

BEDFORD STATION RTC ANALYSIS

Virginia Department of Rail and Public Transportation

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1. Executive Summary

Item 447.10 of Chapter 552 of the 2021 Special Session I Acts of Assembly directed the Secretary of Transportation to “provide an assessment of both the total project costs and incremental costs resulting from...modeling conducted to assess any infrastructure or network costs needed to service a rail station in Bedford, Virginia.” To fulfill this requirement, the Commonwealth and Norfolk Southern Railway (NSR) agreed to assess the track and signal improvements needed for Amtrak to provide service to the Bedford community.

Since October 2017, Amtrak has operated daily state-sponsored round-trip service originating in Roanoke. This service travels north through the Commonwealth on NSR trackage with stops in Lynchburg, Charlottesville, Culpeper, Manassas, Burke Center, and Alexandria before proceeding to Washington, DC and cities in the Northeast Corridor. In 2022, a second daily round trip service will originate in Roanoke.

Due to the success of the service both in Lynchburg and Roanoke, community leaders in the Bedford/Franklin County region have advocated for an Amtrak passenger rail stop in the Town of Bedford, which is located along the route. The Commonwealth and NSR have agreed to assess the track and signal improvements needed for Amtrak to provide service to the Bedford/Franklin County region as a part of the Commonwealth’s partnership with NSR to advance the Transforming Rail in Virginia initiative.

NSR performed Rail Traffic Control (“RTC”) modeling to determine the anticipated infrastructure (including communication and signaling) necessary and reasonable to address the anticipated adverse effects on future freight and intercity passenger service by the addition of the proposed Bedford Amtrak stop, assuming the prior addition of a second round trip Amtrak service.

1.1 Methodology

The Virginia Passenger Rail Authority (VPRA) and the Virginia Department of Rail and Public Transportation (DRPT) worked closely with NSR to review and collaborate on the performance of the RTC Study. NSR, DRPT, and VPRA reviewed the modeling results, non-confidential inputs of freight projections, and agreed upon passenger services. Additional model assumptions are described in section three of this report.

1.2 Results

NSR’s analysis concluded that the addition of Bedford passenger rail stop creates non-material new delay to freight operations, assuming that Amtrak schedules adhere to the agreed-upon schedule and that Amtrak does not add service on any part of the study area above what is included in this study. The assumed 2040 infrastructure defined in this study results in no material increase in fluidity impairment. For additional information about the analysis and results, please refer to NSR’s September 2021 *Amtrak Northeast Regional Proposed Bedford, VA Station RTC Analysis Final Report*, attached as an appendix to this report.

2. Purpose

The purpose of the Bedford Station RTC Analysis is to analyze the reasonable and necessary infrastructure to support the introduction of a passenger rail station depicted in Figure 1 and Figure 2 on track shared with existing and anticipated freight and intercity passenger operations in such a manner as to permit transparency. In the context of this RTC Study, the term "transparency" is the capacity for the added rail stop to be introduced in a manner that does not cause the operations of the existing and anticipated freight and intercity passenger operations to suffer additional delay, however minimal, while still allowing for route maintenance in accordance with NSR standards and practices.

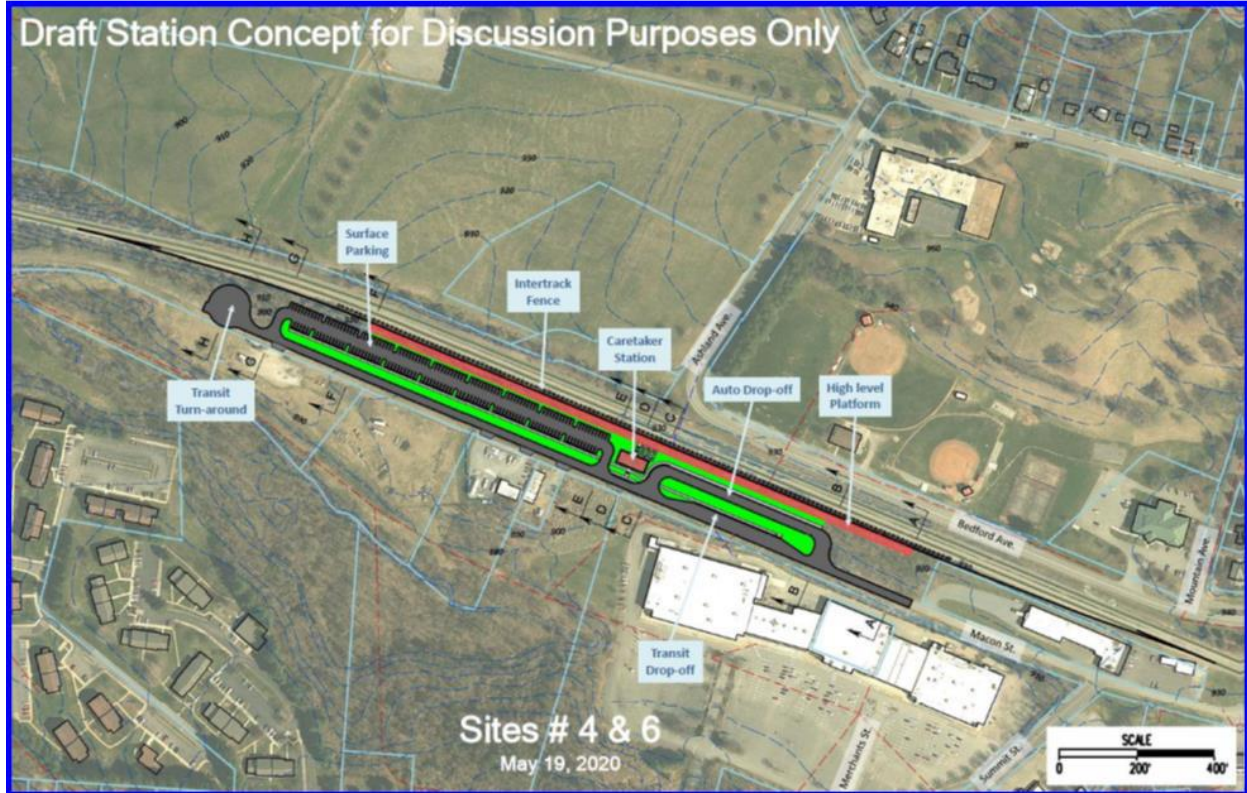
The Transforming Rail in Virginia (Virginia-Norfolk Southern Railway Partnership) Map depicted in Figure 1 shows the location of a potential future station at Bedford, among other improvements in the corridor between Manassas and the New River Valley.

FIGURE 1: CORRIDOR MAP



Figure 2 shows the proposed site of a Bedford Amtrak Station at Macon Street between MP 229 and 230, also known as the Merchants Site.

FIGURE 2: DRAFT STATION CONCEPT



3. Methodology

3.1 Scenarios

The RTC Study used Berkeley Simulation, LLC’s RTC rail network operations simulation software and included the following scenarios:

1) Base Case (year 2040)

- a. NSR freight traffic levels were determined for the future year 2040.
- b. Amtrak service was assumed to operate at pre-COVID-19 levels and frequencies, with the added service in accordance with the general timetable reflected in Figure 3 and Figure 4 below.
- c. The Base Case assumed existing infrastructure, together with the Roanoke Yard infrastructure enhancement, with a defined geographic expanse between Coolwell and Riverside.
- d. The Base Case developed baseline condition scenario metrics, designed to measure the operational fluidity of the study area facilities. The performance metrics were defined as delay minutes per hundred train miles for each train type that exists on the segment of the NSR corridor being studied (i.e. passenger, automotive, bulk, coal, grain, and merchandise).

2) Modified Case (year 2040)

- a. The Modified Case added to the Base Case construction of the Bedford station in general conformance with Figure 2.

- b. The following were identified as necessary elements of the construction: turnouts, station track, and reasonably necessary communication and signaling additions.
- c. Freight and Amtrak traffic were assumed as in the Baseline Condition Scenario, with an added stop at Bedford.

3) Improved Case (year 2040)

Originally, the study anticipated a step in which additional infrastructure would be tested to return the operational fluidity of the improved system (using the Performance Metrics) to at least the operational fluidity of the Baseline Conditions Scenario. No “Improved Case (year 2040)” scenario was needed for analysis, however, as the assumed 2040 operational environment on the assumed 2040 infrastructure (as defined in this document) resulted in no material increase in fluidity impairment.

FIGURE 3: PROPOSED SCHEDULE – NORTHBOUND

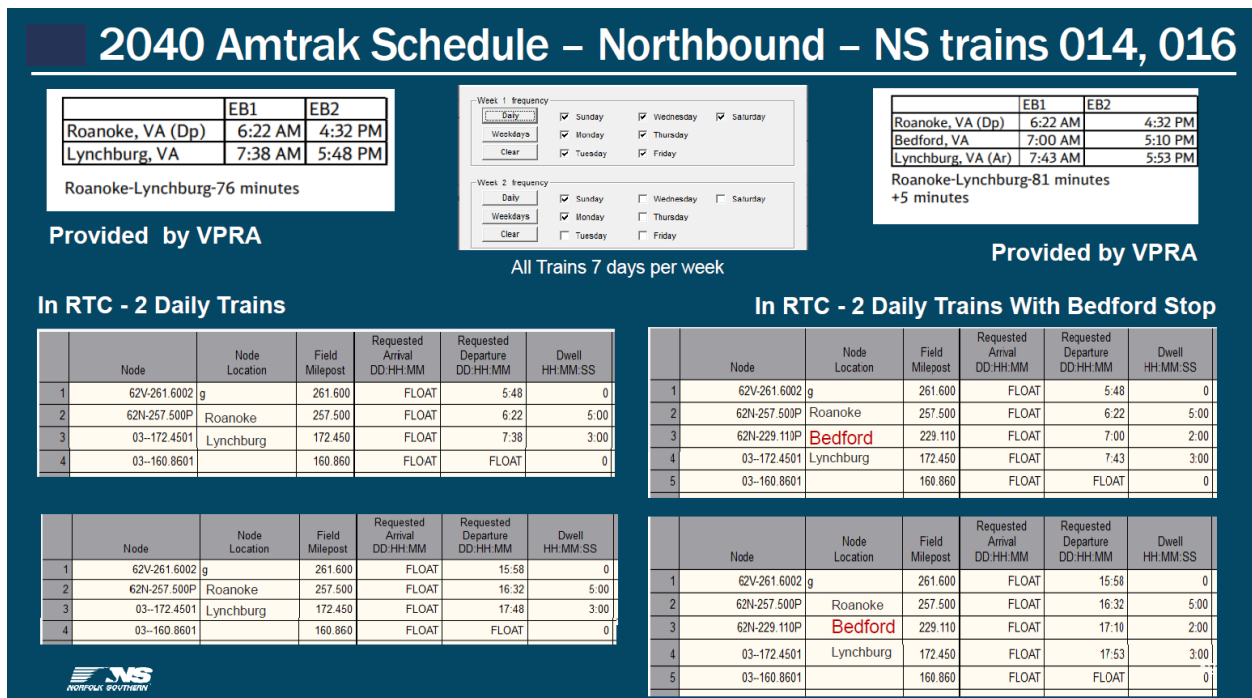
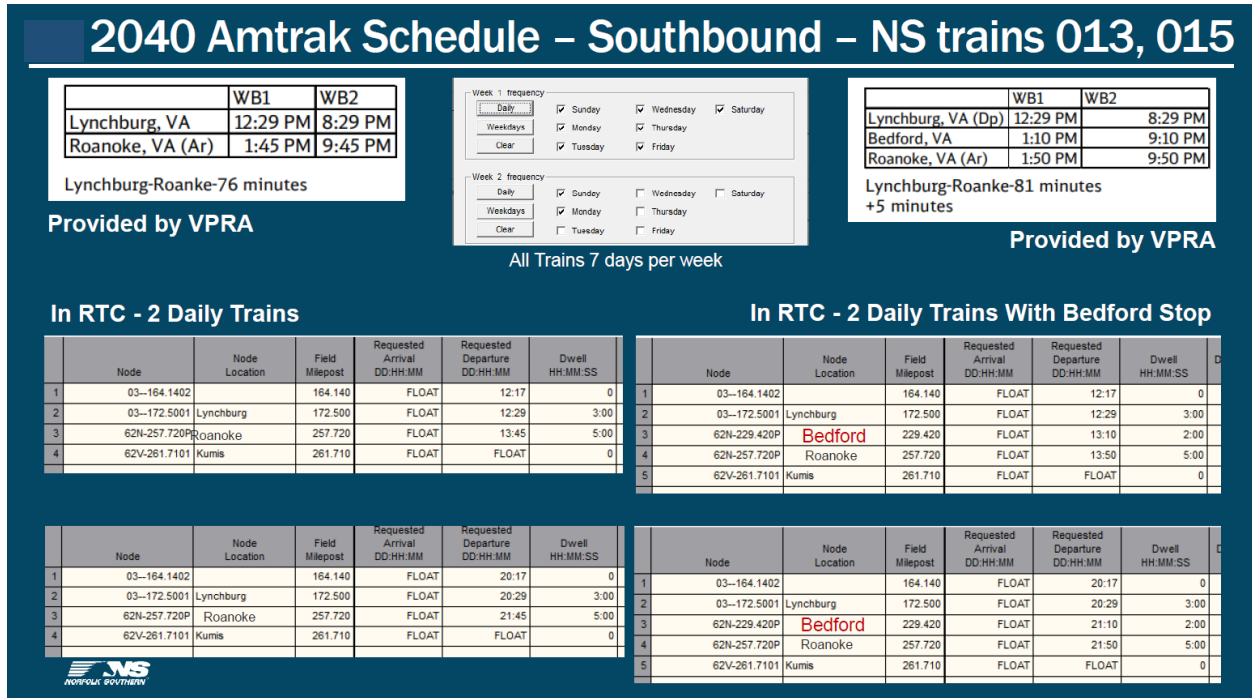


FIGURE 4: PROPOSED SCHEDULE – SOUTHBOUND



3.2 RTC Study Modeling Assumptions

Below is a list of defined assumptions from the “Agreement to Assess the Proposed Bedford Station” between VPRA and Norfolk Southern Railway Company:

- The study used Berkeley Simulation Software LLC., Rail Traffic Controller Model Version 75T (64-bit), August 3, 2021 release date
- Maximum authorized speed for model: 79 mph (Amtrak)
- Freight trains randomized as 15 minutes early to 15 minutes late for departures
- Key Metric for simulation output: delay minutes per 100 train miles by train type
- Passenger trains always departed initial station on time
- For late passenger trains, model assumed full dwell time at station stops
- Each simulation ran a minimum of 10 times with randomization and results averaged
- Trains dispatched in accordance with normal NS priorities by Train Type
 - Passenger trains first, then Intermodal, then non-Intermodal, then everything else

The following positive train control (PTC) and passenger protection assumptions were applied:

- PTC is active on all Amtrak Routes
 - RTC enforces PTC
- No adjacent signal block protection is required if PTC is active
 - No need to model in RTC
- Rule EQ-32, Protecting Passenger Trains, is not required
 - PTC enforces protection
 - No need to model in RTC

The following additional assumptions also were applied:

- 2019 traffic based on actual historical train movements from September 22 through 30
- 2019 traffic grown or reduced to match 2040 projected traffic
 - If sufficient growth warranted daily service, a new train was scheduled
 - If growth is not sufficient for daily service, then cars were added to existing trains
- Nine-day simulation with no statistics collected during first and last day
- Track Patrols are included and are lowest priority movement

The model assumed the following net changes in traffic volume between 2019 and 2040:

- Growth of freight volumes based on NS historic trends, NS Marketing forecast, and Moody's GDP forecast
- Net of 12 NS Trains Added (+1.3 per day)
- Also made 191 trains longer (21.2 per day)
- +11.5% in overall combined train length

4 Results

The addition of Bedford Amtrak stop creates non-material new delay to NSR operations. This assumes that Amtrak schedules do not deviate from those shown in this analysis and that Amtrak does not add service on any part of the study area above what is included in this analysis. It was determined that no "Improved Case (year 2040)" scenario was needed as the assumed 2040 infrastructure (as defined in this document) resulted in no material increase in fluidity impairment. For additional information about the analysis and results, please refer to NSR's September 2021 *Amtrak Northeast Regional Proposed Bedford, VA Station RTC Analysis Final Report*, attached as an appendix to this report.

As per the "Agreement to Assess the Proposed Bedford Station" between VPRA and Norfolk Southern Railway Company, performance of the RTC Study is for informational purposes and does not constitute consent or agreement by any or all of the Parties to either (i) the further consideration of infrastructure that may be evaluated hereunder, or (ii) the implementation of the proposed rail service under any of the scenarios studied.

5 Appendix

***Amtrak Northeast Regional Proposed
Bedford, VA Station RTC Analysis Final
Report***



Amtrak Northeast Regional Proposed Bedford, VA Station

RTC Analysis

Final Report

September 2021

Strategic Planning

Industrial Engineering

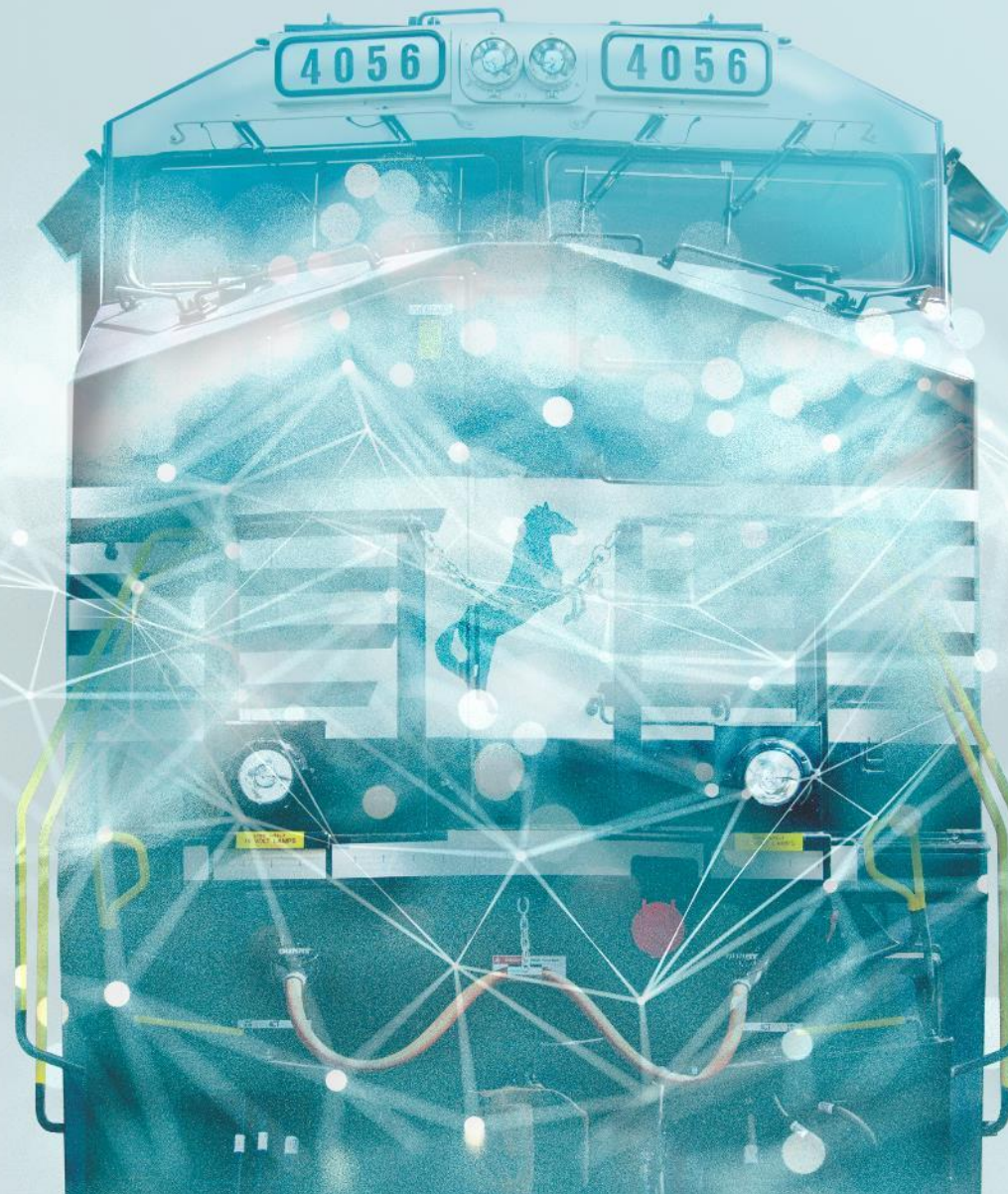


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01 Project Overview

New Amtrak station @ Bedford

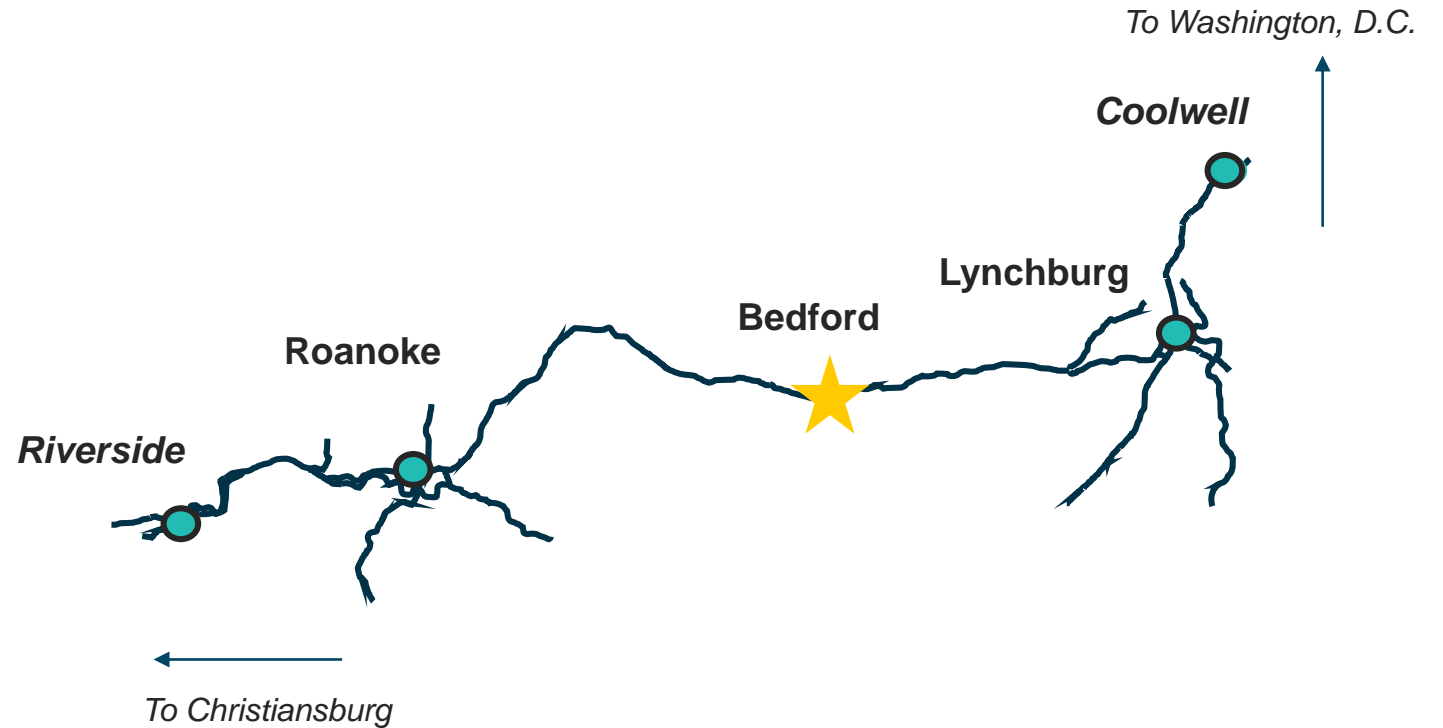
- VPRA and Norfolk Southern have agreed to evaluate, for informational purposes only, collateral track and signal improvements that would enable the addition of an Amtrak station stop at Bedford, Virginia to its existing and proposed future 2nd roundtrip service between Washington, D.C. and Roanoke, VA.
- This evaluation does not constitute an offer or an agreement to permit the construction or institute new service.



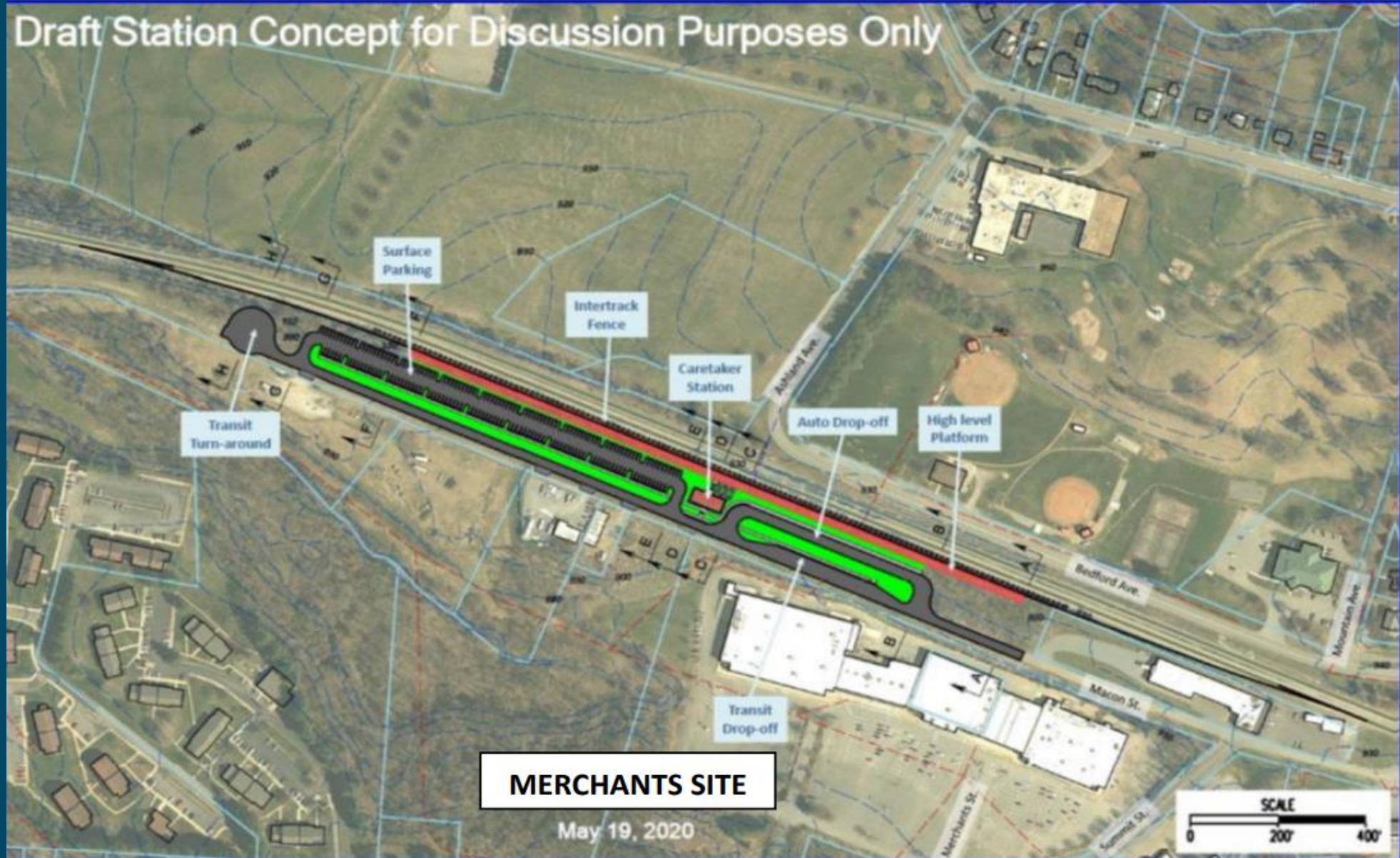
01 Project Scope

Assess the delay introduced by the addition of an Amtrak passenger rail station stop at Bedford, Virginia on track shared with freight and intercity passenger operations between Coolwell and Riverside.

Determine infrastructure and/or operational changes necessary to return operational fluidity of all types of trains to at least the operational fluidity of the Baseline (without Bedford station stop) Scenario.



Bedford Station – Conceptual Design (from agreement)



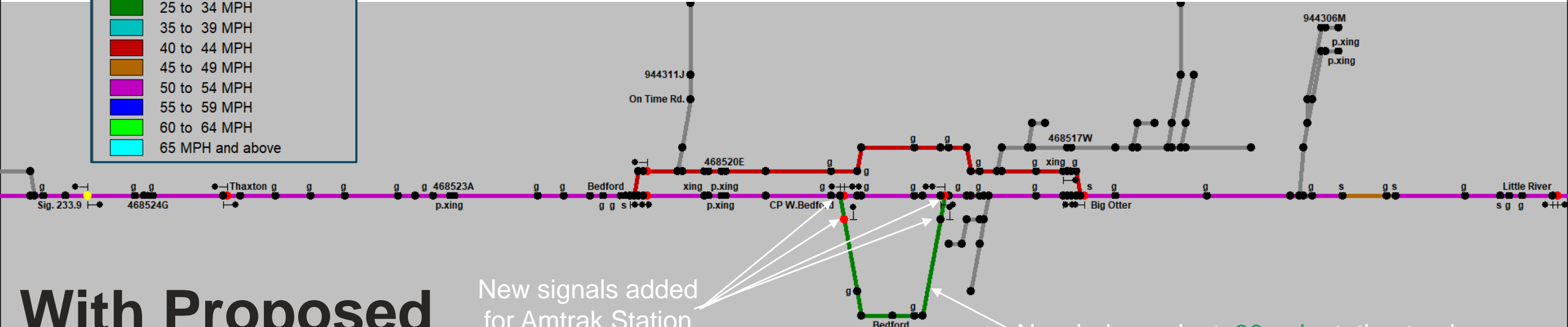
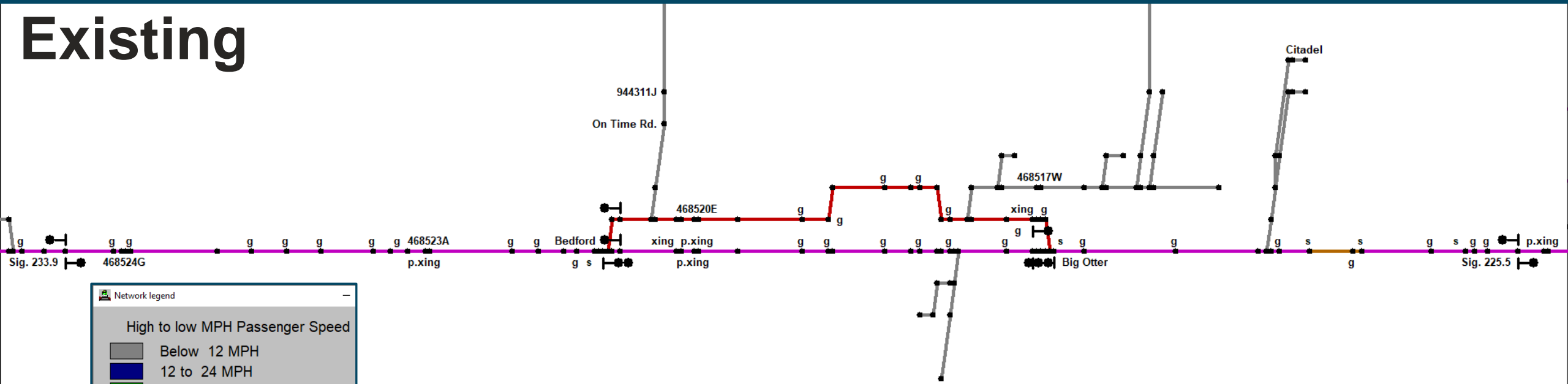
02 Bedford Station NS Passenger Policy

- The General Principles guiding Norfolk Southern's evaluation of passenger station proposals provides that "Stations located along a double-track segment should have platforms adjacent to each outside main line."
- Evaluation of the Merchant's site as a single sided station assumes a less-than-desirable configuration that would demonstrate the worst-case impact scenario.
- Additional time may need to be added in the Amtrak schedule to accommodate a single platform on a single, divergent track.



02 Bedford Station - RTC

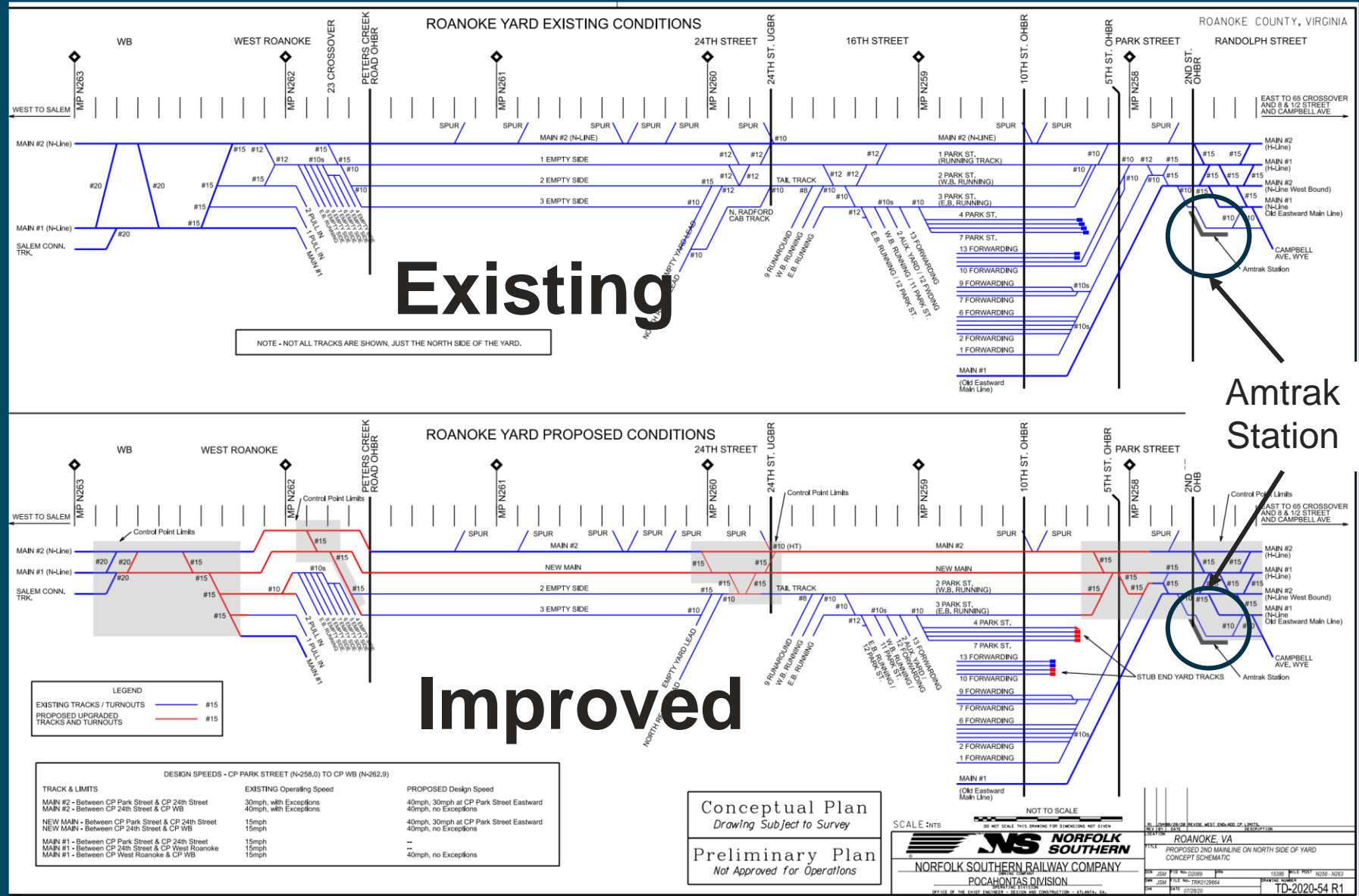
Existing



With Proposed Bedford Station

03 Roanoke Improvements

- Created 2nd Main on North side of yard
- Upgraded tracks to 40mph
- Upgraded Turnouts (15mph to 30mph) between two mains



04 Modeling Assumptions - RTC study agreement

Defined assumptions outlined in Exhibit C - Scope of Work in “Agreement to Assess the Proposed Bedford Station” between VPRA and Norfolk Southern Railway Company

- The study used Berkeley Simulation Software LLC., Rail Traffic Controller Model
 - Version 75T (64-bit) was used, August 3, 2021 release date
- Maximum authorized speed for model: 79 mph (Amtrak)
- Freight trains randomized as 15 minutes early to 15 minutes late for departures
- Key Metric for simulation output: delay minutes per 100 train miles by train type
- Passenger trains always depart initial station on time
- For late passenger trains, model assumes full dwell time at station stops
- Each simulation run a minimum of 10 times with randomization and results averaged
- Trains dispatched in accordance with normal NS priorities by Train Type
 - Passenger first, then Intermodal, then non-Intermodal, then everything else

04 Modeling Assumptions - PTC & Passenger Protection

- PTC is active on all Amtrak Routes
 - RTC enforces PTC
- No adjacent signal block protection is required (Rule 281) if PTC is active
 - No need to model in RTC
- Rule EQ-32, “Protecting Passenger Trains”: PTC enforces protection
 - No need to model in RTC

Rule 281

281. Stopped in a Block in Rule 251, 261, and 271 Territory

If a train or engine has entered a block on a proceed indication that does not require Restricted Speed, and stops, it must proceed prepared to stop at the next signal.

10;

NS Operating Rules — January 1, 2019

EXCEPTIONS:

- (1) At locations where crews change, unless a leaving signal is provided, Restricted Speed must be observed until leading end of movement reaches the next signal.
- (2) When operating with the PTC system in active state in PTC Territory and the next target indicates favorable, this rule does not apply.
- (3) In Cab Signal Territory when cab signals are in service in the directions of movement or that have experienced a cab signal failure in Cab Signal Territory Without Wayside Signal.

04 Other RTC modeling assumptions

- 2019 traffic based on actual historical train movements from September 22 through 30
- 2019 traffic grown or reduced to match 2040 projected traffic
 - If sufficient growth warranted daily service, a new train was scheduled
 - If growth is not sufficient for daily service, then cars were added to existing trains
- Nine-day simulation with no statistics collected during first and last day
- Track Patrols are included and are lowest priority movement

05 2040 Amtrak Schedule – Northbound – NS trains 014, 016

	EB1	EB2
Roanoke, VA (Dp)	6:22 AM	4:32 PM
Lynchburg, VA	7:38 AM	5:48 PM

Roanoke-Lynchburg-76 minutes

Provided by VPRA

Week 1 frequency

Sunday Wednesday Saturday
 Monday Thursday
 Tuesday Friday

Week 2 frequency

Sunday Wednesday Saturday
 Monday Thursday
 Tuesday Friday

All Trains 7 days per week

	EB1	EB2
Roanoke, VA (Dp)	6:22 AM	4:32 PM
Bedford, VA	7:00 AM	5:10 PM
Lynchburg, VA (Ar)	7:43 AM	5:53 PM

Roanoke-Lynchburg-81 minutes
+5 minutes

Provided by VPRA

In RTC - 2 Daily Trains

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	62V-261.6002	g	261.600	FLOAT	5:48	0
2	62N-257.500P	Roanoke	257.500	FLOAT	6:22	5:00
3	03--172.4501	Lynchburg	172.450	FLOAT	7:38	3:00
4	03--160.8601		160.860	FLOAT	FLOAT	0

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	62V-261.6002	g	261.600	FLOAT	15:58	0
2	62N-257.500P	Roanoke	257.500	FLOAT	16:32	5:00
3	03--172.4501	Lynchburg	172.450	FLOAT	17:48	3:00
4	03--160.8601		160.860	FLOAT	FLOAT	0

In RTC - 2 Daily Trains With Bedford Stop

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	62V-261.6002	g	261.600	FLOAT	5:48	0
2	62N-257.500P	Roanoke	257.500	FLOAT	6:22	5:00
3	62N-229.110P	Bedford	229.110	FLOAT	7:00	2:00
4	03--172.4501	Lynchburg	172.450	FLOAT	7:43	3:00
5	03--160.8601		160.860	FLOAT	FLOAT	0

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	62V-261.6002	g	261.600	FLOAT	15:58	0
2	62N-257.500P	Roanoke	257.500	FLOAT	16:32	5:00
3	62N-229.110P	Bedford	229.110	FLOAT	17:10	2:00
4	03--172.4501	Lynchburg	172.450	FLOAT	17:53	3:00
5	03--160.8601		160.860	FLOAT	FLOAT	0

05 2040 Amtrak Schedule – Southbound – NS trains 013, 015

	WB1	WB2
Lynchburg, VA	12:29 PM	8:29 PM
Roanoke, VA (Ar)	1:45 PM	9:45 PM

Lynchburg-Roanoke-76 minutes

Provided by VPRA

Week 1 frequency

Daily Sunday Wednesday Saturday

Weekdays Monday Thursday

Clear Tuesday Friday

Week 2 frequency

Daily Sunday Wednesday Saturday

Weekdays Monday Thursday

Clear Tuesday Friday

All Trains 7 days per week

	WB1	WB2
Lynchburg, VA (Dp)	12:29 PM	8:29 PM
Bedford, VA	1:10 PM	9:10 PM
Roanoke, VA (Ar)	1:50 PM	9:50 PM

Lynchburg-Roanoke-81 minutes
+5 minutes

Provided by VPRA

In RTC - 2 Daily Trains

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	03--164.1402		164.140	FLOAT	12:17	0
2	03--172.5001	Lynchburg	172.500	FLOAT	12:29	3:00
3	62N-257.720P	Roanoke	257.720	FLOAT	13:45	5:00
4	62V-261.7101	Kumis	261.710	FLOAT	FLOAT	0

In RTC - 2 Daily Trains With Bedford Stop

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	03--164.1402		164.140	FLOAT	12:17	0
2	03--172.5001	Lynchburg	172.500	FLOAT	12:29	3:00
3	62N-229.420P	Bedford	229.420	FLOAT	13:10	2:00
4	62N-257.720P	Roanoke	257.720	FLOAT	13:50	5:00
5	62V-261.7101	Kumis	261.710	FLOAT	FLOAT	0

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	03--164.1402		164.140	FLOAT	20:17	0
2	03--172.5001	Lynchburg	172.500	FLOAT	20:29	3:00
3	62N-257.720P	Roanoke	257.720	FLOAT	21:45	5:00
4	62V-261.7101	Kumis	261.710	FLOAT	FLOAT	0

	Node	Node Location	Field Milepost	Requested Arrival DD:HH:MM	Requested Departure DD:HH:MM	Dwell HH:MM:SS
1	03--164.1402		164.140	FLOAT	20:17	0
2	03--172.5001	Lynchburg	172.500	FLOAT	20:29	3:00
3	62N-229.420P	Bedford	229.420	FLOAT	21:10	2:00
4	62N-257.720P	Roanoke	257.720	FLOAT	21:50	5:00
5	62V-261.7101	Kumis	261.710	FLOAT	FLOAT	0

05 2040 Amtrak - Consist

Provided by VPRA

- Schedules with Bedford stop
- Base assumptions use Lynchburg to Roanoke runtimes based on current runtimes as displayed in public timetables
 - For calculation of stopping/starting at Bedford, Acceleration and deceleration based on 1 P42 and 6 cars
 - Dwell of 2 minutes assumed for Bedford stop
 - Additional dwell is a 1:1 addition of total runtime
 - Schedules based on Phase 1 and Phase 2 schedules from the *Transforming Rail in Virginia* effort

in RTC – Consist for all Amtrak Trains

	Node	Node Location	Field Milepost	Departing Loads	Departing Empties	Trailing Departing Tons	Trailing Departing Feet	Total Departing Tons	Type 1 Locomotive	Type 1 Train Position	Type 1 Number Running	Type 1 Number Isolated
1	03--164.1402		164.140	6	0	371	564	505	P42-DC	Front	1	0
2	03--172.5001	Lynchburg	172.500	6	0	371	564	505	P42-DC	Front	1	0
3	62N-257.720P	Roanoke	257.720	6	0	371	564	505	P42-DC	Front	1	0
4	62V-261.7101	Kumis	261.710	6	0	371	564	505	P42-DC	Front	1	0

05 2040 vs. 2019 Traffic Volume – Net Changes

- Growth of freight volumes based on NS historic trends, NS Marketing forecast, and Moody's GDP forecast
- Net of 12 NS Trains Added (+1.3 per day)
- Also made 191 trains longer (21.2 per day)
- +11.5% in overall combined train length

07 Three Scenarios Defined for this study

Base Case (year 2040)

- Future NS operations
 - 2019 traffic plus expected growth
- Current infrastructure plus improvements by 2040
 - Roanoke
 - Bedford Station
- Amtrak schedules
 - Two roundtrips daily
 - Schedule per agreement
 - No Bedford Station Stop

Modified Case (year 2040)

- Future NS operations
 - 2019 traffic plus expected growth
- Current infrastructure plus improvements by 2040
 - Roanoke
 - Bedford Station
- Amtrak schedules
 - Two roundtrips daily
 - Schedule per agreement
 - Add Bedford Station Stop

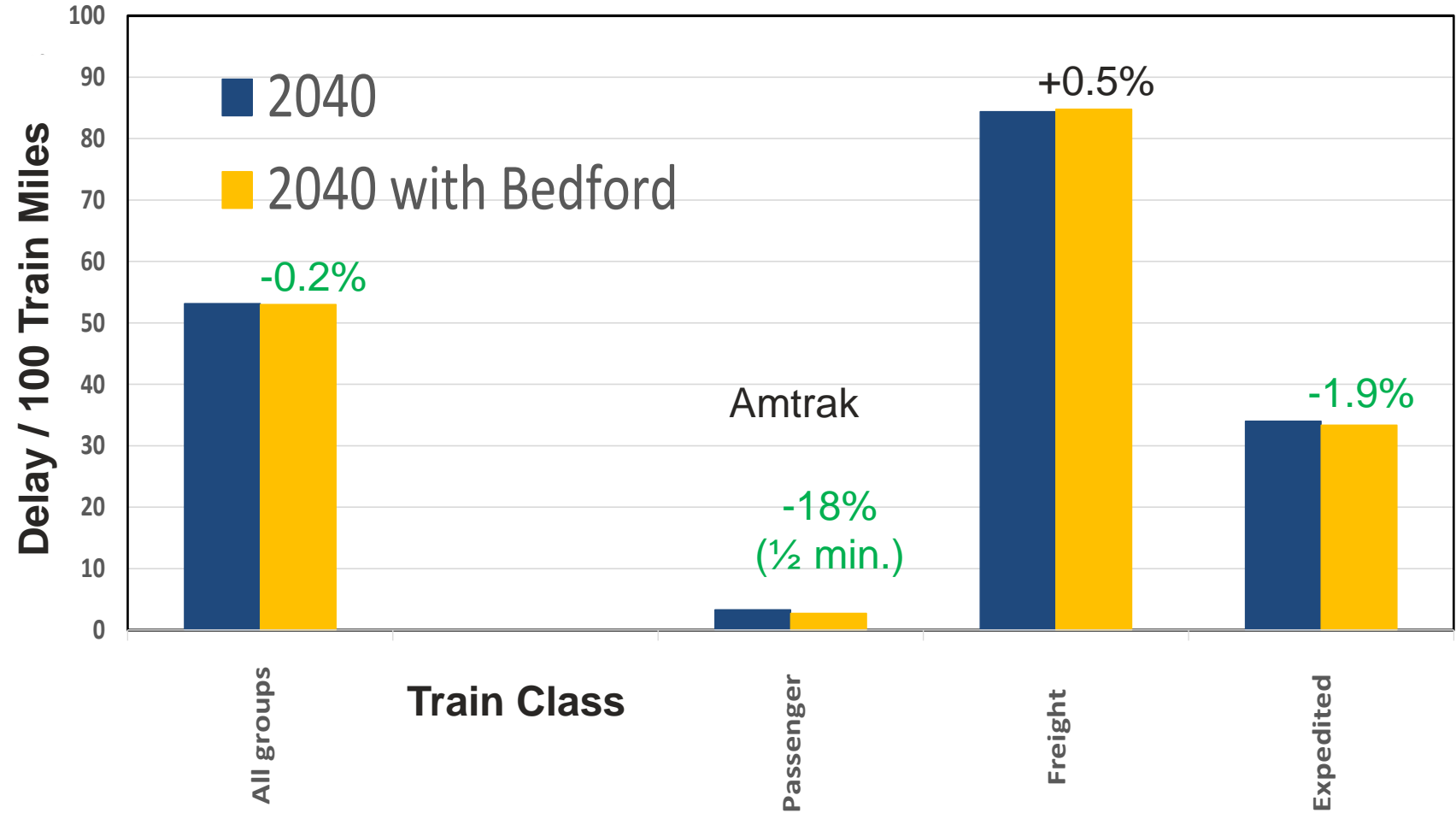
Improved Case (year 2040)

- Future NS operations
 - 2019 traffic plus expected growth
- Current infrastructure plus improvements by 2040
 - Roanoke
 - Bedford Station
 - +Infrastructure / Changes
- Amtrak schedules
 - Two roundtrips daily
 - Schedule per agreement
 - Add Bedford Station Stop

08 Simulation Shows Negligible Added Delay with Bedford Station

2040 with & without Bedford Station Stop

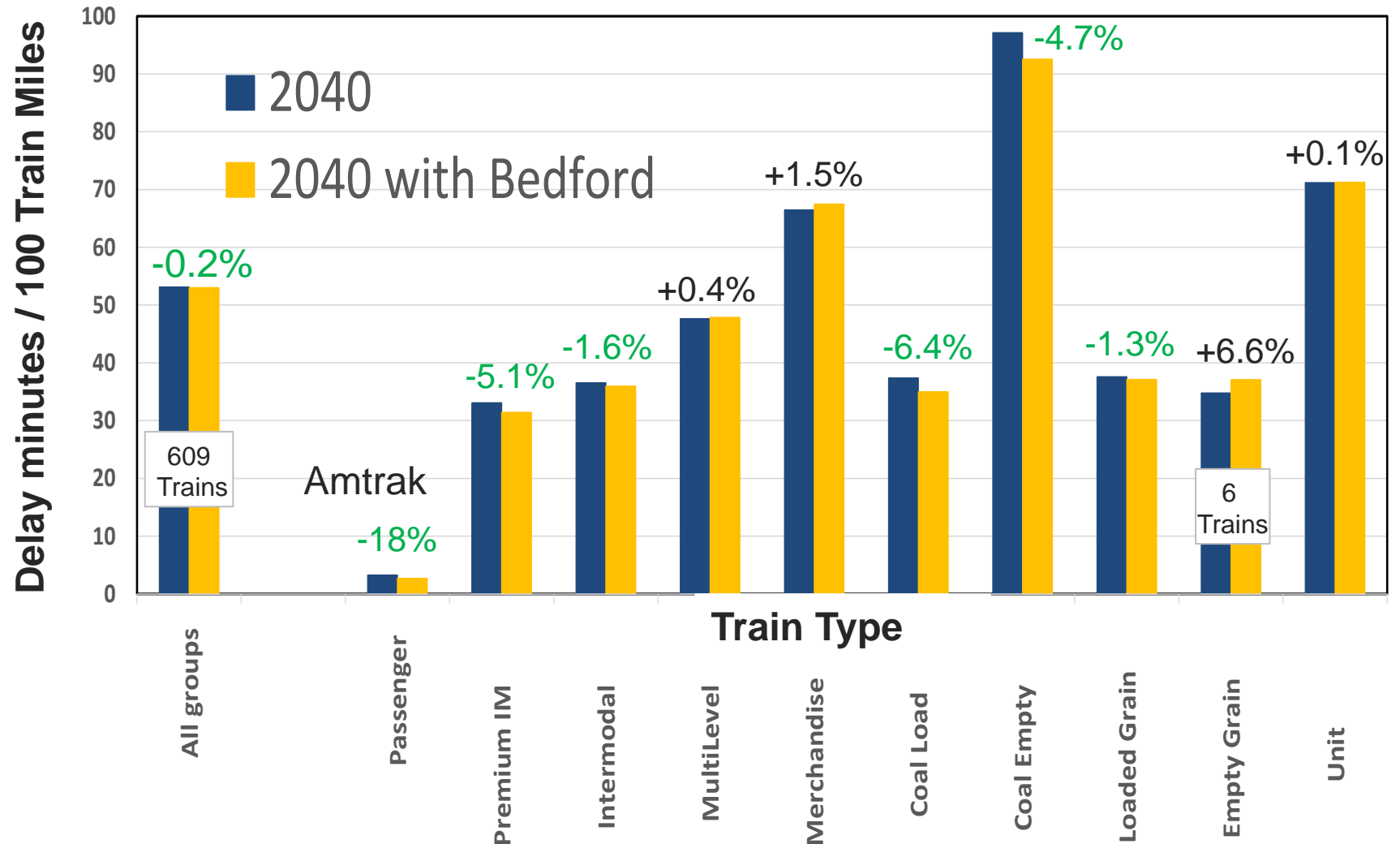
- Overall, there is negligible added delay with Bedford Station
- Amtrak performance is slightly better



08 Simulation Shows Negligible Added Delay by Train Type

2040 with & without Bedford Station Stop

- Overall, there is negligible added delay with Bedford Station
- Trains with less delay
 - Amtrak
 - intermodal
 - Coal
 - grain loads
- Trains with more delay
 - multilevel
 - merchandise
 - empty grain
 - unit



09 Study Conclusion

Proposed Amtrak Station @ Bedford

- Addition of Bedford Station stop creates non-material new delay to Norfolk Southern operations
- This assumes that Amtrak schedules do not deviate from those given in this study and that Amtrak does not add service on any part of the study area above what is included in this study
- No “Improved Case (year 2040)” scenario is needed for analysis as the assumed 2040 infrastructure (as defined in this document) results in no material increase in fluidity impairment.

