Appendix A.
Proposed Multimodal Feasibility Study of the Valley Corridor
Organization and Criteria

Introduction

1. TPO approach to regional transportation Feasibility Study
   a. Objective - to conduct a feasibility study for a multimodal
      transportation system with a planning horizon of 25 years.
   b. Study Area for the Feasibility Study - As depicted in Figure 1, the
      primary study area for the feasibility study is the Valley Corridor, which
      is defined by the rail and interstate highway routes between Memphis,
      TN and Harrisburg, PA. The route connects the Mid-South and
      Southwest with the Northeast via the northern route (Valley Route) of
      the Norfolk Southern Railroad and the highway routes of I-40, I-75,
      and I-81. The route major terminals at each end of the Valley Corridor
      are in the areas of Memphis, TN and Harrisburg, PA. Rail traffic from
      McCalla, located south of Birmingham, AL could easily be routed via
      the Valley Corridor as an option to the Piedmont Route.
   c. Primary feeder rail lines and interstate highways - The Valley Corridor
      is fed by rail lines of Norfolk Southern and other railroads at Memphis
      and at Harrisburg by Norfolk Southern. Interstate highways that feed
      the Valley Corridor may include I-78, I-76, I-70, I-66, I-77, I-26, I-65,
      I-59.
   d. Relationship of the Valley Corridor to the Crescent Corridor - The Valley
      Route is a part of the Norfolk Southern Crescent Corridor, which
      extends between Texas and Mexico and up to Memphis on the
      Southwestern end and Harrisburg, Philadelphia, and New Jersey
      terminals on the Northeastern end.

1 RAIL Solution is a 501(c)(3) non-profit organization that has developed the Steel
Interstate System concept. (www.steelinterstate.org)
e. States hosting the Valley Corridor

1) States through which the Valley Corridor passes include Tennessee, Mississippi, Alabama, Georgia, Virginia, West Virginia, Maryland, and Pennsylvania.

2) States with connecting rail or highway routes to the Valley Corridor include-
   - Southwestern or Midsouth end- includes Louisiana, Texas, and Arkansas.
   - Southeastern and Mid-Atlantic- includes North Carolina and Georgia.
   - Northeastern- includes New York and New Jersey.

2. Need to achieve reliability, capacity, lower cost, and speed on the rail system
a. The objectives for the corridor, from perspective of the public, should ideally have these features ultimately:

1) Removing maximum feasible trucks from I-40, I-75, and I-81, as well as feeder routes and urban connectors through attractive speeds, higher capacity, better reliability, enhanced origin to destination pairs, and lower cost of rail.

2) Providing all classes of freight delivery at highway competitive speeds and reliability (containers, trucks, bulk freight).

3) Providing access to a higher speed freight system throughout the corridor, with more local terminals and open access.

4) Providing the capacity for passenger rail in corridor states for short to medium destinations, in a manner that ensures that passenger trains do not adversely affect freight movement.

5) Providing potential passenger rail connections to High Speed Rail terminals (e.g. Chattanooga to Atlanta or connection at Harrisburg, PA)

b. The assumed objectives of the Norfolk Southern Corporation are to:

1) Maintain historic level of profitability and increase the earnings and stock values.

2) Minimize the risk of undertaking system improvements to maintain market and to increase market share in promising sectors.

3) Anticipate that Federal and state governments will provide capital for public benefits, including grade separation, passenger service provisions, and regional intermodal terminals, and will assist with right-of-way changes as needed.

4) Expect that passenger service will not affect transit times for freight, nor will it increase the cost of freight operations to Norfolk Southern.

5) Expect governments to reimburse infrastructure funding in lieu of what they avoid spending to construct/maintain highway infrastructure.

6) Anticipate that the Federal government will guarantee loans to prime the financial market pump for strategic application of innovative rail technology.

Feasibility Study organization and funding

3. I-40/I-81 Feasibility Study organization and funding

a. Funded under provisions of MAP-21 for intermodal Projects of Regional...
and National Significance with high impact on reducing congestion. (Possibly 80 Fed-20 state or other Split). One question is- "How does the Norfolk Southern effort count in the assessment of other effort?"

The Department of Transportation may solicit project proposals for this in summer 2013.


c. Feasibility Study would be conducted by a Transportation Planning Consortium led by the Knoxville Regional Transportation Planning Organization.

d. Assistance and participation of Norfolk Southern is essential to the Feasibility Study.

4. Possible organization of the Feasibility Study

![Possible Organization of the Feasibility Study](image)

**Figure 2. Organization of the Valley Corridor Feasibility Study**

As depicted in Figure 2, state DOTs and rural planning organizations would be
connected to the feasibility study through the Valley Corridor Consortium. The consortium and Norfolk Southern Management would have members of the Feasibility Executive Committee (6 elected by the MPOs, and 5 appointed by Norfolk Southern). The Knoxville Regional TPO management would appoint a Project Director for the project (appointed from either TPO staff or from a supporting engineering firm). Norfolk Southern would appoint an Associate Project Director to serve as director of the NS effort and assist in the total management of the project.

The Project Director, for the project, would be accountable to the feasibility study Executive Committee. The Executive Committee would have oversight to see that the feasibility study is conducted according to the basic work plan and criteria for the study, and it would review and approve results and documentation. The Executive Committee would have the authority to decide in a timely manner any issue that might arise concerning direction, conduct, or results of the feasibility study.

5. Potential TPO or MPO members of Feasibility Study Consortium

Potential members of the Valley Corridor Consortium include member organizations from the planning organizations of the metropolitan statistical areas within the corridor. The potential members are listed in Figure 3.

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**Figure 3. Potential members organizations are TPOs or planning components of MPOs of the Valley Corridor.**
Basis for the Feasibility Study, including assumptions

6. Region of primary multimodal analysis, with input of interfacing routes
   a. Maximum truck diversion design considers fishbone nature of I-81. The backbone of the Valley Corridor is the Interstate Highways I-40, 1-75, and I-81 and the parallel Norfolk Southern route. The study must consider the traffic patterns that branch to and from that backbone in order to optimize the arrangement of terminals and to project operations. Highway drayage operations that would normally traverse the urban core will be evaluated for interception at new terminals, to eliminate both ongoing highway maintenance costs and societal costs in the urban core.
   b. In addition, for much of the traffic, there needs to be a logical assignment of traffic that goes primarily to the Piedmont Corridor or primarily to the Valley Corridor. There is a mixture of traffic that can be routed efficiently on either the Valley or Piedmont Corridor. The capacity of the Piedmont Corridor must be taken into account when considering diversion of truck freight to the Valley Corridor.
   c. An example of diversion before the truck freight gets to I-81 is the objective of diverting truck freight from I-77 to the Piedmont Corridor, much of it to the terminal at Charlotte, NC.
   d. Another factor that must be considered is the opening of the Panama Canal to larger ships, which may change the patterns of shipping to and from the United States. The effect on the whole Crescent Corridor needs to be analyzed as a contingency in the feasibility study.

7. Underlying strategy and assumptions for the corridor
   a. Design criteria for the rail system will follow in so far as possible, or exceed in performance, the guidelines of the Steel Interstate System. Those guidelines include provisions for multiple tracks, frequent crossovers, additional passing tracks, elimination of grade crossings, higher speeds, automatic train control, and, if economically justified, electrification.
   b. Highway design follows practices of the state DOTs' implementation of AASHTO standards.
   c. Highway improvements are financed by present practice for financing new or improved highways, with priority given within established investment timelines over all existing programmed work other than bridge repairs. Work on enhanced grade crossing mini-barriers and/or signaling as well as grade separations structures will be financed out of
the highway trust fund.

d. Rail improvements are financed primarily by private investment, except for passenger rail and other participation by the government typical of past funding. It is intended that the rail system be privately owned and a for-profit entity.

e. Maximum efforts within economics will be made to seek the lowest cost solution with maximum payoff in terms of lowering environmental impact, increasing permanent economic development benefits, and increasing the safety and health of the public.

f. The Valley Corridor improvements would be done over a period that would be phased according to the availability of capital.

g. Fast Corridor rail will attract utilization by logistics and trucking companies that are within 2-3 hours driving distance of an intermodal terminal. That makes the band of economic influence along the corridor approximately 300 miles wide. Since this is an assumption, the market survey work of the study should determine the width of the band of interest of businesses and logistics companies in access the Valley Corridor.

Analysis of market and need

8. Surveys of traffic - Traffic surveys need to be done at the beginning of the study by most participating states. The objective would be to describe more accurately than is now in the data bases the movement of trucks over the total distances involved in the Crescent Corridor, including the Valley Corridor, and all of its primary connections at the ends and at various key points along the backbone. Typical information should be collected on origin and destination, intermediate stops to load or unload, classification of equipment, characterization of freight, time of departure, expected arrival time. It is very important to document the place(s) of origin and destination within the corridor.
9. **Shippers’ freight selection criteria needs to be revisited** - more data needed.

![Figure 4. Data from marketing study of Reebie Associates.](image)

- Additional work needs to done to survey present and potential customers of intermodal rail freight to determine the importance of various characteristics of service to them. The chart shown here was done by Reebie Associates and had an earlier date for the data than 2009 (approx. 2003). Modern (Post-recession) data needs to be obtained, and the availability of open model solutions as well as distances of interest should be obtained.

- The survey should include changes in routes in the future because of such factors as changes in imports, or ports of call or origin.

10. **The Valley Corridor as an important economic driver for the Appalachian Region**

- More access to rail is needed in the region. Service to the region is tending to be lower in quality than other regions. In addition, passenger rail serving the Appalachian Region is almost non-existent,
both in real time and in plans.

b. Economic development of the region will be enhanced by the presence of fast, reliable rail service. It is already the location of numerous distribution facilities and manufacturers that depend mostly on trucking their freight.

c. The Valley Corridor runs through much of the region, with only a few counties in Virginia and Pennsylvania not being located within the corridor.

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11. **Design speeds** - Norfolk Southern Valley Route would be redesigned for higher speeds, increased efficiency with general Steel Interstate criteria as the ultimate goal. The speeds (portal-to-portal) for the different primary
traffic classifications are:

a. Conventional freight (e.g.: bulk materials, tank cars, box cars, autos) - 60 mph.

b. Intermodal freight - 70 mph.

c. Passenger trains - 90 mph.

12. **Open intermodal needs serious consideration**

a. Open intermodal system should be considered as an option so that regional, small terminal can make the Valley Corridor rail more accessible and increase significantly freight diverted to rail. If a large number of trains were leaving major end terminals, some could be made up to allow stop at intermediate locations. For example, shipments in containers of goods from China destined for the Walmart distribution center near Harrisonburg could be assembled into a regional train (at Rossville) that would be stopping to unload at Roanoke and Harrisonburg and Greencastle. For the container shipments, it might be necessary to mount it on a trailer at Rossville--depends on how the intermediate terminals are designed and what its handling equipment is.

b. The Modalohr system (Figure 6), or similar system, works for quick loading without cranes. While it has the down side of having to carry an articulated platform, it has the advantage of being able to accommodate multiple loading and unloading all at the same time. This is just an example of a new type of system that should be considered. It is certainly not mandated.

c. The feasibility study itself will need to determine if there is sufficient open intermodal traffic to justify special handling provisions and the additional terminals.
d. Other open intermodal systems - There are, of course, a number of open model systems that have been used or proposed. The most salient of these, especially the ones with which there is substantial experience should be analyzed for use on the Valley Corridor. The evaluation should objectively document why various designs or solutions were not chosen for the corridor.

e. Mid-point or en-route sorting by origin and destination pairs should be possible with the open modal systems with less than an hour of delay. This sorting will allow for the enhanced volume that is contemplated to be leveraged to provide solid block service to around four times (4x) the terminals currently proposed for the corridor. The goal would be for each terminal to originate an average of 100 trailers a day to multiple destinations. Since many more terminals are contemplated the overall highway drayage length, time, and financial cost decrease will be studied to determine the most efficient points of operation.
13. **Freight service within the region**
   a. Evaluation of the cost and operations associated with more intermediate terminals should be performed.
   b. Figure 7 includes the most plausible locations for terminals. The traffic expected for each of the terminals would be the most determinant of the feasibility of each terminal.
   c. Intermediate terminals are envisioned as having a small footprint compared to regional terminals. Operation of the intermediate terminals by logistics companies is a possibility. Terminals on as little as 10 acres performing in an equivalent manner to “drop-lots” are envisioned near major activity centers.

![Map of the Valley Corridor with marked terminals](image)

**Figure 7. Proposed terminal layout on the Valley Corridor**

14. **Operating characteristics with various classes of traffic**
   a. Perform operations research with projected mixes of traffic over the system, so that a range of conditions can be accommodated by the design.
b. Determine incremental cost for passenger class of traffic as well as other classes.

15. **Alignment improvements** - Define specific types and exact locations and design of alignment improvements. Some typical improvements, with examples of locations.

   a. Double tracking, such as use of existing right of way where double tracks previously existed. Example: NS Valley Route near Knoxville, TN

   b. Change alignment to larger radius curves, eliminating smaller radius curves that limit speed. Example, speed limits on the Valley Route near Buchanan, VA

   c. Bridges need to be realigned and rebuilt for double track. Condition of NS Valley Route near Natural Bridge Station, VA

   d. Some bridges may be required to eliminate traffic congestions. Example: CSX and NS using same bridges in Alabama.

   e. Provide passing sidings to facilitate operations at terminals and stations.

   f. Define crossover locations.

   g. Straighten out S curves sections using cuts and tunnels as necessary.
h. Some areas may need the Magnolia Cut off solution.

Figure 8. Magnolia Cut-off solution of B & O in 1914
i. Trenches or berms may be necessary in some towns and urban areas for noise abatement and for incorporating road crossings. The study must decide the locations of such berms and their use.

![Trench in Reno, Nevada](image)

Figure 9. Trench in Reno, Nevada
j. To reduce noise and grade crossings, some realignments through towns would be the best alternative. The locations and alignment of such alternatives should be defined by the study.

Figure 10. Possible realignment at Abingdon, VA
k. Bypass some sections of NS Valley route by using Interstate Highway right of way. Some areas might be amenable to relocating main tracks to the interstate median, such as the I-81 section in East Tennessee.

![Possible use of interstate highway median in Tennessee](image)

Figure 11. Possible use of interstate highway median in Tennessee

l. Elimination of at-grade rail crossings, such as the at grade level crossing of main line tracks of CSX and NS in Knoxville, TN.

m. Elimination of grade crossings with roadways—this is a huge task, requiring significant levels of coordination with local communities to eliminate crossings. Savings from avoided accidents and traffic delays at grade crossings would be incorporated among benefits of this investment.

16. **Definition of interstate highway improvement**

a. Rely on previous or parallel studies, such as VDOT analysis of Roanoke
Valley and Wythe Co., VA, Tier 2, EIS improvement segments. The feasibility study should evaluate options for additional lanes, distinguishing requirements for trucks and other vehicles.

b. Define the connections to proposed regional freight terminals.

c. Provide analysis of set of interstate construction options matching truck freight diversion quantities for various scenarios.

17. **Definition of options for passenger rail** - analyze provisions for passenger rail with financing options.

   a. Perform market surveys and analyses for passenger rail options, including such routes as Washington to Roanoke, Bristol, Knoxville, Atlanta; Knoxville to Atlanta. Segments that should be evaluated are those less than 500 miles total. The primary targets are distances averaging 300 miles or less.

   b. Determine potential stations and locations.

   c. Analysis of fit of passenger rail with freight rail requirements.

   d. Cost basis for passenger rail- payments to Norfolk Southern.

   e. Estimates of incremental cost (capital and operating costs) for passenger rail must be separately accounted for and stated in results of the study.

   f. Evaluate the creation of an FDIC type insurance pool for passenger operations with first dollar coverage (e.g. from $10k to $100k options) for liability protection. Full indemnification beyond that first dollar payout. Program charge of around $0.006/PSGM collected with ticket billing, a 5% overhead limit would be set in the statute. Open for any ground common carrier (rail or road) operator using terminals at the endpoints, with a rating factor applied to premiums. This concept would fully protect shareholders if the operator was to be the host railroad.

**Products of the Valley Corridor Feasibility Study**

18. **Products of the Valley Corridor Feasibility Study**

   a. Layout design and estimate of costs and impacts of rail and highway components

   b. Logical best solutions (best cost: benefit) for a mixture of modes of transportation

   c. Select most workable and best solution (or solutions)

   d. Economic development impacts of selected best solution (or solutions)

   e. Methods of financing components of the selected solution (or
19. **Questions regarding divertible truck freight to be addressed by the feasibility study**
   a. How much divertible truck freight is there on the corridor, considering:
      1) Rail system performance - speed, reliability, cost
      2) Desires of the potential users - logistics firms, trucking companies, freight companies.
      3) Attributes of routes/corridors with high diversion rates on presently existing systems (i.e.: Why are the diversion rates high?)
      4) Open intermodal vs. container/dry van only or only containers.
      5) Distribution of terminals and use of intermediate terminals that are not so far apart. (distance and location to be determined by projected business.)
      6) Fuel cost and taxes on fuel
      7) Regional economic development
      8) Attracting traffic more distant from backbone.
      9) Effect of more efficient and cheaper fuel for trucks (e.g. Natural Gas) and for railroad engines.
      10) Electrification.
   b. How is the truck freight diversion allocated to various segments of the Valley Corridor?

20. **Products of the study regarding rail system layout**
   a. Operating characteristics of rail system.
   b. All traffic volumes.
   c. Operational characteristics with higher speeds and different speeds of the various classes of traffic.
   d. Track layout requirements (number of tracks and frequency, grade separation, curvature, super-elevation, etc.).
   e. Alternative layouts (around some towns, channels through, use of interstate highway right of way).
   f. Additional freight terminals, passenger terminals.
   g. Rolling stock, engines, etc.
   h. The alternative motive power over the Valley Route, including both
conversion to natural gas and electrification.

i. Phasing of the buildup to ultimate capability. Define logical steps for phasing the buildup, with analysis of market capture and costs.

21. **Products of the feasibility study related to the highways**

a. Requirements for highways to handle freight volumes as function of rail utilization.

b. Definition and estimates for connectors to rail terminals.

c. Additional lanes for truck traffic.

d. Additional lanes because of auto traffic increase.

22. **Costs and benefits analysis**

a. Cost and benefits of principal scenarios of rail market penetration for period 2015-2040 (a 25 year period from possible implementation date for the project.)

b. Rail costs.

c. Highway costs.

d. Benefits of total solution for each scenario in terms of costs total and costs to various sectors (railroad industry, various governments, the public) and the costs and benefits for safety, environmental impact, and economic development of the Valley Corridor region.

23. **Products of the feasibility study regarding financing**

a. Financing of the multi-modal corridor.

b. Private financing of rail.

c. Government pays for public benefits with rail.

d. Government guaranteed loans for rail.

e. Highway- government financed as usual.

f. Allocation of costs to various sectors.

g. Capital requirements and sources (see next section).

h. Analysis of basis for subsidies based on Federal practice - Perform five decade analysis of Interstate Highway System User Costs and Revenue. Compute full cost recovery using various market interest rates and a capital cost ratio for commercial vehicles varying from 2.0 to 5.0. This calculation would be used to set a historic floor for user non-revenue (subsidy) to finance the system. In conjunction with forward looking projections it could be used to compare alternatives to very small highway segment projects.

24. **Creative work required for financing, including revenues for public sector contributions**

a. Some examples - some require legislation:
1) Repatriation of overseas profits with tax reduction for investments in rail.

2) Loan repayments based on revenue of the route where investment made improvements.

3) Highway funds to be used for grade separation, rerouting of rail lines to eliminate highway problems, and provide access to terminals.

4) Highway funds used for highway improvements.

5) Dedication of government owned rights-of-way to rail.

6) Financing of passenger rail improvements and operations.

7) Whenever it might be feasible to electrify, obtain installation capitalization by the power companies.

8) Tax abatements.

9) Tax applied to imports (allowed for negative balance of payments.

10) Full recovery from the trucking industry their proportional expense of building and maintaining highways.

25. **Schedule and level of effort for Valley Route Feasibility Study**

a. Study period - two to three years total, including organization time.

b. Cost on the order of $5 Million, not counting the effort of Norfolk Southern Railroad effort to supply design input and review.

c. Source of funds

   1) Federal Funds for projects of regional significance that can reduce freight transportation congestion and cost (MAP-21).

   2) There may be other sources.

d. The Knoxville Regional TPO is qualified to manage funds. Funds would come to TDOT.

e. Probable need to have a percentage of state participation (perhaps 20 percent). (Can NS effort be counted in order to decrease contribution of states?)

26. **Next steps to make a proposal to the Federal Government**

a. Must have consent of Norfolk Southern to move ahead with any steps.

b. Must get another state (or more) to agree to participate.

c. Advise TN Commissioner that NS and another state are ready to discuss going forth with the Feasibility Study.

d. Knox Regional TPO meets with Federal DOT for proposal ground rules.

e. Recruit members, organize the MPO-TPO consortium.
f. Recruit Associate members (RPOs, other governmental groups).
g. Obtain pledges of funding and participation.
h. Knox Regional TPO prepares proposal.
i. Submit proposal to Federal Government.