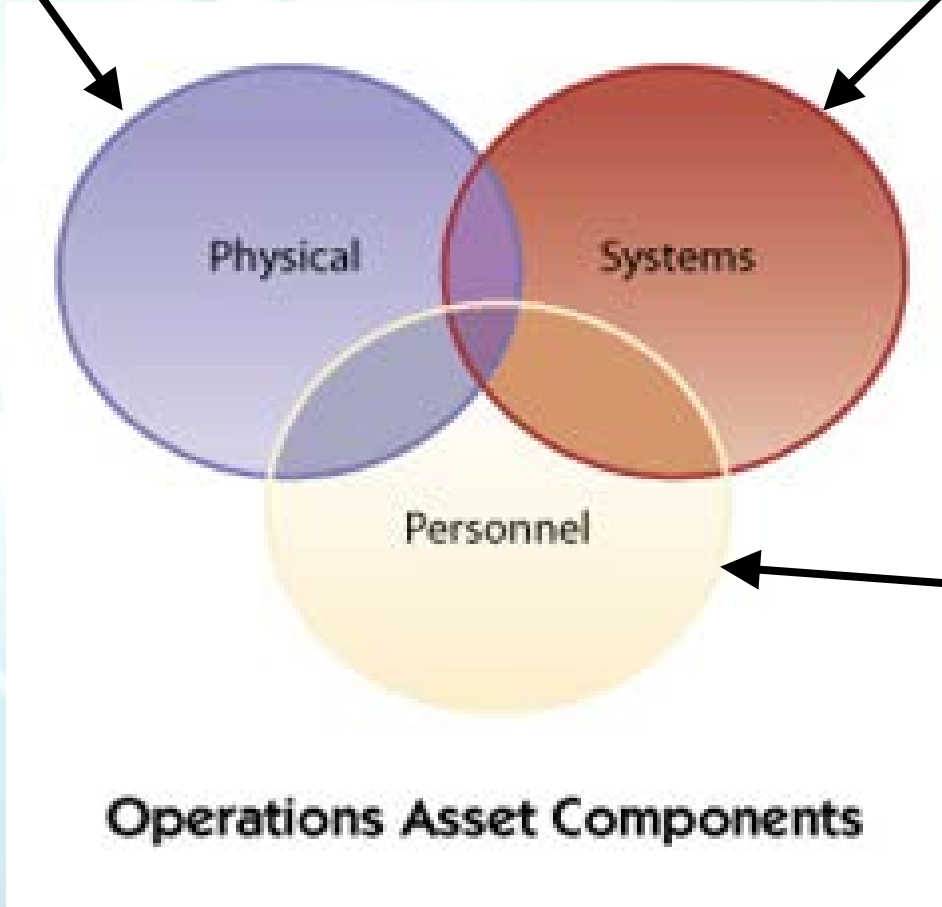
1. **Preserve our assets and minimize their whole life costs.**
2. **Operate in a financially sustainable manner.**
3. **Provides a framework to improve performance on a long-term basis**

The Law: (23 U.S.C. 101(a)(2), MAP-21 § 1103)

Asset management is a strategic and systematic **process** of **operating**, **maintaining**, and **improving** physical assets, with a focus on engineering and economic analysis based upon quality information, to identify a structured sequence of **maintenance**, **preservation**, **repair**, **rehabilitation**, and **replacement** actions that will achieve and sustain a desired **state of good repair over the lifecycle of the assets** at minimum practicable cost.

Where does ITS Infrastructure Fit In?

Signal Heads
Loop Detectors
Video Cameras
Controllers



Hardware
Software
Firmware
Communications
Operational
DataBase

Operators
Maintainers
Managers
Elected Officials

Operations Asset Components

Beyond Pavement and Bridges

Related to Operations Asset Management

- People
- Data
- Processes

Traffic Signal Asset Management applies those objectives to traffic signal systems

Valuation of Traffic Signals

Field hardware

Timing plan development

Communication cost

Central management system

Playing with numbers...

		<u>Hardware</u>	<u>Timing</u>						
Costs per Signal		\$ 240,000	\$ 5,000			1%			
Costs per System		\$ 800,000				10%			
		<u>Hardware</u>	<u>Timing</u>	<u>Comm</u>	<u>Other</u>			<u>M&O/Agency</u>	<u>M&O/Agency</u>
<u>Agency</u>	<u># Signals</u>	<u>Investment</u>	<u>Investment</u>	<u>Network</u>	<u>stuff</u>	<u>Central</u>	<u>Total per agency</u>	<u>1%</u>	<u>10%</u>
VDOT	212	\$ 50,880,000	\$ 1,060,000			\$ 800,000	\$ 52,740,000	\$ 527,400	\$ 5,274,000
Norfolk	306	\$ 73,440,000	\$ 1,530,000			\$ 800,000	\$ 75,770,000	\$ 757,700	\$ 7,577,000
Hampton	235	\$ 56,400,000	\$ 1,175,000			\$ 800,000	\$ 58,375,000	\$ 583,750	\$ 5,837,500
Virginia Beach	374	\$ 89,760,000	\$ 1,870,000			\$ 800,000	\$ 92,430,000	\$ 924,300	\$ 9,243,000
Suffolk	90	\$ 21,600,000	\$ 450,000			\$ 800,000	\$ 22,850,000	\$ 228,500	\$ 2,285,000
Newport News	257	\$ 61,680,000	\$ 1,285,000			\$ 800,000	\$ 63,765,000	\$ 637,650	\$ 6,376,500
Portsmouth	118	\$ 28,320,000	\$ 590,000			\$ 800,000	\$ 29,710,000	\$ 297,100	\$ 2,971,000
Chesapeake	170	\$ 40,800,000	\$ 850,000			\$ 800,000	\$ 42,450,000	\$ 424,500	\$ 4,245,000
Totals	1762	\$ 422,880,000	\$ 8,810,000	\$ -	\$ -	\$ 6,400,000	\$ 438,090,000	\$ 4,380,900	\$ 43,809,000
M&O @ 1%		\$ 4,228,800	\$ 88,100	\$ -	\$ -	\$ 64,000	\$ 4,380,900		
M&O @ 10%		\$ 42,288,000	\$ 881,000	\$ -	\$ -	\$ 640,000	\$ 43,809,000		

Portland Example

- **1070 signalized intersection**
- **10,500 streetlights**
- **Utilized risk of failure to prioritize budget**
- **Risk = Likelihood x Consequence**
 - Likelihood: probable time to failure
 - Consequence: severity of a failure

Portland: Risk Matrix Definition

Likelihood	Consequences				
	1 Very low	2 Low	3 Moderate	4 High	5 Very high
Very low (1)	VL	VL	L	M	M
Low (2)	VL	VL	M	M	H
Moderate (3)	L	L	H	H	E
High (4)	L	M	H	E	E
Very high (5)	L	M	H	E	E

Likelihood Rating	Years until Failure
Very High (5)	< 4 years
High (4)	5-10 years
Moderate (3)	11-14 years
Low (2)	15-19 years
Very Low (1)	> 20 years

Consequences:

- Safety
- Legal/regulatory
- Economic
- Service level
- Environmental

Portland: Signal Risk Examples

Asset	failure mode	Condition	Age interval	% of system	risk score
Traffic Signal Controller - High Crash Intersections (211)	Reached end of useful life (age based)	Very Good	0-5 years	51%	H
		Good			
		Fair	6-10 years	12%	
		Poor	11-15 years	7%	
		Very Poor	> 16 years	30%	
Traffic Signal Controller - School zones (551)	Reached end of useful life (age based)	Very Good	0-5 years	34%	E
		Good			
		Fair	6-10 years	13%	
		Poor	11-15 years	9%	
		Very Poor	> 16 years	43%	
Traffic Signal Controller - Transit/Freight (164)	Reached end of useful life (age based)	Very Good	0-5 years	52%	M
		Good			
		Fair	6-10 years	9%	
		Poor	11-15 years	6%	
		Very Poor	> 16 years	33%	

Utah Example

- **1883 Traffic Signals**
- **Objective (est. 2011)**
 - Realtime monitoring of health and quality
 - Track equipment failures and facilitate proactive maintenance
 - Long term maintenance planning
 - Inventory of equipment and configuration
- **Software tool: Customized TransSuite AIMS**

Virginia Example

- **1300 ITS Devices (CCTV, DMS, RWIS, HAR)**
- **5 Traffic Operations Center**
- **3000 Signalized Intersections**
- **Signal Needs Based Budgeting**
- **Intersection Sufficiency Rating**
- **Asset Management software: IBM Maximo**

Virginia Signal Needs Based Budgeting (NBB)

Utilized Maintenance and Operations needs based on asset inventory and conditions

- Signal Preventive Maintenance Needs
- Signal Repair Needs
- Signal Replacement Needs
- Signal Operating Needs

Allocate budget as percentage of needs

Virginia Intersection Sufficiency Rating (ISR)

Used to programming & prioritizing resources

Factors

- Safety
- Congestion
- Corridor Operations
- Maintenance/conditions levels
- Design standards
- Technology Obsolescence
- Roadway functional class volumes
- Others...

More than counting boxes...

- **Digital information is an asset**
 - Manage the total cost of ownership
 - Replacement vs maintenance vs update?
 - Buy and maintain vs Lease
- **Measuring Return On Investment**
 - Monitor the performance being delivered
 - Monitor the cost to maintain performance

MAP-21 National Goals

- 1. SAFETY**
- 2. INFRASTRUCTURE CONDITION**
- 3. CONGESTION REDUCTION**
- 4. SYSTEM RELIABILITY**
- 5. FREIGHT MOVEMENT AND ECONOMIC VITALITY**
- 6. ENVIRONMENTAL SUSTAINABILITY**
- 7. REDUCED PROJECT DELIVERY DELAYS**

The Law: (23 U.S.C. 119(e)(1), MAP-21 § 1106)

Each State is required to develop a risk-based asset management plan for the National Highway System (NHS) to improve or preserve the condition of the assets and the performance of the system.

What are the scope and content of a risk-based asset management plan?

1. States must address pavements and bridges but are **ENCOURAGED** to include all infrastructure assets within the highway right-of-way in their risk-based asset management plan. (Also can include roads other than on the NHS.)
2. Includes strategies that lead to a program of projects that would make progress toward achievement of the State targets for asset condition and performance of the NHS

Risk-Based Asset Management Plan

1. **Pavement and bridge inventory and conditions on the NHS**
2. **Objectives and measures,**
3. **Performance gap identification,**
4. **Lifecycle cost (management for the whole-life) and risk management analysis,**
5. **A financial plan, and**
6. **Investment strategies**

Resources Are Available

- **FHWA MAP-21 website**
 - <http://www.fhwa.dot.gov/map21/>
- **FHWA Office of Asset Management:**
 - <http://www.fhwa.dot.gov/asset/index.cfm>
- **AASHTO Asset Management Guide – A Focus on Implementation**
 - <http://www.fhwa.dot.gov/asset/pubs/hif13047.pdf>
- **NHI Transportation Asset Management Training Courses**
 - <http://www.nhi.fhwa.gov>
 - Evaluating Performance of Traffic Signal Systems (133123)
 - Successful Traffic Signal Management
- **AASHTO Asset Management Subcommittee**
- **TRB Asset Management Committee**