ITEM #12: HAMPTON ROADS PASSENGER RAIL STUDY – PHASE 2B SCOPE OF WORK

With the completion of the Phase 2A: Data Collection for the Norfolk-Richmond corridor report, work can now proceed with developing the financial and business plan evaluation of the Norfolk-Richmond passenger rail corridor, in line with the program set out in the Blueprint Study (Phase 1B). The results of this study may provide feasibility level justification for further developing the case for high-speed rail and provide data needed to develop the assessment required by USDOT FRA for a Service Development Plan (SDP).

To achieve the direction that the HRTPO Board has prescribed for the Norfolk-Richmond passenger rail corridor and to systematically address federal, state regulations, and guidelines pertaining to Federal funding, the next step is to carry out an evaluation of higher and high-speed rail options. The main tasks proposed include the assessment of two passenger rail alternatives beyond the existing DRPT Amtrak service to Norfolk. These High-Speed Rail (HSR) Service Alternatives are higher-speed (110-mph) operation and high-speed (125+ mph) operation.

The key steps in this evaluation process include:

- Definition of the Service Options
- Ridership and Revenue Analysis
- Rail Service Analysis
- Operating and Capital Costs
- Financial and Economic Feasibility Analysis
- Environmental Scan/Service NEPA
- Implementation Plan
- Vision Plan Report

This item is under the Consent Agenda for approval; see Item #15-J.

Dr. Camelia Ravanbakht, Deputy Executive Director, will brief the HRTPO Board on this item.

Attachment 12
HAMPTON ROADS PASSENGER RAIL STUDY

PHASE 2B: PASSENGER RAIL ALTERNATIVES ANALYSIS

NORFOLK-RICHMOND CORRIDOR

SCOPE OF WORK

MARCH 2013

PREPARED FOR:

HAMPTON ROADS TRANSPORTATION PLANNING ORGANIZATION

PREPARED BY:

TRANSPORTATION ECONOMICS & MANAGEMENT SYSTEMS, INC.

116 RECORD STREET
FREDERICK, MD 21701

301.846.0700
1 BACKGROUND

The Virginia Department of Rail and Public Transportation (DRPT) developed the Richmond/Hampton Roads Passenger Rail Project Tier I Draft Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) to develop conventional passenger rail service to the I-64/CSX corridor and the Norfolk Southern/Route 460 corridor. The state’s draft NEPA document was released for public review and comment in December 2009. In February 2010, based on the evaluation and public comments received, the Commonwealth Transportation Board selected Alternative 1 as the preferred alternative for enhanced passenger rail service between Richmond and Newport News and higher-speed passenger rail service between Petersburg and Norfolk. DRPT has completed the Tier I Final EIS document and was approved in August 2012. The Record of Decision (ROD) was approved by the Federal Railroad Administration (FRA) in January 2013.

The Tier I Final EIS proposes 6 trains per day at 90 mph from Norfolk to Richmond and Washington, and 3 trains per day from Newport News to Richmond and Washington. To support and develop further the Commonwealth’s efforts, the Hampton Roads Transportation Planning Organization (HRTPO) Board approved a resolution in October 2009, endorsing the designation of a “high-speed rail” corridor along the Norfolk Southern/Route 460 (Norfolk-Richmond) corridor designated ultimately at speeds of more than 110 mph and the enhancement of the intercity passenger rail service along the CSX/I-64 corridor (Newport News-Richmond).

TEMS was commissioned to develop a Vision Plan for passenger rail service for the Hampton Roads region to implement the HRTPO objectives. TEMS completed an initial phase (Phase 1) of work in July 2010 and a Blueprint Study (Phase 1B) in December 2010. The Phase 2A Data Collection work is designed to build a database for the future Norfolk-Richmond corridor Phase 2B Passenger Rail Alternatives Analysis study to be completed in 2013. The Phase 2A Data Collection collected all the data needed to complete the Norfolk-Richmond corridor Vision Plan and the Service Development Plan (SDP) assessment needed by U.S. Department of Transportation (USDOT) FRA to support further planning work on high speed rail for the Norfolk-Richmond corridor.

With the completion of the Data Collection report (Phase 2A), work can now proceed with developing the financial and business plan evaluation of the Norfolk-Richmond corridor, in line with the program set out in the Blueprint Study (Phase 1B). The results of this study may provide feasibility level justification for developing the case for high-speed rail further and provide data needed to develop the assessment required by USDOT FRA for a Service Development Plan (SDP).

2 PHASE 2B: PASSENGER RAIL ALTERNATIVES ANALYSIS STUDY APPROACH

To achieve the direction that the HRTPO Board has prescribed for the Norfolk-Richmond corridor and to systematically address federal, state regulations and guidelines pertaining to Federal funding, the next step is to carry out an evaluation of higher and high-speed rail options. The tasks proposed include firstly the continuation of the project management, monitoring of FRA regulations, and coordination with DRPT, and secondly the assessment of two additional passenger rail alternatives beyond the existing
DRPT Amtrak service to Norfolk. These Passenger Rail Alternatives are higher-speed (110-mph) operation and high-speed (125+ mph) operation. The key steps in this evaluation process include –

- Definition of the Service Options
- Ridership and Revenue Analysis
- Rail Service Analysis
- Operating and Capital Costs
- Financial and Economic Feasibility Analysis
- Environmental Scan/Service NEPA
- Implementation Plan
- Vision Plan Report

The analysis of the Passenger Rail Alternatives will include the DRPT Amtrak service to Norfolk ridership along the Route 460/Norfolk Southern Corridor as a baseline to compare alternative forecasts.

The following work plan describes the first five tasks to be undertaken for Phase 2B:

**Task 1 – Project Management**

In this task, the project manager will work closely with the HRTPO to manage the overall study, provide project progress reports, update timelines, the Blueprint Study project management plan, and provide coordination with key stakeholders, freight railroads, and other government entities.

**Monitoring FRA Legislation and Executive Action**

In Task 1, TEMS will provide regular updates on US Congressional and Virginia General Assembly transportation legislation and Federal/State Executive action. Since its creation by the PRIIA and ARRA acts, passenger rail legislation and executive action has moved very fast and both the policy and executive actions are changing the context and requirements of Federal funding and corridor priority. In this task, the opportunities that arise will be identified and related to the overall goals and objectives of the HRTPO and its needs for both study planning money and later design and construction needs. To this end, the Blueprint Study timeline will be updated and adjusted as new policy and executive information becomes available.

**DRPT Coordination**

Working closely with the HRTPO, TEMS will coordinate its work with DRPT to ensure that there is no duplication of effort and that there is a full understanding and support of the DRPT program of incremental passenger rail implementation, the FRA approved TIER I EIS and Record of Decision, and the TIER II EIS study for Richmond-Washington, DC. Progress reports will be given using a PowerPoint format and handouts. To meet this need, the HRTPO will request “consultation” meetings with DRPT to compare progress and ensure effective liaison on all aspects of passenger rail. This will help ensure that the objectives, rationale and benefits of the project as requested by FRA are fully assessed and understood.
**Deliverables:**
- Finalized Work Plan
- Progress Reports
- Updated Timelines
- Updated Project Management Plan
- Whitepapers on changes in the legislative and executive decision-making for passenger rail
- Blueprint Study milestones, timelines and requirements, updates in line with FRA requirements

**Task 2 – Passenger Rail Alternatives**

The Passenger Rail Alternatives will be further developed for the Norfolk-Richmond routes to provide improved timetables and service levels that reflect accurately the market needs for these improved levels of service. The key factors to be considered in defining the scenarios include –

- Train Frequency
- Train Speed
- Track Speed
- Station Stopping Patterns
- Fares

Improvements will include consideration of integration issues with the Richmond-Washington Corridor, Northeast Corridor, and Southeast High-Speed Rail, stopping patterns, quality of onboard services, station facilities, access facilities – taxi, limo, and transit. Fares will be evaluated using revenue maximizing/revenue yield analysis and will consider discounts for different groups such as commuters, senior citizens, students, etc. A refined set of service scenarios will be presented to HRTPO Board and its Passenger Rail Task Force.

The development of Rail Service Alternatives is critical to the preparation of alternatives and the refinement of one alternative into a preferred option. This will be defined in the Project Delivery process, and begins to specify the final structure of the project.

**Deliverables:**
- A set of Alternatives and a Preferred Alternative for HRTPO Board approval.

**Task 3 – Ridership and Revenue**

**Ridership Analysis**

The introduction of new rail systems, which provide substantially reduced travel times, higher comfort levels, and frequently lower fares, has radically changed intercity travel patterns and brought communities closer together. In general, intercity travel is increasing, marked by a substantial increase in travel demand and distances traveled, as well as a significant shift toward rail use as a result of higher gas prices, and highway congestion.

To effectively predict the change pattern and overall rail travel demand levels for new rail systems, models are needed that can accurately forecast the impact of trip making increases and the role of the rail mode. To meet these needs, TEMS developed the COMPASS™ Model System, which uses the latest
discrete choice modeling methods. COMPASS™ has been tested in North America, Europe and Australia on various projects as they progressed from planning, to engineering, to implementation. It provided the foundation for over fifty U.S. corridor studies including the Midwest, Ohio and Florida High-Speed Rail ridership and revenue forecasts and used the approved modeling methods accepted by the USDOT FRA.

This method is based on a Stated Preference (SP) Survey that provides direct market research on how individuals make travel choices in a corridor. The SP survey was completed as part of Phase 2. Using an advanced market research technique, Abstract Mode Trade-Off Analysis, these innate travel characteristics are formulated as preference utilities or demand elasticities, yielding a precise measurement of the responsiveness of travel demand to improvements in the overall level of service and the relative competitive position of alternative modes.

The COMPASS™ Model includes three key sub-models –
- Total Demand Model
- Induced Demand Model
- Modal Split Model

**COMPASS™ Rail Demand Model Structure**

---

1 A.E. Metcalf, G. Santoboni, “How (In) Accurate are Demand Forecasts in Public Works Projects: The Case of Transportation,” October 2005
The objective will be to focus this analysis on the response to rail performance by taking behavioral attitudes into account, rather than simply extrapolating demand on the basis of historical or current travel relationships. This will allow for a more accurate and realistic ridership forecast. The output of the forecasting process can be used to ensure that the most appropriate route and technology combinations have been obtained and that potential revenue is maximized and capital costs minimized.

**FORECASTS**

Using the rail service alternatives developed for the Norfolk-Richmond Corridor and connecting corridors estimates of total demand and market share forecasts for passenger rail traffic will be prepared for yearly intervals for the study period 2013-2050. To forecast the impact of regional economic growth on total demand, socioeconomic scenarios will be prepared that identify the likely changes in income, population, and employment over the study period.

For rail, the Phase 2B study rail alternatives that have been developed in Task 2 include a wide range of service scenario factors tailored to Norfolk-Richmond rail routes. These include train frequency, commercial speed, stopping patterns and passenger interchange. As appropriate, alternative Phase 2B strategies will also be prepared for other intercity transportation modes (e.g., congestion, gas prices, new highways, etc.), so that the impact of investment in these modes is incorporated into the overall demand analysis. This task will be carried out in conjunction with the HRTPO Passenger Rail Task Force, who will advise on highway improvements and Long Range Plans.

The rail ridership forecasts will be assigned to show segment volumes, station volumes, and passenger miles and revenues on an annual basis. The forecasts will also be provided on an origin and destination basis and on a corridor, segment, and city pair basis. For each rail passenger alternative, rail revenues will be generated. Revenues will be based on a fare/tariff structure, which can be compared with fares and costs of competing traffic (air, auto, and bus). This will ensure that the optimum revenue stream is generated for the rail service, and will provide a basis for considering higher fares and lower subsidies for the Norfolk-Richmond-Washington, DC passenger rail service. Revenues will be given in 2013 dollars. In this study, a sensitivity and risk analysis will be performed on a range of factors such as socioeconomic growth, train times, train fares, gas prices to show how demand is impacted. This will provide the “upside” and “downside” and risk profile of the forecasts.

This provides Ridership and Revenue that meet FRA requirements.

**DELIVERABLES:**

- High-Speed rail forecasts for the Norfolk-Richmond Corridor: 2013 to 2050.

**TASK 4 – RAIL SERVICE ANALYSIS**

The determination of appropriate rail service for the Norfolk-Richmond Corridor depends on balancing the trade-off between revenues and costs for any given route and associated technology. Higher levels of ridership generate higher revenues, which permit a greater level of infrastructure investment and
thus higher speeds. Lower levels of ridership and lower revenues require that infrastructure investment be minimized and/or the use of more sophisticated vehicles (e.g., tilt technology to compensate for less developed track geometry).

As a result, the TEMS Team proposes an Interactive Analysis as the most efficient means of developing an appropriate passenger rail service and identifying infrastructure needs.

The result of the Interactive Analysis is an operating strategy for each route/alternative technology option that optimizes the infrastructure, technology and traffic levels.

For the proposed corridor, the first step in the Interactive Analysis is to identify the most appropriate route alignment and train speed. To achieve a desired train speed, the route is examined and specific infrastructure improvements are proposed for each mile of track. For the Phase3 analysis, the Phase 1 unit costs will be re-evaluated and adjusted to local conditions to generate cost estimates for specific track improvements.

The actual operating speed of the train along the track is calculated using LOCOMOTION™. Output from LOCOMOTION™ will be examined to identify specific bottlenecks, such as bridges, crossings, tunnels and curves that restrict train speeds unnecessarily and reduce the overall timetable performance of a specific technology.

The output of LOCOMOTION™ provides an assessment of train running times for any given set of infrastructure proposals. By reviewing the timetables, the level of infrastructure improvements can be increased or reduced to meet specific timetable and thus specific ridership needs. In this way, the Interactive Analysis will result in the development of an operating strategy for each right-of-way/corridor and technology that best combines infrastructure requirements, operating speeds and frequencies, and potential ridership.

It should be noted that the time saved by removing speed restrictions (curves, capacity delays, etc.) will be different for different train technologies. For example, removing moderate curves is less important than removing bridge speed restrictions for trains with steerable trucks.

Where restrictions are found, TRACKMAN™ will be used to identify the cost of upgrading the right-of-way. By using LOCOMOTION™ and TRACKMAN™ together, a priority ranking of improvements can be developed. This consists of a cost per train travel time (minute) saved and cost per revenue (dollar) earned.

The Interactive Analysis will identify key bottlenecks that prevent a given technology from achieving its maximum capability, listing the priorities for each train type and estimating the civil engineering costs to overcome these bottlenecks. Equally, the analysis will be used to assess the effect of train speed on ridership levels and the cost of aligning the track to avoid locations with important environmental or
cultural characteristics. In each case, the required infrastructure improvements will be quantified in terms of the full range of factors that affect infrastructure costs (grading, track quality, signaling, and grade crossing protection).

The results of this analysis provide the definition of the delivery system and the delivery requirements specified by the FRA for the Project Implementation and Procurement.

**DELIVERABLES:**
- Rail Operating Plan Norfolk-Richmond Alternatives.

**TASK 5 – OPERATING AND CAPITAL COSTS**

**OPERATING COSTS** – For each of the Passenger Rail Alternatives options, a set of Phase 2B study 2013 base year operating costs will be developed following a survey of vehicle manufacturers. These estimates will be based on the operating timetable. The operating unit costs will include the following –

- Track maintenance
- Train crew
- Rolling stock maintenance
- Electrification maintenance
- Signals and communications maintenance
- Energy costs
- Control staff
- Terminal personnel
- On-board services
- Administration

**DELIVERABLES:**
- Operating Cost Analysis Norfolk-Richmond Alternatives.

**CAPITAL COSTS** – The passenger rail service includes cost for rolling stock, as well as infrastructure costs. Rolling stock costs for the various technologies will be obtained directly from equipment manufacturers.

As for infrastructure costs, the TEMS Team has a set of unit costs derived from its ongoing studies across the U.S., which have been updated to 2013 dollars. It is proposed that these be reviewed and adjusted to reflect specific conditions in the Norfolk-Richmond Corridor. The infrastructure cost databank will include unit costs for the following –

- Land and right-of-way
- Sub-grade, structures, and guideway
- Track
- Rolling stock
• Signals and communications
• Electrification
• Demolition
• Stations
• Maintenance and facilities
• Highway and railroad crossings
• Farm and animal crossings
• Pedestrian crossings
• Fencing

This analysis provides the key Capital and Operating Cost Analysis required to meet FRA requirements.

DELIVERABLES:
• Capital Cost Assessment for Norfolk-Richmond Alternatives.

TASK 6 – FINANCIAL AND ECONOMIC FEASIBILITY ANALYSES

To ensure the support of the Federal Railroad Administration (FRA) for the results of the Norfolk-Richmond Corridor, a public-private partnership analysis will be completed in line with the recommendations of two key USDOT FRA reports –

• High-Speed Ground Transportation for America, USDOT FRA, September 1997
• Maglev Deployment Program, USDOT FRA, June 2000
• High-Speed Rail Intercity Passenger Rail (HSIPR) Program, USDOT FRA, 2010

These studies with Office of Management and Budget (OMB) endorsement set out the evaluation approach that is recommended for attracting USDOT funding support. To meet this need the following financial and economic analysis is proposed for Phase 2B.

• Comprehensive financial analysis
• Comprehensive FRA approved user benefits (consumer surplus) economic analysis
• Preliminary community benefit (Economic Rent) analysis

FINANCIAL ANALYSIS – The financial analysis will be based on a detailed cash flow analysis of passenger revenues, operating and maintenance costs, and infrastructure and rolling stock costs. The analysis will include the discounting of costs and revenues to an appropriate base year, the establishment of an infrastructure cost implementation program, and the assessment of both Net Present Values and Internal Rates of Return showing the overall worth of the rail service in financial terms.

In addition, a number of ancillary revenue/cost relationships will be defined in the financial analysis, including project profitability (rate of return), operating ratio (cost/revenue relationship), investment
standards (investment dollar/passenger mile), and train efficiency (cost/train mile). These will be used to provide a comparative analysis of corridor performance, and to demonstrate to the FRA the ability of the project to be franchised, and developed using a PPP approach.

**Economic Analysis of User Benefits (Consumer Surplus)** – In the demand side economic analysis, transportation user costs and benefits will be assessed in terms of increased user benefits (consumer surplus), increased trip making (regional mobility), reduced journey travel times and congestion (travel time savings), and improved quality of service (maximum service levels). The economic analysis will be based on the flow of economic costs and benefits over time and the impact of the proposed rail service on both users and non-users. This analysis will include resource savings, energy savings, accident savings, and producer surplus. The economic benefits and costs will be discounted to an appropriate base year and evaluated in terms of Net Present Values, Internal Rates of Return, and Cost Benefit Ratios. The analysis will also include a public sector constrained capital assessment. A positive Cost Benefit Ratio is the key to USDOT FRA funding. A risk analysis will be used to show the impact of different variables as specified by the FRA.

**Economic Benefits for Communities (Economic Rent)** – A critical output is the measure of supplyside community benefits generated by developing the corridor. This shows the communities the benefits they will receive from the implementation of the high-speed rail corridors in terms of Jobs, Income, and Property Values (Economic Rent). This has been used successfully in public outreach programs to develop community support (e.g., Ohio Hub, MWRRI, and Florida). The Economic Rent Analysis estimates the increase in jobs, income, property values, and the expansion of the tax base, as a result of implementing high-speed rail projects. It is particularly useful to show both the federal and state governments the return they get from increased tax revenues over the life of the project. A recent America Public Transportation Association (APTA) study completed for the MWRRI using TEMS data showed that the expanded tax base from the project provided a 100 percent return for federal funds, and a 50 percent return for state funds.

**Funding Arrangements** – The TEMS Team will work with the HRTPO, DRPT and the HRTPO Passenger Rail Task Force to develop financing and funding plans for the rail service. The analysis will consider different ways to generate federal, state, local, and private sector support for the rail service. Specific issues to be considered include –

- Federal and state match
- Local funding of station
- Private sector roles in provision of services and contracting
- Freight railroad contracting and funding options

The analysis will consider the full range of innovative financing proposed by the USDOT FRA and evaluate the potential roles of grants, Transportation Infrastructure Finance and Innovation Act (TIFIA) loans, Amtrak participation, franchising, Grant Anticipation Notes (GANS) and other financial instruments. In Phase 1, the major structures of the funding plans were defined; in Phase 2B, a detailed program will be developed.
DELIVERABLES:
- Financial and Economic Analysis, Proforma Spread Sheets, Funding Plan.
- Financial and Economic Funding Assessment.

**TASK 7 – ENVIRONMENTAL SCAN**

In this task an overview of environmental issues associated with the development of the higher and high-speed routes. The analysis will review public data on key environmental issues such as wetlands, battlefields, cultural amenities, historic amenities, superfund sites, landuse, and provide an overview of critical issues, mitigation needs and mapping of key areas to be assessed in later environmental studies. The data will use input from the TIER 1 Environmental Impact Statement for the route, and the Phase 2A data collection process.

DELIVERABLES:
- “Service NEPA Report” for Norfolk-Richmond Alternatives.

**TASK 8 – IMPLEMENTATION PLAN**

In this Task the Implementation Plan for Norfolk-Richmond routes developed in Phase 1B will be reviewed given the findings of the Phase 2B study and as required, a more detailed and updated Implementation Plan will be developed. This will consider the public outreach, engineering, environmental, manufacturing and construction activities needed to implement the proposed plan. This task is critical to the FRA project delivery process.

DELIVERABLES:
- Implementation Plan for Norfolk-Richmond Preferred Alternative.

**TASK 9 – DOCUMENTATION: COMPLETION OF THE HAMPTON ROADS PASSENGER RAIL: NORFOLK-RICHMOND CORRIDOR “VISION PLAN”**

A Hampton Roads Passenger Rail: Norfolk-Richmond Corridor “Vision Plan” report will be prepared describing databases, research methods, ridership and revenue forecasts, results of the financial and economic feasibility analyses, proposed institutional framework, financing and funding arrangement. The report will describe the study results in the context of a corridor implementation program and make recommendations to the HRTPO for maximizing the benefits of a passenger rail service in the Norfolk-Richmond Corridor.

DELIVERABLES:
- The Hampton Roads Passenger Rail: Norfolk-Richmond Corridor Vision Plan will be produced at the end of the Study.
**Deliverables**

The TEMS Team will provide the following deliverables for the study –

- **Phase 2B – Project Progress Presentations** – (5 PowerPoint presentations)
- **Phase 2B – HRTPO Meetings** – (6 total, with one at the end of each major milestone)
- **Phase 2B – Final Hampton Roads Passenger Rail: Norfolk-Richmond “Vision Plan”**
  - Market, Engineering, Environmental and Operating Databases (from Phase 2A Report)
  - Ridership and Revenue Forecasts – Technical Memo
  - Corridor Engineering and Environmental Review – Technical Memo
  - Operations, Schedules and Timetables, and Operating Costs – Technical Memo
  - Financial/Funding Plan – Technical Memo
- **Phase 2B – Executive Summary Report** (10 electronic copies and CD in PDF format)
- **Phase 2B – HRTPO Board and HRTPO Passenger Rail Task Force Meetings**

**Meetings**

- **HRTPO** – At four to six week intervals during the course of the study, the TEMS Team will attend meetings and make a PowerPoint™ presentation to the HRTPO Passenger Rail Task Force. The meetings are scheduled at key decision-making points to ensure that the HRTPO fully understand and approve the work underway before the TEMS Team proceeds to the next task. Key meetings are as follows –
  - HRTPO Passenger Rail Task Force Study Plan Workshop Phase 2B Analysis – beginning of month 2
  - Service Scenarios – end of month 2
  - Interactive Analysis – end of month 6
  - System Forecasts and Outputs – end of month 8
  - Financial Funding Plan – end of month 9
  - Draft Passenger Rail Alternatives Analysis report – end of month 12
- **DRPT** – In conjunction with HRTPO the TEMS team will meet to coordinate activities with DRPT.
- **Other stakeholder meetings** – as specified by the HRTPO, the TEMS team will support additional stakeholder meetings beyond the HRTPO Board and HRTPO Passenger Rail Task Force meetings. These may include meetings with route communities, Chambers of Commerce, railroads and other public bodies.
### HAMPTON ROADS PASSENGER RAIL STUDY: NORFOLK-RICHMOND CORRIDOR

#### Phase 2B WORKPLAN (Months)

<table>
<thead>
<tr>
<th>#</th>
<th>Tasks</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M7</th>
<th>M8</th>
<th>M9</th>
<th>M10</th>
<th>M11</th>
<th>M12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rail Alternatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ridership and Revenue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Forecasts Sensitivity Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rail Service Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Operating and Capital Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Financial and Economic Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Financial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Economic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Environmental Scan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Implementation Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Report</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### MEETINGS
- M6
- M3
- M4

#### PRESENTATIONS
- M5
- M8
- M10

#### MONTHLY PROGRESS REPORTS
- M1
- M2
- M3
- M4
- M5
- M6
- M7
- M8
- M9
- M10
- M11
- M12
## HAMPTON ROADS PASSENGER RAIL STUDY: NORFOLK-RICHMOND CORRIDOR
### Phase 2B BUDGET

<table>
<thead>
<tr>
<th>TEMS, Inc. Consultant Team - Hours</th>
<th>Project Management Task 1</th>
<th>Rail Alternatives Task 2</th>
<th>Ridership/Revenue Analysis Task 3</th>
<th>Rail Service Analysis Task 4</th>
<th>Operating Capital Cost Analysis Task 5</th>
<th>Financial &amp; Economic Analysis Task 6</th>
<th>Environmental Scan Task 7</th>
<th>Implementation &amp; Business Plan Task 8</th>
<th>Report Task 9</th>
<th>Total Base Workplan Hours/Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>$2.50</td>
<td>40</td>
<td>32</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>40</td>
<td>$198</td>
</tr>
<tr>
<td>Managing Operations Planner</td>
<td>$1.62</td>
<td>14</td>
<td>40</td>
<td>0</td>
<td>88</td>
<td>60</td>
<td>24</td>
<td>24</td>
<td>40</td>
<td>$308</td>
</tr>
<tr>
<td>Managing Railroad Engineer</td>
<td>$1.50</td>
<td>14</td>
<td>20</td>
<td>0</td>
<td>80</td>
<td>60</td>
<td>0</td>
<td>16</td>
<td>24</td>
<td>$236</td>
</tr>
<tr>
<td>Senior Equipment Engineer</td>
<td>$1.25</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>40</td>
<td>40</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>$100</td>
</tr>
<tr>
<td>Senior Demand Modeler</td>
<td>$1.10</td>
<td>0</td>
<td>40</td>
<td>160</td>
<td>20</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>26</td>
<td>$264</td>
</tr>
<tr>
<td>Senior Economist</td>
<td>$1.00</td>
<td>16</td>
<td>0</td>
<td>80</td>
<td>0</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>$272</td>
</tr>
<tr>
<td>Transportation Analyst</td>
<td>$0.95</td>
<td>0</td>
<td>0</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>80</td>
<td>80</td>
<td>4</td>
<td>$280</td>
</tr>
<tr>
<td>Tech Support</td>
<td>$0.75</td>
<td>0</td>
<td>20</td>
<td>80</td>
<td>40</td>
<td>30</td>
<td>40</td>
<td>40</td>
<td>24</td>
<td>$314</td>
</tr>
<tr>
<td><strong>TOTAL HOURS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,982</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEMS, Inc. - COST</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>$250</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$4,000</td>
<td>$4,000</td>
<td>$4,000</td>
<td>$4,000</td>
<td>$4,000</td>
<td>$10,000</td>
<td>$52,000</td>
</tr>
<tr>
<td>Managing Operations Planner</td>
<td>$162</td>
<td>$2,592</td>
<td>$6,480</td>
<td>$0</td>
<td>$12,960</td>
<td>$9,720</td>
<td>$3,888</td>
<td>$3,888</td>
<td>$3,888</td>
<td>$49,896</td>
</tr>
<tr>
<td>Managing Railroad Engineer</td>
<td>$150</td>
<td>$2,400</td>
<td>$3,000</td>
<td>$0</td>
<td>$12,000</td>
<td>$9,000</td>
<td>$0</td>
<td>$2,400</td>
<td>$3,000</td>
<td>$35,400</td>
</tr>
<tr>
<td>Senior Equipment Engineer</td>
<td>$125</td>
<td>$0</td>
<td>$1,500</td>
<td>$0</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$0</td>
<td>$5,000</td>
<td>$0</td>
<td>$12,500</td>
</tr>
<tr>
<td>Senior Demand Modeler</td>
<td>$110</td>
<td>$0</td>
<td>$4,400</td>
<td>$17,600</td>
<td>$2,200</td>
<td>$1,760</td>
<td>$0</td>
<td>$2,200</td>
<td>$880</td>
<td>$29,040</td>
</tr>
<tr>
<td>Senior Economist</td>
<td>$100</td>
<td>$1,600</td>
<td>$8,000</td>
<td>$0</td>
<td>$16,000</td>
<td>$3,800</td>
<td>$0</td>
<td>$3,800</td>
<td>$800</td>
<td>$27,200</td>
</tr>
<tr>
<td>Transportation Analyst</td>
<td>$95</td>
<td>$0</td>
<td>$1,520</td>
<td>$0</td>
<td>$7,600</td>
<td>$3,500</td>
<td>$0</td>
<td>$3,500</td>
<td>$0</td>
<td>$26,900</td>
</tr>
<tr>
<td>Tech Support</td>
<td>$75</td>
<td>$0</td>
<td>$1,500</td>
<td>$6,000</td>
<td>$3,000</td>
<td>$2,250</td>
<td>$3,000</td>
<td>$1,800</td>
<td>$3,000</td>
<td>$25,550</td>
</tr>
<tr>
<td><strong>SUBTOTAL CONSULTANT COSTS</strong></td>
<td>$16,592</td>
<td>$26,880</td>
<td>$50,800</td>
<td>$39,160</td>
<td>$29,970</td>
<td>$36,248</td>
<td>$17,088</td>
<td>$16,288</td>
<td>$25,160</td>
<td>$256,186</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXPENSES</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$3,000</td>
</tr>
<tr>
<td>Subsistence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,200</td>
</tr>
<tr>
<td>Printing &amp; Photocopying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$100</td>
</tr>
<tr>
<td>Telecommunications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$100</td>
</tr>
<tr>
<td><strong>SUBTOTAL EXPENSES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$4,400</td>
</tr>
</tbody>
</table>

| TOTAL BASE WORKPLAN COST          | $16,592                   | $26,880                  | $50,800                           | $39,160                     | $29,970                                 | $36,248                               | $17,088                 | $16,288                                | $25,160      | $260,586                      |