Hampton Roads Transportation Operations Strategy

May 2016

Prepared for:

VDOT

the heartbeat of HAMPTON ROADS TPO
Transportation Planning Organization

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1.0 Introduction

The urbanized area of Hampton Roads contains 14 county-level jurisdictions consisting of 5 counties and 9 Cities. Seven of these cities have responsibilities for operating and maintaining the arterial roadway networks and traffic signal systems within their respective jurisdictions. In addition, the Virginia Department of Transportation operates and maintains the Region's interstate facilities and the arterial roadway networks and signal systems in the surrounding counties. In 2004, the region developed an ITS Strategic Plan, which has been used to support the development and funding for ITS projects throughout the region. While the plan had a positive effect on advancing ITS on the interstate system, the plan had little impact to operations on the arterial/surface streets. In order to build upon where the ITS Strategic Plan left off, the Hampton Roads Transportation Planning Organization has begun efforts to identify and document Transportation System Management and Operations (TSM&O) activities that have applicability to the region and can be implemented to advance local and regional transportation operations. The ultimate goal of these efforts will be to develop a Hampton Roads Transportation Operations Strategy that will guide the implementation of TSM&O activities.

Developing a Hampton Roads Transportation Operations Strategy will be a continual process that will be completed across multiple tasks. The purpose of the initial task described in this document was to begin identifying the Regional Vision for TSM&O, assess each individual locality's TSM&O capabilities, and identify the challenges and opportunities of the localities and the region in developing a TSM&O strategy. In order to achieve these objectives, a committee of stakeholders was developed including representatives from the following organizations and jurisdictions:

- City of Chesapeake
- City of Hampton
- Hampton Roads Transit (HRT)
- Hampton Roads Transportation Planning Organization (HRTPO)
- City of Newport News
- City of Norfolk
- City of Portsmouth
- City of Suffolk
- City of Virginia Beach
- Virginia Department of Transportation (VDOT)
- Williamsburg Area Transit Authority (WATA)

1.1 Proposed Regional Vision

In order to begin to develop the Regional Vision for Hampton Roads, it was necessary to involve all stakeholders to ensure consensus and a shared purpose. To facilitate development of the Regional Vision, a daylong Vision Development Workshop was held with all stakeholders on September 15, 2015 to discuss what they thought the region's vision for TSM&O should be. Key topics discussed included the scope of the vision, horizon (near-term and long-term objectives),

limitations, and challenges/impediments to achieving a regional vision. The complete meeting summary for the Vision Development Workshop is provided in Appendix A; however, the following key criteria were established to begin framing the Regional Vision:

- The Regional Vision should focus on long-term, fiscally unconstrained goals and objectives with subsequent plans/programs focused on constrained, near-term solutions to make progress towards the long-term goals.
    - The Regional Vision will need to be a living document that evolves over time to address the ever-changing landscape of TSM&O.
- The Regional Vision should focus on arterial operations. Although interstate and arterial operations were acknowledged to be inextricably linked, it was decided that the Regional Vision should focus more so on arterials since the VDOT Transportation Operations Center (TOC) already operates regional interstate facilities in a coordinated manner.
- The Regional Vision should focus on providing motorists throughout Hampton Roads with a seamless experience as they traverse jurisdictional boundaries.
- The Regional Vision should strive to develop active traffic management (ATM) practices for the region to create a more proactive rather than reactive TSM&O strategy.
- The Regional Vision should strive to achieve full integration between agencies and jurisdictions including improved communications, data sharing, and collaboration.

Based upon these high level criteria and feedback from stakeholders, the preliminary Hampton Roads Regional Vision statement for TSM&O is as follows:

To actively manage traffic 24 hours per day, 7 days per week through a fully integrated Regional system of information and devices in order to provide Hampton Roads motorists with a seamless travel experience.

2.0 Capabilities Assessment Criteria

In order to assess the current state of TSM&O throughout Hampton Roads, it was necessary to establish a set of criteria on which to measure existing TSM&O programs and practices. Rather than create a unique set of metrics for TSM&O in Hampton Roads, it was determined that a more objective, national standard should be used. To this end, "a specific guidance framework has been developed [by the Federal Highway Administration (FHWA)] to help transportation agencies improve the effectiveness of their TSM&O activities. The framework is based on self-evaluation regarding the key process and institutional capabilities required from a transportation agency (or group of agencies) to achieve effective TSM&O. This framework is adapted from a concept developed in the IT industry called the Capability Maturity Model, which has been tailored to the transportation community." [1] It was therefore decided to use the FHWA Capability Maturity Model (CMM) as a metric for examining existing TSM&O programs in Hampton Roads.

The CMM identifies a total of six key dimensions (and corresponding sub-elements) for effective TSM&O activities which include: [1]

1. Business Processes – formal scoping planning, programming, and budgeting;
2. Systems and Technology – systems architecture, standards, interoperability, and standardization and documentation;
3. Performance Measurement – measures definition, data acquisition, analysis, and utilization;
4. Culture – technical understanding, leadership, policy commitment, outreach, and program authority;
5. Organization and workforce – organizational structure, staff capacity, development, and retention; and
6. Collaboration – relationships with public safety agencies, local governments, MPOs, and the private sector.

[1] Federal Highway Administration. *Creating an effective program to advance transportation system management and operations.* Publication FHWA-HOP-12-003. FHWA, U.S. Department of Transportation, 2012.

For each of the six dimensions noted above, the CMM identifies four distinct levels of agency capability through measures/observations of the agency's TSM&O activities. (For the purposes of this document, the term "agency" will be used interchangeably to refer to individual municipalities/localities and VDOT.) The four levels of capability and general definitions are as follows: [1]

- Level 1: Performed – Activities and relationships largely ad hoc, informal, and champion-driven – substantially outside the mainstream of other transportation activities.
- Level 2: Managed – Basic strategy applications in place with key process and needed staff capacities under development – but limited accountability and collaboration and sustainable resources.
- Level 3: Integrated – Standardized strategy applications implemented in priority contexts and managed for performance; the TSM&O technical and processes developed, documented, and integrated into the regional transportation agencies, partnerships aligned.
- Level 4: Optimized – The TSM&O as full, sustainable, region-wide program, established on the basis of continuous improvement with all partners.

The four levels of capability as noted above can be further defined based on each individual dimension of the CMM as shown in

Table 1 on the following page. Using this framework as a basis, a questionnaire was developed and disseminated to each of the agencies to assess the state of their current TSM&O activities. The questionnaire was designed to help each agency arrive at a self-assessment scoring level through a detailed examination of their program at a deeper level than what is provided for in the FHWA CMM framework directly. Questions were created based on feedback from stakeholders at the Vision Development Workshop and were also designed to help begin the process of identifying next steps to achieving the regional vision and areas for improvement for each agency such that common themes could be identified. A copy of the questionnaire is provided in Appendix B.

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Table 1: Capabilities Maturity Model Self-Assessment Framework[2]

Dimensions	Capability Level Criteria – Level 1 Performed	Capability Level Criteria – Level 2 Managed	Capability Level Criteria – Level 3 Integrated	Capability Level Criteria – Level 4 Optimizing
Business Processes (Planning and Programming)	Each jurisdiction doing its own thing according to individual priorities and capabilities	Consensus regional approach developed regarding TSM&O goals, deficiencies, B/C, networks, strategies and common priorities	Regional program integrated into jurisdictions' overall multimodal transportation plans with related staged program	TSM&O integrated into jurisdictions' multi-sectoral plans and programs, based on formal continuing planning processes
Systems and Technology	Ad hoc approaches to system implementation without consideration of systems engineering and appropriate procurement processes	Regional ConOps and architectures developed and documented with costs included; appropriate procurement process employed	Systems and technology standardized and integrated on a regional basis (including arterial focus) with other related processes and training as appropriate	Architectures and technology routinely upgraded to improve performance; systems integration interoperability maintained on continuing basis
Performance Measurement	Some outputs measured and reported by some jurisdictions	Output data used directly for after-action debriefings and improvements; data easily available and dashboarded	Outcome measures identified (networks, modes, impacts) and routinely utilized for objective-based program improvements	Performance measures reported internally for utilization and externally for accountability and program justification
Culture	Individual staff member champions promote TSM&O, varying among jurisdictions	Jurisdictions' senior management understands TSM&O business case and educates decision makers/public	Jurisdictions' mission identifies TSM&O and benefits with formal program and achieves wide public visibility/understanding	Customer mobility service commitment accountability accepted as formal, top level core program of all jurisdictions
Organization/Staffing	TSM&O added on to units within existing structure and staffing – dependent on technical champions	TSM&O-specific organizational concept developed within among jurisdictions with core capacity needs identified, collaboration takes place	TSM&O Managers have direct report to top management; Job specs, certification and training for core positions	TSM&O senior managers at equivalent level with other jurisdiction services and staff professionalized
Collaboration	Relationships ad hoc and personal (public-public, public-private)	Objectives, strategies, and performance measures aligned among major players (transportation and public safety agencies (PSAs)) with after-action debriefing	Rationalization/sharing/formalization of responsibilities among key players through co-training, formal agreements, and incentives	High level of TSM&O coordination among owner/operators (State, local, private)

[2] Federal Highway Administration. O*rganizing for reliability – capability maturity model assessment and implementation plans. Table 1.2.* FHWA, U.S. Department of Transportation, 2002.

3.0 Capabilities Assessment Process and Findings

The capabilities assessment questionnaire discussed in Section 2.0 was then administered to TSM&O staff from each municipality and VDOT through a series of capabilities assessment interviews conducted over the course of November and December 2015. Prior to conducting the interviews with each agency, TSM&O staff at the City of Norfolk volunteered to provide a pilot interview to assess the effectiveness of the questionnaire and refine the interview process. After the pilot interview, one interview—with follow-up conversations as necessary—was conducted with each agency's TSM&O activity overseers or their designated staff based upon direction from each agency. Interviews were conducted either face-to-face or via teleconference depending on the availability of TSM&O staff. Detailed summaries of each interview are provided in Appendix C.

After conducting capabilities assessment interviews with each agency, results were synthesized to identify common themes between agencies and develop an assessment of the region's TSM&O capabilities as a whole. Results from each agency were taken into consideration to develop a regional score for each dimension of the framework based upon the most common activities practiced—or not practiced—by each agency. Table 2 provides a summary of the self-assessment results for the Hampton Roads region as a whole with supporting details provided to substantiate each score. For the purposes of the regional assessment, scores were assigned using only whole numbers or ranges (i.e. 1-2) where necessary to capture the differences between agencies within the region. It was determined that precise numerical scores were not necessary since the goal of the self-assessment was to examine relative performance and guide the development of enhancement strategies.

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Table 2: Regional Self-Assessment Scoring Results

Regional Capability Maturity Matrix		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• Each jurisdiction has its own priorities and capabilities that are not greatly influenced by surrounding jurisdictions. • Operations are generally of some importance to the management within each jurisdiction, but the level of involvement ranges greatly. When specific issues arise, level of management involvement increases. • Jurisdictions in the region do not have dedicated operations budgets. Instead, operations is funded through the General Fund or transportation/public works operating budgets. • The jurisdictions largely feel that they do not have adequate budgets for operations. Many would like the ability to hire additional staff. • There are some asset management programs in place throughout the region; however, they are used to varying degrees. Programs are not used for planning and programming with limited personnel cited as primary reason for lack of use.
Systems and Technology	1	• The systems/technologies that would be needed to allow seamless boundaries for travelers across the region are not in place. • Technologies and processes are not standardized regionally or within many jurisdictions in the region. • There is a general need to collect more data including video surveillance in order to better manage operations. • All jurisdictions support implementing some region-wide standards for items such as flashing yellow arrows, emergency vehicle preemption, and signal timings; however, there would need to be further discussion and agreements in place before moving forward with regional signal hardware or adaptive signal control standards.
Performance Measurement	1	• There are no programs in place within jurisdictions to measure system reliability. • There are no jurisdictional or regional, user-based performance measures in place to measure the effectiveness of travel through the network (e.g., travel time reliability). *See footnote below
Culture	1-2	• Senior management within most jurisdictions is supportive of operations. Executive management becomes engaged on specific issues. • Most jurisdictions see benefit in being able to actively manage traffic but few feel that it would be possible in the near future given limited personnel and budgets.
Organization/ Staffing	1	• The jurisdictions generally do not have dedicated operations staff. Most jurisdictions have several staff members who share responsibilities between operations and maintenance tasks. • TOCs throughout the region are generally staffed during the work week; however staff are typically also responsible for responding to field calls which leaves the TOC unmanned. • Most jurisdictions identified the need for additional, dedicated TOC personnel. • Many jurisdictions cited a lack of skilled labor force available to fill operations positions (e.g., signal engineers, TOC operators, and technicians).
Collaboration	1	• There is some collaboration and information sharing between different departments within each jurisdiction, but in general relationships are on a case by case basis rather than systematic. • Jurisdictions would generally like to improve communication and collaboration with 911 operators, EOCs, and first responders. This could include computer aided dispatch feeds to jurisdictional and regional TOCs. • Most jurisdictions are interested in creating Corridors of Regional Significance to create seamless boundaries for motorists on key corridors. Depending on the level of integration, standard operating procedures would need to be established. • There are mixed opinions amongst jurisdictions on allowing an outside organization to support/control systems after hours. It is agreed that MOUs would need to be developed which document specific criteria for when and how control would be assumed.
General	The following facilities were proposed to be considered as Corridors of Regional Significance (See Section 4.1.1 of this report): Airline Boulevard, Centerville Turnpike, Denbigh Boulevard, Fort Eustis Boulevard, George Washington Highway, Hampton Boulevard, High Street, J Clyde Morris Boulevard, Jefferson Avenue, Kempsville Road, Mercury Boulevard, Military Highway, Portsmouth Boulevard, Route 10, Route 17, Route 58, Route 60, Route 134, Route 168, Route 460, Shore Drive, Tidewater Drive, Victory Boulevard, Virginia Beach Boulevard, Warwick Boulevard, and Wythe Creek Road.	

*HRTPO measures speeds, congestion level, and travel time reliability by roadway segment as part of their Congestion Management Process.

4.0 Opportunities for Enhancement

Using the results of the self-assessments conducted with each agency and the overall regional self-assessment, a series of opportunities for enhancement were identified to help improve TSM&O activities in Hampton Roads and move the region closer to achieving the proposed Regional Vision. These opportunities are described in more detail below, but are generally broken into short-, medium-, and long-term categories based on the level of complexity or perceived challenges associated with capitalizing on the individual opportunity.

4.1 Short-term Opportunities (0-2 years)

Opportunities categorized as short-term included those that could be easily implemented or for which there seemed to be few barriers such that implementation could occur with two years. Short-term opportunities include strategies that generally require enhanced collaboration and will require some regional dialogue but will likely not require significant infrastructure investments. Short-term opportunities are discussed in more detail in the following subsections.

4.1.1 CORRIDORS OF REGIONAL SIGNIFICANCE (CORS)

In order to create seamless boundaries for motorists traveling between cities and VDOT-maintained facilities, there is an opportunity to identify major corridors and alternate routes that will benefit the most from having better coordination and communication amongst agencies. The map shown in Figure 1 depicts the CoRS identified by the agencies interviewed. These facilities represent critical arterial and freeway corridors that provide links between localities within Hampton Roads or provide connectivity to key water crossings and evacuation routes. The facilities identified on this map may require additional cameras for added surveillance capabilities, additional field hardware for data collection, communication equipment to allow for integration and connectivity, and coordinated signal timing plans to address incident response.

4.1.2 ENHANCED COMMUNICATION

Using the CoRS as an initial subset of facilities on which to focus attention, there is an immediate opportunity to enhance communication among affected agencies when planned and unplanned incidents occur. Near-term communications enhancements could include simply calling the affected jurisdictions/agencies, email alerts, text messages, or other means of notification. The actual processes and procedures for enhanced communication will need to be identified in future efforts. Any communication alternatives should not significantly increase workloads for the notifying agency or be difficult to acquire/interpret by the receiving agency.

Figure 1
Proposed Corridors of Regional Significance

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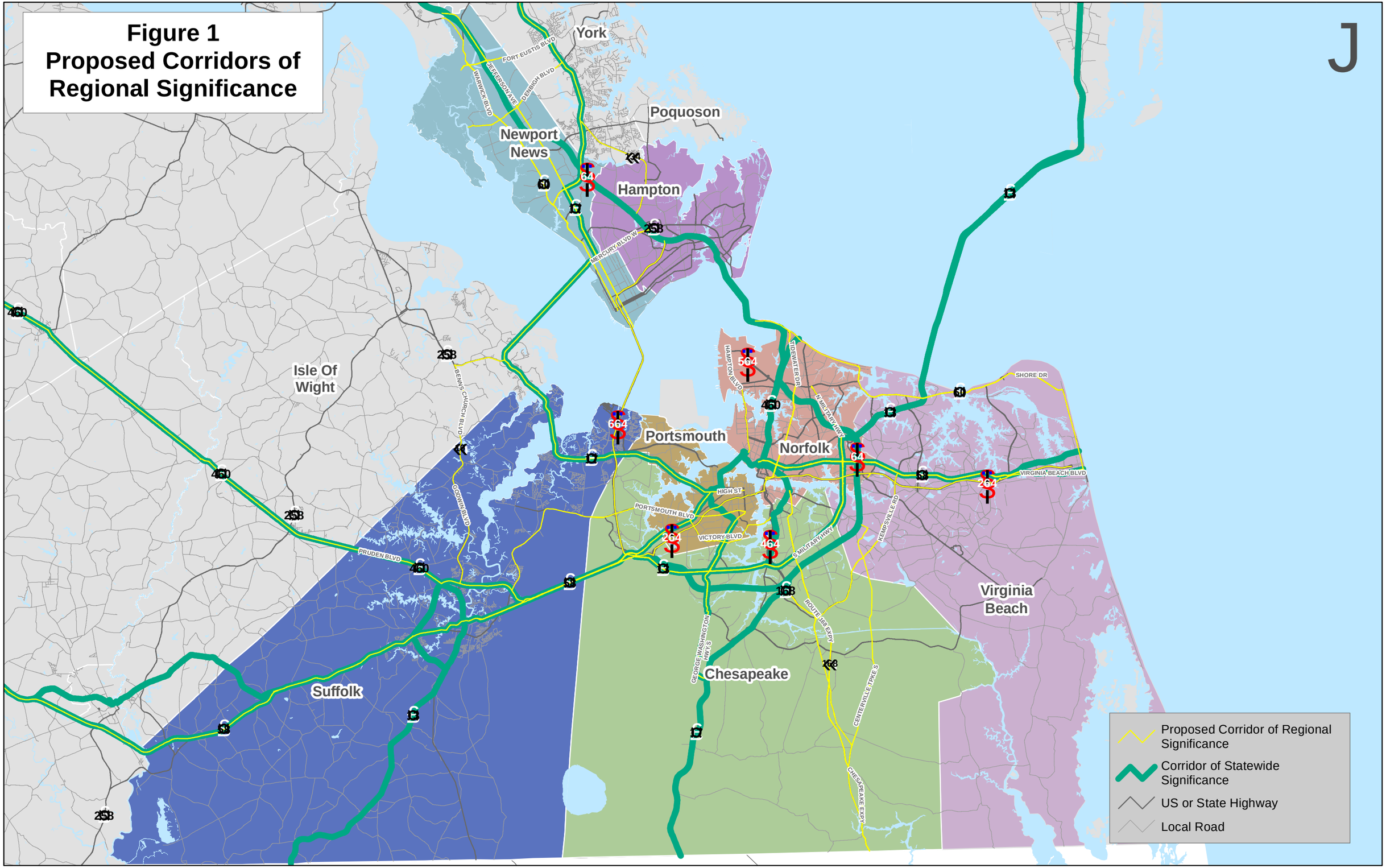

4.1.3 COMPUTER AIDED DISPATCH (CAD) ENHANCEMENTS

As an initial means to better identify incidents along the CoRS and elsewhere, there is an opportunity to improve integration of computer-aided dispatch (CAD) feeds from local police departments with VDOT's 511 Virginia system. It was identified through the interviews that a number of incidents occurring on the arterial network are not being identified by jurisdictional Traffic Operations Centers (TOC) nor the VDOT TOC. By modifying and removing filters on local jurisdiction CAD feeds there is an opportunity to better identify incidents on the arterial network that may negatively impact operations at the local and regional levels. Any enhancements to CAD feeds/filters will likely require additional coordination with the local police departments and may require Memoranda of Understanding (MOU) to be developed to protect sensitive information that may be provided. In addition, a review of the workload that will be required of the VDOT TOC operators to input the information into VATraffic may be needed.

4.1.4 INCIDENT RESPONSE SIGNAL TIMING PLANS

A number of the jurisdictions have predeveloped incident response signal timing plans to address the rerouting of traffic during planned and unplanned incidents. This rerouting of traffic may occur from the freeway system to the arterial system and vice versa. There is an opportunity to create coordinated timing plans across jurisdictions and agencies as well as link existing plans together to create a unified approach to incident response. The initial focus of this effort may be on the CoRS and the alternate routes.

4.1.5 PERFORMANCE MEASURES

There is an opportunity to measure the performance of existing infrastructure and how it impacts travel across the region. Currently the Region, with the exception of VDOT, is not measuring performance of the system or its components (infrastructure). There is an opportunity to identify performance measures and develop a "report card" for transportation systems within the region. Any performance measures to be developed will need to be vetted so as to not create undue burden on those entities collecting and analyzing the data while maintaining consistency across agencies. Secondly, the results of the analyses need to be in a format that will be easily understood by executive management such that they will be able to make informed business decisions, particularly with respect to funding obligations. Example measures could include:

- System Reliability – measure of how a jurisdiction's infrastructure is functioning and its availability (device uptime)
    - Number and percent of cameras online
    - Number and percent of detectors functioning
    - Percent of communication system operational
    - Produce a "Report Card" for the Region
        - Questions that would be required to be answered include - Who could report these metrics on a quarterly/annual basis? Could the HRTPO be the entity to provide the quarterly updates as part of their annual work program?

- System Performance (initially on CoRS) – measure of how the system is performing relative to moving people and goods. (Additional discussion is required to identify a complete list)
    - Travel Time
    - Incident Duration
    - Etc.

4.1.6 REGIONAL TRAFFIC ENGINEERING/ITS STANDARDS

All of the municipalities and VDOT identified that there is an opportunity to adopt regional traffic engineering/ITS standards to help reduce the number of different traffic engineering devices/strategies deployed across neighboring jurisdictions. With the adoption of regional standards, there is an opportunity to create more consistency in the application of devices and strategies from one jurisdiction to another that results in uniform driver expectancy for the region. Several of the standards identified as immediate adoptions included:

1. Flashing Yellow Arrow (FYA) – the adoption of this standard could include when and where to use the device, standard signage to be used with the device, and a regional deployment strategy
2. Change and Clearance Intervals – most localities in the region indicated that they have adopted the updated VDOT change and clearance interval calculations. This could simply be a formal adoption of the VDOT Traffic Engineering Division memorandum by each jurisdiction.
3. Emergency Vehicle Preemption (EVP) – there is currently a project being vetted through the Hampton Roads Transportation Operations subcommittee for the regional deployment of EVP. This includes the identification of a regional standard for the equipment and regional coding schema.
4. Other – Other yet to be determined standards to be identified by stakeholders.

4.2 Medium-term Opportunities (3-10 years)

Opportunities categorized as medium-term included those that could be implemented with some strategic planning and significant coordination to build consensus or establish standards and could likely be implemented in 3 to 10 years. Medium-term opportunities may require some infrastructure investment and broad-ranging regional concurrence on agreements and Memoranda of Understanding. Medium-term opportunities are discussed in more detail in the following subsections.

4.2.1 CONTROLLER PLATFORM

A number of localities indicated that there may be an issue with connectivity of signal systems due to different hardware and controller platforms. As VDOT continues to conduct its systems engineering evaluation for a single statewide controller platform, the outcome of VDOT's evaluation may provide the necessary information for the Region to adopt its findings and reduce integration issues by establishing a regional standard platform. The HRTO subcommittee should continue to monitor the efforts of VDOT. While migrating to a new platform would likely be a long-term process, CoRS could be the first facilities identified for replacement/upgrade.

4.2.2 MEMORANDA OF UNDERSTANDING (MOU)

All of the jurisdictions interviewed do not have TOCs that operate 24/7/365, but all of them have the capability to remotely access/control/operate their signal systems. In order to create a seamless network for motorists that operates in a 24/7 environment, there is an opportunity for VDOT's TOC to operate the signal systems of local jurisdictions after hours, particularly in the event of a planned or unplanned event that may impact the arterial system. Findings from the interviews conducted indicate that there is a willingness to allow VDOT to control signals under prescribed conditions. In order to allow VDOT to control their signals, each locality indicated that they would require an MOU to be developed and executed prior to the assumption of control. In support of the MOU, a clear set of prescribed conditions and Standard Operating Procedures (SOP) will need to be developed that articulate under what conditions assumption of control will be permissible and what level of control/modification would be allowed. This assumption of control will also require the development of the Incident Response Signal Timing Plans discussed in a previous, short-term opportunity.

Other MOUs and SOPs may be required to address the CAD feeds/filtering, resource sharing, integration, and other data sharing items that may be identified as the Regional Operations evolve. MOUs and SOPs will be critical for improving collaboration throughout the region from a resources and operational perspective.

4.2.3 ASSET MANAGEMENT

Almost all of the localities interviewed indicated that they currently have an asset management system in some form. If the Region elects to implement Performance Measures, having asset management systems that are more widely used would be beneficial for determining the magnitude of the investment the Region has made in Operations infrastructure, the remaining useful life of devices, and developing a needs-based budget that accurately reflects the state of the system. The asset management system(s) should be capable of providing decision makers with adequate information to make informed decisions without significantly increasing the workload of those maintaining the system.

4.2.4 REGIONAL TRAFFIC ENGINEERING/ITS STANDARDS

VDOT and all of the jurisdictions interviewed identified that there is an opportunity to adopt regional traffic engineering/ITS standards to reduce the number of different traffic engineering devices/operations deployed across neighboring jurisdictions. However, a number of jurisdictions indicated that some standards would need more vetting than others and may require a systems engineering evaluation to ensure the various devices and software would meet their functional requirements. The adoption of regional standards would create more consistent operations (fewer variables) from one jurisdiction to another for the motoring public, and allow for integration of systems among the numerous jurisdictions in the Region. Several of the standards identified as medium to long-term adoptions included:

1. Adaptive Signal Systems – most localities within the region either have limited deployments of adaptive traffic signal control in place or are interested in its deployment. Establishing a regional standard would allow for economies of scale with respect to system hardware

and software procurement as well as training costs for TSM&O staff. Opinions on the type of adaptive control system used and its appropriate use differ significantly throughout the region which would require further discussion between stakeholders to agree upon a regional standard.

2. Traffic Signal and ITS Hardware – most localities in the region expressed interest in establishing regional traffic signal controller standards. Notable benefits include the opportunity for cost savings due to purchasing strength (economy of scale) and shared training for locality staff.
3. Traffic Signal Central System Software – establishing a regional standard for traffic signal central system software would allow ease of interoperability between local agencies and would streamline after hours control of local traffic signals by VDOT.
4. Other – Other yet to be determined standards to be identified.

4.2.5 OPPORTUNITY FOR THIRD PARTY VENDORS

There may be an opportunity to support Regional Operations over the 3-10 year timeframe through the use of third party vendors. This may take the form of enhanced traffic data to detect incidents or delays such as Google, INRIX, Tom Tom, HERE, etc.

4.3 Long-term Opportunities (11+ years)

Opportunities categorized as long-term included those that would need significant infrastructure investment or likely face substantial barriers to implementation and would require more than 10 years to realize. Long-term opportunities are discussed in more detail in the following subsections.

4.3.1 INTEGRATED INFRASTRUCTURE

The long term vision of the region is to have localities fully integrated with one another to allow for interoperability, data sharing, and the potential to operate as a fail over site. Long term integration of the infrastructure would require regional standards to be adopted, common software and hardware platforms, and MOUs and SOPs to be established.

4.3.2 REGIONAL 24/7/365 TOC

The long term vision of the region is to develop a fully integrated regional TOC that operates not only the interstate system but also the arterial system 24/7/365. This regional TOC would provide signal system operations for each city and county, incident management, traveler information services, etc.

4.3.3 REGIONAL TRAFFIC ENGINEERING/ITS STANDARDS

This item will be a long term effort as technology and traffic engineering principles evolve.

4.3.4 CONNECTED VEHICLES

The development and deployment of a fully connected transportation system will require a robust technological platform. The platform will need to be a combination of well-defined technologies, interfaces, and processes that will ensure a safe, stable, interoperable, and reliable transportation system. The United Stated Department of Transportation (USDOT) and private-sector firms are currently in the process of conducting research and small scale deployments to advance the connected vehicle concept. While connected vehicles may be a long term focus area, the region will need to remain abreast of developments in this area so that the region can begin to identify strategies and procedures to address issues pertaining to adopting standards for interoperability; ensuring security of the system; strategies that may be impacted by human behavior and risks associated with driver's workload; and processes that define how travelers and equipment become a certified part of the connected system.

5.0 Recommended Next Steps

Based on the findings from the Capability Maturity Assessment, it is recommended that the HRTO Subcommittee consider advancing the elements found in the Short-Term Opportunities section to initiate the creation of a Regional Operations strategy. Those activities require coordination and communication between agencies and minimal financial investment in infrastructure.

As opportunities for improvement are implemented, technologies and processes throughout the region will change. Consequently, the Regional ITS Architecture will need to be revisited and updated to reflect the operational enhancements implemented in the region.

APPENDIX A
VISION DEVELOPMENT WORKSHOP MEETING SUMMARY

HAMPTON ROADS TRANSPORTATION OPERATIONS STRATEGY

WORKSHOP #1 — SUMMARY | September 15, 2015 9:00am-2:00pm

Vision Development

Attendees

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The following summary represents our understanding of the topics covered during our September 15, 2015 Hampton Roads Transportation Operations Strategy Vision Development Workshop. This summary is based on notes taken during the discussion. If this differs from your understanding, please notify us within the next two weeks so that we may resubmit a final copy for the project records.

Introduction

- Meeting attendees offered introductions for the benefit of the group.
- HRTO Co-Chairs offered overview of the project and intended purpose.
  - More focus needs to be placed on operations in the region.
  - Need to develop a collaborative plan that each municipality and VDOT and embrace.
  - Region will have a stronger voice if a unified plan is developed.
  - Need to develop a living plan that is revisited over time to assess its effectiveness and adjust goals/objectives.

  - The region needs to determine what operations will look like in the future and develop a plan or set of plans to move the region in that direction.
- Kimley-Horn provided an overview of the project process and purpose of the Vision Workshop and the desired goals and objectives for the day's discussion.
  - Vision workshop to develop vision for operations in Hampton Roads.
  - Capabilities assessments to determine where each stakeholder's operations program currently is with respect to the regional vision.
  - Summarize capabilities in a capabilities matrix.
  - Develop regional operations framework
- It was determined that a final vision statement would not be agreed to at this workshop but that development of the vision statement would be an iterative process.

Visioning Discussion

- Limitations
  - It was determined that the focus of the vision should be on improving arterial operations.
    - Focus on freeway operations can be limited in nature since VDOT currently has an integrated operations system. However freeways cannot be ignored as freeway operations have direct, substantial impacts on arterial operations.
    - It was acknowledged that a well-developed, robust operations program would address the arterial/freeway interface (i.e. interchanges).
- Vision development
  - It was noted that the previous Operations Plan written in 2004 was more focused on details and less on long term vision.
    - Stakeholders agreed that this should be reversed for the current visioning.
    - Existing plan is now obsolete as technologies and industry trends have changed.
  - Desire is for vision to remain relevant for long term use.
  - Desire was for vision to look at a 25 to 30 year horizon.
    - Desire to develop more detailed interim plans/programs for interim milestones such as 5 or 10 years.
  - Discussion was held regarding whether vision should be fiscally constrained or unconstrained. Ultimately it was decided that vision should be unconstrained to provide long-term goals/objectives.
    - Individual plans to achieve the vision should be fiscally constrained.
  - It was discussed that motorists should have a seamless experience as they travel throughout Hampton Roads.
    - More real-time data will be required to achieve seamless experience.
    - Operators need more data to manage traffic in real time and motorists need more data to make informed decisions.
    - Discussion was held regarding what seamless means for day-to-day operations such as clearance intervals, flashing yellow arrow implementation, etc.

- Communications will be key between stakeholders, not only automated/data communications but also basic voice/telephone coordination between operators.
  - It was noted that better communications links need to be established between local operations centers.
  - The types of data/information to be shared will need to be better defined than it currently is.
- It was noted that active traffic management is desirable. Discussion was held on how to define active traffic management (ATM).
  - Noted that ATM may be defined differently by different jurisdictions and there should be some standardization of what ATM is so expectations on implementation are clear.
  - Stakeholders indicated that ATM should include monitoring and adjusting traffic operations in real time.
  - Providing transportation information to the public in real time.
  - Observing traffic conditions to make adjustments to existing operations plans.
- It was noted that not all arterials are equal. Discussion was held regarding corridors of regional significance that could be identified (e.g. I-264 and Virginia Beach Boulevard or I-664 and Bridge Road).
  - Task forces could be established to create subcommittees that focus on specific corridors. This will help keep the right stakeholders focused on issues that impact them.
  - This approach could be considered as a phased approach to implementing regional operations.
- The vision needs to address both everyday operations as well as active management during incidents/planned events.
- Discussion was held regarding freight considerations. Although it was determined that the vision should focus on vehicular movement, freight should be a part of the plan as rail crossings, bridge lifts, and port operations have substantial impacts on the arterial network.
  - It was noted that federal regulations often limit operational capabilities to influence rail and water crossings. A regional plan or committee would be able to have a stronger voice to influence scheduling of rail operations or water crossings.
- It was discussed that 24/7 active management of operations should be an ultimate goal.
  - Several municipalities noted that they currently do not have resources for 8 hours per day, 5 day per week operations management.
  - It was noted that the benefits of 24/7 operations would need to be evaluated. The benefits of active traffic management during off peak periods (e.g. late at night) may not justify the costs of staffing operations centers around the clock.
  - It was noted that VDOT currently staffs their freeway operations centers 24 hours per day and personnel there could manage traffic signal operations during nighttime and off peak periods.

- Stakeholders generally agreed that they would be in favor of exploring options for sharing control of their systems with other agencies. It was noted that this will require a very high degree of communications reliability to achieve.
    - Sharing control of a jurisdictions' system would need to be done under pre-approved conditions. MOUs would need to be developed to support this concept.
- The ability to use technology and automation was suggested in order to reduce staffing requirements for 24/7 management.

o It was suggested that a regional entity could be established to help manage regional operations. The entity could be a standalone organization or a subset of a current organization such as Hampton Roads Transportation Planning Organization (HRTPO).

o Discussions were held regarding the opportunity to share resources and benefit from economies of scale.
- Stakeholders agreed that it is not necessary to fully staff nine independent traffic operations centers. This duplication of resources creates unnecessary costs for each municipality.
- Discussion was held regarding sharing of existing resources. It was noted that each municipality may not need to have duplicate staff.
- Virginia Beach noted that they could share signal technicians with fiber splicing skills.
- The cooperation between Virginia Beach and Chesapeake with respect to the shared traffic sign production shop was noted as a good example of sharing resources.
- Economy of scale could be leveraged for regional maintenance or installation contracts. A single contractor could be procured to serve the region which could help drive down unit costs and share overhead costs between municipalities.
- It was suggested that sharing resources could help increase staffing resources for each municipality. The example was used that a traffic signal operations engineer may not be justified to manage only the signals of a single entity, but hiring a regional signal operations engineer would allow the cost to be borne by several budgets instead of only one.

o Summary of the high level points identified for the vision
- Seamless operations
- 24/7 active traffic management
- Fully integrated between agencies

o Hampton Roads Transit (HRT) noted that better communication between municipalities/agencies and transit would enhance their operations.
- HRT would like to keep riders better informed when operations issues arise.
- It was noted that no passenger information systems are currently in place along the Tide light rail system.
- Better information sharing will allow HRT to better manage their fleet and adjust to incidents/planned construction.

- HRT remains more of a user of the system rather than a provider. Enhanced operations on the arterial system enhances HRT's operations, which in turn enhances the services provided to its riders.

- Challenges/Impediments
  - Some municipalities have different philosophies with regards to operations.
    - Each municipality has unique challenges and issues that it faces.
    - The vision will need to be broad enough so that it can be applied to each municipality.
    - VDOT discussed the need for policy changes that can easily be implemented to effect change. The example of reducing data filtering for shared data was given. By allowing more data to be shared, VDOT and municipalities can make better decisions about how to manage operations. It was noted that current systems are not focused on the needs of transportation managers.
      - Need to have a focus area on defining data needs and how that data will be used to manage the system more effectively.
      - Data should not be collected simply for the sake of collecting it, data needs to serve a purpose.
  - City Council/government may be a challenge.
    - Political issues - such as traffic progression through business districts.
    - Personal concerns for council members (increasing traffic speeds near neighborhoods).
  - MOUs
    - MOUs will need to be established to share resources and personnel.
    - Several stakeholders noted that they have to establish MOUs even between departments internal to their agency. External MOUs are more difficult to establish.
    - Implementation of MOUs was discussed for sharing communications resources (e.g. fiber), CCTV cameras, and computer-aided dispatch (CAD) data.
  - Support for operations
    - Support at the executive/political level is best achieved when traffic directly impacts management.
  - Staffing
    - Several stakeholders noted they do not have the funds to hire and retain adequate staff.
    - Generally stakeholders noted that it is difficult to find staff with the necessary skillsets.
  - It was noted that lack of proper asset management systems can be an impediment. As agencies look to share resources, consistent asset management/documentation will be critical.
    - Municipalities have some information on assets, but not one that has adequate information to document need of system or remaining useful life of systems.
  - IT departments can pose challenges to transportation operations when it comes to communications and networking policies/support.

- Funding
  - Funding for maintenance was noted as a major challenge facing most stakeholders.
  - Several stakeholders noted that VDOT should better define how urban maintenance payments can be spent. Current policy does not adequately define if maintenance funds can be used for ITS and operations maintenance.
    - Opportunity for HRTO to ask clarifying question to VDOT Local Assistance Division.
    - It was noted that urban maintenance funds and funds for operations/maintenance are generally not adequate for most stakeholders' needs.
  - It was noted that HRTO could champion changes to the policy to clarify use of maintenance funds based on outcome of this effort.
  - Stakeholders agreed that a regional vision and operations plan will help provide a strong, unified voice to justify operations funding.
  - It was suggested that the region could pursue House Bill 2/ Districtwide funding for projects of regional significance if consensus on project prioritization could be achieved.
  - Several municipalities noted that it is challenging to change perceptions about operations and educate management about the benefits of operations.
- Differences in technology and hardware were noted as a source of impediment for better integration between agencies.
  - Stakeholders discussed the potential for the region to move towards a unified hardware standard for traffic signal systems (i.e. central system software and traffic signal controller hardware). Stakeholders were generally in favor of a regional standard so long as current functionalities were not lost.

Measures of success and performance

- Lack of measurement for operations performance and reporting of metrics was noted as a challenge.
  - Comparison was made to traditional public works investments where pavement condition indices and bridge sufficiency ratings are used to justify and prioritize maintenance costs.
  - It was noted that operations will need to define metrics to help leverage maintenance funding.
- Discussion was held regarding ways to measure success/progress.
  - Travel time reliability and safety were identified as measures of effectiveness.
  - Performance metrics will provide support to obtain funding as well as provide measurements to improve operations over time.

Wrap Up/Next Steps

- Kimley-Horn will provide a meeting summary to all stakeholders.
- Kimley-Horn will schedule conference calls/meetings with stakeholders to discuss capabilities.
  - Topics will include
    - Level of asset coverage
    - Connectivity
    - Maintenance
    - Staffing
    - Funding
    - Champions
    - Overall support for operations
  - Kimley-Horn will provide questions to stakeholders in advance so the necessary information can be gathered.
- Kimley-Horn will prepare a capabilities matrix for use at the second workshop on capabilities maturity.

Respectfully submitted,

KIMLEY-HORN AND ASSOCIATES, INC.

Carlin J. Hebert, P.E.

cc: All Meeting Attendees

Kimley-Horn Project Files

APPENDIX B
CAPABILITIES SELF-ASSESSMENT QUESTIONNAIRE

Hampton Roads Transportation Systems Management and Operations Capabilities Assessments

Questionnaire

1. How did you score your agency under each of the six dimensions included in the attached Capabilities Maturity Model Self-Assessment Framework?
2. Where does operations stand in the mind of your locality's (agency) management in terms of its relative importance as an activity and as a responsibility?
3. Does management visibly support operations and systems management? If so, how and at what levels? (e.g. City Manager, Director of Public Works)
4. Does your locality (agency) employ dedicated operations staff? How many? For reference, operations staff would include signal system engineers, traffic engineers, signal optimization engineers, TOC operators, etc.
5. Does your agency have a TOC?
    a. During what hours is the center staffed and operational?
    b. Has there been consideration of increasing the hours of operation? Please explain.
    c. Is the center integrated with any other centers in the City? Or with the State?
6. How would you define Active Traffic Management?
    a. Is having the ability to actively managing traffic important to your agency?
    b. Is 24/7 active management a priority for your agency? If no, what would make it a priority?
7. Recognizing that the Regional Vision includes creating seamless boundaries for travelers, would your locality support the creation of Corridors of Regional Significance?
    a. Can you suggest what corridors may be considered for this designation?
8. Does your locality (agency) have the systems/technology (devices/communications) to provide seamless boundaries on the Corridors of Regional Significance? Please explain.
    a. Are there any systems/technology issues that may be a concern for creating seamless boundaries on these corridors?
    b. Are there any institutional or policy issues that may be a concern for creating seamless boundaries on these corridors?
    c. Are there any communication impediments today that would need to be addressed to provide seamless boundaries?
9. Do your operators have the data (information) they need to manage operations? If not, what data or information is needed? Please explain.

VISION

- 24/7/365
- Seamless Boundaries
- Integrated
- Regional Standards & Policies
- Performance Measures
- Platforms
- Asset Management

10. Has technology for communications and field devices been standardized in your jurisdiction? Are the devices maintained/managed in-house or outsourced?
11. Would your locality be comfortable with allowing others to support/control your system after hours? If no, why not? If yes, what would you require to allow this to occur? (e.g. MOU, specific parameters?) Please explain.
12. Does your agency have any documented incident management response plans that would include signal timing adjustments? Do first responders regularly communicate with your TOC when an incident occurs? If so, how?
13. How is operations (traffic engineering and TOC functions) funded within your jurisdiction (agency)? For example, does a percentage of funds come from your CIP or VDOT maintenance funds, etc.
14. What is your annual budget for operations?
15. Is operations funded in your jurisdiction to a level that is adequate? If not, please explain what level of funding would be adequate?
16. Is the budget for operations mainstreamed on the same terms as the budgeting for construction and maintenance (needs development, allocations based on need, visible in the normal process)?
17. Does your jurisdiction (agency) have an asset management program(s) or procedures in place? Is the program sufficient to make program management decisions related to remaining useful life of equipment and devices? Do you use the system to report the status of your system?
18. Does your agency measure the reliability of your various systems which include:
    a. Communications network
    b. Field devices (includes detection, cameras, etc.)
    c. Repair frequency
19. Does your agency have any performance measures for Operations? If so, what are they and how are they used?
20. What would it take to share resources (equipment and personnel) across jurisdictions? What is your agency's willingness?
21. Do you share any data/information with other agencies? In what capacities? What information do you provide to the public? Is it real-time?

    Do you coordinate any operations with neighboring jurisdictions (agencies) along key corridors? (e.g., coordinated signal systems across agency boundaries) If so where/how?

VISION

- 24/7/365
- Seamless Boundaries
- Integrated
- Regional Standards & Policies
- Performance Measures
- Platforms
- Asset Management

22. Recognizing that regional operations and creating seamless boundaries for travelers may have an impact on the deployment of standardized approaches or equipment, would you or your jurisdiction (agency) support region-wide standards? Below are several examples that may be considered. Please explain any issues or concerns you may have in adopting standardized approaches similar to these below:
    a. System wide conversion to flashing yellow arrows?
    b. Emergency vehicle preemption (EVP)?
    c. Signal hardware?
    d. Signal software?
    e. Signal timing strategies/clearance intervals?
    f. Adaptive signal control (or similar)
23. Have you developed any MOUs with neighboring jurisdictions or agencies? If so, what do they cover?
24. Do you have internal support for the Regional Vision? Please explain.
25. What would it take to establish a regional operations center?
26. In your opinion, what are the biggest challenges you face with your agency embracing a Regional Operations vision and TSM&O as a whole?

VISION

- 24/7/365
- Seamless Boundaries
- Integrated
- Regional Standards & Policies
- Performance Measures
- Platforms
- Asset Management

Capabilities Maturity Model Self-Assessment Framework

Dimensions	Capability Level Criteria – Level 1 Performed	Capability Level Criteria – Level 2 Managed	Capability Level Criteria – Level 3 Integrated	Capability Level Criteria – Level 4 Optimizing
Business Processes (Planning and Programming)	Each jurisdiction doing its own thing according to individual priorities and capabilities	Consensus regional approach developed regarding TSM&O goals, deficiencies, B/C, networks, strategies and common priorities	Regional program integrated into jurisdictions' overall multimodal transportation plans with related staged program	TSM&O integrated into jurisdictions' multi-sectoral plans and programs, based on formal continuing planning processes
Systems and Technology	Ad hoc approaches to system implementation without consideration of systems engineering and appropriate procurement processes	Regional ConOps and architectures developed and documented with costs included; appropriate procurement process employed	Systems and technology standardized and integrated on a regional basis (including arterial focus) with other related processes and training as appropriate	Architectures and technology routinely upgraded to improve performance; systems integration interoperability maintained on continuing basis
Performance Measurement	Some outputs measured and reported by some jurisdictions	Output data used directly for after-action debriefings and improvements; data easily available and dashboarded	Outcome measures identified (networks, modes, impacts) and routinely utilized for objective-based program improvements	Performance measures reported internally for utilization and externally for accountability and program justification
Culture	Individual staff member champions promote TSM&O, varying among jurisdictions	Jurisdictions' senior management understands TSM&O business case and educates decision makers/public	Jurisdictions' mission identifies TSM&O and benefits with formal program and achieves wide public visibility/understanding	Customer mobility service commitment accountability accepted as formal, top level core program of all jurisdictions
Organization/Staffing	TSM&O added on to units within existing structure and staffing – dependent on technical champions	TSM&O-specific organizational concept developed within among jurisdictions with core capacity needs identified, collaboration takes place	TSM&O Managers have direct report to top management; Job specs, certification and training for core positions	TSM&O senior managers at equivalent level with other jurisdiction services and staff professionalized
Collaboration	Relationships ad hoc and personal (public-public, public-private)	Objectives, strategies, and performance measures aligned among major players (transportation and public safety agencies (PSAs)) with after-action debriefing	Rationalization/sharing/formalization of responsibilities among key players through co-training, formal agreements, and incentives	High level of TSM&O coordination among owner/operators (State, local, private)

APPENDIX C
DETAILED SELF-ASSESSMENT SUMMARIES

Suffolk		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• Operations are of high importance to management. Management is actively involved in how citizens' concerns and issues are addressed. • There is no dedicated operations budget – funding is part of a shared Operations & Maintenance Budget of $4.7M annually. • The city feels that current funding for operations is inadequate. Feel that a larger percentage (suggested about 25%) of shared budget would be appropriate and improve operations. • The City uses an asset management program (Cityworks) that determines useful life measurements but is not used for investment strategy. Asset management would be improved by having employees analyzing results of Cityworks and using information to justify operations budget. System not being used to its full potential.
Systems and Technology	3	• According to the city, automated systems that are currently in place are good, but could be improved with more personnel to actively manage the system. • Would like to incorporate more traffic cameras. • Standardized communications technology throughout city. • Support region-wide standards for flashing yellow arrows, emergency vehicle preemption, signal hardware, and signal timings.
Performance Measurement	1-2	• Periodically assess the reliability of various systems but do not have the personnel to conduct regular assessments. • Have defined performance measures and track them. However, the first priority is given to keeping equipment working properly.
Culture	2	• Operations are important to management. • Feel that Active Traffic Management would be beneficial but not foreseen in the near future. • Internal support from City Manager, City Council, Director of Public Works.
Organization/ Staffing	1	• No dedicated operations staff. Estimate that between the staff sharing operations duties there is the equivalent of about three full time employees. • Focus on staffing TOC during AM and PM peak times and special events.
Collaboration	1	• The TOC is connected via fiber to the 911 Center, EOC, and VDOT TOC at Indian River. The TOC also shares video with VDOT. • Would like to see Corridors of Regional Significance and feel that key players involved would need to agree on basic parameters. • In favor of allowing other organizations to support/control systems after hours but feel that there are issues to be considered. . Feel that this integration would bring up policy and liability issues that may be difficult to work through. • Do not currently share information with other agencies. • Publish work zone information daily to the public. • Aim to ultimately provide public with real-time information from the TOC. • No MOUs currently in place.
Corridors of Regional Significance	Suffolk would like Route 58, Route 17, Route 10, and Route 460 to be considered for designation as Corridors of Regional Significance.	

Newport News		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• There is no dedicated operations budget. The operations budget comes from general fund for Urban Maintenance. • Money is available for resurfacing projects and some for contracts/materials, but little is available for staffing. • Funding is controlled by public works and not by engineering. • The city feels that current funding for operations is not adequate. In need of more engineers and technicians. • The City is transitioning to using Cityworks asset management program. The City feels that this program is insufficient for identifying needs in life cycle and maintenance programs. The city foresees that that there will be issues funding asset management in the future.
Systems and Technology	1	• Cameras and Google traffic are data sources used to manage operations. Would like more system detectors and radar count equipment. • Technology for communications and field devices are not standardized throughout the city. • Fiber network exists but is not fully standardized. • Support region-wide standards for flashing yellow arrows, emergency vehicle preemption, signal software, and signal timing. Concerns regarding standardizing adaptive signal control and signal hardware.
Performance Measurement	1	• No program in place to measure the reliability of various systems. • No formal performance measures for operations, but have standards for preventative maintenance and repair.
Culture	2	• Operations are of high importance to management and considered a critical function of the city. • Do not consider Active Traffic Management a priority, but would like to provide more elements if resources were available.
Organization/Staffing	1-2	• No dedicated operations staff. There are 17 staff that are involved with signals and signal systems in some capacity. There is an engineer and two technicians at City Hall. • TOC is staffed from 7:00 am to 5:00 PM M-F and as needed during key after hours events. A maintenance technician is on-call 24/7. • Have requested another engineer to help provide more active traffic management.
Collaboration	1	• The TOC is integrated with the EOC using WebEOC. Cameras are integrated with city entities such as the fire and police departments and provide feed for VDOT 511. • TOC data is not exchanged with other localities. • Fire Chiefs are spearheading a fiber agreement with VDOT to connect Newport News with Hampton to share CAD data. • In favor of Corridors of Regional Significance and feel that there are no particular technological or political obstacles to creating these corridors. • Would like to improve communication with 911 center for incident management. • In favor of allowing other organizations to support/control systems after hours with appropriate MOUs established. • Willing to share information with other jurisdictions, but not sure it would be practical. • Share operations data along Mercury Boulevard with Hampton. • No MOUs are currently in place, but developing one with VDOT and work closely with Hampton.
Corridors of Regional Significance	Newport News would like Jefferson Avenue, Warwick Boulevard, J Clyde Morris Boulevard, Denbigh Boulevard, and Ft. Eustis Boulevard to be considered for designation as Corridors of Regional Significance.	

Portsmouth		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• There is no dedicated operations budget. Budget comes from general fund. $2.7-2.9M total annual budget. Capital is identified to meet federal requirements and is not part of general fund. Capital budget is used for replacements/upgrades, CIP efforts, and repairing property damage due to crashes. • Spend more than the urban maintenance funds received annual from VDOT. • Would like funding to hire another technician.
Systems and Technology	1	• Missing some data needed from system to manage operations such as train data and better accident data. • Would like Computer Aided Dispatch (CAD) data if an automated system could be put in place to manage it. • Technology for communications and field devices are managed within the department. • Generally support region-wide standards for flashing yellow arrows, emergency vehicle preemption, signal software, signal hardware, adaptive signal control, and signal timing, but would want to consider details more thoroughly.
Performance Measurement	1	• No program in place to measure the reliability of various systems. Replacement program is manually defined. • No formal performance measures for operations.
Culture	1	• Little communication with city manager and city council, but in general they are in support of regionalism and of the operations system.
Organization/ Staffing	1	• Staff TOC from about 7:00 am to 4:00 PM M-F. There are no considerations to expand hours of operations • Would like to hire an additional technician if funding was available.
Collaboration	1	• Does not coordinate with other jurisdictions on timing plans. • In favor of Corridors of Regional Significance. • Would like to improve communication with 911 center for incident management. First responders currently only contact operations in the event of major issues. • Not opposed to allowing other organizations to support/control systems after hours, but feel the details could be difficult to sort out and would require MOU to be established. • Willing to share information with other jurisdictions, but not communicating with nearby jurisdictions as of now. • Fire department has MOUs in place with Chesapeake and Norfolk. No MOUs in place for public works.
Corridors of Regional Significance	Portsmouth would like Victory Boulevard, Portsmouth Boulevard, George Washington Highway, High Street, and Airline Boulevard to be considered for designation as Corridors of Regional Significance.	

Hampton		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• City does not have a dedicated operations budget. Costs are partially reimbursable through VDOT maintenance payments. • Traffic signal budget is $80K annually for traffic signal functions, signal heads, detection, fiber optic repair, TOC functions, etc. • Budget is adequate for maintenance purposes but not for buying new or replacement equipment. • Budget is mainstreamed and projected a year in advance. • The City uses an asset management program. It is not currently used to determine remaining useful life of equipment or to report the status of the operating system.
Systems and Technology	1-2	• Use Trafficware (formerly Naztec) controllers as traffic management system. This system is incompatible with the Econolite system used in Newport News. • Good infrastructure including CCTV, ATMS, and system data collection to operate at a medium to high level. • Incident management plans are in place and documented in TMC Operations Manual. • Support region-wide standards for flashing yellow arrows and emergency vehicle preemption. Have some reservations regarding standardizing signal hardware and software and adaptive signal control. Feel that more information would be needed to commit to standardization.
Performance Measurement	1-2	• Assess communications network and field devices operating status on a daily basis. • Repair frequency is checked on a case by case basis. • Use traffic signal timing reports for coordinated corridors to provide performance measures.
Culture	1	• Operations staff feel that City Manager and City Council are not highly involved in operations. • Director of Public Works is involved and considers operations important.
Organization/ Staffing	1	• There are no dedicated operations staff. Several employees have ATMS software on computers and observe operations periodically, whilst also performing other duties. • TOC is staffed from 7:00 AM to 3:30 PM M-F. The TOC is staffed as needed when incidents occur. • Feel that a dedicated employee monitoring TOC functions would be important to improving Active Transportation Management. Though this person would not be needed 24/7 – only as incidents occur or peak periods.
Collaboration	1	• The TOC is partially integrated with VDOT through CCTV cameras. • Fiber link in place between Hampton and Newport News. • Use VDOT 511 but do not get communication back from VDOT regarding incidents. • Support idea of Corridors of Regional Significance, and feel that they are feasible if MOUs can be created. • Not opposed to allowing other organizations to support/control systems after hours with appropriate MOUs in place. • Share CCTV video stream with VDOT 511 website. • Would be willing to share resources across jurisdictions if MOUs were in place. • Hampton maintains the traffic signals in the City of Poquoson via a MOU/MOA.
Corridors of Regional Significance	Hampton would like Mercury Boulevard and Wythe Creek Road to be considered for designation as Corridors of Regional Significance.	

Virginia Beach		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• Operations are of high importance to management. • Operations are funded through a General Fund that supports a range of city activities. • Budget is $4.8M annually which includes salaries of sign/pavement marking shop and signal shop. • Feel that budget is inadequate. Would like to see a higher budget for sign/pavement markings, TMC, and signal shop as well as various other projects including extending fiber, wireless network, school zone flashers, gas generators at critical intersections, and ATC controllers. • Budget is mainstreamed on the same terms as the budgeting for construction and maintenance. • The City uses the Hansen asset management program in place. This program is not being used to make program management decisions. Have plans to hire infrastructure engineer to head an asset management program to make useful life determinations.
Systems and Technology	2	• Operators generally have data needed to manage operations. • Have standard communications and field devices and developed sole source purchasing contracts to obtain them. The devices are managed in house. • Documented incident management response plans are in place for incidents on I-64 and I-264 which implement timings on City arterials to allow traffic flow from the interstate to the surface streets. • Support region-wide standards for flashing yellow arrows, emergency vehicle preemption, signal hardware and software, signal timing, and adaptive signal control.
Performance Measurement	1	• No programs are in place to measure the reliability of communications networks or field devices, but there is a program to measure frequency of repairs. • Track signal repair staff hours as an indicator of the effectiveness of signal preventative maintenance program.
Culture	2	• Operations is a high priority to management. The Deputy City Manager, Director of Public Works, and City Operations Engineer all show visible support for operations and systems management. • Active Traffic Management is considered important.
Organization/ Staffing	1	• There is one signals engineer, two traffic engineers, one TOC operator, eight traffic signal electronic technicians, and two traffic electricians on staff. • TOC is staffed from 6:30 AM to 6:00 PM M-F. Would like to expand hours to 6:00 to 8:00 PM in order to fully cover AM and PM peaks. Do not feel that 24/7 coverage is necessary. • Currently only one operator, but could use additional support.
Collaboration	1	• TOC shares video with VDOT TOC, City of Virginia Beach 911 Center, CVB Police Department, and City of Virginia Beach Fire Department. • In support of Corridors of Regional Significance. Have fiber and CCTV cameras installed on corridors to help provide seamless transitions on these roads. Do not feel there are any particular policy issues to prevent creating CORS but different signal controllers and communications devices could be restrictive. • Not opposed to allowing other organizations to support systems after hours but do not feel that after hours control would be possible. Feel that either control or support would require legal and risk management agreements. Appropriate MOUs would need to be developed and executed. • First responders do not inform operations when incidents occur. • Shared service agreement in place with Chesapeake and Norfolk for sign shops. • Have coordinated signal timings at boundaries with Chesapeake and Norfolk. • MOU exists with Norfolk for a fiber sharing program.
Corridors of Regional Significance	Virginia Beach would like Military Highway, Kempsville Road, Virginia Beach Boulevard, and Shore Drive to be considered for designation as Corridors of Regional Significance.	

Chesapeake		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• Assistant Director of Public Works oversees transportation. Director of Public Works oversees the rest of the program. This was a recent change in management to try to better address transportation network issues. • The city feels that management is more focused on major projects, where the majority of the funding for improvements is allocated. • Operations budget includes sign shop, pavement markings, and traffic control. $200K operations budget in place to cover signal repairs and TMC maintenance. Funding for new projects comes from CIP budget. • Funds are requested from Director of Public works for particular issues/projects. • The City uses Maximo asset management program. It is not currently used to justify improvements. Want to establish a citywide detector replacement program. Asset management is more reactive than proactive.
Systems and Technology	1	• No incident management plans currently in place. • Generally support region-wide standards for flashing yellow arrows, emergency vehicle preemption, signal hardware and software, signal timing, and adaptive signal control. Would likely need to discuss what type of adaptive signal control would be used and what type of controller.
Performance Measurement	1	• No program in place to measure the reliability of various systems. Replacement program is manually defined. • No formal performance measures for operations, but would like to establish metrics.
Culture	1	• Executive management feels there is a need for transportation improvements and that congestion issues are worsening. • Management is interested in transportation network and transportation issues but do not get involved in operations or TMC. • Feel that Active Traffic Management would be beneficial in circumstances such as monitoring after hours congestion on the expressway and monitoring weekend traffic on Greenbrier Pkwy and Portsmouth Boulevard, but not necessarily 24/7.
Organization/ Staffing	1	• Currently in need of an engineer dedicated to measuring the performance of arterials. • TOC is staffed from 6:00 AM to 6:00 PM M-F. There are no plans in place to expand hours of operation. • TOC staff are also responsible for responding to field calls, which leaves the center unmanned. • Signal technicians are on-call 24/7 and respond to incidents within 24 hours. This is coordinated through the police department.
Collaboration	1	• No integration with other centers in the city or other jurisdictions, but there are plans in place to integrate TOC video with VDOT 511 within six months. • Would like to have more communication with 911 center to improve responsiveness. • In favor of Corridors of Regional Significance and feel that integration with VODT 511 would be beneficial. Do not feel there are any particular policy issues to prevent creating CORS but feel that detection issues may be a concern. • Not opposed to allowing other organizations to support/control parts of systems after hours with appropriate MOUs in place. Would not want others making changes to pre-established signal timing plans. • Would be willing to share resources with other jurisdictions. • Have MOU with Virginia Beach for use of sign shop.
Corridors of Regional Significance	Chesapeake would like Military Highway, George Washington Highway, Route 168, and Kempsville Road to be considered for designation as Corridors of Regional Significance.	

Norfolk		
Dimension	Level	Description
Business Processes (Planning and Programming)	1	• Feel that operations are generally not a focus for management unless there are specific complaints or issues. The Assistant City Engineer is more engaged with operations than other management personnel. • There is no dedicated operations budget – funding is from Public Works Budget from General Fund. • Operations business plan is not well defined. • Current funding for operations is inadequate. Feel that the budget should be at least double what it is now.
Systems and Technology	1	• In need of signal system software and controller upgrades. • Reliability of detection equipment is poor. More than 20% of signalized intersections have detection issues. • 10-20% of signals are offline at any given time due to communications issues. • Would like to incorporate more traffic cameras and expand camera coverage. • No incident management plans are in place and City is not planning on incorporating them. • Support region-wide standards for flashing yellow arrows, emergency vehicle preemption, signal hardware and software, and signal timing. City would support adaptive signal control on certain corridors with additional regional discussion.
Performance Measurement	1	• No program in place to measure the reliability of various systems. Replacement program is manually defined. • No formal performance measures for operations.
Culture	1	• Operations are generally not a priority for management unless there are specific complaints or issues.
Organization/ Staffing	1	• Roles are shared between employees. There are two technicians and one engineer for operations. • TOC is generally staffed from 6:00 AM to 6:00 PM M-F. Staff in TOC are not always technologically capable of performing necessary duties. • TOC is staffed during events such as Harborfest and the Grand Illumination.
Collaboration	1	• The TOC is not integrated with other jurisdictions or the state. • Would be willing to support Corridors of Regional Significance, but do not feel that they would be necessary for day-to-day operation. • Lacking communication between Norfolk TOC and VDOT. • Not currently in favor of allowing other organizations to support/control systems after hours. • Might be interested in sharing resources with other jurisdictions if a well-defined plan was in place, but not currently in favor. • Coordinate with Virginia Beach on signals and signal timing at city boundaries. • No MOUs currently in place.
Corridors of Regional Significance	Norfolk would like Military Highway, Virginia Beach Boulevard, Hampton Boulevard, and Tidewater Drive, to be considered for designation as Corridors of Regional Significance.	