PUBLIC VERSION

BEFORE THE
SURFACE TRANSPORTATION BOARD

SUNBELT CHLOR ALKALI PARTNERSHIP Complainant, v. NORFOLK SOUTHERN RAILWAY COMPANY Defendant.	)	Docket No. NOR 42130

REPLY EVIDENCE OF NORFOLK SOUTHERN RAILWAY COMPANY

NARRATIVE SECTIONS III-E THROUGH IV

(Volume 2 of 3)

John M. Scheib
David L. Coleman
Christine I. Friedman
Norfolk Southern Corporation
Three Commercial Place
Norfolk, VA 23510

G. Paul Moates
Paul A. Hemmersbaugh
Terence M. Hynes
Matthew J. Warren
Hanna M. Chouest
Marc A. Korman
Sidley Austin LLP
1501 K Street, N.W.
Washington, D.C. 20005
(202) 736-8000
(202) 736-8711 (fax)

Counsel to Norfolk Southern Railway Company

Dated: January 7, 2013

Filing Contains Color Images

SHORT FORMS FOR FREQUENTLY CITED CASES

The following short form case citations are used herein:

AEPCO 2001	*Arizona Electric Power Cooperative, Inc. v. Burlington Northern & Santa Fe Railroad Co. & Union Pacific Railroad Co.*, STB Docket No. 42058 (served Dec. 31, 2001)
AEPCO 2002	*Arizona Electric Power Cooperative, Inc. v. Burlington Northern & Santa Fe Railroad Co. & Union Pacific Railroad Co.*, 6 S.T.B. 322 (2002).
AEPCO 2005	*Arizona Electric Power Cooperative, Inc. v. Burlington Northern & Santa Fe Railroad Co. & Union Pacific Railroad Co.*, STB Docket No. 42058, (served Mar. 15, 2005)
AEPCO 2011	*Arizona Electric Power Cooperative, Inc. v. Burlington Northern & Santa Fe Railroad Co. & Union Pacific Railroad Co.*, STB Docket No. 42113, (served Nov. 16, 2011)
AEP Texas	*AEP Texas North Co. v. BNSF Railway Co.*, STB Docket No. 41191, (Sub-No. 1) (served Sept. 10, 2007)
CP&L	*Carolina Power & Light Co. v. Norfolk Southern Railway Co.*, 7 S.T.B. 235 (2003)
Duke/CSXT	*Duke Energy Corp. v. CSX Transportation, Inc.*, 7 S.T.B. 402 (2004)
Duke/NS	*Duke Energy Corp. v. Norfolk Southern Railway Co.*, 7 S.T.B. 89 (2003)
Duke/NS Reconsideration	*Duke Energy Corp. v. Norfolk Southern Railway Co.*, 7 S.T.B. 862 (2004)
FMC	*FMC Wyoming Corp. v. Union Pacific Railroad Co.*, 4 S.T.B. 699 (2000)
IPA	*Intermountain Power Agency v. Union Pac. R.R. Co.*, STB Docket No. 42127 (served April 2, 2012).
M&G	*M&G Polymers USA, LLC v. CSX Transportation, Inc.*, STB Docket No. 42123 (served Sept. 27, 2012)
Major Issues	*Major Issues in Rail Rate Cases*, STB Ex Parte No. 657 (Sub-No. 1) (served Oct. 30, 2006), *aff'd sub nom. BNSF v. STB*, 526 F.3d 770 (D.C. Cir. 2008)

McCarty Farms	*McCarty Farms, Inc. v. Burlington Northern, Inc.*, 2 S.T.B. 460 (1997)
Otter Tail	*Otter Tail Power Co. v. BNSF Railway Co.*, STB Docket No. 42071 (served Jan. 27, 2006)
PPL Montana	*PPL Montana v. BNSF Railway Co.*, 6 S.T.B. 286 (2002)
Rate Regulation Reforms	*Rate Regulation Reforms*, STB Ex Parte No. 715 (served July 25, 2012)
SAC Procedures	*General Procedures for Presenting Evidence in Stand-Alone Cost Rate Cases*, 5 S.T.B. 441 (2001)
TMPA I	*Texas Municipal Power Agency v. Burlington Northern & Santa Fe Railway Co.*, 6 S.T.B. 573 (2003)
TMPA II	*Texas Municipal Power Agency v. Burlington Northern & Santa Fe Railway Co.*, 7 S.T.B. 803 (2004)
West Texas	*West Texas Util. Co. v. Burlington Northern Railroad Co.*, 1 S.T.B. 638 (1996).
WFA I	*Western Fuels Ass'n & Basin Elec. Power Cooperative v. BNSF Railway Co.*, STB Docket No. 42088 (served Sept. 10, 2007)
WFA II	*Western Fuels Ass'n, Inc. v. BNSF Railway*, STB Docket No. 42088 (served Feb. 17, 2009)
WP&L	*Wisconsin Power & Light v. Union Pac. R.R. Co.*, 5 S.T.B. 955 (2001)
Xcel	*Public Service Co. of Colorado d/b/a Xcel Energy v. Burlington Northern & Santa Fe Railway Co.*, 7 S.T.B. 589 (2004)

ACRONYMS

AAR	Association of American Railroads
ABC	Algorithmic Blocking and Classification
AEI	Automatic Equipment Identification
AEO	Annual Energy Outlook
AFE	Authorizations for Expenditure
APA	Administrative Procedure Act
AREMA	American Railway Engineering and Maintenance-of-Way Association
ARIL	Arrival at Intransit Location
ATC	Average Total Cost
B&B	Bridge & Building
BCFD	Billion Cubic Feet per Day
BCY	Bank Cubic Yard
BMP	Best Management Practices
BNSF	Burlington Northern Santa Fe Railway Company
BRC	Belt Railway of Chicago
C&S	Communications and Signals
CAGR	Compound Annual Growth Rate
CAPP	Central Appalachian
CBG	Coal Business Group
CDL	Commercial Driver's License
CFS	Commodity Flow Survey
CMA	Chemical Manufacturers Association
CMP	Aluminized Corrugated Metal Pipe

CRE	Counselors of Real Estate
CSAPR	Cross-State Air Pollution Rule
CSXT	CSX Transportation, Inc.
CTC	Centralized Traffic Control
CWA	Clean Water Act
CWR	Continuous Welded Rail
DCF	Discounted Cash Flow
DFLC	Departed From Location
DME	Dimethyl Ether
DMF	Dimethyl Formamide
DMI	Digital Mapping Index
DOT	Department of Transportation
DP	Distributed Power
EAP	Employee Assistance Program
ECY	Embankment Cubic Yard
EIA	Energy Information Administration
EJ&E	Elgin Joliet & Eastern Railway
EMT	Elizabeth Marine Terminal
ENS	Emergency Notification Signs
EOS	End of Siding
EPA	Environmental Protection Agency
ERP	Enterprise Resource Planning
EVA	Energy Ventures Analysis, Inc.
FAS	Financial Accounting Standards
FASB	Federal Accounting Standards Board

FED	Failed Equipment Detector
FELA	Federal Employers Liability Act
FMLA	Family and Medical Leave Act
FRA	Federal Railroad Administration
FRICS	Fellow of the Royal Institute of Chartered Surveyors
FSC	Fuel Surcharges
G&A	General & Administrative
GAO	Government Accountability Office
GDP	Gross Domestic Product
GVW	Gross Vehicle Weight
G&W	Genesee and Wyoming Railroad
HM-1	United States Hazardous Materials Instructions for Rail
HTUA	High Threat Urban Area
ICC	Interstate Commerce Commission
ICHD	Interchange Delivery
IHB	Indiana Harbor Belt Railway
IPO	Initial Public Offering
ISA	Intercarrier Service Agreement
ITMS	Integrated Transportation Management System
KCS	Kansas City Southern Railway
LARS	Locomotive Assignment and Routing System
LCY	Loose Cubic Yard
LNW	Louisiana and North West Railroad
LUM	Locomotive Unit Mile
MACRS	Modified Accelerated Cost Recovery System

MAI	Member of the Appraiser Institute
MATS	Mercury and Air Toxics Standards
MGT	Million Gross Ton
MM&A	Montreal, Maine, and Atlantic Railroad
MMBtu	million British Thermal Units
MMM	Maximum Markup Methodology
MOW	Maintenance-of-Way
MRE	Market Research and Economics Group
MRL	Montana Rail Link
MSE	Mississippi Export Railroad
MSP	Modified Straight-Mileage Prorate
N&W	Norfolk and Western
NAPP	Northern Appalachian
NARS	Non-accident Releases
NERC	North American Electric Reliability Corporation
NMC	Natural Moisture Content
NPRM	Notice of Proposed Rule Making
NRCS	Natural Resource Conservation Service
NROI	Net Railway Operating Income
NS	Norfolk Southern Railway Company
NYMEX	New York Mercantile Exchange
O/D	Origin/Destination
OMC	Optimum Moisture Content
PACT	Placed at Customer Facility
PFPS	Pulled from Patron Siding

PHMSA	Pipeline and Hazardous Safety Administration
PIH	Poisonous-by-Inhalation
PRB	Powder River Basin
PTC	Positive Train Control
PTRA	Port Terminal Railroad Association
P&W	Providence and Worcester Railroad
R/VC	Revenue to Variable Cost
RBMN	Reading Blue Mountain and Northern Railroad Company
RCAF	Rail Coal Adjustment Factor
RCP	Reinforced Concrete Pipe
RCRA	Resource Conservation and Recovery Act
RMS	Risk Management Solutions, Inc.
ROW	Right-of-Way
RPMS	Real Property Management System
RSAM	Revenue Shortfall Allocation Method
RSC	Rail Security Coordinator
RTA	Railroad Tie Association
RTC	Rail Traffic Controller
SAC	Stand-Alone Cost
SARR	Stand-Alone Railroad
SBRR	SunBelt Railroad
SCAN	Soil Climate Analyst Network
SCTG	Standard Classification of Transportation Goods
SFAS	Statement of Financial Accounting Standards
SIP	State Implementation Plans

SPLC	Standard Point Location Code
SSA	Shared Asset Area
SSI	Sensitive Security Information
STB	Surface Transportation Board
STCC	Standard Transportation Commodity Code
SWPPP	Stormwater Pollution Prevention Plan
T&E	Train & Engine
TBT	Thoroughbred Bulk Terminal
TCS	Triple Crown Services
TDIS	Thoroughbred Direct Intermodal Services
TIH	Toxic-by-Inhalation
TKMV	Track Move/Inventory Move
TMS	Transportation Management Services
TRANSCAER	Transportation Community Awareness and Emergency Response
TRRA	Terminal Railroad Association of St. Louis
TSA	Transportation Security Administration
TYES	Thoroughbred Yard Enterprise System
USDOT	U.S. Department of Transportation
USPAP	Uniform Standards of Professional Appraisal Practice
W&LE	Wheeling and Lake Erie Railway
WQMP	Water Quality Management Plan
WSS	Web Soil Survey
WTI	West Texas Intermediate

Table of Contents

Page

I. COUNSEL'S ARGUMENT AND SUMMARY OF EVIDENCE I-1

A. The Board Should Dismiss This Case For Several Independent Reasons. I-3

1. NS's Reply Evidence Demonstrates that the Properly Calculated and Attributable Costs to Construct, Operate and Maintain the SBRR Exceed Its Properly Calculated and Attributable Revenues. I-4

2. The SunBelt Railroad Relies on an Impermissible Cross-Subsidy Between the New Orleans-Birmingham Line and the Burstall-McIntosh Line. I-6

3. SunBelt's Failure to Provide Complete Train Service for 91% of the Issue Traffic Is A Failure of Proof That Requires Dismissal I-9

4. SunBelt Relied on Overhead Cross-Over Traffic That Would Be Disallowed By the Board's Proposals in Ex Parte 715 ..... I-12

B. The Board Should Recognize the Unique Costs and Risks of Transporting Chlorine, and Take Them Into Account Fully in its Rate Reasonableness Analyses. I-15

1. Chlorine Is Inherently Dangerous. I-16

2. All Railroads, Including the SBRR, Face Risks Inherent in the Transportation of Chlorine I-19

3. Public Policy Demands that the Board Account for the Inherent Risk of Transporting Chlorine in This Rate Case. I-22

4. NS Incurs the Externalities of Regulatory Policy, and Therefore the SAC Analysis Outcome and the Maximum Regulatory Rate Must Also Reflect that the Railroad Bears the Externalities. I-25

C. SUMMARY OF NS'S REPLY EVIDENCE I-29

II. MARKET DOMINANCE I-29

A. Quantitative Market Dominance I-29
B. Qualitative Market Dominance I-29

III. STAND ALONE COST I-30

A. Traffic Group I-30
B. Stand Alone Railroad System I-40

C. Operating Plan I-44
D. Operating Expenses I-50
E. Non-Road Property Investment I-55
F. Road Property Investment I-55
G. Discounted Cash Flow Analysis I-61
H. Results of SAC Analysis I-62
H.1 The Costs Of TIH Traffic Must Be Properly Allocated To That Traffic In The Event That The Board Performs An MMM Analysis. I-62

D. CONCLUSION I-69

II. MARKET DOMINANCE II-1

A. QUANTITATIVE EVIDENCE II-1
B. QUALITATIVE EVIDENCE II-3

III. STAND ALONE COST III-A-1

A. TRAFFIC GROUP III-A-1

1. Stand-Alone Railroad Traffic. III-A-1

2. Volumes (Historical and Projected). III-A-3

a. Historical III-A-3
b. Projected Volumes III-A-4

i. 2012 Through 2016 ..... III-A-4
ii. 2017-2021 SBRR volumes III-A-6

(a) Non-Coal Traffic Volumes 2017-2021 ..... III-A-8
(b) Coal Traffic Volumes 2017-2021 ..... III-A-8

3. Revenues (Historical and Projected) III-A-9

a. Single-Line. III-A-9

i. Historical Revenues for Intermodal Traffic III-A-9

(a) Because Sunbelt Did Not Account For The Costs Of Services Provided By TDIS Other Than NS Rail Linehaul, It May Not Claim Revenues Generated By Those Other Services. III-A-10

ii. Projected Revenues III-A-12

(a) Sunbelt Mis-Calculated Intermodal Revenue Growth From 2011 To 2012. ..... III-A-12

(b) SunBelt Overstated Projected Net Fuel Surcharge Revenues. III-A-14

b. Divisions—Existing Interchanges. III-A-19

i. Handling Carrier Payments. III-A-19
ii. Switching Carrier Payments. III-A-21

c. Divisions—Cross-Over Traffic. III-A-23

i. The Board Should Apply The ATC Rule Because At All Times Relevant To This Case, ATC Has Been The Only Legally Valid Rule And Methodology Governing Cross-Over Traffic Revenue Allocation. III-A-27

(a) Original ATC Was Adopted In Notice-And-Comment Rulemaking And Affirmed On Appeal And Is The Only Cross-Over Traffic Rule Applicable To This Case. III-A-28

(b) As A Matter Of Administrative Law, The Board Must Apply The ATC Rule In All SAC Cases Unless And Until It Has Completed A Full Notice-And-Comment Rulemaking That Adopts A Different Rule. III-A-31

(c) Application of ATC To Low R/VC Movements Is Not "Illogical," And The Concern That Led The Board To Modify The ATC Rule Is Not Present Here. III-A-32

ii. The Board Must Address In This Case The Complainant's Excessive Use Of Distorting Cross-Over Traffic. III-A-35

(a) The SBRR Includes Extensive Amounts Of The Very Carload And Multi-Carload Cross-Over Traffic That Concerns The Board. III-A-36

(b) Placing Limits on Cross-Over Traffic In This Case Would Substantially Reduce SBRR Traffic Volumes and Revenues. III-A-40

(c) Sunbelt Would Not Be Prejudiced By A Limitation On SBRR Cross-Over Traffic. III-A-41

iii. Application Of New Rules Adopted In Ex Parte 715 To This Case Would Be Appropriate, And Would Not Constitute "Retroactive Rulemaking." III-A-43

(a) Application Of New Cross-Over Revenue Allocation Rule To This Case. III-A-45

(b) New Cross-Over Traffic Limits Should Be Applied In This Case. III-A-48

iv. Other Corrections To Cross-Over Revenue Allocation Calculations Are Necessary. III-A-55

B. STAND-ALONE RAILROAD SYSTEM III-B-1

1. Routes and Mileage III-B-1

a. Main Line III-B-1
b. Branch Lines III-B-2
c. Interchange Points III-B-2
d. Total Route Mileage III-B-3

2. Track Miles and Weight of Track III-B-3

a. Main Lines III-B-5
b. Branch Lines. III-B-6
c. Sidings III-B-6
d. Other Tracks III-B-6

3. Yards III-B-7

a. Miles and Weight of Yard Track III-B-8

4. Other III-B-9

a. Joint Facilities III-B-9
b. Intermodal Facilities III-B-9
c. Automotive Facilities III-B-9
d. Signal/Communications System III-B-10
e. Turnouts, FEDs and AEI Scanners III-B-11
f. RTC Model Simulation of SBRR Configuration III-B-12

C. OPERATING PLAN III-C-1

INTRODUCTION III-C-1

A. SunBelt Did Not Present A Feasible Operating Plan For Its SARR III-C-12

1. SunBelt's "Automated" Operating Plan Methodologies Are Fatally Flawed And Should Be Rejected. III-C-12

a. SunBelt's "Automated" Train Service Plan Failed To Capture Hundreds Of Trains That Are Necessary To Provide Complete On-SARR Service. III-C-13

b. SunBelt Had All The Data Necessary To Develop The Detailed Operating Plan Required By The Board's Regulations. III-C-19

c. SunBelt's Yard Service Plan Is Based Upon Unsupported Mathematical Calculations That Produce Absurd Results. III-C-30

d. SunBelt's Operating Plan Is Woefully Short of Yard Crews And Locomotives III-C-37

2. SunBelt Has Failed To Present A Feasible Operating Plan For General Freight Traffic III-C-41

3. SunBelt Has Not Presented A Feasible Operating Plan For the Issue Traffic III-C-52

4. SunBelt's Operating Plan Fails To Account For The SBRR's Reciprocal Obligations To Connecting Carriers. III-C-60

a. SunBelt's Operating Plan Makes No Provision For Pre-Blocking Cars Interchanged By The SBRR To Connecting Carriers III-C-64

b. SunBelt Improperly Assumes That Locomotives Will Run Through On All Trains Interchanged By SBRR With Other Railroads. III-C-67

c. SunBelt's Allocation Of Responsibility For Fueling Locomotives Is Inconsistent With Both NS's Intercarrier Agreements And Real World Operating Practices..... III-C-69

d. SunBelt Makes No Provision For Running Repairs To Foreign Railcars On The SBRR Network..... III-C-73

5. SunBelt's Operating Plan Does Not Comply With Regulations And Best Practices Relating To The Transportation Of TIH Shipments. III-C-77

a. SunBelt's Operating Plan Does Not Track TIH Traffic..... III-C-79

b. SunBelt's Assumed Train Speeds Exceed Those Allowed For Trains Carrying TIH Traffic. III-C-81

c. SunBelt's Operating Plan Fails To Provide The Personnel That The SBRR Would Need To Handle TIH Commodities Safely. III-C-83

B. SunBelt's RTC Model Simulation Is Meaningless..... III-C-89

1. SunBelt's RTC Simulation Is Based Upon A Fatally Deficient Train Service Plan..... III-C-90

2. SunBelt's RTC Model Contains Incorrect Grade Information. III-C-104

3. SunBelt's RTC Model Does Not Properly Account For Random Outages And Train Delays..... III-C-106

4. SunBelt Failed To Input Foreign Railroad Crossings And Road Crossings Into Its RTC Model..... III-C-112

5. SunBelt's RTC Simulation Fails To Give Effect To The Impact Of Hi-Rail Vehicles..... III-C-114

1. General Parameters and Methodology..... III-C-118

a. SBRR Car Blocking and Train Service Plan III-C-121

i. Carload Traffic III-C-121
ii. Intermodal Traffic III-C-131
iii. Unit Train Traffic III-C-132

b. Development of SBRR Yard Facilities III-C-133

i. Birmingham Hump Yard III-C-139
ii. Flat Switching Yards III-C-143
iii. Track Allocation For Ancillary Functions III-C-145

c. Traffic Flow and Interchange Points III-C-146
d. Joint Use and Interchange Agreements III-C-148
e. Track and Yard Facilities III-C-149

i. Main Line Track III-C-149
ii. Side Tracks and Spurs III-C-149
iii. Yards III-C-150
iv. Intermodal Facilities III-C-154
v. Automotive Facilities III-C-155

f. Crew-Change Location/Times III-C-156

i. Road Crews III-C-156

g. Switching and Yard Activity III-C-157

i. Locomotive inspections and fueling III-C-157
ii. Railcar inspections III-C-158

(a) Inspection procedures III-C-158

(b) Trains requiring inspection III-C-161

h. Trains and Equipment III-C-163

i. Train Sizes III-C-163
ii. Locomotives III-C-163

(a) Road Locomotives III-C-164

(b) Helper Locomotives III-C-169

(c) Switch/Work Train Locomotives III-C-169

iii. Railcars III-C-172

i. Crew Districts and Crew Requirements III-C-173

i. Road Crews III-C-173
ii. Yard Crews III-C-175

2. Other III-C-178

a. Car Repair Facilities III-C-178
b. Train Control and Communication III-C-179

3. NS's RTC Model Simulation III-C-180

a. Train Size and Weight III-C-181
b. Maximum Train Speeds III-C-182
c. Road Locomotive Consists III-C-182
d. Dwell Times at Origins and Destinations III-C-183

i. General Freight Traffic III-C-183
ii. Unit Train Coal Traffic III-C-186

e. Dwell Times at Yards III-C-187
f. Time Required to Interchange Trains With Other Railroads. III-C-188
g. Crew Change Locations/Times III-C-188
h. Track Inspections/Maintenance Windows III-C-188
i. Time for Random Failures/Line Outages III-C-189

D. OPERATING EXPENSES III-D-1

1. Locomotives III-D-6

a. Locomotive Acquisition III-D-7

i. SunBelt Understates the Number of Locomotives III-D-7
ii. SunBelt Understates the Locomotive Lease Cost III-D-15

b. Locomotive Maintenance III-D-19
c. Locomotive Servicing (Fuel, Sand, and Lubrication) III-D-20

i. Fuel Cost III-D-20
ii. Fuel Consumption III-D-20
iii. Locomotive Servicing III-D-23

2. Railcars III-D-23

a. Acquisition III-D-23

b. Maintenance III-D-28
c. Private Car Allowances III-D-29

3. Operating Personnel III-D-29

a. Train/Switch Crew Personnel III-D-29

i. Compensation III-D-36
ii. Fringe Benefits III-D-38
iii. Taxi and Hotel Expense III-D-41

b. Non-Train Operating Personnel III-D-42
c. General and Administrative III-D-42

i. SunBelt's Justifications For Its Extraordinarily Low G&A Staffing and Spending Levels Are Meritless. III-D-48

(a) SunBelt's Evidence is Not "Consistent With" G&A Levels Approved in Previous SAC Cases. III-D-48

(b) SunBelt's Other Claimed Reasons For the SBRR's Low G&A Spending and Staffing Are Not Credible. III-D-50

(i) The SBRR's IT Systems Are Unexceptional and Do Not Offer Substantial Savings. III-D-51

(ii) The SBRR's Reliance on Outsourcing. III-D-55

(iii) The SBRR's Reliance on Cross-Over Traffic Does Not Justify Inadequate G&A Spending III-D-57

(iv) SBRR's Use of Non-Union Personnel Has a Minimal Impact on G&A Spending. III-D-58

(v) Being a Privately Held Company Has A Minor Impact on G&A Needs III-D-59

ii. Staffing Requirements III-D-60

(a) Executive Department III-D-64
(b) Board of Directors III-D-66

(c) Marketing & Sales Department III-D-68
(d) Finance and Accounting Department..... III-D-72

(i) Vice President and Chief Financial Officer. III-D-74
(ii) Treasury. III-D-75
(iii) Audit. III-D-77
(iv) Revenue Accounting. III-D-79
(v) Disbursements. III-D-83
(vi) Tax. III-D-85
(vii) Financial Reporting. III-D-86
(viii) Purchasing. III-D-88

(e) Administration Department III-D-90

(i) Law. III-D-90
(ii) Casualty Claims. III-D-92
(iii) Human Resources. III-D-93
(iv) IT III-D-98
(v) Asset Protection. III-D-100

(1) Environmental Staffing III-D-100
(2) Police III-D-108

(vi) Real Estate. III-D-113

iii. Compensation III-D-114

(a) Salaries for Non-Executives III-D-114
(b) Executive Compensation III-D-114
(c) Outside Director Compensation III-D-118
(d) Fringe Benefits III-D-118

iv. Materials, Supplies and Equipment III-D-118
v. Other III-D-119

(a) IT III-D-119
(b) Other Outsourced Functions III-D-121

(i) Tax Preparation. III-D-122
(ii) Payroll Processing. III-D-122
(iii) Audit and Internal Review. III-D-122
(iv) Claims Handling. III-D-123
(v) Outside Counsel. III-D-123

(c) Start-up and Training Costs III-D-124

(i) Training III-D-124
(ii) Recruitment III-D-125

(d) Travel III-D-127
(e) Bad Debt III-D-129

vi. Benchmarking to Other Railroads Shows that NS's Proposed G&A Staffing Would Make the SBRR A Best-in-Class Efficient Railroad III-D-130

4. Maintenance-of-Way III-D-135

a. SBRR Operating Staff III-D-140
b. General Office Organization III-D-142
c. Track Department III-D-146

i. General Office Staff III-D-148
ii. Field Staff III-D-148

(a) Roadmasters and Assistant Roadmasters III-D-148
(b) Track Crews III-D-150
(c) Roadway Machine Operators III-D-154
(d) Welder/Helper/Grinders III-D-156
(e) Rail Lubricator Repairmen III-D-157
(f) Roadway Equipment Mechanics III-D-158
(g) Ditching Crews III-D-158
(h) Smoothing Crews III-D-161

d. Signals and Communications III-D-162

i. General Office Staff III-D-165
ii. Field Staff III-D-167
iii. Signal Maintainers, Inspectors and Technicians III-D-167
iv. Norris Hump Yard III-D-171
v. Dispatch Center III-D-172
vi. Communications Technicians III-D-173

e. Bridge & Building Department III-D-173

i. General Office Staff III-D-175
ii. Field Staff III-D-175

(a) B&B Supervisors III-D-175
(b) Bridge Inspectors and Other Field B&B Employees III-D-175

f. Misc. Administrative/Support Personnel III-D-177

i. Engineer of Programs and Contracts III-D-178
ii. Public Project Engineers III-D-179
iii. Manager of Administration & Budgets III-D-180
iv. Managers Environmental/Safety/Training III-D-180
v. Manager Mechanical Operations III-D-181
vi. Water Plant and Fuel Technicians III-D-181
vii. Allocation of MOW Personnel to Operations and Maintenance Expense III-D-182

g. Non-Program MOW Work Performed by Contractors III-D-183
h. Planned Contract Maintenance III-D-184

i. Track Geometry Testing III-D-184
ii. Ultrasonic Rail Testing III-D-185
iii. Rail Grinding III-D-186
iv. Yard Cleaning III-D-187
v. Vegetation Control III-D-189
vi. Crossing Repaving III-D-190
vii. Shoulder Ballast Cleaning III-D-190
viii. Equipment Maintenance III-D-192
ix. Communications System Inspection and Repair III-D-193
x. Bridge Inspections III-D-193
xi. Building Maintenance III-D-193

i. Unplanned Contracted Maintenance III-D-193

i. Snow Removal III-D-193
ii. Storm Debris Removal III-D-193
iii. Building Repairs III-D-194

j. Large Magnitude Unplanned Maintenance III-D-194

i. Derailments III-D-194
ii. Washouts III-D-196
iii. Environmental Cleanups III-D-197

k. Program Maintenance III-D-197

i. Rail Grinding III-D-198
ii. Bridge Substructure and Superstructure Repair III-D-198

l. Vehicles and Equipment III-D-198

i. Vehicle Inventory III-D-198
ii. Equipment and Vehicle Monthly Rental Rates III-D-201

5. Leased Facilities III-D-204

6. Loss and Damage III-D-204

7. Insurance III-D-204

8. Ad Valorem Tax III-D-210

a. Unit Valuation Is the Basis for Ad Valorem Taxation In Each of the SBRR States III-D-212
b. Railroad Income Value Is the Primary Factor Considered By the SBRR Unit Value States III-D-215
c. A NROI Adjustment Should Be Made to Account for the SBRR's Relative Income Value III-D-217

9. Other III-D-219

a. Intermodal Lift and Ramp Cost III-D-219
b. Automotive Handling Cost III-D-220
c. Costs Incurred By Residual NS For New SBRR-NS Interchanges III-D-221
d. Calculation of Annual Operating Expenses III-D-223
e. Excess Risk III-D-224

i. The Risk of A Catastrophic TIH Release That Exceeds The Limits of Reasonably Obtainable Insurance Cannot Be Eliminated Entirely 225
ii. Quantification of Cost of Excess Risk III-D-233

E. NON-ROAD PROPERTY INVESTMENT III-E-1

F. ROAD PROPERTY INVESTMENT III-F-1

1. Land III-F-2

a. The SBRR's Land Must Be Valued As of the Date the SBRR Would Need to Acquire It III-F-4
b. NS's Approach to its Appraisal of the ROW Produced More Accurate Results III-F-9

i. Identification of Land Valuation Units along the ROW. III-F-13

(a) Land Physically Inspected. III-F-13

(b) Land Not Physically Inspected III-F-17

ii. Collection and Analysis of Comparable Sales Data.....III-F-17

(a) Comparable Sales for the SBRR Should Include Only Unimproved Land. III-F-18

(b) Comparable Sales Should Be Aggregated Using A Stratified Mean Methodology to Preserve the Accuracy of the Valuation.....III-F-20

iii. Calculation of Total Value of Land To Be Acquired By the SBRR.....III-F-23

(a) Concluded Values Must Be Logically Connected To The Comparable Sales Relied Upon. III-F-24

(b) Assessed Values are an Improper Basis of Comparison for Concluding Market Value III-F-26

(c) The SunBelt Appraiser Provided No Justification for Its Valuation of Rural Towns.....III-F-27

(d) The SunBelt Appraiser's Valuation of Easements Is Contrary to Board Precedent.....III-F-27

c. Appraisal of Land for Yards and Communications Facilities.....III-F-29

d. Conclusion III-F-30

2. Roadbed Preparation.....III-F-31

a. SunBelt's Fabricated Rationale.....III-F-40

b. Clearing and Grubbing.....III-F-48

i. Clearing and Grubbing Quantities III-F-48

ii. Acres Requiring Both Clearing and Grubbing III-F-51

c. Acres Requiring Only Clearing III-F-51

d. Earthwork.....III-F-53

i. Earthwork Quantities from ICC Engineering Reports III-F-53
ii. Other SBRR Earthwork Quantities and Earthwork Costs III-F-55

(a) SBRR Yards III-F-55
(b) Total Earthwork Quantities III-F-55
(c) Earthwork Unit Costs III-F-56

(i) Haul Distance Assumptions III-F-56
(ii) Common Excavation III-F-57
(iii) Loose Rock Excavation III-F-59
(iv) Solid Rock Excavation III-F-62
(v) Embankment/Borrow III-F-64

(d) Other Earthwork Quantities & Unit Costs III-F-65

(i) Land for Waste Excavation III-F-65
(ii) Stripping III-F-68
(i) Undercutting III-F-70
(ii) Over-Excavation III-F-80
(iii) Fine Grading III-F-81
(iv) Swell III-F-83

(e) Subgrade Preparation III-F-86
(f) Total Earthwork Cost III-F-95

e. Drainage III-F-95

i. Lateral Drainage III-F-95
ii. Yard Drainage III-F-95

f. Culverts III-F-96

i. Culvert Unit Costs III-F-97
ii. Culvert Installation Plans III-F-99
iii. Culvert Quantities III-F-102
iv. Total Culvert Costs III-F-108

g. Other III-F-108

i. Sideslopes III-F-108
ii. Ditches III-F-108
iii. Retaining Walls III-F-108

(a) Retaining Walls Replaced With Gabions III-F-109

(i) Conversion of Masonry and Timber Retaining Wall Quantities to Gabions III-F-109

(ii) Additional Retaining Wall Quantities to Accommodate Modern Roadbed Standards III-F-113

(b) Piling Retaining Walls III-F-116

iv. Rip-rap III-F-116
v. Relocating and Protecting Utilities III-F-117
vi. Seeding/Topsoil Placement III-F-117
vii. Water for Compaction III-F-117
viii. Surfacing for Detour Roads III-F-118
ix. Environmental Compliance III-F-118
x. Lighting for Night Work III-F-118
xi. Dust Control Work III-F-119

3. Track Construction III-F-120

a. Geotextile Fabric III-F-121
b. Ballast III-F-122

i. Ballast Quantities III-F-123
ii. Ballast Pricing III-F-126
iii. Ballast Material Transportation to the SBRR Railheads III-F-127
iv. Ballast Material Distribution Along the SBRR Right-of-Way III-F-129
v. Material Transportation Cost for Ballast III-F-131
vi. Subballast III-F-133

(a) Subballast Quantities III-F-133

(b) Subballast Material Costs III-F-134

(c) Subballast Material Placement Costs III-F-136

c. Ties III-F-137
d. Rail III-F-140

i. Main Line and Yards and Siding III-F-140
ii. Rail Pricing III-F-140
iii. Rail Unloading Costs III-F-142
iv. Field Welds III-F-145
v. Insulated Joints III-F-146

e. Switches III-F-146
f. Other III-F-149

i. Rail Lubricators III-F-149
ii. Plates Spikes and Anchors III-F-151
iii. Derails and Wheel Stops III-F-152

(a) Derails III-F-152
(b) Wheel Stops III-F-154

iv. Crossing Diamonds III-F-154

(a) Materials Transportation III-F-157
(b) Track Construction Labor III-F-158

4. Tunnels III-F-158

5. Bridges III-F-158

a. Bridge Inventory III-F-160
b. Bridge Design and Cost Overview III-F-167

i. Cost Overview III-F-167
ii. Bridge Design III-F-170

(a) Superstructure Design (Spans) III-F-171

(b) Substructure Design (Piers and Abutments) III-F-174

iii. Type I Bridges III-F-177
iv. Type II Bridges III-F-179
v. Type III Bridges III-F-180
vi. Type IV Bridges III-F-184
vii. Bridges with Multiple Span Types III-F-184
viii. Special Bridges III-F-186

(a) Movable Bridges III-F-186
(b) Non-Movable Bridges over Navigable Waters III-F-196

c. Highway Overpasses III-F-198

6. Signals and Communications III-F-199

a. Centralized Traffic Control III-F-200

i. The SBRR Could Not Install PTC In 2011 ..... III-F-200

ii. SunBelt's Inventory of Signals Components Is Unreliable....III-F-206
iii. SunBelt's Unit Costs For Signals Components Are Incorrect. III-F-213

b. PTC III-F-217

i. PTC Wayside System III-F-217
ii. PTC IT Costs....III-F-219
iii. PTC Locomotive Costs....III-F-221
iv. PTC Development Costs....III-F-221
v. PTC Expenditure Schedule....III-F-227

c. Detectors III-F-227
d. Crossing Signal Equipment....III-F-229
e. Communication System III-F-235
f. Hump Yard Equipment....III-F-235

7. Buildings and Facilities....III-F-235

a. Headquarters Building III-F-236
b. Fueling Facilities....III-F-239

i. Fueling Platforms....III-F-239

c. Locomotive Repair Facilities....III-F-240
d. Car Repair III-F-244

i. Major Car Repair Facility III-F-244
ii. Freight Car Repair Tracks....III-F-245

e. Crew Change Facilities....III-F-246
f. Yard Offices....III-F-248
g. MOW Buildings....III-F-249
h. Wastewater Treatment III-F-252

i. Other Facilities/Site Costs....III-F-253

i.a. Guard Booths III-F-258
i.b. Mechanic Repair Shops III-F-259
i.c. Observation/Yard Master Tower III-F-260
i.d. Storage & Warehouse Buildings....III-F-261
i.e Two-Person Signal Maintainers Building....III-F-262

8. Public Improvements III-F-263

a. Fences III-F-263

b. Signs and Road Crossing Devices III-F-263

i. Advance Warning Signs and Crossbucks III-F-263
ii. ENS III-F-264

c. Grade-Separated and At-Grade Crossings III-F-265

i. Grade Separations III-F-265
ii. At-grade Crossings III-F-265
iii. At-grade Crossing Detours III-F-266
iv. At-grade Crossing Vegetation Removal III-F-266

9. Mobilization III-F-268

10. Engineering III-F-272

11. Contingencies III-F-272

12. Construction Schedule III-F-272

a. Additive to Compensate for Days Lost to Rain Events III-F-274

G. DISCOUNTED CASH FLOW ANALYSIS III-G-1

1. Cost of Capital III-G-1
2. Inflation Indices III-G-4
3. Tax Liability III-G-5
4. Capital Cost Recovery III-G-5

H. RESULTS OF SAC ANALYSIS III-H-1

1. Results of SAC Analysis III-H-1

a. Cost of Capital III-H-1
b. Road Property Investment Values III-H-2
c. Interest During Construction III-H-2
d. Amortization Schedule of Assets Purchased With Debt Capital III-H-2
e. Present Value of Replacement Cost III-H-4
f. Tax Depreciation Schedules III-H-5
g. Average Annual Inflation in Asset Prices III-H-8
h. Discounted Cash Flow III-H-8
i. Computation of Tax Liability – Taxable Income III-H-11
j. Operating Expenses III-H-11
k. Summary of SAC Analysis III-H-12

2. If The Board Were to Find That The SBRR Revenues Exceed SAC Costs Over The 10-Year DCF Period, It Must Administer Its Internal Cross-Subsidy Test to Ensure Traffic on the Birmingham to New Orleans Segment Would Not Subsidize Traffic on the McIntosh to Burstall Segment. III-H-13

a. Background III-H-15
b. The Board's Internal Cross-Subsidy Test is Essential to Prevent Subsidization of the Issue Traffic by Other Shippers Who Do Not Benefit from Facilities Used By the Issue Traffic. III-H-16
c. Application of the Threshold Cross-Subsidy Test Would Demonstrate That This Case Must Be Dismissed Because the Evidence Fails to Demonstrate That SunBelt's Traffic Is Cross-Subsidizing Other Traffic on the NS System. III-H-19

3. Maximum Rate Calculations III-H-20

a. Any MMM Analysis Conducted in this Case Should Properly Allocate Unique Costs of TIH Traffic Solely to that Traffic III-H-21
b. The Board Should Apply the Trainload Adjustment Advocated in AEPCO 2011 to Shipments Moving In Single Trainload Service Over the SBRR III-H-28
c. If It Applied MMM, the Board Would Also Need to Correct SunBelt's Two Other Clear Implementation Errors. III-H-29

IV. WITNESS QUALIFICATIONS AND VERIFICATION IV-1
James D. Bagley IV-1
Michael R. Baranowski IV-12
Willie Benton III IV-23
F. Douglas Bess IV-26
Paul E. Bobby IV-31
Richard Brown IV-43
Patrick J. Bryant IV-48
Kaustuv Chakrabarti IV-59
Xingang Clark Cheng IV-62
Benton V. Fisher IV-66
Rob Fisher IV-77
Randall G. Frederick IV-80
Roberto J. Guardia IV-85
Michael P. Hedden IV-94
David Hughes IV-102
Kenneth LeCroy IV-108
Ronnie D. Johnson IV-111

David A. Magistro IV-113
Michael Matelis IV-121
Mark D. Mathewson IV-124
Joseph C. Osborne, Jr. IV-128
Mark A. Peterson IV-133
Robert C. Phillips IV-145
A. Mitchell Polinsky IV-152
Michael K. Quinn IV-165
Richard Ray IV-167
Dale A. Schaub IV-171
Dewey D. Smith IV-173
Kathleen C. Smith IV-175
Richard L. Smith IV-177
Gerhard Thelen IV-181
David R. Wheeler IV-184
Michael K. Williams IV-188
George T. Zimmerman IV-191

Table of Contents

Page

III. STAND-ALONE COST III-E-1

E. NON-ROAD PROPERTY INVESTMENT III-E-1

III. STAND-ALONE COST

E. NON-ROAD PROPERTY INVESTMENT

Non-road property investment costs, including costs for locomotives, railcars, and other equipment, are addressed in other sections of NS's reply evidence.

Table of Contents

Page

III. STAND-ALONE COST 1

F. ROAD PROPERTY INVESTMENT 1

1. Land 2

a. The SBRR's Land Must Be Valued As of the Date the SBRR Would Need to Acquire It. 4

b. NS's Approach to its Appraisal of the ROW Produced More Accurate Results. 9

i. Identification of Land Valuation Units along the ROW. 13

(a) Land Physically Inspected. 13

(b) Land Not Physically Inspected 17

ii. Collection and Analysis of Comparable Sales Data. 17

(a) Comparable Sales for the SBRR Should Include Only Unimproved Land. 18

(b) Comparable Sales Should Be Aggregated Using A Stratified Mean Methodology to Preserve the Accuracy of the Valuation. 20

iii. Calculation of Total Value of Land To Be Acquired By the SBRR. 23

(a) Concluded Values Must Be Logically Connected To The Comparable Sales Relied Upon. 24

(b) Assessed Values are an Improper Basis of Comparison for Concluding Market Value 26

(c) The SunBelt Appraiser Provided No Justification for Its Valuation of Rural Towns. 27

(d) The SunBelt Appraiser's Valuation of Easements Is Contrary to Board Precedent 27

c. Appraisal of Land for Yards and Communications Facilities 29

d. Conclusion 30

2. Roadbed Preparation 31

a. SunBelt's Fabricated Rationale 40

b. Clearing and Grubbing 48

i. Clearing and Grubbing Quantities 48
ii. Acres Requiring Both Clearing and Grubbing 51

c. Acres Requiring Only Clearing 51
d. Earthwork 53

i. Earthwork Quantities from ICC Engineering Reports 53
ii. Other SBRR Earthwork Quantities and Earthwork Costs 55

(a) SBRR Yards 55
(b) Total Earthwork Quantities 55
(c) Earthwork Unit Costs 56

(i) Haul Distance Assumptions 56
(ii) Common Excavation 57
(iii) Loose Rock Excavation 59
(iv) Solid Rock Excavation 62
(v) Embankment/Borrow 64

(d) Other Earthwork Quantities & Unit Costs 65

(i) Land for Waste Excavation 65
(ii) Stripping 68
(i) Undercutting 70
(ii) Over-Excavation 80
(iii) Fine Grading 81
(iv) Swell 83

(e) Subgrade Preparation 86
(f) Total Earthwork Cost 95

e. Drainage 95

i. Lateral Drainage 95
ii. Yard Drainage 95

f. Culverts 96

i. Culvert Unit Costs 97
ii. Culvert Installation Plans 99
iii. Culvert Quantities 102
iv. Total Culvert Costs 108

g. Other 108

i. Sideslopes 108
ii. Ditches 108
iii. Retaining Walls 108

(a) Retaining Walls Replaced With Gabions 109

(i) Conversion of Masonry and Timber Retaining Wall Quantities to Gabions 109
(ii) Additional Retaining Wall Quantities to Accommodate Modern Roadbed Standards113

(b) Piling Retaining Walls 116

iv. Rip-rap 116
v. Relocating and Protecting Utilities 117
vi. Seeding/Topsoil Placement 117
vii. Water for Compaction 117
viii. Surfacing for Detour Roads 118
ix. Environmental Compliance 118
x. Lighting for Night Work 118
xi. Dust Control Work 119

3. Track Construction 120

a. Geotextile Fabric 121
b. Ballast 122

i. Ballast Quantities 123
ii. Ballast Pricing 126
iii. Ballast Material Transportation to the SBRR Railheads .127
iv. Ballast Material Distribution Along the SBRR Right-of-Way 129
v. Material Transportation Cost for Ballast 131
vi. Subballast 133

(a) Subballast Quantities 133
(b) Subballast Material Costs 134
(c) Subballast Material Placement Costs 136

c. Ties 137
d. Rail 140

i. Main Line and Yards and Siding 140
ii. Rail Pricing 140
iii. Rail Unloading Costs 142
iv. Field Welds 145
v. Insulated Joints 146

e. Switches 146
f. Other 149

i. Rail Lubricators 149

ii. Plates Spikes and Anchors 151
iii. Derails and Wheel Stops 152

(a) Derails 152
(b) Wheel Stops 154

iv. Crossing Diamonds 154

(a) Materials Transportation 157
(b) Track Construction Labor 158

4. Tunnels 158

5. Bridges 158

a. Bridge Inventory 160
b. Bridge Design and Cost Overview 167

i. Cost Overview 167
ii. Bridge Design 170

(a) Superstructure Design (Spans) 171
(b) Substructure Design (Piers and Abutments) 174

iii. Type I Bridges 177
iv. Type II Bridges 179
v. Type III Bridges 180
vi. Type IV Bridges 184
vii. Bridges with Multiple Span Types 184
viii. Special Bridges 186

(a) Movable Bridges 186
(b) Non-Movable Bridges over Navigable Waters 196

c. Highway Overpasses 198

6. Signals and Communications 199

a. Centralized Traffic Control 200

i. The SBRR Could Not Install PTC In 2011 200
ii. SunBelt's Inventory of Signals Components Is Unreliable 206
iii. SunBelt's Unit Costs For Signals Components Are Incorrect. 213

b. PTC 217

i. PTC Wayside System 217
ii. PTC IT Costs 219

c. Highway Overpasses III-F-198

6. Signals and Communications III-F-199

a. Centralized Traffic Control III-F-200

i. The SBRR Could Not Install PTC In 2011 ..... III-F-200
ii. SunBelt's Inventory of Signals Components Is Unreliable III-F-206
iii. SunBelt's Unit Costs For Signals Components Are Incorrect. III-F-213

b. PTC III-F-217

i. PTC Wayside System III-F-217
ii. PTC IT Costs III-F-219
iii. PTC Locomotive Costs III-F-221
iv. PTC Development Costs III-F-221
v. PTC Expenditure Schedule III-F-227

c. Detectors III-F-227
d. Crossing Signal Equipment III-F-229
e. Communication System III-F-235
f. Hump Yard Equipment III-F-235

7. Buildings and Facilities III-F-235

a. Headquarters Building III-F-236
b. Fueling Facilities III-F-239

i. Fueling Platforms III-F-239

c. Locomotive Repair Facilities III-F-240
d. Car Repair III-F-244

i. Major Car Repair Facility III-F-244
ii. Freight Car Repair Tracks III-F-245

e. Crew Change Facilities III-F-246
f. Yard Offices III-F-248
g. MOW Buildings III-F-249
h. Wastewater Treatment III-F-252

i. Other Facilities/Site Costs III-F-253

i.a. Guard Booths III-F-258
i.b. Mechanic Repair Shops III-F-259
i.c. Observation/Yard Master Tower III-F-260

9. Mobilization....268

10. Engineering....272

11. Contingencies....272

12. Construction Schedule....272

a. Additive to Compensate for Days Lost to Rain Events....274

III. STAND-ALONE COST

F. ROAD PROPERTY INVESTMENT

NS's Reply Evidence demonstrates that SunBelt underestimated the road property investment costs of the SBRR by more than $1.5 billion, as summarized by Table III-F-1. In this Section III-F, NS explains the significant differences between SunBelt's road property investment evidence and the superior evidence NS provides in this Reply.

Table III-F-1

SBRR Road Property Investment Costs NS Reply

(in millions)

	Item	SunBelt Opening Investment	NS Reply Investment	Difference
	(1)	(2)	(3)	(4)
1	Land - 1/	$199	$218	$19
2	Roadbed Preparation	$244	$677	$433
3	Track Construction	$537	$874	$338
4	Tunnels	$0	$0	$0
5	Bridges	$316	$486	$170
6	Signals & Communications - 2/	$95	$198	$104
7	Buildings & Facilities	$17	$176	$159
8	Public Improvements	$8	$18	$9
9	Subtotal	**$1,416**	**$2,647**	**$1,231**
10	Mobilization	$33	$73	$40
11	Engineering	$122	$238	$116
12	Contingencies	$137	$269	$132
13	Total Road Property Investment Costs	**$1,708**	**$3,227**	**$1,519**

Source: NS Reply WP "III-F-Total NS Reply"

1/ - Reply land values reported at 2009 levels

2/ - A total of $47.6 Million in 2011 3Q PTC costs are invested after start up

1. Land[1]

SunBelt's Opening Evidence on real estate costs for the SBRR is predicated on fundamentally flawed methodologies and incorrect assumptions regarding when the SBRR would need to acquire land for its Right-of-Way ("ROW") if it is to begin operations in July 2011. The SunBelt appraiser[2] posits that the SBRR could acquire all of the necessary land—including land for the ROW for 578 SBRR-owned route miles, and land for yards and microwave towers totaling 6,995.7 acres—for $199.1 million. SunBelt's valuation underestimates the cost of acquiring land in part by choosing to value the real property as of July 31, 2011, which is the day after the SBRR is supposed to commence operations, and which is, according to SunBelt's own construction schedule, over *two years* after the SBRR would need to acquire its property in order to begin construction. *See* SunBelt Opening WP "Complete Construction Schedule (with % By Year).xls;" SunBelt Opening III-F-46. The SunBelt appraiser offers no justification for this valuation date.[3] The SunBelt appraiser's reliance upon the

---

[1] This Land Valuation Section is sponsored by Michael P. Hedden, who is a real estate expert. Mr. Hedden has reviewed the SunBelt land valuation evidence and prepared an alternative retroactive mass-appraisal valuation report. Mr. Hedden's credentials and expertise are described in more detail in Section IV.

[2] SunBelt's real estate evidence was sponsored by Richard R. Harps and several other witnesses who appear to have been working under Mr. Harps' direction. *See* SunBelt Opening III-F-2. Because in some cases it is not clear whether work was performed by Mr. Harps or by one of SunBelt's other witnesses, the terms "SunBelt appraiser" and "SunBelt appraisal team" are used herein to refer collectively to SunBelt's real estate witnesses.

[3] The only semblance of an attempt by the SunBelt appraiser to justify July 31, 2011, as a valuation date is a bizarre claim that a July 31, 2011, valuation date was "the date specified by the Surface Transportation Board." *See* SunBelt Opening WP "SunBelt SAR Land Valuation.pdf" at 18. The Board plainly did not "specify" 2011 as the valuation date, and indeed Board precedent plainly requires use of a valuation date that corresponds to the date land would be acquired. *See McCarty Farms,* 2 S.T.B. at 525, n.132 (adjusting the land valuation date back to the beginning of the construction period); *Arizona Pub. Serv. Co. v. The Atchison, Topeka & Santa Fe Railroad Co.*, 2 S.T.B. 367, 387, n.55 (1997) (valuing land at 1993 values so as to provide for a 1-year construction period prior to the initiation of service in 1994).

June 31, 2011, valuation date is unsupportable, and its land valuation evidence should be rejected for that reason alone.

This manipulation of the real estate valuation date, however, is not the only flaw in SunBelt's real estate evidence. As detailed below, the SunBelt appraiser failed to accurately identify Valuation Units; selected inappropriate comparable sales; used a flawed "global mean" approach to aggregate sales data in a way that artificially depressed per-acre prices; and valued easements in a way that is directly contrary to Board precedent. NS's expert witness Michael Hedden details the oversights, distortions, and improper methodologies used by the SunBelt appraiser in his Rebuttal Report, which is attached as NS Reply Exhibit III-F-2. Mr. Hedden is a member of the Appraiser Institute ("MAI") and the Counselors of Real Estate ("CRE") and is a distinguished Fellow of the Royal Institute of Chartered Surveyors ("FRICS").

Because SunBelt's real estate appraisal is biased and methodologically flawed, Mr. Hedden prepared an alternative retrospective mass-appraisal valuation report that is consistent with Uniform Standards of Professional Appraisal Practice ("USPAP") and Board precedent. Mr. Hedden's valuation report is NS Reply Exhibit III-F-3. Mr. Hedden performed an independent valuation analysis of the cost of land needed to acquire the ROW for the SBRR. As demonstrated below and in the Report itself, Mr. Hedden's appraisal applied methodologies that are consistent with USPAP standards, and features more specific and detailed analysis than the SunBelt appraiser's report. Mr. Hedden concludes that the land acquisition costs for the SBRR would total $218,110,000. In comparison, SunBelt posited that the SBRR could acquire

land for $199,100,000—$19,010,000, or 8.72%, less than NS's properly developed appraisal value.[4]

The following sections detail the process Mr. Hedden undertook in his appraisal and summarize the flaws in SunBelt's appraisal. These flaws render SunBelt's real estate evidence unreliable and unsupportable. Mr. Hedden's more thorough technique produced a more reliable and accurate valuation. As such, Mr. Hedden's analysis should be accepted by the Board in its entirety.

a. The SBRR's Land Must Be Valued As of the Date the SBRR Would Need to Acquire It.

One of the most significant and pervasive errors in the SunBelt appraiser's approach is his decision to value the SBRR's real estate as of July 31, 2011—over two years after the SBRR would need to begin acquiring property. SBRR's own construction schedule proposes that the SBRR would acquire land between June 2009 and December 2009 and that it would begin construction in October 2009. *See* SunBelt Opening WP "Complete Construction Schedule (with % By Year).xls;" SunBelt Opening III-F-46. The SunBelt appraiser's choice of a July 31, 2011, valuation date for a SARR that is to commence operations the day before is irreconcilable with its proposed construction schedule, and plainly fails to take into consideration the substantial time that would be required to acquire all of the land needed for the SBRR ROW and facilities and to construct the SBRR. The SunBelt appraiser's decision to assume that the SBRR would be paying 2011 prices for the land it would be acquiring in 2009 directly conflicts with both Board precedent and common sense, and it should be rejected.

---

[4] In fact, as explained *infra* at III-F-5, in performing its DCF calculations, SunBelt indexed its land acquisition costs back to 2009 values, resulting in an even more substantially understated real estate acquisition cost of $179,177,216—18% less than the value NS's reasoned analysis produced.

Perhaps recognizing the fundamental methodological flaw in its real estate appraiser's analysis, SunBelt applied an indexing mechanism in its Discounted Cash Flow model that purportedly indexed its 2011 valuation back to 2009. This technique effectively decreased the land value used by SunBelt to levels that are significantly lower than the values reported in the appraisal report and in its opening narrative. *Compare* SunBelt Opening at III-F-2 (valuing land at $199,100,000 in 2011 dollars); SunBelt Opening WP "SunBelt SAR Land Valuation" (valuing land at $199,100,000 in 2011 dollars) *with* SunBelt Opening Ex. III-H-1, Table C, line 2 (using land value of $179,177,216 in DCF calculations). But this indexing cannot correct the inherent flaws in the SunBelt appraiser's decision to present a 2011 appraisal based in large part on 2010 and 2011 sales that postdate the time when the SBRR's right-of way would need to be acquired. Mr. Hedden's approach of determining real estate value at the date when the SBRR would be acquiring land is far superior to SunBelt's approach of valuing the land at the wrong time and then attempting to index the value back to 2009.

In contrast, Mr. Hedden selected a valuation date of July 1, 2009—a date in the middle of the land acquisition period specified by SunBelt—which accords with the SBRR construction schedule and accounts for the time necessary to acquire the land and construct the infrastructure for the SBRR in order to provide rail service beginning July 30, 2011. *See* NS Reply Ex. III-F-3 at 4.

Land for the SBRR's ROW must be purchased before construction of the SBRR can begin. The Board has recognized the common-sense truth that a SARR must purchase the land at values consistent with the timing of its construction schedule; that is, land valuation dates must correspond to the date of acquisition. *See McCarty Farms,* 2 S.T.B. at 525 n.132 (adjusting the land valuation date back to the beginning of the construction period); *Arizona Pub. Serv. Co. v.*

The Atchison, Topeka & Santa Fe Railroad Co., 2 S.T.B. 367 at 387 n.55 (1997) (valuing land at 1993 values so as to provide for a 1-year construction period prior to the initiation of service in 1994).[5] SunBelt provides no justification for its attempt to depart from Board precedent and SAC theory, and its failure to do so requires rejection of its arguments. *See SAC Procedures*, 5 S.T.B. at 446 ("[T]he parties to SAC cases are cautioned not to attempt to relitigate issues that have been resolved in prior cases. Unless new evidence or different arguments are presented, we will adhere to precedent established in prior cases."). There is no justification for SunBelt's July 31, 2011, valuation date.

SunBelt's use of a July 31, 2011, valuation date is not a mere technicality. On the contrary, it substantially distorts the analysis in two ways. First, the SunBelt appraiser included comparable sales data from 2010 and 2011—including third quarter 2011 sales, which occurred following the commencement of SBRR operations[6]—to value land that the SBRR would have had to purchase in 2009. Those post-2009 sales are not reasonable evidence of the prices that the SBRR would have had to pay to acquire land in 2009. Second, the SunBelt appraiser made improper market adjustments that equated the value of all comparable sales to the 2009 marketplace. Again, this "adjustment" to 2011 values is not a reasonable measure of what the SBRR would have been required to pay to acquire land in 2009.

---

[5] Real estate valuation has not been a contested issue in many prior SAC cases, primarily because most previous cases involved low-value, rural land and did not involve the unique real estate market shifts that occurred during the recent recession. For these reasons, it may be that in some past cases a defendant railroad may have accepted a valuation date as of the SARR start date. But both SAC principles and the Board's *McCarty Farms* and *Arizona Public Service* precedents demand that in this case, the valuation date must correspond to the acquisition date.

[6] *See, e.g.*, SunBelt Opening WP "ALABAMA Sunbelt SALES.xlsx," Tab "AL-AGRICULTURAL" Row 88 (sale from 8/03/2011); SunBelt Opening WP "ALABAMA Sunbelt SALES Corelogic.xlsx," Tab "Autauga," Rows 140-143 (sales from 08/2011).

First, the SunBelt appraiser used "forward-looking" comparable sales data in its appraisal calculations that were based on future events that were unknown as of July 1, 2009, resulting in erroneous valuations. *See* SunBelt Opening WP "SunBelt SAR Land Valuation.pdf" at 26. This technique does not comply with USPAP Rules, which hold that "[t]he appraiser should determine a logical cutoff [date] because at some point distant from the effective date, the subsequent data will not reflect the relevant market." The Appraisal Foundation, *2012-2013 Uniform Standards of Professional Appraisal Practice*, Standard No. 3 (2012). Sales from the third-quarter of 2010 and 2011 do not reflect market conditions and real estate values in 2009 and should not have been considered. Using these sales to influence the value of property that would have been purchased earlier is not reasonable.[7]

Second, the SunBelt appraiser improperly indexed the value of comparable sales from other years to reflect its improper July 31, 2011, valuation date, rather than indexing to 2009 levels, which had a negative impact on SunBelt's value conclusions.[8] As compared with a 2009 valuation date, the indices the SunBelt appraiser used to calculate these market adjustments reduced comparable values by three to eight percent, depending on the year of the comparable

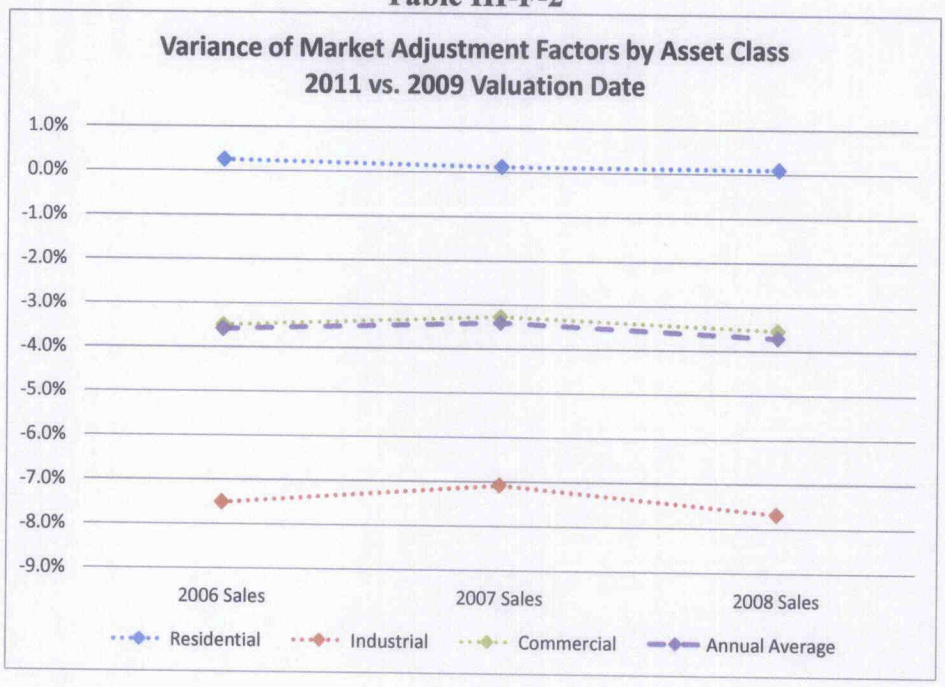
---

[7] For this reason, the information the SunBelt appraiser supplied regarding the April 27, 2011, tornado in the Tuscaloosa, AL, area is inapposite, as the land should have been valued at its mid-2009 value in accordance with the SBRR's construction schedule—well in advance of the destruction caused by the tornado. *See* SunBelt Opening WP "SunBelt SAR Land Valuation.pdf" at 48-51.

[8] Indeed, SunBelt's technique of indexing all of its comparable sales (gathered from several different years prior to 2011) to its erroneous July 31, 2011, valuation date for purposes of the appraisal report, and then indexing the final land acquisition value back to 2009 values for purposes of DCF calculations (*see supra* at III-F-5 resulted in a double adjustment—up to 2011 values, and then down to 2009. For reasons explained more fully in Mr. Hedden's reports, this double-indexing further skewed the numbers and resulted in even greater inaccuracy and unreliability. *See* NS Reply Exhibits III-F-2 and III-F-3.

sale. *See* NS Reply Ex. III-F-2 at 3. Thus, as demonstrated in the following Table III-F-2, the total impact of the SunBelt appraiser's erroneous "market adjustments" was notable.

Table III-F-2



As reflected in Table III-F-2, on average, the SunBelt appraiser made negative market adjustments of 3.6%, 3.4%, and 3.7% across all asset classes for comparable sales from the years 2006, 2007, and 2008, respectively. Thus, Mr. Hedden determined that the total effect of the SunBelt appraiser's improper market adjustments reduced comparable sale values by approximately 3.6% on average for the 2006 through 2008 period. *See id.* at 3.

Together, both of these errors—using "forward-looking" sales and applying inappropriate market adjustments to deflate comparable sales to 2011 values—produced inaccurate and reduced appraisal values. Because the July 31, 2011, valuation date selected by SunBelt is clearly inappropriate for a SARR that commences service on July 30, 2011, and because of the negative impact the valuation date had on the analysis of comparable sales, the SunBelt appraiser's conclusion of value is neither reasonable nor accurate for the relevant 2009 time

period and cannot be relied upon. Instead, Mr. Hedden's appraisal report uses a valuation date of July 1, 2009, which accounts for the time needed to construct the SBRR facilities in time to begin operations on July 30, 2011. *See* NS Reply Ex. III-F-3 at 4. Mr. Hedden based his conclusions of value on comparable sales from January 1, 2006, through December 31, 2009, which represents a reasonable cutoff period after the valuation date in July 2009.[9] As such, Mr. Hedden's valuation date and methods produced more reliable results and should be accepted as the best evidence.

While the inappropriate valuation date and market adjustments were the most egregious of the SunBelt appraiser's errors, other factors discount the reliability of the appraisal report as well. The following sections contrast SunBelt's erroneous analysis with NS's more thorough and supported appraisal.

b. NS's Approach to its Appraisal of the ROW Produced More Accurate Results.

Mr. Hedden conducted a retrospective appraisal using the widely accepted sales comparison approach, in which fair market value is determined by comparing a subject property to similar recent sales. *See* NS Reply Ex. III-F-3 at 11.[10] This approach has been sanctioned by the Board. *See FMC*, 4 S.T.B. at 797 (expressing preference for comparable sales approach to

---

[9] Appraisers use comparable sales that may occur within a reasonable timeframe after a valuation date under the assumption that the financial terms of a transaction are understood prior to the actual sale date. *See* NS Reply Ex. III-F-2 at 2 (noting the USPAP standard the requires that an "appraiser should determine a logical cutoff [date]").

[10] Mr. Hedden's appraisal is subject to certain assumptions and limiting conditions. For example, Mr. Hedden assumes that the ROW to be acquired is 100 feet wide, except in certain towns and cities where it is 75 feet wide. Mr. Hedden's appraisal does not include an assemblage premium or certain acquisition costs, such as brokerage fees. In addition, Mr. Hedden assumes the property is vacant land and that title to the property is good and marketable; that there are no hidden conditions that would affect the value; and that no property is encumbered by leasehold interests. For a complete list of the assumptions and limiting conditions underlying the appraisal report, see NS Reply Exhibit III-F-3 at 36-38.

valuation); *WP&L*, 5 S.T.B. at 1018 (same). The following Table III-F-3 presents Mr. Hedden's conclusions regarding the total appraised value for the SBRR land.

Table III-F-3
SBRR Appraised Market Value

Component of Valuation	Acres	Market Value	Avg. Value Per Acre [1]
ROW - Fee Simple Value	6,852	$192,505,000	$28,095
Land Value for Yards	378	$35,348,000	$93,416
Land Value for Communications Facilities	50	$1,937,000	$38,740
Less: Land Value for Easement Areas	273	($12,111,000)	($44,427)
Plus: Cost for DRR Easement Areas	273	$431,000	$1,581
Total Valuation	7,280	$218,110,000	$29,959

Notes:
1. Total average value per acre does not include easement acres.

Mr. Hedden's appraisal of the SBRR ROW land valued 6,852 acres of property—577 miles of land divided into 741 Valuation Units. In comparison, the SunBelt appraiser valued 6,778.5 acres of land, and a total of 577.88 miles. The difference in mileage and acreage appraised by the two parties reflects the areas FTI visited where waterways acreage was included in the calculation. In addition, Mr. Hedden did not employ a system mileage variation adjustment as the SunBelt appraiser did. *See* SunBelt Opening WP "SunBelt SAR Land Valuation.pdf" at 83-84. The following Table III-F-4 reflects the amount of SBRR ROW appraised by Mr. Hedden in each state traversed by the SBRR.

Table III-F-4:
Valuation Units and Acreage of SBRR ROW Land

States	Valuation Units	Miles	Acres
Alabama	324	356	4,231
Louisiana	327	50	544
Mississippi	90	171	2,077
Total	741	577	6,852

In addition to the land necessary to acquire the ROW, Mr. Hedden included in his appraisal the retrospective market value of the land necessary to support the SBRR's yards and support facilities including fiber optic sites. *See infra* III-F-29.

Mr. Hedden applied well-accepted appraisal methodologies as part of the sales comparison approach to determine the aggregate retrospective market value for the SBRR. First, Mr. Hedden classified the land along the SBRR ROW and identified appropriate Valuation Units. He derived classifications either using (i) physical inspection conducted by FTI, during which typical parcels along both sides of the SBRR's ROW were inspected to determine the across-the-fence Highest and Best Use and classification, or (ii) for ROW FTI did not physically inspect, Mr. Hedden accepted the SunBelt appraiser's classification of land and identification of Valuation Units. NS Reply Ex. III-F-3 at 17-18. Second, Mr. Hedden compiled comparable sales data from CoStar, LoopNet, and CoreLogic[11] data services, and used that data to develop an average comparable value per acre of vacant land without improvements for each land use classification in each county through which the SBRR travels. *See id.* at 12-13. Third, Mr. Hedden valued the SBRR land using the comparable sales approach. *Id.* at 11. For properties that FTI physically inspected, Mr. Hedden compared those properties to sales data for

[11] CoStar, LoopNet, and CoreLogic are recognized sources of real estate sales data routinely used by market participants including appraisers.

comparable properties to determine appropriate market values. For land not physically inspected by FTI, Mr. Hedden reviewed aerial and ground photography and comparable sale values to develop an average unit value (per acre) for each Valuation Unit. *Id.* at 17-18. Finally, Mr. Hedden aggregated the market values of all Valuation Units along a particular SBRR route to conclude the overall market value of that route. He subsequently aggregated the values of all routes in a state. *Id.* at 19. By aggregating the market value for all Valuation Units by state, Mr. Hedden calculated the market value of the entire SBRR ROW. *Id.*

In contrast, the SunBelt appraiser failed to apply well-accepted methodologies; made determinations of appraised value for high-value urban areas based upon a desktop review of property, only using minimal physical inspection to "confirm" the conclusions of its desktop review[12]; and failed to aggregate appropriately market values to derive an accurate conclusion of overall market value.

The analysis below compares the flawed SunBelt approach and Mr. Hedden's approach on the following issues: (i) identification of Valuation Units, including physical inspection of the SBRR ROW; (ii) the development of appropriate comparable sales data; and (iii) ultimate valuation of the ROW based upon the classification of the parcels of land and application of the comparable sales data. As demonstrated below, in addition to using the incorrect valuation date, other significant errors in the SunBelt appraiser's analysis render the entire analysis unreliable.

[12] *See* SunBelt Opening WP "SunBelt SAR Land Valuation.pdf" at 21 ("These on-the-ground inspections confirmed the reliability of determining the adjacent uses for the line segments using aerial imagery from Google Earth and other internet sites.").

i. Identification of Land Valuation Units along the ROW.

In order to identify the various land uses along the ROW, Mr. Hedden applied one of two methods. First, NS's experts ("FTI")[13] physically inspected approximately 66 miles of the SBRR ROW in high-value areas, during which parcels along both sides of the SBRR's ROW were inspected to determine the Highest and Best Use and classification. While this detailed physical inspection is the preferred valuation method, the size of the SBRR made inspections of the full ROW impractical. Therefore, for ROW NS's experts did not physically inspect, Mr. Hedden accepted the SunBelt appraiser's classification of land and identification of Valuation Units. NS Reply Ex. III-F-3 at 17. This technique has been approved by the Board. *See TMPA I*, 6 S.T.B. at 698 (accepting such a technique and noting that "BNSF's more detailed procedure produces a better estimate of land values").

(a) Land Physically Inspected.

One of the most significant differences between the approach taken by Mr. Hedden and that of the SunBelt appraiser was the manner in which each appraiser relied on physical inspection. Both parties engaged in appraisal analysis that involved some form of physical inspection of land abutting the SBRR's ROW, as well as appraisal of land absent physical inspection. However, whereas the SunBelt appraiser conducted a desktop review, and only ventured into the field to "confirm" the results of that analysis, *see* SunBelt Opening WP "SunBelt SAR Land Valuation" at 21 ("These on-the-ground inspections confirmed the reliability of determining the adjacent uses for the line segments using aerial imagery from Google Earth and other internet sites."), NS's experts relied upon physical inspections to drive

[13] Inspections were performed by Mr. Arnold Tesh (now deceased). Mr. Hedden completed the appraisal report following Mr. Tesh's untimely death and reviewed Mr. Tesh's inspection reports as part of the process of appraising the value of the land.

and inform a more detailed and accurate appraisal of high-value metropolitan areas along the SBRR.

NS's experts spent a total of five days in the field in April 2011 and January 2012, physically inspecting property along both sides of the ROW in Birmingham, AL, and New Orleans, LA. By comparison, in keeping with the SunBelt appraiser's decision to use physical inspections only to "confirm" results of a desktop review, SunBelt inspectors spent a total of three days in the field, including one day in which they "inspected" three different cities—Hattiesburg, MS, Meridian, MS, and Tuscaloosa, AL. *See* Table III-F-5 below. It is difficult to understand how the SunBelt appraisal team could perform a thorough inspection of three cities in a single day. Moreover, all of SunBelt's inspections occurred on back-to-back days from June 3, 2012 through June 5, 2012, and required travel in excess of 350 miles between five destination cities. Such drive-by inspections are insufficient to develop accurate, detailed determinations of the land uses in these cities. Indeed, the brief periods of time spent in these cities illustrate that the SunBelt appraisal team viewed city visits as simply a mechanism to "confirm" its desktop appraisal. *See* SunBelt Opening WP "SunBelt SAR Land Valuation.pdf" at 21.

In comparison, FTI spent three days in New Orleans, LA, and two days in Birmingham, AL. The following Table III-F-5 depicts the dates that each party's appraisers spent in the inspected cities.

Table III-F-5
Days Spent On Physical Inspections

City	SunBelt Date	Total SunBelt Days	NS Date	Total NS Days
Birmingham, AL	6/5/2012	1	4/7 - 4/8/2011	2
New Orleans, LA	6/3/2012	1	1/10 - 1/12/2012	3
Hattiesburg, MS	6/4/2012	0.3	N/A	N/A
Meridian, MS	6/4/2012	0.3	N/A	N/A
Tuscaloosa, AL	6/4/2012	0.3	N/A	N/A
	Total	**3**		**5**

In areas where FTI physically inspected the ROW, it independently identified Valuation Units based upon land use classifications as determined by the land's Highest and Best Use or a change in unit value across the fence on either side of the ROW. *See* NS Reply Ex. III-F-3 at 15-17. FTI's physical property inspections identified the variation in land use and changes in value along the SBRR as the basis for identifying Valuation Units. The physical property inspections provided the opportunity to identify the ATF Highest and Best Use of the properties, as well as observe market conditions and comparable sales in the immediate vicinity of the SBRR ROW. *Id.* at 15.

Actual, thorough, on-the-ground physical inspections are the Board's preferred method for classifying Highest and Best Use. *See, e.g., FMC*, 4 S.T.B. at 797 (approving of UP's physical inspection approach to valuation). Such direct actual inspections are particularly important for accurate classification of land in metropolitan areas where land use changes rapidly and value is typically highest. However, physical inspections should be preferred only to the extent they are part of the process employed to conclude value; to the extent their sole purpose is to "confirm" conclusions of value that have already been reached, those physical inspections add little to the reliability of those value conclusions, especially when such "confirmations" occur in such a short period of time. SunBelt's appraiser did little more than "check the box" that he

visited the SBRR's urban areas, without truly making the physical inspection a part of his appraisal methodology. Thus, FTI's more extensive and thorough physical inspections of high-value urban areas produced more accurate land classifications, and ultimately valuation conclusions, than those of SunBelt.

Indeed, FTI's extensive and thorough physical inspection resulted in the identification of a significantly higher number of Valuation Units along the ROW in dense urban areas than the SunBelt appraiser identified. For example, in the Birmingham, AL, metropolitan area, the SunBelt appraiser aggregated 6.4 miles of land spanning from Division Street South to 54th Street South West in Birmingham into seven Valuation Units. In comparison, NS's experts identified 14 distinct Valuation Units within this same segment. *See* Ex. III-F-2, Appendix A. Moreover, in this particular example, SunBelt applied a higher value to the commercial and industrial land along this segment, but significantly undervalued the 3.5 miles of residential land. As a second example, over a 3.3 mile segment in New Orleans, LA, the SunBelt appraiser identified five Valuation Units, where NS's experts identified 31. *See* Ex. III-F-4, A-NEWOR-04. SunBelt failed to identify any of the land along this segment as commercial property, contrary to the conclusions of FTI's physical inspection of the ROW. This comparison demonstrates that FTI's more extensive analysis consistently identified a higher number of Valuation Units in segments along the ROW in urban areas, which led to a more thorough and accurate appraisal.

In sum, the manner in which FTI relied upon physical inspections in its appraisal process provided a more accurate understanding of the nature of the varying land uses along the SBRR ROW than the approach used by the SunBelt appraiser, thus leading to more accurate classifications. FTI's overall approach to the ROW inspection and Valuation Unit classification

is reasoned and supported. Mr. Hedden's superior appraisal should be accepted as the best evidence of the valuation of land that the SBRR will have to acquire in Birmingham, AL, and New Orleans, LA.

(b) Land Not Physically Inspected

For land in areas not physically inspected by FTI, Mr. Hedden accepted the SunBelt appraiser's classification of land use and its quantification of Valuation Units. Thereafter, Mr. Hedden relied upon comparable sales data and his own calculations to derive a market value of this land based upon the value of typical parcels abutting each side of the Valuation Unit. Mr. Hedden's practice of valuing inspected land based upon FTI's field inspection and analysis of land sales along the ROW, while accepting SunBelt's categorization of land use along the areas of the ROW he did not inspect and adjusting the values of the land accordingly, has been accepted by the Board as an appropriate valuation technique.[14]

The following discussion explains Mr. Hedden's collection and analysis of comparable sales data, which was used to value both inspected and uninspected land.

ii. Collection and Analysis of Comparable Sales Data.

In addition to performing physical and non-physical inspections of the SBRR Row, Mr. Hedden collected and analyzed comparable sales data to develop accurate land valuations. In reviewing sales data reported by CoStar, LoopNet, and CoreLogic data services, Mr. Hedden took the following approach to valuation. First, Mr. Hedden sorted the data from all three sources by county and land use classification (agricultural, industrial, residential, and commercial). To determine whether a sale is comparable, various factors are considered, including the real property rights conveyed, the physical characteristics of the land, and the use

[14] *See TMPA I*, 6 S.T.B. at 698 (accepting such a technique and noting that "BNSF's more detailed procedure produces a better estimate of land values.").

of the land. *See* NS Reply Ex. III-F-3 at 12-13. Second, sales were adjusted upwards or downwards, depending on the date of sale.[15] Third, Mr. Hedden removed from the analysis transactions that were clear outliers,[16] duplicates, or had incomplete data. Fourth, he sorted the data to correspond to the SBRR routes. Finally, Mr. Hedden calculated the average comparable value per acre of vacant land without improvements for each land use classification and county. *Id.* at 13. Mr. Hedden's approach is consistent with USPAP Standard No. 6 regarding mass-appraisal development and reporting. *See* The Appraisal Foundation, *2012-2013 Uniform Standards of Professional Appraisal Practice*, Standard No. 6 (2012).

In comparison, while the SunBelt appraiser also relied upon a sales comparison approach, it made numerous errors both in selecting appropriate sales and aggregating the value of those comparable sales.

(a) Comparable Sales for the SBRR Should Include Only Unimproved Land.

Unlike Mr. Hedden, who relied upon only sales of vacant land in his appraisal analysis, the SunBelt appraiser inappropriately relied upon sales of improved land in valuing the vacant land of the SBRR ROW. Both parties agree that the land to be acquired by the SBRR is "vacant and unimproved." *See* SunBelt Opening WP "SunBelt SAR Land Valuation.pdf" at 12; NS Reply Ex. III-F-3 at 6; *cf., WP&L*, 5 S.T.B. at 1018 (approving of the method used by both parties, who "assume[d] that the EWRR would acquire vacant, unimproved land in fee simple"). The SunBelt appraiser, however, relied upon approximately 74.4 acres of comparable sales with

[15] For example, sales were adjusted upwards for strong market conditions until July 1, 2007. Sales of residential and commercial land were adjusted downwards between July 1, 2007 and June 1, 2009, to account for declining market conditions. *See* NS Reply Ex. III-F-2 at 12-13.

[16] Mr. Hedden employed a conservative approach and excluded transactions that were clearly inconsistent with the volume of market activity (*i.e.*, transactions with pricing above the range of the predominant volume of transactions).

improvements, even though there was sufficient vacant land sale data upon which it could have relied. *See* NS Reply Ex. III-F-2 at 4. The applied value of these sales amounted to $39,073,954. *Id.*

Using sales of land with improvements as a basis of comparison for valuation of vacant land requires the use of a "market extraction" technique that attempts to remove the value of the improvement and estimate the value of the land absent the improvement. *See* NS Reply Ex. III-F-2 at 5. While typically the value of the improvement is determined by that improvement's depreciated value, the SunBelt appraiser used tax assessment ratios to approximate the value of the improvements. *Id.* When the extraction technique is applied to assessment ratios, however, the technique "is generally not persuasive because the assessment ratios may be unreliable and the extraction method does not reflect market considerations." APPRAISAL INSTITUTE, THE APPRAISAL OF REAL ESTATE at 295 (10th ed. 1993), *in* NS Reply WP "Appraisal of Real Estate 10th.pdf." Thus, the use of the market extraction technique was inappropriate, especially since the SunBelt appraiser had readily available comparable data for the sales of actual vacant land.

Even assuming that the extraction technique would have been appropriate, however, SunBelt's workpapers provided insufficient detail to determine the nature of the improvements or the accuracy of assessment values. Instead, the value of improvements was incorporated into the SunBelt appraiser's calculation of its global mean of comparable sales value for vacant land. *See* NS Reply Ex. III-F-2 at 5. The SunBelt appraiser incorrectly applied this valuation technique, and simply incorporated the value of improvements into its calculations, resulting in a distorted and unreliable analysis of the average value of comparable vacant land.

The SunBelt appraiser's reliance on sales of land with improvements contributed anywhere from 28% to 95% of the total assessed value of the comparable sales. *Id.* Without

explanation, the appraiser did not perform an improvement extraction calculation at all and instead included the entire value of the land and its improvements in its calculation of comparable value for vacant land. The inclusion of these sales of improved land distorted the analysis of average value of comparable vacant land and distorted the SunBelt appraiser's ultimate conclusion of value.

In sum, the SunBelt appraiser's consideration of sales of improved land when valuing the vacant land of the SBRR is further evidence of its flawed methodology and the unreliability of its ultimate conclusion of value.

(b) Comparable Sales Should Be Aggregated Using A Stratified Mean Methodology to Preserve the Accuracy of the Valuation.

In order to assess market conditions for purposes of valuation, it is necessary to aggregate comparable sales. Mr. Hedden used a stratified data analysis, calculating the average value per acre of comparable sales based on the sales price paid per acre for each individual transaction. This precise method accounts for the unique attributes of each transaction and allows for the extraction of patterns in the data that are otherwise hidden by the use of a global mean. Comparatively, when data is aggregated on a macro level, as with the SunBelt analysis, the unique aspects of the transactions—and thus more detailed patterns in the data—are lost.

Rather than accounting for the appropriate unit of comparison (dollars per acre)[17] of prevailing and specific individual transactions in the marketplace, the SunBelt appraiser aggregated sales into a global mean to "effectively act as a single transaction" in order to analyze sales data. NS Reply Ex. III-F-2 at 6. To calculate the global mean of each particular market area, the SunBelt appraiser "divided the total of all individual comparable sale prices for that

[17] That is, unique dollars per acre produced by each individual transaction (as opposed to a global mean or weighted average of overall dollars per acre).

area by the total acreage to calculate the comparable price paid per acre based on all the sales in that particular market area." *Id.* This approach leads to unreliable results because it is not representative of the volume of transactions in the actual marketplace, prevents the appraiser from analyzing the specific attributes of individual transactions, and fails to account for the more accurate dollars per acre unit of comparison. The Appraisal Institute rejects this kind of mass agglomeration, noting that "[l]ike units must be compared, so each sales price should be stated in terms of appropriate units of comparison." APPRAISAL INSTITUTE, THE APPRAISAL OF REAL ESTATE at 305 (13th ed. 2008). By amalgamating sales into a global mean, the specific attributes of each transaction and associated values are diluted and direct market comparisons become impossible, leading to unreliable results.

In contrast, the stratified data analysis employed by Mr. Hedden identifies specific market conditions most frequently encountered by market participants, and thus presents a more accurate view of overall market conditions. The following Table III-F-6 illustrates the effect of applying a global mean analysis as opposed to a stratified mean.

Table III-F-6
Illustration of Difference Between Global Mean and Stratified Mean

	Sale Price	Acres	$ per Acre
Parcel 1	$100	1	$100
Parcel 2	$100	1	$100
Parcel 3	$100	1	$100
Parcel 4	$100	1	$100
Parcel 5	$100	1	$100
Parcel 6	$100	1	$100
Parcel 7	$100	1	$100
Parcel 8	$100	1	$100
Parcel 9	$100	1	$100
Parcel 10	$100	1	$100
Parcel 11	$500	10	$50
Global Mean: $1,500 / 20 =			**$75**
Stratified Mean: $1,050 / 11 =			**$95**
Percentage Variance			**-21.43%**

As illustrated by Table III-F-6, suppose there were ten one-acre parcels in a particular county that had each sold for $100 each, or a price of $100 per acre. Suppose that an eleventh parcel of 10 acres sold for $500, or a price of $50 per acre. SunBelt's approach simply would add together these transactions to reach a "global mean" of $75 per acre ($1,500 for 20 acres), which would have prevented the SunBelt appraiser from analyzing the attributes of the individual transactions separately and from noticing the prevailing price for smaller parcels was only $100 per acre, with the larger transaction being a significant outlier. Using a stratified mean analysis, the average value per acre is $95 ($1,050 for 11 parcels), which takes into account the significant discount being paid for the larger parcel of land. The variance produced between the two methods is a considerable 21.43%.

As Table III-F-6 illustrates, a global mean tends to overweigh the influence of large land purchases on the per-acre calculation and to give less influence to the per-acre averages from smaller transactions. As a result, a stratified mean is a significantly superior approach to a global mean here, for assembling the SBRR's right of way would require hundreds of individual purchases of relatively small parcels of land. *See* NS Reply Ex. III-F-2 at 6-8; *cf.* APPRAISAL INSTITUTE, THE APPRAISAL OF REAL ESTATE at 305 (13th ed. 2008). SunBelt's reliance upon the global mean thus resulted in conclusions of value that "significantly undervalued comparable market sales and as a consequence significantly understated the actual value of the SBRR." NS Reply Ex. III-F-2 at 8. SunBelt's analysis of the comparable sales data cannot be relied upon to provide an accurate analysis of the value of the land to be acquired by the SBRR.

* * * * *

In sum, these significant errors in the SunBelt appraiser's collection and analysis of comparable sales render its appraisal unreasonable and unreliable. The SunBelt appraiser relied upon inappropriate comparable sales such as improved land and developed an overly-broad global mean purchase price. To the contrary, Mr. Hedden analyzed only unimproved comparable sales and evaluated comparable sales using a stratified rather than a global mean. Because Mr. Hedden employed a more reliable methodology for evaluating comparable sales, his appraisal should be accepted by the Board.

iii. Calculation of Total Value of Land To Be Acquired By the SBRR.

In determining the conclusion of value for each route, Mr. Hedden reviewed the land classifications along each segment of the ROW, based on across-the-fence Highest and Best Use and changes in market conditions. For the land inspected by FTI, Mr. Hedden determined the market value for Valuation Units based upon FTI's physical site inspections and comparable sale

indices, including average values. Where FTI did not physically inspect the SBRR ROW segments (Valuation Units), Mr. Hedden relied upon the SunBelt appraiser's identified segments and used the average unit value of comparable sales to conclude the market value for these Valuation Units. *See* NS Reply Ex. III-F-3 at 17.

Mr. Hedden aggregated the market values of Valuation Units to conclude the overall market value for each route and, subsequently, the market value of the ROW located in each state traversed by SBRR routes. Finally, Mr. Hedden determined the market values for all Valuation Units by state, including yards, communications facilities, and easements, and aggregated them to conclude the market value for the entire proposed SBRR land acquisition. *Id.*

Nevertheless, while both Mr. Hedden and the SunBelt appraiser followed the ATF comparable sales valuation technique (which has been widely accepted in SAC cases),[18] the SunBelt appraiser's implementation of that technique was careless and error-filled. In particular, the SunBelt appraiser failed to reconcile or explain the considerable differences from the comparable sales data and its ultimate conclusions of value, improperly relied upon assessed values, provided no analysis of its conclusion of value for Rural Towns, and valued easements in a manner that is inconsistent with Board precedent.

(a) Concluded Values Must Be Logically Connected To The Comparable Sales Relied Upon.

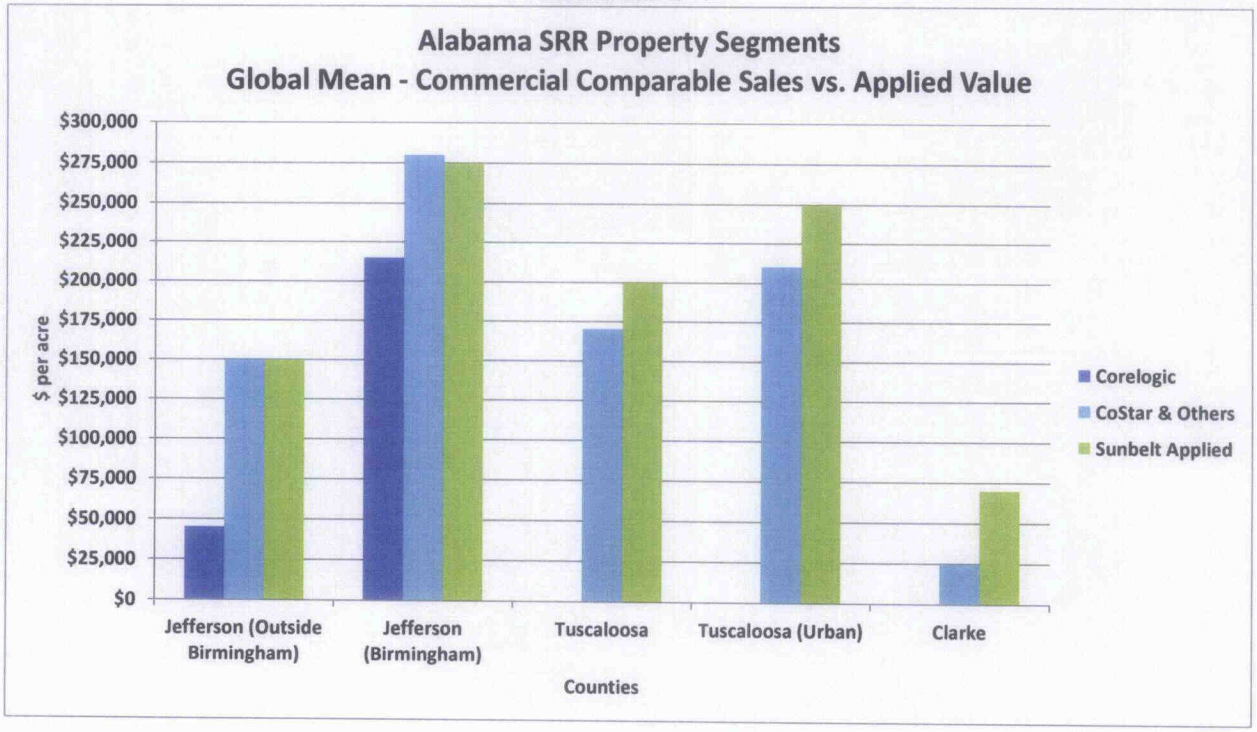
For a significant number of SBRR segments, the SunBelt appraiser's concluded values appear to be entirely arbitrary—*i.e.,* there is no apparent nexus between the concluded values and

[18] *See, e.g., West Texas*, 1 S.T.B. at 702, n.143 ("ATF value is the highest price that a piece of property will bring on the open market when the buyer and seller have full knowledge of all potential uses of the property."); *McCarty Farms*, 2 S.T.B. at 505; *Duke/CSXT*, 7 S.T.B. at 473-74; *TMPA I*, 6 S.T.B. at 698.

the global mean values the SunBelt appraiser derived from CoStar and CoreLogic comparable sales data, nor is there any other support or explanation provided by the SunBelt appraiser for its ultimate conclusions of value. *See* NS Reply Ex. III-F-2 at 14. The analyses of the two datasets (CoStar and CoreLogic) often offered conflicting valuations in a given county. In such instances, the SunBelt appraiser provided no explanation for its method (if indeed there was any systematic method) of reconciling the differences and concluding value. And the SunBelt appraiser offered no workpaper to explain or support its conclusions. The lack of support or explanation of the SunBelt appraiser's determination of values from disparate data suggests that the SunBelt appraiser relied upon random selection and undocumented or anecdotal information to derive its final conclusions of value.

By way of example, the following Table III-F-7 compares the SunBelt appraiser's assigned values for commercial property segments in Alabama to the global mean values it derived from the CoreLogic and CoStar comparable sales data.

Table III-F-7



As illustrated, there is no consistent correlation between SunBelt's applied values and the CoreLogic and CoStar data. At times it appears that the appraiser selected a rough average between the two datasets. For example, in Jefferson (Birmingham) County, SunBelt's applied value falls between the two datasets. In other counties SunBelt's applied value is significantly higher than one of the datasets. For example, in Jefferson (Outside Birmingham), the selected value is the same as the CoStar dataset, but is significantly higher than the CoreLogic data. Conversely, in Clarke County, Clarke County, SunBelt's workpapers indicate that its appraiser relied upon three comparable sales, which averaged approximately $25,000 per acre. *See* SunBelt Opening WP "ALABAMA Sunbelt SUMMARIES.xlsx." The SunBelt appraiser then unaccountably applied a value of $70,000 per acre, representing a 180% increase over the comparable sales. The variance between the comparable sales data and the selected applied values is unexplained, unjustified, and undocumented.

Because SunBelt's methodology cannot be discerned or evaluated from the evidence submitted in its case-in-chief, it has failed to meet its burden of proof and its unsupported value conclusions must be rejected. *See, e.g.*, *AEPCO 2011*, STB Docket No. 42113, at 115 ("AEPCO has failed to satisfy its burden of proof by not supporting or explaining its input choices"); *id.* at 117 (noting that complainant, "AEPCO[,] has the burden of proof and did not support its [evidence].").

(b) Assessed Values are an Improper Basis of Comparison for Concluding Market Value

The SunBelt appraiser improperly relied upon assessed values as a basis for concluding the value of SBRR land. Reliance upon assessed values of real estate is frowned upon and is not considered a "good indicator[] of the market value of individual properties because mass-appraisal value based on statistical methodology tend to equalize the application of taxes to

achieve parity among assessment levels in a given district." APPRAISAL INSTITUTE, THE APPRAISAL OF REAL ESTATE at 211 (13th ed. 2008). Indeed, assessed values are often subject to appeal and revision and are not responsive to short- or mid-term changes in market conditions. Thus, the reliance upon assessment values is not a suitable substitute for readily available market data and is not a method cited in modern appraisal texts. Despite the lack of reliability of such data, however, the SunBelt appraiser relied upon values supplied by assessors and local appraisers as the concluded value in certain instances, and in doing so impacted 586 acres of land in Alabama and Mississippi, with an applied value of $21,847,020. *See* NS Reply Ex. III-F-3 at 9. The SunBelt appraiser's reliance on such flawed methodology further undermines the reliability of its conclusions.

(c) The SunBelt Appraiser Provided No Justification for Its Valuation of Rural Towns.

Neither the SunBelt appraisal nor the appraisal workpapers provide a clear explanation of its conclusion of value for SBRR ROW in rural towns, which amounted to $4,209,000. *See* NS Reply Ex. III-F-2 at 11. Rural towns comprise approximately five percent of the total SBRR acreage; however, there are no distinct sets of comparable sale values for rural towns, nor did SunBelt provide any indication of how this value was concluded. *Id.* Notably, it appears that SunBelt failed to value the rural town category for the entire state of Mississippi, which comprises approximately seven percent of the total acreage in the state. *Id.* This is yet another example of the SunBelt appraiser's flawed appraisal methodology.

(d) The SunBelt Appraiser's Valuation of Easements Is Contrary to Board Precedent.

The SunBelt appraiser inappropriately valued the approximately 273 acres of easements to be acquired by the SBRR, as the SunBelt appraiser failed to properly index the historical costs of those easements to current market value. After the SunBelt appraiser estimated the fee simple

value for the portions of the ROW for which the SBRR would acquire easements, it then removed those costs from the overall land valuation in its entirety and substituted a crude, general "average cost per easement acre for each state . . . applied to the acreage for each easement in the individual state." SunBelt Opening III-F-5. SunBelt does not make any attempt to explain this methodology or how it used the easement data produced by NS in discovery, which SunBelt states that it reviewed. *See id.* Rather than taking the actual cost of each easement paid by NS and indexing it to the current market value, the SunBelt appraiser valued the easements based upon the unindexed historic value paid by NS or its predecessors at the time that the easement was acquired. The SunBelt appraiser refused to index values even though the vast majority of these easements dated from before 1952—and many from 1871 and earlier. The SunBelt appraiser then took an average of those historic costs and applied that average to all of the easements in each SARR state. *Id.* at III-F-5.

This method of valuation is flatly contrary to settled Board precedent. The Board has made it abundantly clear that, like all other investments, easements must be valued at their current market value. *Xcel*, 7 S.T.B. at 669 ("Because all of a SARR's investments should be valued at current costs, BNSF's estimate is used here [for valuing easements]. Xcel's evidence does not reflect the current value of obtaining the necessary easements."). SunBelt made no attempt to index the costs of the easement values paid by NS to current market prices. SunBelt's easement valuation plainly does not "reflect the current value of obtaining the necessary easements." *Id.*

Mr. Hedden, in contrast, properly indexed easement values to current market levels. Using this proper easement valuation methodology, Mr. Hedden indexed the actual historical cost of the easements to determine the 2009 value per acre. Mr. Hedden then calculated each

state's average cost per easement acre and applied that value to the total SBRR easement acreage in the state. Mr. Hedden totaled the value of all easements and added that to the total valuation of SBRR land to account for the cost of acquiring easements. Mr. Hedden has determined that the 2009 market value of the easements along the ROW is $431,000.

c. Appraisal of Land for Yards and Communications Facilities

In addition to valuing the SBRR ROW, Mr. Hedden also valued the land required for SBRR yards, support facilities, and communications facilities, correcting for the mistakes of the SunBelt appraiser. With respect to valuing yard facilities, the SunBelt appraiser's approach is inaccurate for two reasons. First, because SunBelt did not properly configure or size its yards based upon its level of operations, the number of acres valued by the SunBelt appraiser was grossly insufficient. As explained in Sections III-B and III-C, the 13 yard facilities posited by SunBelt, which span a total of 163 acres, are wholly inadequate to meet the needs of the SBRR's customers. *See* NS Reply WP "SBRR Yard List NS Reply.xlsx." Thus, Mr. Hedden instead valued the 378 acres necessary under NS's SBRR configuration, which includes seven yards, 15 industrial support tracks, one automotive facility, and two intermodal facilities; these facilities are specifically sized and configured to handle the necessary classification and blocking of the 500,000 carloads of merchandise traffic that SunBelt selected. *See* NS Reply III-C-135 to III-C-139. In addition to the fact that the SunBelt appraiser valued too few acres for yard and support facilities, however, the SunBelt appraiser's methodology for appraising this land is also inaccurate and unreliable for the same reasons explained above pertaining to valuation of the ROW. Mr. Hedden, meanwhile, valued the land required for the yards and support facilities as industrial land using the same sound methodologies applied to sections of the SBRR ROW that were not physically inspected by FTI. *See* NS Reply Ex. III-F-3 at 32. Mr. Hedden valued the 378 acres required for yard facilities at $35,348,000. *Id.*

With respect to the land necessary for SBRR communications facilities, NS does not dispute SunBelt's microwave tower communications site acreage or placement. *See* NS Reply Sec. III-F-6. Mr. Hedden concluded that the value of the land required for the communications facilities is $1,937,000. *See* NS Reply Ex. III-F-3 at 33.

d. Conclusion

As demonstrated, Mr. Hedden's retrospective appraisal report relies on sound appraisal methodology that is far superior to the SunBelt appraiser's unreasonable and unsupported methodology. While the SunBelt appraiser improperly valued land as of July 31, 2011, Mr. Hedden properly relied upon a July 1, 2009, appraisal date, which took into consideration the land acquisition period that SunBelt admits is required for a SARR of this size. Therefore, unlike the SunBelt appraiser, Mr. Hedden appropriately excluded any comparable sales after the year 2009 and refrained from the improper market adjustments the SunBelt appraiser used to deflate comparable sale values to 2011-levels. SunBelt's subsequent indexing of the concluded appraisal value down to 2009 levels for purposes of its DCF analysis is further evidence that the use of 2011 values for a SARR that will acquire land in 2009 is inappropriate and unsupported. Furthermore, FTI relied upon its detailed and thorough physical inspections of high-value urban areas as an integral part of its appraisal methodology, as compared with the three back-to-back days spent by the SunBelt appraiser "confirming" the results of its desktop review. This detailed inspection allowed Mr. Hedden to classify the ROW more accurately than the SunBelt appraiser, who used significantly fewer Valuation Units than Mr. Hedden. Moreover, Mr. Hedden's analysis uses appropriate comparable sales of vacant land in areas along the SBRR ROW, unlike the SunBelt appraiser who relied upon sales of improved land. While the SunBelt appraiser relied upon an overly-broad global mean to evaluate comparable sales data, Mr. Hedden's valuation is based upon a stratified mean analysis that takes into consideration the price per acre

paid for each transaction and thus accounts for prevailing market conditions. Whereas Mr. Hedden has provided a detailed explanation as to his ultimate conclusions of value, the SunBelt appraiser provided no evidence or justification as to how it reconciled the comparable sales data with its ultimate applied values. Mr. Hedden's analysis properly took into consideration the value of easements, which must be acquired by the SBRR, but which the SunBelt appraiser inaccurately valued. And finally, Mr. Hedden accurately valued the acreage required for SBRR yards, support facilities, and communications facilities.

In sum, Mr. Hedden's retrospective appraisal report presents a far more accurate, reliable, and supported analysis of the land acquisition costs required of the SBRR. Mr. Hedden's analysis is supported not only by real estate industry practices, but also by Board precedent. Mr. Hedden's analysis should be accepted in its entirety.

2. Roadbed Preparation

The roadbed preparation section of the NS Reply is sponsored by NS witnesses Michael Baranowski, Robert Phillips, Paul Bobby, and Patrick Bryant. Mr. Baranowski is a Senior Managing Director at FTI Consulting and has over thirty years of experience in transportation analysis. Mr. Baranowski has testified in numerous Board proceedings and stand-alone cost cases, and sponsored evidence in virtually every SAC case since 1997, including sponsoring earthwork and other road property investment evidence in numerous cases. Mr. Bobby is a Project Manager with STV, a firm offering engineering, architectural, planning, environmental and construction management services. He has worked on several railroad construction projects and has participated in their design of roadway and track alignment, cost estimation, and the development of construction staging plans. Mr. Bryant is a Civil Engineer with STV and has more than 15 years of experience in rail, roadway, highway, and bridge design and construction. He has worked as a Rail Engineer on several rail projects for KCS and NS. Mr. Phillips is Vice

President of the Rail Division of STV and has over 35 years of experience in track design and maintenance, grade crossings, and construction management of rail projects. Mr. Phillips has also developed road property investment evidence in several prior SAC cases. These experts' qualifications are further detailed in Section IV.

SunBelt made several fundamental errors and omissions in calculating roadbed preparation costs, which are described in this section. A summary comparison of NS's roadbed preparation costs with those submitted in SunBelt's opening evidence is presented in Table III-F-8.

Table III-F-8[19]
Roadbed Preparation Costs
($ thousands)

SBRR Roadbed Preparation Costs NS Reply				
	Category	**SunBelt Open**	**NS Reply**	**Difference**
1.	Earthwork			
	a) Common	$43,358	$140,099	$96,742
	b) Loose Rock	$15,053	$18,598	$3,544
	d) Solid Rock	$17,501	$27,647	$10,146
	e) Borrow	$93,250	$136,036	$42,786
	f) Total	$169,162	$322,380	$153,218
2.	Clearing & Grubbing	$13,866	$16,868	$3,001
3.	Lateral Drainage	$2,792	$3,674	$882
4.	Retaining Walls	$39,015	$74,523	$35,508
5.	Rip Rap	$437	$139,628	$139,192
6.	Seeding/Topsoil Placement	$6	$4	$(3)
7.	Land for Waste Excavation	$5,551	$22,344	$16,793
8.	Subgrade Preparation	$0	$5,104	$5,104
9.	Lighting and Dust Control Work	$0	$20,666	$20,666
10.	Yard Drainage	$0	$10,296	$10,296
11.	Access Road Mats	$0	$33,262	$33,262
12.	**Total**	**$230,830**	**$648,749**	**$417,920**

Much of the difference in the parties' earthwork costs is driven by two elements. First is the fact that, contrary to well-established Board precedent favoring the use of R.S. Means costs for common earthwork excavation, clearing and grubbing, and seeding, SunBelt instead proposes to extrapolate all of these costs from a single, 1.3 mile railroad line relocation project in rural Tennessee, and apply them to the entire 578 route-mile SBRR.[20] The small line relocation

[19] *See* NS Reply WP "SBRR Open Grading NS Reply," Tab "Summary."

[20] As discussed in section III-F-3, SunBelt also relies inappropriately on this isolated, unrepresentative project for subballast costs.

project on which SunBelt relies, the "Trestle Hollow Project" conducted for the South Central Tennessee Railroad near Centerville, Tennessee, is not even located on any portion of the NS lines replicated by the SBRR. Second, SunBelt has failed to account properly for the construction challenges attributable to the significant amount of wetlands traversed by the SBRR.

The Board has long accepted R.S. Means as the appropriate, authoritative source for earthwork costs. Indeed, in nearly every SAC case, the Board has applied R.S. Means as the best source of earthwork construction costs, as well as other road property investment unit costs. In *FMC*, for example, the Board applied R.S. Means in calculating the appropriate unit costs for earthwork. *FMC*, 4 S.T.B. at 800. In *WP&L* the parties agreed to use R.S. Means, which the Board accepted. *WP&L*, 5 S.T.B. at 1020, n.147. In *Duke/NS*, the Board relied on R.S. Means costs. *Duke/NS*, 7 S.T.B. at 171; *see also CP&L*, 7 S.T.B. at 310. In *Otter Tail*, the Board accepted R.S. Means unit costs. *Otter Tail*, STB. Docket No. 42071 at D-11.[21]

---

[21] *See also West Texas*, 1 S.T.B. at 704 (Accepting Complainant's "unit costs for earthwork as reasonable, because they are based upon actual quotations obtained from the construction industry and recognized compilation services" where the Complainant used R.S. Means); *PPL v. BNSF*, 6 S.T.B. 286, 305, n.26 (2002) (Applying Complainant's unit cost for excavation, based on R.S. Means); *TMPA I*, 6 S.T.B. at 705 (Using Complainant's culvert costs estimate based on R.S. Means); *Duke/CSXT*, 7 S.T.B. at 479 (Complainant's unit cost for blasting, based on R.S. Means, is used); *Xcel*, 7 S.T.B. at 616 (R.S. Means is "a set of nationwide standardized unit costs that is often relied upon in SAC cases to estimate construction costs."); *Id.* at 677 ("Xcel's common excavation costs are supported by *Means* ... Xcel's cost figures for common excavation are used here ... Xcel's equipment specifications are used here because they are supported by *Means*"); *APS v. ATSF*, STB Docket No. 41185, at 27 (July 27, 1997) (Accepting Complainant's R.S. Means-based index); *WFA I*, STB Docket No. 42088, at 86 (Applying Complainant's R.S. Means-based excavation costs); *Id.* at 86-87 (Accepting Complainant's "Means average for drilling and blasting and bulk drilling and blasting"); *AEP Texas*, STB Docket No. 41191, at 79 ("For segments that would require both clearing and grubbing, AEP Texas uses the R.S. Means Manual (Means) cost"); *AEPCO 2011,* STB Docket No. 42113, at 83-84 ("AEPCO submits separate unit costs for clearing and grubbing, using Means to determine its unit costs ... Therefore, we accept AEPCO's unit costs for clearing as the best evidence of record. We use the agreed-upon grubbing unit costs.").

SunBelt erroneously cites the Board's 2007 decision in *WFA I* and its 2011 decision in *AEPCO* as supporting its unprecedented approach of using a small, short-line project that is unrelated to any track owned by NS as the basis for earthwork unit costs for construction of a larger SARR.[22] In *WFA I*, defendant BNSF produced actual construction unit costs for common excavation and embankment from its then-recently-completed Shawnee-to-Walker Third Main line construction project on the Orin line. At approximately 126 miles,[23] the BNSF's Orin line comprised a substantial portion of the actual route replicated and traversed by the relatively short 218 mile SARR proffered by complainants in *WFA I.*[24] And the Shawnee-to-Walker construction project comprised 14 miles[25] of the 126 mile Orin line. *Defendant* BNSF *accepted* the use of *its own actual costs* of the very *lines replicated by the SARR* for common excavation costs in that proceeding. *See WFA I*, STB Docket No. 42088, at 86. Unlike in *WFA I*, (1) the Trestle Hollow Project was not constructed by NS and is not on the NS (or SBRR) system; (2) the Trestle Hollow project was tiny in size and scope in comparison to the SBRR; and (3) Defendant NS does not accept it.

Similarly, in *AEPCO 2011*, the complainant based its common excavation unit costs on the average costs of five actual BNSF capacity expansion projects covering nearly seventy-seven miles on the Orin and Hereford Subdivisions, based upon actual construction cost documents and materials produced by BNSF in discovery.[26] Unlike *AEPCO*, the Trestle Hollow Project is not

---

[22] *See* Sunbelt Opening at III-F-11 to III-F-12.

[23] The BNSF Orin Line extends generally from MP 0 near Donkey Creek, WY to MP 126.2 at Orin Junction, WY. *See* NS Reply WP "BNSF Orin Line.pdf."

[24] *See WFA I*, STB Docket No. 42088, (served Sept. 10, 2007) at 25-26, 81-82.

[25] NS Reply WP "BNSF Shawnee to Walker miles.pdf."

[26] *See* NS Workpaper "UP and BNSF AEPCO Public Reply Excerpt – Project Miles.pdf."

an expansion project on the lines of the defendant carrier. Indeed, Trestle Hollow is not even a project on a Class I railroad like the SBRR.

In both *WFA I* and *AEPCO 2011*, due primarily to the projects' proximity to the route being replicated by the SARR and the fact that they were projects conducted by the defendant itself on a Class I railroad system, the defendant railroad accepted the use of its own actual experience and costs for common excavation for estimating SARR common excavation costs.[27]

Neither *WFA I* nor *AEPCO 2011* provides precedent for using the costs of a small project on a foreign short-line as the basis for the costs of constructing a SARR that purports to replicate the core of a Class I carrier. Rather, the projects used to derive construction costs for both *WFA I* and *AEPCO 2011* were much larger in size and far closer in geographic proximity and topography to the lines being replicated by the SARRs involved in those cases. The unit costs proffered by SunBelt in its opening evidence are not those of the incumbent on the SARR route as in *WFA I* and *AEPCO 2011*. Instead those costs are extrapolated from a small, isolated, and atypical short-line construction project on the South Central Tennessee Railroad in middle Tennessee. The size, scope, and range of different conditions encountered by the SBRR make it much more suited to use of R.S. Means average costs than to extrapolation from any single project—particularly gross extrapolation from a small, atypical project like Trestle Hollow, which was not even conducted on lines replicated by the SBRR.

Even if it were otherwise appropriate to extrapolate unit costs for a *7,000 foot* short-line relocation project to a nearly *600 mile* SARR, there are many reasons that the South Central

---

[27] *See WFA I*, STB Docket No. 42088, at 86 (explaining that the parties agreed on the cost for common excavation); BNSF and UP Reply, *AEPCO 2011*, STB Docket No. 42113 at III-F-22 (May 7, 2010).

Tennessee Railroad's purported costs on a construction project that was not even located on lines replicated by the SBRR are not applicable, reliable, or appropriate estimates for this case:[28]

- The Trestle Hollow Project introduces a new earthwork category not previously used by the Board: "Mass Excavation." SunBelt has not explained what it means by the term mass excavation or how it is distinguished from common excavation. Critically, SunBelt has not demonstrated that any of the common excavation required for the SBRR is properly characterized as "Mass Excavation." SunBelt's application of a mass excavation unit price to common excavation should be summarily rejected as unprecedented, unexplained, and unsupported.

- Even if SunBelt's very low unit price for mass excavation in the Trestle Hollow Project were otherwise accurate for that particular small project, NS's Engineering Experts have determined the project's unit price is a function of the high concentration of excavation volumes within a small geographic area. According to workpapers provided by SunBelt, the Trestle Hollow Project involved 787,223 units of common excavation over 7,000 feet, or an average of nearly 600,000 units per mile.[29] The SBRR total earthwork including common, loose and solid rock excavation and borrow would average less than 51,000 cubic yards per mile,[30] 8.5 percent of the volume per mile in the Trestle Hollow Project (using SunBelt's cubic yards assumption). Common excavation alone averages just over 40,000 cubic yards per mile[31] or 6.7 percent of the Trestle Hollow Project volumes. The economies realized by the Trestle Hollow Project contractor from conducting all of its work in a small concentrated area would not be available to the SBRR contractors. NS's engineering experts have determined that those economies likely were realized through shorter equipment cycles for excavating and transporting materials along the right of way, which tremendously increases the productivity of the manpower and equipment.

---

[28] The discussion of the Trestle Hollow Project is sponsored by NS witness Don Bagley, who personally visited the Trestle Hollow Project as well as many segments replicated by the SBRR. *See* NS Reply WP "South Central Tennessee Railroad-Trestle Hollow Project.pdf."

[29] 787,223 / 7,000 x 5,280 = 593,791. Without explanation or support, SunBelt assumes that the term "units" used in the Trestle Hollow estimate means cubic yards.

[30] SunBelt Opening Workpaper "SBRR Open Grading.xls," Tab "EW Costs," Cell E40 divided by Tab "CY Grad by seg" Cell H32.

[31] SunBelt Opening Workpaper "SBRR Open Grading.xls," Tab "EW Costs," Cell L40 divided by Tab "CY Grad by seg" Cell H32.

- The Trestle Hollow Project was a lump sum bid contract. There is no discernible link between the contract bid documents included by SunBelt in its work papers showing the K.W. Lankford lump sum bid price of $2,698,324 and the separate single page entitled "Trestle Hollow Line Change Cost Tracker" ("Cost Tracker") totaling $2,698,334 upon which SunBelt relies for its unit costs. The Cost Tracker document was not included in the Lankford bid documents, there is no evidence it was created contemporaneously with the Lankford bid, or was even intended to support or be used with that bid. Because the totals in the bid and the Cost Tracker sheet are not the same, there is no way to determine if the unit price details in the Cost Tracker sheet were used to develop a project price and then the contractor reduced its actual final bid amount, or if the cost tracker price details were created after the fact, possibly for litigation purposes.

- Inconsistencies between the contract bid documents and the contractor notes further undermine the credibility of SunBelt's proffered unit costs. Specifically, the Cost Tracker sheet relied upon by SunBelt for the SBRR's common excavation unit cost identifies 787,223 "units" of mass excavation.[32] There is no indication anywhere in SunBelt's supporting documentation of how that figure was derived or what the term "units" represents. SunBelt treats the unit cost as a cost per cubic yard applicable to common excavation. The 6/08/06 contractor meeting notes, however, indicate the yardage for the project as 630,000 cubic yards[33] or only 80 percent of the mass excavation quantities used in SunBelt's work papers. This represents a considerable difference.

- SunBelt asserts that the Trestle Hollow project was challenging due to hilly terrain and that some of the unit prices are conservative.[34] In fact, based on a site visit and review, a review of the aerial photos of the area,[35] and the limited concept documents provided in SunBelt's workpapers, NS's Engineering Experts have determined there was nothing complicated or unusually challenging about the Trestle Hollow project.[36]

---

[32] SunBelt Opening WP "Trestle Hollow Project Cost Sheet.pdf."

[33] SunBelt Opening WP "Trestle Hollow Specifications.pdf" at 279.

[34] SunBelt Opening III-F-13.

[35] SunBelt Opening WPs "Aerial_Photos #1.pdf" and "Industrial_Map.pdf" in Trestle Hollow Pictures subfolder. These pictures show easy access to a major highway and that the area appears to have been partly clear cut by previous logging.

[36] NS Reply WP "South Central Tennessee Railroad-Trestle Hollow Project.pdf."

- Grading contractors working on the Trestle Hollow Project had the significant cost-saving advantage of a wide right-of-way that provided ample width for vehicle turning; inadvertent over-excavation; and haul roads adjacent to the roadbed under construction. Based on SunBelt's report that 30 acres were cleared and grubbed for the project and an overall project length of 7,000 feet, the average right of way width is at least 187 feet. Some contractor notes suggest Trestle Hollow rights of way areas with as much a 600 feet of clearance before encroaching on adjacent property lines.[37] SunBelt's case-in-chief limited SBRR rights-of-way widths to 75 and 100 feet, which would constrain grading operations significantly, because equipment operators would have to exercise special care not to encroach on adjacent properties, and equipment would have less mobility, thereby reducing productivity.[38] Moreover, the lack of hauling roads along the SBRR right-of-way would force its construction haulers to use the railroad roadbed during construction, further reducing equipment productivity.

- The Trestle Hollow Project enjoyed additional unusual economies because the contractor was able to distribute excavated spoil materials along the right of way.[39] In contrast, because of the narrow SBRR 75 and 100 foot rights of way, SBRR earthwork contractors would be required to haul spoil materials longer distances to special disposal areas acquired at points adjacent to the right of way.

- According to the soil boring reports prepared by Qore Property Sciences and provided by SunBelt as part of the overall bid package on the Trestle Hollow Project, the in-situ moisture contents of the soils tested for the Trestle Hollow Project was nearly optimal meaning little if any additional water was needed for compaction.[40] Encountering soils with such optimal moisture content is atypical and, as explained below, quite unlikely for the majority of the terrain traversed by the SBRR. Using the Soil Climate Analysis Network (SCAN) and the Web Soil Survey (WSS), NS's Engineering Experts have found ten monitoring stations located close to the SBRR route. Of the ten, three areas are below the optimum and would require water for compaction, two are within 4% of optimum, and five are

[37] SunBelt Opening WP "Trestle Hollow Specifications.pdf" at 279.

[38] SunBelt Opening III-F-3.

[39] SunBelt Opening WP "Trestle Hollow Specifications.pdf" at 279.

[40] SunBelt Opening WP "Trestle Hollow Specifications.pdf" at 226 – "Report of Geotechnical Exploration Services."

above the optimum moisture content requiring drying of material before compaction.[41] *See infra* III-F-2-g-vii.

- The Trestle Hollow Project route followed a ridgeline and did not traverse any wetlands.[42] In comparison, the SBRR route traversed 90.8 miles of wetlands (15.7% of route).[43]

- The Trestle Hollow project near Centerville, Tennessee is situated in the Highland Rim Section of the Interior Low Plateaus Province of the Interior Plains. Topography of this project is essentially flat, with small drainage crossings. The Trestle Hollow Project did not have to address rock outcroppings or slope stability concerns that are associated with more geologically complex or steep terrain such as in the Appalachian Highlands/Valley and Ridge Province in northern Alabama. Nor were there river crossings or swamp and bog sites with soft soil conditions such as in the Coastal Plain involved in the Trestle Hollow Project. The Trestle Hollow Project is situated in a small portion of a physiographic region off of the SBRR route, and is not representative of increased roadway design, construction, and maintenance costs associated with more difficult terrain and unsuitable soft ground conditions.

a. SunBelt's Fabricated Rationale

In an effort to avoid the use of actual costs that NS has recently incurred for earthwork activities, SunBelt complains that NS produced in discovery only a limited volume of documents containing earthwork cost information. SunBelt further claims that because the documents relate to construction of { } the Board should reject NS's actual costs as not representative of the costs of constructing the SBRR. SunBelt Opening III-F-12.

SunBelt's complaints ring hollow. In response to SunBelt's discovery requests related to earthwork costs, NS produced a list of Authorizations for Expenditure ("AFE") for all NS construction projects completed during the time period from January 1, 2007 through December of 2011. The NS AFE list included information for 897 separate AFEs covering all aspects of

[41] NS Reply WP "SBRR Soil Moisture Content.xls."

[42] NS Reply WP "Aerial Photos #1 by SunBelt.pdf."

[43] NS Reply WP "SBRR_Wetland_Map.pdf" and "SBRR_Wetlands_Route MP.xlsx."

NS capital expenditures over the relevant time frame.[44] Ninety-seven of the AFEs on the list included costs for "Grading" activities at a total cost of $103 million.[45] Of the ninety-seven grading projects, however, SunBelt selected only thirteen for detailed review.[46] After this limited review, SunBelt dismissed the costs from all of the AFEs for which it requested detailed supporting information because SunBelt deemed the projects it had chosen to be too small.[47] SunBelt has not described the criteria it used in concluding that the specific NS projects it selected for review were too small. Nor did SunBelt seek to review any additional NS projects once it deemed those it had selected to be unfit for its purposes.

It is difficult to understand how SunBelt deemed the actual NS projects to be too small while it found the smaller Trestle Hollow Project to be an appropriate size to extrapolate to a 578 route-mile rail network. The Trestle Hollow Project upon which SunBelt relies for SBRR common excavation costs is a scant 1.3 miles. NS reviewed the details of its AFEs that report costs under the NS grading function (code 5103). Of the thirteen projects reporting costs under the grading function code, eleven projects included costs directly related to excavation and borrow. Table III-F-9 summarizes the relevant details of the earthwork costs.

---

[44] *See* NS Reply WP "AFE List.xlxs."

[45] *See* NS Reply WP "AFE List.xlsx."

[46] *See* NS Reply WP "SunBelt Letter Requesting Detailed AFEs.pdf."

[47] SunBelt Opening III-F-12.

Table III-F-9
Summary of Earthwork Costs From NS AFEs Produced to SunBelt

AFE	Year	Length (miles)	Earthwork Description	Earthwork Quantity (cubic yards)	2011 Unit Cost
40856	2004	1.46	Unclassified Excavation	25,000	$13.55
50096	2005	2.14	Unclassified Excavation	10,500	$12.60
50739	2005	0.31	Unclassified Excavation	1,270	$12.60
51323	2005	1.63	Grading - Cut	18,000	$10.08
60561	2005	2.18	Grading - Cut/Borrow	20,300	$18.19
70553	2006	2.59	Grading - Borrow	21,600	$13.51
70565	2007	2.27	Unclassified Excavation	30,000	$10.57
81228	2008	0.19	Rock Excavation	17,000	$64.86
90203	2010	1.74	Grading - Cut/Borrow	11,000	$10.55
90204	2008	2.29	Grading - Borrow	27,000	$21.88
202004	2009	3.83	Unclassified/Rock Excavation	160,000	$19.45
Total (incl. rock excv.)		20.64		341,670	$19.22
Total (excl. rock excv.)		20.45		194,670	$14.03

Source: NS Reply Workpaper "NS Actual Earthwork Costs.xlsx."

As Table III-F-9 shows, NS AFEs produced to SunBelt in discovery include costs for over 20 miles of earthmoving work, totaling nearly 342,000 cubic yards. The ten projects not involving rock excavation averaged 2.05 miles[48] in length, or approximately 54% longer[49] than the Trestle Hollow Project. The NS actual cost per cubic yard, indexed to 2011 using the AAR

[48] 20.45 / 10 = 2.05.

[49] 2.05 / 1.33 = 1.54.

indexes of charge out prices and wage rates, range from a low of $10.08 for excavating a cut, to a high of $64.86 for excavating rock.[50] The NS actual cost averages $19.22 per cubic yard including the rock excavation project and $14.03 per cubic yard if the high cost of the rock excavation project is removed.[51] The AFE costs are developed and used in NS's regular course of business by experienced railroad project engineers and are accurate and reliable. SunBelt fails to acknowledge the real reason it seeks to dismiss NS's real-world AFE unit costs—that those realistic costs are well above those of the unrepresentative Trestle Hollow Project and well above earthwork costs developed from R.S. Means construction cost data, upon which most Board decisions have relied.[52]

In addition to the AFEs, NS produced in discovery to SunBelt details of NS's sixteen mile Keystone Build-Out Project near Shelocta, Pennsylvania. The project was completed by NS in 2006 and involved the construction of a new 5.3 mile rail line between Saltburg and Clarksville, Pennsylvania, along with the rehabilitation of 10.8 miles of existing abandoned track between Clarksville and Shelocta.[53] The 5.3 miles of new construction is one of the largest greenfield rail construction projects in the U.S. in recent years. The new construction portion of the project involved the excavation of over 1.4 million cubic yards of soil, most of which involved making large cuts in the existing hillside to carve out a flat path for the rail corridor.

---

[50] NS Reply WP "NS Actual Earthwork Costs.xls."

[51] *Id.*

[52] *FMC*, 4 S.T.B. at 800; *WP&L,* 5 S.T.B. at 1020, n.147; *Duke/NS*, 7 S.T.B. at 171; *CP&L*, 7 S.T.B. at 310; *Xcel*, 7 S.T.B. at 616; *Otter Tail*, STB Docket No. 42071, at D-11.

[53] *See* NS Reply Exhibit III-F-5 ("Building the Shelocta Line") (DVD); NS Reply WP Folder "Keystone Data," NS Reply WP "Keystone Videos," "Keystone Narrative.pdf" (materials also produced to SunBelt in discovery: Keystone Videos, NS-DP-HC-DVD-025 to 029; and Keystone narrative, NS-DP-HC-25663-25701).

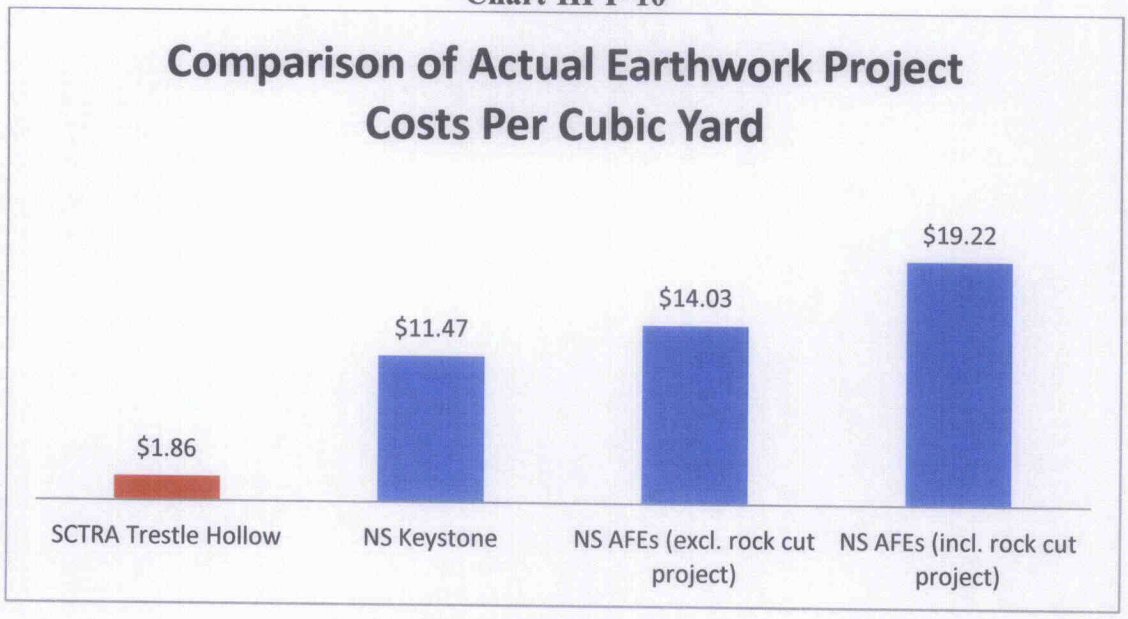
NS's cost for just the earthwork on the Keystone Build-Out Project averaged $11.47 per cubic yard at 2011 levels.[54] Details of the Keystone Project were produced to SunBelt in discovery and are included in the NS reply workpapers.[55]

SunBelt suggests that the NS AFE information is somehow deficient because it involves extensions to existing track. *See* SunBelt Opening III-F-13. SunBelt says nothing regarding the recent NS experience on the Keystone Build-Out Project. The Chart below compares the earthwork costs actually incurred by NS in the AFEs produced to SunBelt and on the Keystone Project (indexed to 2011 levels) with the Trestle Hollow Project costs proffered by SunBelt.

[54] *See* NS Reply WPs "SPENDING FORECAST 2002-03-22 (NS-DP-HC-37990.pdf" and "NS Actual Earthwork Costs.xlsx." Although the Keystone Project represents NS actual experience in building a new line of railroad, unlike R.S. Means the Keystone Project costs reflect the construction characteristics of a single project and therefore should not be assumed to be representative of the costs of building a railroad the scope of the SBRR.

[55] NS Reply WP Folder "Keystone Data."

Chart-III-F-10



Source: NS Reply Workpaper "NS Actual Earthwork Costs.xls."

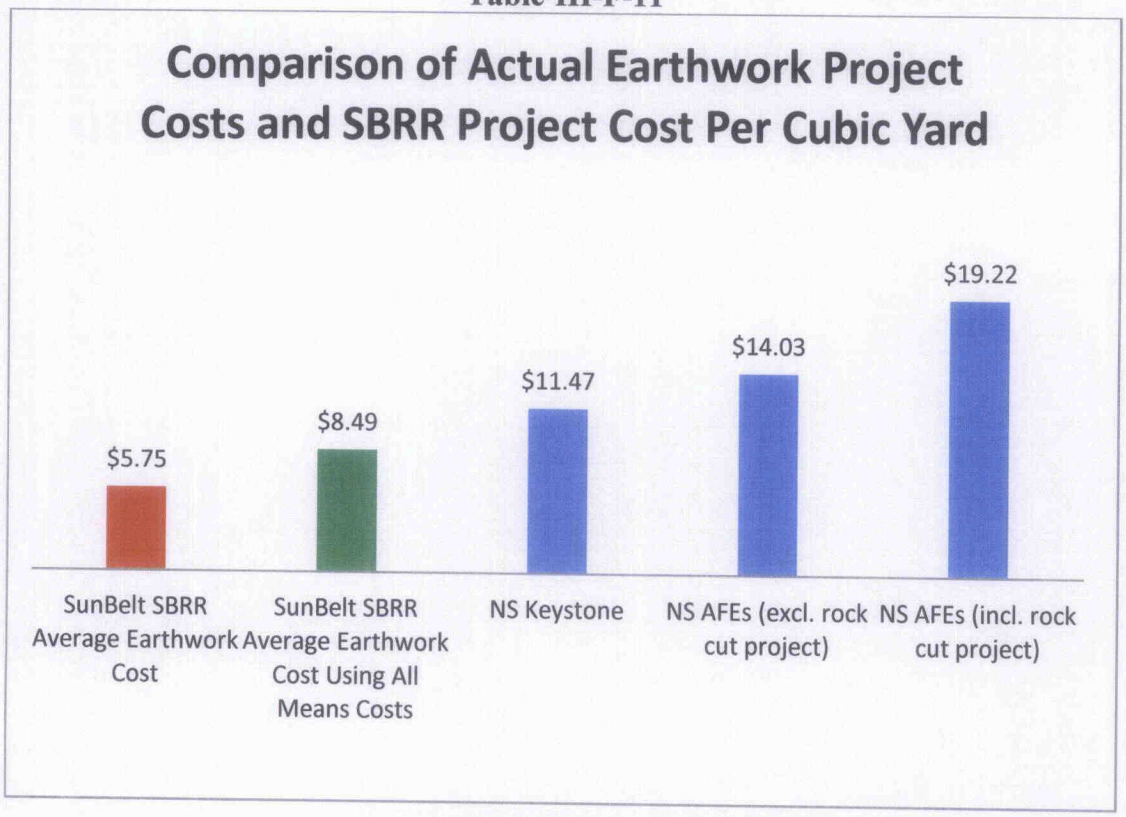
As Table III-F-10 shows, the Trestle Hollow Project costs are far out of line with NS's actual earthwork project experience.

Neither the NS AFEs nor the Keystone documents provide separate unit costs for common, loose rock or solid rock excavation so the cost per cubic yard reflected in Table III-F-10 are the average cost for all categories of earthwork in each of the representative projects. In SAC cases, earthwork quantities normally are separated into individual classifications of common excavation, loose rock excavation, solid rock excavation, and borrow.[56] In order to compare the reasonableness of the SBRR earthwork unit costs, it is useful to compare the overall project cost per cubic yard from the NS AFEs and Keystone project to the overall average SBRR earthwork costs. Chart III-F-3 below compares (i) the average SBRR cost per cubic yard for common, loose rock and solid rock excavation from SunBelt's opening evidence, which includes use of the Trestle Hollow Project unit cost for common excavation to (ii) SunBelt's average

[56] *See, e.g.*, *Xcel*, 7 S.T.B. at 676.

SBRR cost per cubic yard if, as in past cases, SunBelt's costs were calculated using R.S. Means for all earthwork costs. (i.e., if R.S. Means unit costs were substituted for the Trestle Hollow project-based costs SunBelt inserted in its opening evidence).

Table-III-F-11



Source: NS Reply Workpaper "NS Actual Earthwork Costs.xlxs."

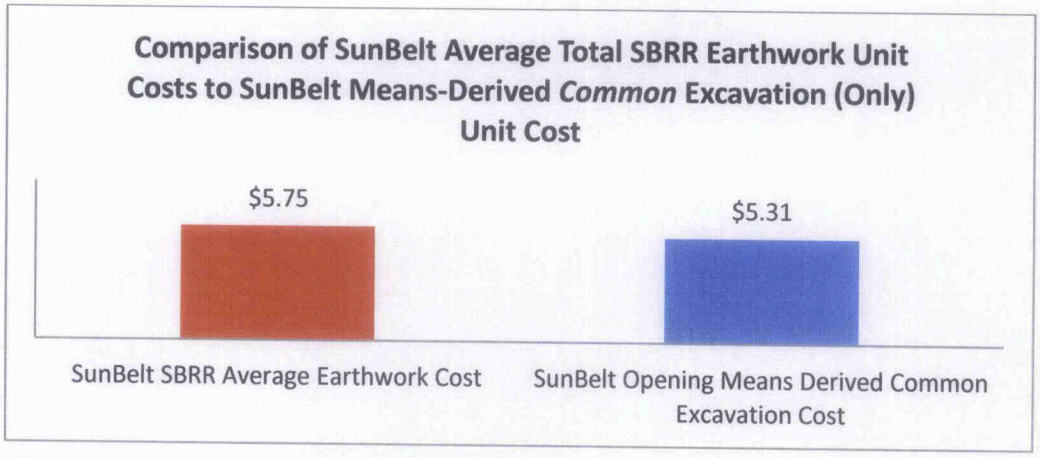
Table III-F-11 shows that even when R.S. Means is used to develop the SBRR cost for common excavation, the overall earthwork average project cost for the SBRR is still well below NS's actual costs in the Keystone Project and in the AFEs provided to SunBelt in discovery. This is because the Trestle Hollow Project costs assumed by SunBelt for SBRR common excavation are unrealistically low outliers and produce average SBRR earthwork costs that are roughly half of the average cost NS incurred in building the 5.3 mile Keystone Project and are less than one-third of the costs actually incurred by NS for earthwork on for the AFE projects

produced to SunBelt in discovery.[57] Table III-F-11 shows that composite SBRR costs that include the use of R.S. Means for common excavation, while still conservatively lower than the NS actual experience, are more in line with typical railroad construction project costs.

SunBelt's own calculation of common excavation cost consistent with Board precedent further demonstrates that the Trestle Hollow Project costs are out of line and unreasonably skew the average SBRR earthwork costs. SunBelt calculated those costs using R.S. Means data and included those calculations in its workpapers. SunBelt WP "SBRR Open Grading.xls," Tab "Unit Costs." Seeing the results of calculating costs in accordance with the Board's standard R.S. Means approach, SunBelt jettisoned that work in an attempt to depress the SBRR's excavation costs. Table III-F-12 below compares SunBelt's proposed overall unit cost for *all earthwork* (which includes common excavation, loose and solid rock excavation, and borrow and is shown in red) to the R.S. Means-derived unit cost for *common excavation alone* (which is shown in blue). As discussed, SunBelt developed the latter R.S. Means-based common excavation unit cost in its electronic grading work but then decided not to use it. This shows that the standard R.S. Means-based cost approach (which the Board has used in most prior cases) for the single earthwork cost component of common excavation alone– as calculated by SunBelt itself – is nearly the same as the cost SunBelt ultimately proposed in its opening evidence for *all* earthwork. Clearly, Sunbelt substantially understated SBRR earthwork costs.

[57] As Table III-F-11 shows, SunBelt average earthwork cost for all aspects of SBRR earthwork activities is only slightly higher than the Board-accepted, R.S. Means-derived unit price for common excavation.

Table-III-F-12



Source: NS Reply Workpaper "NS Actual Earthwork Costs.xlxs."

b. Clearing and Grubbing

Clearing is the process of removing brush and trees (leaving roots and stumps), and is the initial step in roadbed preparation. Clearing quantities from the ICC Engineering Reports can be divided into two general types based on the type of plant cover and degree of difficulty of clearing. The first type is clearing of areas having primarily smaller brush and few trees. This entails using a rake to cut the brush, and stockpiling the cut material. The stockpiled brush is loaded into trucks and hauled to a waste site. The second type is clearing of areas with trees, a more arduous undertaking that involves cutting and chipping the trees.

Grubbing is the process of removing tree roots and stumps left by clearing of the areas with trees. Grubbing is required for areas with trees, but generally is not required for areas primarily covered with brush and smaller vegetation. *See* NS Reply WP "WP III-F-2-a. Clearing and Grubbing Diagram.pdf" showing what is cleared, and what is grubbed.

i. Clearing and Grubbing Quantities

NS accepts SunBelt's method of determining clearing quantities and grubbing quantities and its resulting clearing and grubbing quantities. *See* NS Reply WP "SBRR Open Grading NS

Reply.xls," Tab "Clearing and Grubbing Costs." NS rejects SunBelt's proffered clearing and grubbing unit costs. In past cases, clearing and grubbing costs have been split into two separate categories – those acres containing trees that require both the clearing of trees and the grubbing of stumps and those acres without trees that require only light clearing to remove and dispose of brush.[58] Here, SunBelt applied a combined clearing and grubbing unit cost of $2,257/Acre based upon the Trestle Hollow Project. As NS explained in detail in Section III-F-2-a the Trestle Hollow Project is not comparable—in scale, scope, topography, rock and soil conditions, and other conditions and parameters—to the areas traversed by the SBRR system.

SunBelt attempts to justify the use of a one-size-fits-all "combined" cost by claiming that applying this combined unit cost to the total acres requiring clearing is conservative and may "overstate[] the total costs as not all acres have trees or require grubbing." SunBelt Opening III-F-8. Although it is true that not all SBRR land would require grubbing, SunBelt's workpapers show its approach is not conservative. SunBelt's opening workpapers show it did develop *separate* "alternative" costs for clearing and grubbing, using the R.S. Means Handbook.[59] The R.S. Means Handbook provides a "set of nationwide standardized unit costs, adjusted for localities, used to estimate the cost of construction" that has long been accepted by the Board. *See, e.g.*, *CP&L*, 7 S.T.B. at 310; *Duke/NS*, 7 S.T.B. at 171, n.99. Although SunBelt ultimately chose not to use R.S. Means-based costs to determine the SBRR clearing and grubbing costs, its workpapers nonetheless show most of the relevant R.S. Means unit costs required for clearing

---

[58] *AEPCO 2011*, STB Docket No. 42113, at 83.

[59] *See* SunBelt Opening WP "SBRR Open Grading.xls," Tab "Unit Costs," Rows 97 – 108. Specifically SunBelt calculates separate unit costs applicable to acreage with trees that require both clearing of trees and grubbing of stumps and acreage without trees that require only the clearing of brush.

and grubbing activities.[60] Instead of using the separate unit costs it identified for clearing and grubbing in its workpapers, SunBelt substituted a lower cost based upon the Trestle Hollow Project.[61] SunBelt offers no justification for why the Trestle Hollow Project costs are either more accurate or more representative than its Means costs.

Further, SunBelt has failed to demonstrate that the clearing and grubbing cost per acre from the Trestle Hollow Project is representative of the clearing and grubbing costs that would be incurred in the construction of the SBRR. Specifically, the limited supporting documents provided by SunBelt for the Trestle Hollow Project unit costs reflect only an amount of 30 acres and a unit cost of $2,000 per acre.[62] The documents provide no indication of whether the 30 acres represent all of the Trestle Hollow Project acreage that required both clearing and grubbing or something else. The ICC Engineering Reports used to determine the SBRR clearing and grubbing quantities contain detailed splits of the relative amount of acres requiring clearing only versus those requiring both clearing and grubbing.[63] Without information on the relative mix of clearing only versus clearing and grubbing from the Trestle Hollow Project—which SunBelt has not provided —it is impossible to determine the relevance of the undifferentiated and unexplained Trestle Hollow Project clearing and grubbing costs to the costs that would be incurred by the SBRR.

---

[60] *Id.*

[61] *See* SunBelt Opening WP "SBRR Open Grading.xls," Tab "Unit Costs," Rows 110 – 113.

[62] *See* SunBelt Opening WP "Trestle Hollow Project Cost Sheet.pdf."

[63] *See* SunBelt Opening WP "SBRR Open Grading.xls," Tab "Eng Rpt Input," Columns AU and AX.

ii. Acres Requiring Both Clearing and Grubbing

For land with trees that would require both clearing and grubbing, NS rejects SunBelt's proposed use of the Trestle Hollow Project as the source for SBRR clearing and grubbing unit costs and adopts SunBelt's alternative R.S. Means-based approaches included in SunBelt's workpapers[64] that develop separate unit costs for clearing of $5,458 per acre based on the R.S. Means cost for cutting and chipping trees up to twelve inches in diameter[65] and for grubbing of $3,275 per acre based on the R.S. Means cost for grubbing and removing stumps. *See* Sunbelt Open. WP SBRR Open Grading.xlsx," Tab "Unit Costs."

NS's approach is consistent with Board precedent. *See, e.g., AEPCO 2011*, STB Docket No. 42113, at 83 (providing separate R.S. Means unit costs for clearing and grubbing); *CP&L*, 7 S.T.B. at 310 (same). NS's Reply Evidence applies these unit costs to the SBRR acres requiring both clearing and grubbing. See SunBelt Opening WP "SBRR Open Grading.xls," Tab "Other Items," Columns Y through AE.

c. Acres Requiring Only Clearing

SunBelt's alternative R.S. Means-based clearing and grubbing costs include a unit cost of $246.19/acre for areas that require clearing but do not need to be grubbed. NS accepts the application of a separate unit cost to land requiring only clearing, but rejects SunBelt's proposed unit cost for clearing. SunBelt made two significant errors in deriving its clearing costs estimate: (a) applying the R.S. Means costs for equipment that could not clear land at the rate of speed assumed by SunBelt; and (b) neglecting to include the R.S. Means cost of the equipment and

[64] See SunBelt Opening WP "SBRR Open Grading.xlsx," Tab "Unit Costs," Rows 101 through 108.

[65] SunBelt Opening WP "SBRR Open Grading.xlsx," Tab "Unit Costs," Rows 101 through 105.

labor necessary to load and haul away loose material created during clearing. NS explains those errors in more detail below.

First, the equipment corresponding to the unit cost SunBelt selected would be incapable of clearing land at the production rate SunBelt assumes. The R.S. Means unit cost that SunBelt developed is based on a B-11A crew with a single 200-horsepower dozer capable of clearing eight acres per day using a twelve-foot wide brush rake.[66] However, SunBelt necessarily assumes the same dozer would both pull the clearing rake and stockpile resulting materials. The R.S. Means cost does not include any additional equipment (e.g., dozers) to stockpile cleared material.[67] Under SunBelt's approach, therefore, a single bulldozer would have to split its time between the two tasks, which would substantially increase the time and unit costs for clearing. NS's Engineering Experts have adjusted the clearing rate by cutting it in half (to four acres per day) to reflect this division of time and work.[68]

Second, once the materials are cleared and stockpiled they could not remain on the narrow SBRR roadbed (because they would impede other construction work) and instead necessarily would be hauled away for disposal. This task could not be accomplished with a bulldozer selected from R.S. Means to perform the clear and stockpiling operations because the bulldozer blade is incapable of lifting the stockpiled materials and placing them in a truck to be hauled away. SunBelt failed to account separately for the time, labor, and equipment necessary to load and haul away the stockpiled material. To correct this error and account for the necessary costs of removal, NS's Engineering Experts added the R.S. Means cost of a B-30 crew—an

---

[66] *See* NS Reply WP "Clearing Crews.pdf" and NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Unit Costs," Rows 132 to 133.

[67] *Id.*

[68] *See* NS Reply WP "Clearing Equipment_Selection_NS_Reply.xlsx."

equipment operator, an excavator, two dump trucks and drivers—to remove such material. This is an economical choice of equipment, allowing the small excavator to load one truck while the second truck is hauling the waste to the dump sites.

After reducing the clearing rate to an achievable four acres per day and adding the cost of a crew to load and haul away materials after clearing, the total daily cost of clearing and loading a 30-foot wide section of land is $1,173.94 per acre.[69]

d. Earthwork

NS accepts SunBelt's general method of determining earthwork quantities from the ICC Engineering Reports (sometimes referred to hereafter as "Engineering Reports"), however for one of the Engineering Reports, SunBelt erroneously placed a borrow quantity in the Common Excavation quantities and did not include a lateral drainage quantity from another report. As detailed below, NS accepts SunBelt's general methodology for determining yard earthwork quantities but rejects SunBelt's overall yard track construction earthwork quantities because SunBelt understates both the number and size of SBRR yards. NS also rejects SunBelt's unit costs for earthwork excavation and land for waste sites, but accepts SunBelt's borrow unit cost. In addition, NS's Reply Evidence corrects SunBelt's failure to include stripping, undercutting, swelling of excavation for haulage, solid rock over-excavation, and finish grading quantities and costs.

i. Earthwork Quantities from ICC Engineering Reports

NS accepts SunBelt's assignment of valuation sections to the SBRR route, but rejects its calculation of earthwork quantities by valuation section. Without explanation, SunBelt understated the quantity of borrow materials hauled for placement in the SBRR's roadbed

[69] NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Unit Costs," Rows 122 to 123.

because it excluded material hauled from sources up to 5,000 feet away. Specifically, SunBelt's opening workpaper "SBRR Open Grading" captures reported borrow quantities moved to the SBRR roadbed from distances greater than 5,000 feet under "Train Overhaul"[70] but omits quantities reported under "Team Overhaul" from distances up to 5,000 feet.[71] Both the Train Overhaul and Team Overhaul line items in the Engineering Reports have been assigned unit values indicating a cost incurred at the time of the ICC valuation[72] and should be treated similarly today. Because they are reported in "cubic yards station," the Team Overhaul quantities need to be converted to cubic yards. NS did this conversion in a manner similar to the process used by SunBelt to convert Train Overhaul quantities which are reported as "cubic yards 1000 feet." Specifically, NS assumed the Team Overhaul distances range from 500 feet (the distance up to which haul is considered free) and 5,000 feet (the distance at which Train Overhaul begins) and assumed the average length of haul as the midpoint of that range, or 2,750 feet. NS then added these Team Overhaul quantities to SunBelt's Train Overhaul quantities to account accurately for the costs to move all borrow materials. Details of the NS calculations are included in NS Reply WP "SunBelt Open Grading NS Reply.xlsx."

---

[70] *See* SunBelt Opening WP "SBRR Open Grading.xlsx," Tab "Eng Rpt Input," Columns "O" through "U."

[71] The specific ICC Engineering Report line item is "Team Overhaul – 500' free haul." SunBelt might have been confused by the reference to free haul, however the "free" designation applies only to the first 500 feet of haulage. Indeed, the ICC Engineering Reports also include a value for "Team Overhaul – 500' free haul" reported quantities, indicating they were not considered to be free at the time of the ICC valuation. The quantities are reported in the ICC Engineering Reports in units of "CY Sta" or cubic yards station. A station represents 100 feet, so one unit of "Team Overhaul – 500' free haul" represents one cubic yard hauled 100 feet beyond the 500 foot free haul distance.

[72] *See, e.g.*, SunBelt Opening WP "SunBelt ICC Engineering Reports.pdf" at 5.

NS accepts SunBelt's adjustment of the ICC Engineering Reports' quantities to reflect modern construction standards including its proposed roadbed widths.

ii. Other SBRR Earthwork Quantities and Earthwork Costs

(a) SBRR Yards

SunBelt proposed that the SBRR would include one large yard and 12 lesser yards including interchange yards. SunBelt Opening III-F-11. SunBelt developed the earthwork quantity estimates for all of these facilities by assuming an average one-foot fill height per yard-track foot. The one-foot fill assumption for yard tracks is a function of the assumptions made to remove earthwork quantities attributable to yard and other tracks from the quantities reported in the ICC Engineering Reports. NS's Engineering Experts agree with the method of earthwork estimation but reject SunBelt's yard locations and yard track configurations. See NS Reply WP "SBRR Yard List NS Reply.xlsx." The changes made by NS result in 693,349 cubic yards of earthwork for yards rather than SunBelt's opening figure of 311,026 cubic yards. *See supra* III-B-Final Yards. Because the NS Reply SBRR yards are within reasonable proximity of where NS has yards today, NS's Engineering Experts accepted the one-foot fill height per yard track mile and added the resulting quantities to the Common Earth Excavation quantities.

(b) Total Earthwork Quantities

For the reasons set forth above, NS rejects the total earthwork quantities SunBelt submitted in its Opening Evidence. NS has adjusted SunBelt's earthwork quantities to correct the errors and omissions described above. Those corrections, and resulting earthwork quantities, are detailed in NS's workpapers.[73] The following table compares earthwork quantities proposed by SunBelt and the corrected quantities developed by NS in this Reply.

[73] NS Reply WP "SBRR Open Grading_NS Reply.xls," Tab "EW Cost."

Table III-F-13
SBRR Earthwork Quantities and Costs[74]

	Item	SunBelt(CY)	NS Reply(CY)	Difference(CY)
1	Common Excavation	23,310,654	23,623,883	313,228
2	Loose Rock Excavation	1,388,676	1,401,474	12,798
3	Solid Rock Excavation	1,210,317	1,453,584	243,267
4	Borrow	3,487,283	5,059,490	1,572,207
5	Total	29,396,930	31,538,431	2,141,501

(c) Earthwork Unit Costs

NS has evaluated SunBelt's proffered earthwork unit costs and made appropriate corrections and adjustments. Revisions to SunBelt's unit costs are described in the following sections.

(i) Haul Distance Assumptions

Implicit in earthwork unit prices is a necessary assumption regarding the average length of haul for materials excavated and loaded into vehicles for placement in embankment or dumping to waste pits. To develop common excavation costs from R.S. Means, SunBelt selected a unit price for a scraper with an average haul distance of 3,000 feet.[75] Haul distance represents the distance the loaded materials are actually moved,[76] so the round trip distance (loaded plus empty) for the scraper posited by SunBelt is 6,000 feet. In its development of R.S. Means derived earthwork unit costs for loose rock, and solid rock, SunBelt assumed that haulage would be accomplished by large dump trucks or haulers, but without any support, however, SunBelt assumed that the round trip distance would be less than half the distance assumed for the

---

[74] *Id.*

[75] SunBelt Opening Workpaper "SBRR Open Grading.xlsx," Tab "Unit Costs," Row 12.

[76] See NS Reply Workpaper "Haul_Definition.pdf."

scraper.[77] Specifically, SunBelt selects from R.S. Means hauler unit prices for round trips of one-half mile or only 2,640 feet.[78] This lower, unsupported round trip produces unachievable efficiencies that artificially lower earthwork construction costs. Under SunBelt's assertion, all material would have to be excavated within 1,320 feet of embankments and excavation waste dump sites. A more realistic and efficient choice is to develop haulage costs consistent with the haul assumptions for common excavation and select costs for a 1-mile (5280 feet)) cycle. NS has adopted this approach in restating SunBelt's R.S. Means-based excavation costs that rely on haulers to transport excavated materials.

(ii) Common Excavation

As discussed previously, SunBelt based its unit costs for common excavation on the Trestle Hollow Project. NS rejects the notion that common excavation unit cost for the SBRR will be the same as the single, isolated 7,000 *foot* Trestle Hollow project. *See* NS Reply WP "South Central Tennessee Railroad-Trestle Hollow Project.pdf." Instead, NS's experts have developed common excavation unit cost for the SBRR from R.S. Means. NS Reply WP "SBRR Open Grading NS Reply.xls," Tab "Unit Costs."

Unlike the unrepresentative, dubious unit price estimates derived from the small and isolated Trestle Hollow Project, R.S. Means costs are developed from real-world costs of a large variety of actual construction projects, which serve as a far better basis for calculating the costs of constructing the 578 –mile SBRR. To develop its annual average costs, R.S. Means contacts manufacturers, dealers, distributors, and contractors all across the U.S. and Canada for input.

---

[77] SunBelt Opening workpaper "SBRR Open Grading.xlsx" develops R.S. Means-based costs for common earthwork and loose and solid rock excavation in adverse conditions. Those unit costs were not used by SunBelt in its development of SBRR earthwork investment.

[78] SunBelt Opening Workpaper "SBRR Open Grading.xlsx," Tab "Unit Costs," Rows 22, 46, 60 and 75.

R.S. Means' labor costs are based upon the average of wage rates from 30 U.S. cities. Its wage rates are determined from both union labor agreements and open-shop rates. R.S. Means bases its equipment costs on national rental rates and those costs include operating costs such as servicing, fuel, and lubricants. R.S. Means obtains equipment rental rates from contractors, suppliers, dealers, manufacturers, and distributors throughout North America.[79] And R.S. Means has long been accepted by the Board as an authoritative source. *See, e.g., CP&L*, 7 S.T.B. at 310.

In SunBelt Opening workpaper "SBRR Open Grading.xls" SunBelt added 332,600 CY of slag to the Common Excavation quantities for ICC Engineering Report AGS-2-AL.[80] Slag is an acceptable fill material from off site (waste from Steel Mills), and should be considered Borrow, not Common Excavation. NS has corrected this error by deleting the quantity from Common Excavation and adding it to the Borrow quantity.[81]

In its workpaper "SBRR Open Grading.xls." SunBelt also developed a unit cost across the diverse terrain and conditions traversed by the entire 578 route mile SBRR network based upon R.S. Means data.[82] NS accepts the R.S. Means-based unit cost for common excavation that SunBelt included in its unit cost workpaper (but did not use in its final cost calculations). NS applied that unit cost to common excavation quantities to derive common excavation costs for the SBRR.

---

[79] NS Reply WP "Equipment_Selection_Graphics.pdf."

[80] SunBelt Opening WP "SBRR Open Grading.xls," Tab "Eng Rep_Inputs."

[81] NS Reply WP "SBRR Open Grading_NS Reply.xls," Tabs "Eng Rep_Inputs." Line 20 & "SBRR-ICC Quantity Errors."

[82] SunBelt Opening WP "SBRR Open Grading.xls," Tab "Unit Costs."

(iii) Loose Rock Excavation

NS accepts SunBelt's use of R.S. Means data as the source for loose rock excavation costs. NS's Engineering Experts selected a more reasonable hauler combination than that proposed by SunBelt, and adjusted unit costs accordingly.

Specifically, NS rejects the uniform use of the 42 CY Hauler proposed by SunBelt for loose rock excavation costs.[83] NS's Engineering Experts evaluated this hauler based on the physical dimensions of the hauler, its loaded weight, overall practicality, cycle distance, and daily production as presented by SunBelt's workpapers and in R.S. Means.[84] These extremely large haulers are mainly used in mining, quarries, and other large, broadly sprawling earthwork projects in areas that are as wide as they are long. Such huge haulers are rarely used in very long, narrow, linear roadbed projects. Particularly because of the narrow right-of-way widths SunBelt has specified for the SBRR, the 42 CY haulers would be infeasible for SBRR excavation. The massive 42 CY haulers are 17 feet 8 inches wide, which would prevent two haulers from meeting or passing one another on a 24-foot wide roadbed.[85] Moreover, even a single 42 CY hauler could not fit on bridges designed to SunBelt's standard. Due to their tremendous weight, the haulers would not be allowed to traverse public roads and could only traverse the previously constructed SBRR roadbed. Public roads and bridges usually are designed for AASHTO H20 or HS20, which allow a maximum of 32,000 pound axial loading.

---

[83] Aspects of the 42 CY hauler, primarily its massive size and tremendous weight, render it demonstrably infeasible for various stages of roadbed construction in non-adverse terrain.

[84] SunBelt assumes the use of a 42 CY off-road hauler in its development of earthwork unit costs for common excavation in loose rock excavation and solid rock excavation. As discussed in detail in these sections, NS accepts limited use of 42 CY where potentially feasible (but not practical) for loose and solid rock excavation.

[85] *See* NS Reply WP "42_CY_Hauler_on_34.5 ft_Roadbed.pdf" and "42_CY_Hauler_on_24 ft_Roadbed.pdf," "22_CY_Hauler_on_Roadbed.pdf."

Loaded weight for the hauler is 219,760 pounds. When loaded the rear axle carries 68% of the weight or 149,437 pounds (75 tons), which is 4.7 times the allowable load. Horizontal clearance dimensions for single track bridge widths are less than 14 feet with guard timbers in place.[86] This would prohibit the 14-foot wide (outside wheel to outside wheel) 42 CY haulers from safely passing over completed bridge decks.

Further, the 42 CY hauler's loaded weight would require 3.0 to 4.5 feet of compacted cover over all SBRR corrugated metal pipe culverts to absorb the load without damaging the pipe.[87] From SunBelt's workpaper "Contech Pipe Weights.pdf," Contech[88] requires 3-feet of cover for small diameter Corrugated Metal Pipes ("CMPs") and 4.5-feet of cover for medium and large diameter CMPs for axle loads greater than 110,000 pounds (110 kips). Moreover, for SBRR earthwork tasks, the 42-CY hauler would be grossly inefficient. For example, the 42 CY haulers could not achieve their rated efficiency when paired with a 3 CY excavator that SunBelt posited. These large haulers, which are used mostly for large scale mining operations, are normally paired with larger excavators meant for mining sites, which have buckets in the 6-12 CY size to achieve maximum productivity.[89]

Moreover, the weight of these vehicles would make it very difficult to operate in the wetland segments of the terrain over which the SBRR must be built. This is a practical problem that gives rise to costs that are not related to environmental concerns and regulations. The

---

[86] *See* SunBelt Opening WP "BR05-TypeII-1.pdf."

[87] Because of the practical limitations like the loaded weight of a 42 CY hauler exceeding the capacity of the culverts, prior Board precedent accepting the use of 42 CY haulers in rate cases is inapposite.

[88] Contech is a pipe manufacturer and is assumed by SunBelt to be the supplier of SBRR culvert pipe material.

[89] WP III-F.2-b._Hitachi_Mining_Excavators.pdf.

practical problem is that heavy equipment like a 42 CY hauler would sink and be unable to operate effectively in the soft soils of the many wetland areas traversed by the SBRR network.

As explained below, comparing the production rates presented in R.S. Means, the 42 CY haulers (882 CY/day) paired with a 3 CY excavator (2,000 CY/day) could only achieve an efficiency rating of 76%. To maximize production, SunBelt would require three 42 CY haulers (totaling 2,646 CY/day) to fully utilize the 3 CY excavator (2,000 CY/day). This would necessarily require each truck to wait to be loaded while other trucks were being loaded, thereby reducing the efficiency of the hauler and causing the price per cubic yard of the haul to increase. Efficiency = 2000/2646 = 76%. A common rule of thumb in the earthmoving industry is the excavator should only take 4-7 passes to fill a hauler.[90] The 3 CY excavator would require fourteen passes to fill a 42 CY hauler. This combination would be extremely inefficient and would more than offset the efficiency gains of the greater capacity hauler.

Solely because the Board has accepted the use of 42 CY haulers in prior SAC cases, NS's Engineering Experts reluctantly accept its use where it would be physically possible for loose rock excavation. Specifically, using the criteria outlined above concerning roadbed width and the ability to pass, culvert cover, bridge design, and loading efficiency, NS's Engineering Experts determined a 45/55 split between the 42 CY haulers and the 22 CY haulers is more realistic and feasible for non-adverse loose rock excavation.[91] *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Unit Costs Modified," Lines 19 to 21. NS's Engineering Experts looked at specific roadbed dimensions and their capacity to accommodate large haulers at various stages of construction (with an average height of 8.0' of fill). They determined that the

---

[90] *See* NS Reply WP "NS Number of Excavator Bucket Loads per Hauler.pdf."

[91] NS Reply WP "45-55_Hauler_Roadbed Stage of Construction.pdf."

42 CY hauler could be used on the roadbed up to the level called for in the SBRR culvert plan (one foot above the top of culverts).[92] From that level up to 4½ feet above the top of the culvert, the 42 CY hauler cannot operate over culverts without damaging or crushing them and must be replaced with a lighter 22 CY hauler. Also, from that level to the top of the roadbed, only the 22 CY hauler can be used due to width of the roadbed—larger haulers would not have room to pass each other at this width. As NS's workpapers show, applying these criteria to the loose rock excavation yields the conclusion that 45% of the roadbed could be built using the 42 CY hauler, while construction of 55% of the roadbed would require the use of a 22 CY hauler. NS has applied this split, corrected SunBelt's unrealistically low cycle assumption, and calculated an overall unit cost of $13.27/CY.[93]

As explained below, SunBelt also failed to include necessary costs due to swell and shrinkage of hauled excavated and embanked materials in its calculation of unit costs for loose rock excavation and solid rock excavation. *See infra* III-F-2-d-vi. NS's Engineering Experts included these inevitable costs in their calculation of unit costs for these earthwork categories. *See* NS Reply WP "SBRR Open Grading_NS Reply.xlsx," Tab "Unit Costs."

(iv) Solid Rock Excavation

NS rejects SunBelt's solid rock excavation unit costs. In general, NS's Engineering Experts agree with SunBelt's assessment of the type of effort required for solid rock excavation. Based upon their experience, site inspections, and examination of the physiological characteristics along the SBRR route, NS's Engineering Experts have further determined that solid rock removal would in some cases require pre-splitting of rock slopes in order to prevent

---

[92] *Id.*

[93] NS Reply WP "SBRR Open Grading_NS Reply.xlsx," Tab "Unit Costs."

over-excavation and arbitrary weathering of exposed slopes that eventually could result in rock slides on the roadbed. In other areas, NS's Engineering Experts have determined that solid rock removal would require benching[94] in order for weathered rock to have a safe place to fall. Instead of considering the actual specific conditions that would likely be encountered in construction of a railroad bed in the areas traversed by the SBRR and then developing solid rock excavation cost estimates tailored to those conditions, SunBelt arbitrarily averaged open face rock blasting costs with the costs of bulk drilling and blasting generally used in mining and quarry operations. *See* SunBelt Opening WP "SBRR Open Grading," Tab "Unit Costs," Lines 70 to 72. NS agrees with SunBelt's use of unit costs for open face blasting of rock over 1,500 cubic yards, but does not agree with SunBelt's facile averaging of this cost with that of bulk blasting. In reality, some areas would require pre-splitting of rock faces, and areas close to highways and densely populated areas would require blasting mats.[95] SunBelt has erroneously excluded those costs.

NS accepts SunBelt's 50% reduction in solid rock quantities and reclassification of the remaining 50% classified as loose rock. The ICC Engineering Reports classified loose rock as being up to less than one cubic yard in size (approximately 2 tons based on a density of 150 lbs/cu.ft.). SunBelt contends that modern earthmoving machinery could excavate and load this material. But SunBelt has failed to include in its revised cost estimate the additional cost of loading, hauling, and burying the resulting boulders[96] in the embankments or waste pits.

---

[94] Benching is a form of slope stabilization consisting of horizontal berms cut into the sideslope to mitigate water runoff and control erosion.

[95] A heavy, flexible, tear-resistant covering that is spread over the surface during blasting to contain earth fragments.

[96] A detached and rounded or much-worn mass of rock. http://www.merriam-webster.com/dictionary/boulder.

Boulders are much heavier and more difficult to handle than regular loose rock.[97] Production rates for excavating and hauling rock are much lower than for common excavation. And the costs of excavating rock is higher. *See* NS Reply WP Means_2009_Earthwork_Production_Rate.pdf" R.S. Means correctly accounts for these extra costs in its "Drilling and Blasting Rock" cost data. *See* NS Reply WP "RSMeans_Blasting_Items.pdf." NS's Engineering Experts estimate, based on the expected characteristics of the rock the SBRR would encounter, that 20% of the entire quantity of the solid rock classification (both blasted and ripped) found in the ICC Engineering Reports would be boulders of at least one-half cubic-yard in size. The SBRR would be required to excavate and haul such large boulders to embankments or waste pits during the construction process. NS's Engineering Experts' 20% assumption is very conservative and likely substantially underestimates the volume of boulders the SBRR would encounter, particularly given that loose rock classification could also contain many large boulders. NS has revised the unit cost developed from R.S. Means by using the correct open face blasting item, excavating and hauling boulders, and using a 45/55 split of the 42 CY hauler and the 22 CY hauler (*see* Section III-F.2-c.(iii)). The resulting corrected unit price for solid rock excavation is $19.02 per cubic yard. See NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Unit Costs," Lines 4 to 104.

(v) Embankment/Borrow

NS accepts SunBelt's unit cost for borrow. NS rejects SunBelt's exclusion of water for compaction for the entire extensive SBRR network roadbed. NS added a separate conservative water for compaction charge. *See* Section III-F-2-d-ii-(e) Subgrade Preparation. NS rejects SunBelt's Borrow quantity. In SunBelt Opening workpaper "SBRR Open Grading.xls" SunBelt

[97] NS Reply WPs "US 70 Hondo Valley Project 021203.pdf" and "Hondo Valley Equipment 030603 RCP.pdf."

added 332,600 CY of slag to the Common Excavation quantities.[98] Slag is an acceptable fill material from off site (waste from Steel Mills), and should be considered Borrow, not Common Excavation. NS has corrected this error by deleting the quantity from Common Excavation and adding it to the Borrow quantity.[99]

(d) Other Earthwork Quantities & Unit Costs

NS rejects SunBelt's proposed quantities and unit cost for land for waste excavation, for the reasons described below. *See infra* III-F-2-d-ii-(d)-i. As further described below, NS also corrects SunBelt's failure to include stripping, undercutting, swelling of excavation for haulage, solid rock over-excavation, and fine grading quantities and costs. *See infra* III-F-2-d-ii-(d)-(ii) thru (vi).

(i) Land for Waste Excavation

SunBelt assumes that the SBRR would acquire additional land adjacent to its right-of-way to store materials excavated from the SBRR right-of-way that would not be re-used for fill or embankment. *See* SunBelt Opening III-F-15. Overall, SunBelt assumes that 30% of the materials excavated in building the SBRR roadbed will not be used as embankment and will instead be "wasted" along the SBRR right-of-way. *Id.* III-F-2-b-iii-(3). This assumption is consistent with prior Board SAC precedent and NS accepts this assumption.[100] However, NS rejects both SunBelt's estimate of the land area that the SBRR would need to acquire to accommodate this wasted material, and its hypothesized cost per acre of such land. As discussed below, there are three major flaws in SunBelt's calculation of land for waste excavation.

---

[98] SunBelt Opening WP "SBRR Open Grading.xls," Tab "Eng Rep_Inputs."

[99] NS Reply WP "SBRR OpenGrading_NS Reply.xls," Tabs "Eng Rep_Inputs" & "EW Costs."

[100] *See AEP Texas*, STB Docket No. 41191 (Sub-No. 1), at 86.

First, SunBelt assumes a very short cycle distance for waste excavation haulers, which would result in an inordinate number of waste dump sites. The cycle (round trip) distance for common excavation associated with the unit cost selected by SunBelt is only one-half mile. *See* SunBelt Opening WP "SBRR Open Grading.xls," Tab "Unit costs," Line 22. This means that all material would have to be excavated within 1,320 feet of embankments and excavation waste dump sites (requiring an excavation waste dump site to be established every half mile of the 578 mile SBRR which would result in 1,156 sites across the SBRR network). SunBelt's evidence only provided an area needed to contain the waste, but did not specify how many dump sites are needed. *See* SunBelt Opening WP "SBRR Open Grading.xls," Tab "Other Costs," Lines 76 to 87. A more appropriate and efficient choice would be to select costs for a 1-mile cycle, putting the material placement within an average of one-half mile (2,640-ft.) from the point of excavation. This approach, adopted by NS in this Reply, allows for a more reasonable one waste dump at each mile (rather than every half mile, as would be required by SunBelt's proffered unit cost) of SBRR route miles, for a total of 578 dumps.[101]

Second, SunBelt's area calculations assume that waste can be placed 15 feet high with a perfectly vertical sideslope (0:1 sideslope). According to NS's Engineering Experts, without an angled sideslope or a retaining wall of some sort, a pile of waste would collapse under its own weight into a wider, lower heap.[102] NS has corrected the footprint to include a conservative 1:1 sideslope for the waste pile materials.[103] A related flaw in SunBelt's waste area evidence is

---

[101] *See infra* III-F-2-d-ii-(c)-(i).

[102] NS Reply WP "Waste_Ex._Pile_Field_Pictures.pdf" and "Waste_Ex._And_Borrow_Methodology.pdf."

[103] *See* NS Reply WP "SBRR Open Grading_NS Reply.xlsx" Tab "Other Costs," Line 94; NS Reply WP "Waste_Ex._And_Borrow_Methodology"; NS Reply WP "Waste_Ex._And_Borrow_Cross_section.pdf"; NS Reply WP

that the land area SunBelt has proposed for excavation waste is exactly the same size as the area SunBelt estimated would be needed for the waste material not an acre more, and with no setback. This unrealistic assumption would leave no space or way for equipment to work the site to deposit and pile the excavation waste or to prevent drainage problems and embankment collapse onto property owned by the neighboring site. NS's Engineering Experts corrected this oversight by including land for a standard 20-foot setback from the toe of the slope to the property line.[104] NS conservatively assumed that each waste site would be perfectly square in shape, thereby minimizing land area needed for sideslope and setback. *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Other Costs," Lines 87 to 96.

Third, for the costs of the excavation waste dump sites, SunBelt used the average of its estimated cost of all rural land acquired by the SBRR of $14,402 per acre. SunBelt provides no explanation or support for the counter-intuitive notion that land for disposal of excavation waste would be necessary only in rural areas. SunBelt posits in its Opening Section III-F-1 that almost 25% of the SBRR right-of-way would be in more expensive residential, industrial, or commercial areas.[105] If SunBelt were to limit its disposal land acquisition to rural locations, it would be required to adjust the SBRR earthwork excavation costs to account for the substantially longer haul distances required to transport excavated materials from residential, industrial, and commercial areas (such as New Orleans and Birmingham) to the rural excavation waste areas.

"Waste_Ex._Pile_Field_Picture.pdf." This common sense principle is demonstrated anytime one digs a hole for a tree, stacks the removed dirt on the ground, and watches the pile spread each time more removed dirt is added.

[104] *See* NS Reply WP "SBRR Open Grading_NS Reply.xlsx" Tab "Other Costs," Line 95.

[105] SunBelt Opening Table III-F-4 shows the SBRR distribution of land use as 12 percent residential, 9 percent industrial and 4 percent commercial, or a total of 25 percent.

SunBelt made no such adjustment and therefore may not assume that land for excavation would be located exclusively in rural areas.

SunBelt's excavation unit cost buildup from R.S. Means assumes haul distances of between one-quarter mile[106] and 3,000 feet,[107] which means that the SBRR would need one excavation waste dump site for every half mile of the SBRR,[108] regardless of land classification. Further, because SunBelt's excavation unit costs do not provide for any transportation over the road, logic dictates that all of the SBRR waste sites would necessarily be adjacent to the right-of-way. NS has corrected SunBelt's assumed average unit cost of land for excavation waste to reflect the average price of all land acquired by the SBRR, not just the average cost of rural land.[109] As discussed below, NS also added land for waste excavation material generated by necessary stripping, undercutting, and solid rock excavation activities. With this additional land, the land needed for sideslope and setback, and the unit cost adjustments described above, the total corrected cost for land for excavation waste derived by NS's Engineering Experts is $22.3 million, instead of SunBelt's opening estimate of $5.6 Million. *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Other Costs."

(ii) Stripping

SunBelt failed to include stripping costs, claiming that costs for stripping and undercutting were included in the unit costs of the Trestle Hollow project. As NS has

---

[106] One-half mile average round trip translates into an average of one-quarter mile for the loaded portion of the haul.

[107] *See* SunBelt Opening WP "SBRR Open Grading .xls," Tab "Unit Costs."

[108] Spacing every mile will result in an average haul length equal to one-half the distance between each site or 2,640 feet (5,280 / 2).

[109] *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx" Tab "Other Costs," Lines 98 to 103.

demonstrated the Trestle Hollow Project does not provide a reasonable or reliable basis for extrapolating costs for the 578-route-mile SBRR network.[110] And there is no evidence that the Trestle Hollow costs included any of this work *See* Section III-F-2-a.

Contrary to SunBelt's simplistic claim, separate stripping is required for roadbeds built on embankments, because this work requires far more than simply removing a layer of soil. Based on NS's Engineering Experts' experience, before building an embankment, all vegetation at the base of the embankment must be removed down to the root mat, a task a brush rake cannot perform. This requires removing all roots exceeding three inches in diameter. Otherwise, the roots will decompose, leaving soft spots that will cause the embankment to shift under the loading of live tracks. Where roots and stumps are removed, the ground must be filled and compacted. This differs from grubbing in that grubbing is only removing stumps and roots of trees, not other vegetation. Then, the entire area that will support the embankment must be proof-rolled to locate any soft areas. Where soft areas are found, the entire area must be plowed or scarified,[111] then compacted with water. Only after all those preparation steps is it possible to place the embankment material. The foregoing stripping costs are not subsumed in the initial excavation costs because areas to be stripped are in embankment areas that are not subject to excavation. Further, stripped organic material removed must be disposed of in waste pits. SunBelt has not included these necessary costs of stripping in its excavation waste cost estimate, or anywhere else.[112]

---

[110] NS Reply WP "SBRR Open Grading_NS Reply.xlsx," Tab "Unit Costs."

[111] The term "scarified" refers to the process of breaking up the surface using specialized machinery.

[112] NS Reply WP "NS Clearing & Grubbing Spec.pdf" and "Construction Planning, Equipment, and Methods - Robert Peurifoy - Clearing.PDF" and "Railroad Engineering - William Hay - Clearing and Grubbing.pdf."

To determine the amount of the SBRR roadbed that would require stripping, NS's Engineering Experts developed the square footage of the roadbed under embankment based on the relative proportion of embankment to excavation calculated based on the ICC Engineering Report quantities. Although roots that must be removed by the stripping process (those exceeding 3 inches in diameter) often extend deep into the ground, NS's Engineering Experts conservatively assumed an average of only six inches of stripping would be needed to stabilize the roadbed properly to support embankment. NS's Engineering Experts used this depth to convert the square footage to cubic yards. They added this quantity to the total Common Excavation quantity. *See* NS Reply WP "SBRR Open Grading NS Reply.xls," Tab "Stripping."

(i) Undercutting

SunBelt similarly failed to include separate undercutting costs, asserting that any additional costs for stripping or undercutting were included in the unit costs of the discredited Trestle Hollow Project. *Compare* SunBelt III-F-8 to III-F-9 *with* NS Reply Evidence at Section III-F-2. Undercutting involves the removal of pockets of organic and other materials unsuitable for use in railroad embankments including organic peat, silty clays, and unsuitable soils. The volume of undercutting needed to stabilize a roadbed varies based on the amount of organic material in a given location. The SBRR route, unlike any other SARR presented to the Board, traverses a substantial amount of wetlands, which contain wet, decomposed organic materials that are not suitable for use in railroad roadbed construction and must be removed and replaced with suitable materials.

In *CP&L*, the Board rejected undercutting cost estimates because NS had not demonstrated how much right of way would be constructed in solid rock areas. *See CP&L*, 7 S.T.B. at 304. Here, to determine how much of the SBRR roadbed embankment would require undercutting, NS's Engineering Experts began with embankment quantities in the ICC

Engineering Reports. The ICC Engineering Reports do not specify the amount of undercutting because they are based on post-construction cross-sections taken every 100 feet and on observations of physical characteristics of topography or structures that were readily observable parts of the roadbed construction effort. Such information and observation could not and does not provide estimates of subsurface roadbed or slope stabilization devices—including undercutting of unsuitable material—subsurface under-drainage, subsurface excavation, or subsurface fill preparation. A cross-section viewed long after completion of construction simply cannot be used to determine what was removed or added to create a stable roadbed. In the experience of NS's Engineering Experts, however, unsuitable soils are commonly encountered in large roadbed construction projects, particularly in the region traversed by the SBRR.

In real-world roadbed construction, extensive soil borings and geotechnical investigations are used to determine if peat, organic clay, soft clay, or other unsuitable materials are present and must be mitigated. Because data from such investigations are not available for the SBRR route, NS's Engineering Experts utilized wetland map data from the United States Fish and Wildlife Service ("USFWS") National Wetlands Inventory to identify which sections of the SBRR route would require undercutting of such unsuitable materials. Though unsuitable materials are sometimes found outside of wetlands areas, soils in wetlands are consistently unsuitable for roadbed construction.[113] Therefore, NS's Engineering Experts have conservatively assumed

[113] *See, e.g.*, NS Reply WP "USFS Temporary Stream and Wetland Crossing Options.pdf" at 3 (defining wetlands as "areas that contain soil with poor load-bearing capacity and high moisture content or standing water…Examples include peat, muck, wet mineral soils, or unstable sections of access roads and trails").

undercutting would be conducted only where segments of the SBRR traverse USFWS wetland boundaries.[114]

To estimate the amount of the SBRR roadbed that would require undercutting, NS's Engineering Experts superimposed the geospatial USFWS National Wetlands Inventory map over the SBRR route.[115] By using a geospatial wetlands map in conjunction with a geolocated SBRR route (shape file of NS Alabama Division), a spatial analysis was able to inventory wetland locations along the route into a spreadsheet database.[116] Graphically, Exhibit III-F-6, "SBRR Wetland Map.pdf" depicts existing wetland areas along the SBRR track found by analyzing the USFWS National Wetlands Inventory data layer with geographic information system (GIS) software.[117] Because it covers the entire SBRR route, Exhibit III-F-6 ("SBRR Wetland Map.pdf") does not depict all of the relevant wetlands detail. Snapshots of wetland details are included in NS workpapers. *See* NS Reply WP III-F "SBRR Wetland GIS Example.pdf," NS Reply WP Folders "Wetland/Google Earth" and "Wetland/GIS."

---

[114] NS is not referring to "wetlands" herein from an environmental or environmental regulatory compliance perspective. Rather, NS refers to wetlands and their unsuitable soil conditions because they affect construction methods and costs. *See, e.g.*, NS Reply WP "USFS Temporary Stream and Wetland Crossing Options.pdf" at 1-9, 21-32.

[115] *See* NS Reply WP "SBRR Wetland Map.pdf" and "SBRR Wetland GIS Example.pdf"; See NS Reply folders "Wetlands/Google Earth" and "Wetlands/GIS."

[116] *See* NS Reply WP "SBRR_Wetlands_Route MP.xlsx."

[117] Wetlands Data Reference: USFWS Web Page: http://www.fws.gov/wetlands/data/Web-Map-Services.html Data Type: WMS Service

WMS Server:
http://107.20.228.18/ArcGIS/services/FWS_Wetlands_WMS/mapserver/wmsserver?

Service Name: FWS_Wetlands_WMS.

Those portions of the route where the track traversed a segment of wetlands equal to or greater than 150 feet in length and where wetlands are present on both sides of the track at a scale of 1:24000 (approximately 1 inch = 0.4 miles) are identified in red on the Wetland Map exhibit.[118] The delineation of the wetland areas shown in this map is a conservative representation and does not include smaller wetlands (less than 150 feet) or those that are present only along one side of the track.

Using the USFWS National Wetland Inventory, at least 90.79 miles of the 578.24 SBRR route miles (of which 10.34 miles are double tracked) traverse wetlands as indicated in the Wetland Map. The 322 wetland occurrences depicted in the exhibit range in length from 0.03 miles to 2.72 miles, and average 0.28 miles per occurrence. More detailed exhibits may be observed using the USFWS wetland data and the NS Alabama Division shape file with a GIS viewer such as Google Earth.[119] See "SBRR_Wetlands_Route MP.xlsx" work sheet page "SBRR Wetland MP."

Wetland areas typically consist of peat, soft to very soft silt/clays, and organic clays with a high water content, high settlement, and high bearing capacity failure potential. *See, e.g.,* AREMA, Practical Guide to Railway Engineering at 164 (discussing the weakness of silt) and 184 (discussing the influence of soil type on track structure).[120] In addition, wetlands typically are rich in vegetation growth, organic material, and decaying vegetation accumulation. When these conditions are encountered in new track construction, additional measures need to be taken to provide a suitable base for a railroad embankment. Without such measures, the railroad

---

[118] *See also* NS Reply WP "SBRR Wetland Map.pdf."

[119] NS Reply WPs "Wetlands-Data.kml"; "Viewing Wetlands With Google Earth-pdf."

[120] *See generally,* NS Reply WP "USFS Temporary Stream and Wetland Crossing Options.pdf."

roadbed would be built on a wet, slippery and decaying foundation that quickly would lead to catastrophic failure. The approaches available to construction engineers for wetlands and unsuitable soil mitigation vary widely. Mitigation options range from clearing and excavating a shallow top layer and laying expensive specially designed geotextile fabric, to excavating unsuitable materials—regardless of the depth—and replacing them with suitable material. *See id.* at 176 (discussing the need to excavate and replace with stronger soils).[121] These and other mitigation measures are often used in conjunction with chemical treatments such as lime stabilization and injection grouting depending on the nature and severity of the conditions. The optimal solution will vary by location and cannot be known before detailed soil borings are taken and analyzed, or in many cases only after excavation has commenced. For example, in a 2010 study conducted in conjunction with the North Carolina Department of Transportation, researchers in the Department of Civil, Construction and Environmental Engineering at North Carolina State University lay out four alternatives when unsuitable soils are encountered. These approaches are to: (i) excavate and replace with adequate backfill (referred to here as *undercut*); (ii) install chemical stabilization, which is usually performed by mixing the top 6 to 8 inches of soil with cement or lime; (iii) employ reinforcement geosynthetics in cases where the depth of the undercut is limited by, for example, the presence of subsurface utilities in order to attenuate applied traffic loads and therefore reduce the required depth of the excavation; or, (iv) install subsurface drainage using vertical or horizontal drainage elements.[122]

---

[121] *See also* "NS Reply WP "USFS Temporary Stream and Wetland Crossing Options.pdf" at 2-8.

[122] *See* NS Reply Workpaper "Establishment of Subgrade Undercut Criteria and Performance of Alternative Stabilization Measures.pdf" at page 5.

Other examples of the myriad of mitigation alternatives at the construction engineers' disposal are found in brochures from mitigation product manufacturing companies. NS Reply workpaper "BrockWhite Sitework Field Guide.pdf" identifies hundreds of products and procedures available for water mitigation ranging from various types of geotextile fabric to biaxial geogrids for soil reinforcement.[123]

NS Engineering Specification GR-10 Undercutting and Mucking states broadly that "Unsuitable materials in marshes, muddy areas,... or other unstable areas within construction limits shall be undercut to a depth as directed by the Engineer."[124] NS's guideline intentionally did not specify particular strategies or methods, in order to allow tailored material stabilization measures to be used that efficiently and effectively remediate varying soil conditions encountered in different roadbed construction projects. In some cases, a geogrid or geotextile material that requires less undercutting and suitable backfill material may be as effective as undercutting several feet until hitting suitable material and replacing with fill for roadbed construction. In many other instances, deeper undercutting and filling with rip-rap or similar material is a more effective method. Again, the variance in soil composition, depth of organics, and saturation observed over even several hundred feet of an alignment shows why the NS undercutting specification, and many other railroad and heavy construction texts, suggest several different alternatives for removing and replacing unsuitable material.[125]

Because detailed soil boring data for the SBRR route does not exist, NS's Engineering Experts relied in part on their recent and ongoing experience on the NS Birmingham Regional

---

[123] *See* NS Reply Workpaper "BrockWhite Sitework Field Guide.pdf" at B-1 through B-8.

[124] *See* NS Reply Exhibit III-F-6 at 5.

[125] *See generally* NS Reply Exhibit III-F-6; NS Reply WPs "Undercutting PE write-up.pdf.", "UC_WP_01.pdf", & "UC_WP_02.pdf."

Intermodal Facility expansion project in McCalla, AL. This facility is being built on and around wetlands similar to those found on much of the SBRR route. During construction of the McCalla facility, unsuitable materials were encountered along several segments of the facility, which is located in the middle of a USFWS designated Wetland.[126] The engineers for this project undercut and removed the unsuitable material found along the wetland areas and replaced it with rip-rap as suitable backfill for the roadbed subgrade.[127] The tightly compacted rip-rap provides stability to support and distribute loads sustained under freight traffic, and to bridge the wetland soils which, unaltered, would have resulted in a failure of the roadbed.

For purposes of this analysis, NS's Engineering Experts have conservatively assumed that average, wetland areas traversed by the SBRR would require 2-foot undercutting and backfilling with rip-rap. As previously explained, different soil conditions and circumstances across hundreds of areas with unsuitable soil may make one mitigation measure more effective or desirable in some locations, another more suited to other locations, and still others better for other areas. In some instances, less extensive mitigation measures than those posited by NS could be sufficient and in other areas, more extensive measures would be required. Without detailed soil analyses and data, however, it is not possible to determine the optimal approach for

---

[126] NS Reply WP Mccalla Wetland Map.pdf."

[127] *See* NS Reply WP "Undercutting PE write-up.pdf." STV Engineering (the firm at which NS Engineering Experts P. Bobby and R. Phillips are employed) is performing the construction management function for NS at the McCalla facility. To address and mitigate the wetlands issues at the McCalla facility, NS excavated unsuitable materials ranging in depth from 18 inches to over three feet. *See* NS Reply Ex. III-F-6. The excavated material was replaced with rip-rap and then covered with clean borrow material. See NS Reply WPs "Undercutting Field Engineer Statement.pdf" and "Undercutting field photos.pdf." Even though the unsuitable material excavation for the McCalla project often reached depths in excess of three feet, NS Engineering Experts conservatively assumed an average of two feet of unsuitable material excavation and replacement with rip-rap backfill as a suitable sub-base material for roadbed construction through the SBRR wetland conditions.

each individual area along the SBRR alignment. NS's assumption of two feet of undercutting and replacement with rip-rap is a sound and conservative overall assumption for the wetland areas to be traversed by the SBRR. Given the nature of the soils in the area and NS's conservative limitation of undercutting and fill to federally designated wetlands, NS's proxy assumption of two feet of undercutting and rip-rap fill likely significantly understates the extent and cost of soil mitigation measures the SBRR would be required to undertake.[128] In the experience of NS's Engineering Experts, two feet is the minimum depth of rip-rap fill necessary to allow it to properly engage and provide a stable foundation and subgrade for roadbed construction.

In addition to NS's Engineering Experts' experience on the McCalla project, other documentation demonstrates that two feet is a conservative assumption. For example, the North Carolina State University study referenced previously explains that in the case of poor soils, undercutting can involve six feet of excavation.[129]

Undercut Fill Quantities. Based on the earthwork quantities reported in the ICC Engineering Reports, the average height of fill for the SBRR is eight feet.[130] To calculate necessary fill quantities, NS's Engineering Experts used the average fill of approximately eight feet and standard roadbed width of 24 feet for single track, and assumed side slope of 1.5:1 to estimate cubic yardages of undercut material.[131] NS developed wetland undercutting quantities

---

[128] See NS Reply WP "Undercutting PE write up.pdf."

[129] *See* NS Reply Workpaper "Establishment of Subgrade Undercut Criteria and Performance of Alternative Stabilization Measures.pdf" at page 3.

[130] NS Reply WPs "SBRR Open Grading NS Reply.xlsx" Tabs "Calculations" Column O average.

[131] Specifically, NS used an excavation width of 48 feet for single track (24 foot roadbed plus 8 foot average height times 1.5 sideslope ratio times two side slopes).

using the following assumptions: undercut an average of two-feet of material below the width of proposed roadbed base (48 feet for single track, 63 feet for double track) to replace with suitable material, wasting of unsuitable material, filling cut with rip-rap and compaction for placement of the embankment, as required by modern railroad construction standards.[132] Based upon those parameters, NS's Engineering Experts calculated that approximately 1,765,148 CY of rip-rap would be required for undercutting backfill. *See* NS Reply WP "SBRR Open Grading NS Reply.xls," Tab "Undercutting – Wetlands."

Additional Wetland Undercutting Costs. To adequately account for the challenges and costs of undercutting in wetlands, NS's Engineering Experts developed a unit cost for excavation in wetland areas which is outlined in the "Unit Cost" tab of NS Reply WP "SBRR Open Grading NS Reply.xls." Due to the soil characteristics encountered in wetlands, the scraper proposed for common earth excavation cannot be used and a backhoe shovel was selected for the wetland excavation. R.S. Means applies a 50% mark-up to the unit cost of the excavation in wet conditions to account for the reduction in productivity resulting from excavating of such wet soils and material. *See* NS Reply WP "Undercutting Unit Cost Mark Up.pdf." All undercut material warrants wasting due to its unsuitability for fill in other areas of the alignment and was added to the total waste material quantity in the "Other Costs" of NS Reply WP "SBRR Open Grading NS Reply.xls."[133] The volume of rip-rap material was also adjusted to include material required to fill the average two foot undercut in the total rip-rap quantities.[134] *See* NS Reply WP "SBRR Open Grading NS Reply.xls," Tab "Other Items"; *see also* NS Reply Ex. III-F-6.

---

[132] NS Reply WP "Undercutting PE write-up.pdf."

[133] NS Reply WP "UC_WP_02.pdf."

[134] NS Reply WPs "SBRR Open Grading NS Reply.xlsx" Tabs "EW Costs" and "Undercutting – Wetlands."

NS's Engineering Experts also have determined that temporary access roads would be needed to allow continuous roadbed construction, site access, and corridor connectivity along portions of the SBRR that traverse wetlands. To sustain the aggressive construction production rate proposed for the 36 SBRR contracts, continuous access along the roadbed alignment is necessary for equipment and materials to move across these 322 wetland locations while the undercutting operation is underway. Laminated hardwood or "swamp" mats are typically used in areas of wetland construction where heavy excavating and hauling equipment require access.[135] Without at least such minimum measures, the proposed earthwork equipment with their heavy axle loads would sink into the soft unsuitable ground surface that undercutting is required to mitigate.[136] Hardwood mats enable heavy equipment to temporarily cross over such soil conditions by distributing these heavy loads over a wide surface area.[137] NS's Engineering Experts gathered various price quotes of typical hardwood laminated mats (dimension: 8 foot by 16 foot) from suppliers in the Alabama and Mississippi area, which yielded an average cost of

---

[135] NS Reply WPs "TM_WP_01.pdf", "TM_WP_02.pdf", "TM_WP_03.pdf," "TM_WP_04.pdf," "TM_WP_05.pdf"; *see also* NS Reply WP "NU Best Practices Manual.pdf" (Best Management Practices Manual: Connecticut, Northeast Utilities Transmission Group, at 3-19 to 3-22 (December 2011) (noting that swamp mats are necessary so heavy equipment does not sink in mud)); NS Reply WP "USFS Temporary Stream and Water Crossing Options.pdf" at 21-32.

[136] NS Reply WP "NU Best Practices Manual.pdf" at 3-19 to 3-22; *see also* http://pipelinesinternational.com/news/getting_the_job_done_in_swamp_marsh_and_wetland_terrain/053595/ ("If standing water or saturated soils are present. . . constructors should use low ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats"). NS Reply WP "USFS Temporary Stream and Water Crossing Options.pdf" at 21-32.

[137] NS Reply WP "NU Best Practices Manual.pdf" at 3-19; NS Reply WP "USFS Temporary Stream and Water Crossing Options.pdf" at 21-32; *see also* BrockWhite *Site Work Field Guide* at B-14 (mats are used for site access). To be clear, NS is not suggesting that Sunbelt would need these mats for environmental protection or to comply with environmental regulations. Rather, mats or similar measures are a necessary tool to allow the use of equipment such as backhoes and trucks/haulers in soft soils.

$69.38 per linear foot of access road.[138] Based upon those costs and the wetland areas traversed by the SBRR right-of-way, the SBRR would require approximately 479,395 feet of matting or 59,932 eight foot sections, at a cost of approximately $33.3 million.[139]

(ii) Over-Excavation

SunBelt failed to include costs for over-excavation. When solid rock is encountered at subgrade levels in cuts, modern roadbed construction requires at least twelve inches of over-excavation and replacement of that over-excavated rock with at least of twelve inches of select material, compacted to the same specifications as embankments.[140] On many projects, sub-ballast is used for the twelve inches of material to bring the level back to subgrade elevation. However, a lower-cost alternative is to use compacted fill to replace the over-excavation of solid rock.[141]

NS's Engineering Experts used the roadbed dimensions provided by SunBelt to estimate cubic yard quantities of solid rock over-excavation required in rock cuts. NS's Engineering Experts corrected SunBelt's omission of over excavation quantities by adjusting the quantity of rock excavation, using the unit cost developed in Section III-F-2-d-ii-(c)-(iv).[142]

---

[138] NS Reply WP "Laminated Mat Quote.pdf."; *see also* "Ritter Forrest mat quote.pdf."

[139] *See* NS Reply III-F WPs "Laminated Mat Quote.pdf" and "SBRR Open Grading NS Reply.xls," Tab "Undercutting – Wetlands" at Column P.

[140] NS Reply WP "SBRR Open Grading_ NS Reply.xlsx" Tab "EW Costs"; *see also* "NS Grading Spec.pdf" page GR-5 section D.

[141] NS Reply WP "Over_Excavation of Solid Rock_Cross_Section.pdf."

[142] NS Reply WP "SBRR Open Grading_ NS Reply.xlsx," Tab "EW Costs" and Tab "Over Ex."

(iii) Fine Grading

Fine grading is the final shaping of the constructed roadbed in order to establish the cross sections and profile of the engineering design. NS's Engineering Experts explain that fine grading is not included in normal grading because fine grading requires different equipment. The excavation and borrow unit costs use scrapers and bulldozers to achieve a rough grade while fine grading uses motorgraders to achieve a more precise final grade.[143] The Board has held that fine grading uses specialized equipment and is not included in normal grading. *Otter Tail*, STB Docket No. 42071, at D-14. Indeed, the Board recognized R.S. Means lists fine grading separately. *Id.* at D-14; R.S. Means at 31-22-16.10-0200 Finish Grading-Grade subgrade for base course, roadways.[144] Moreover, the Board found in *Xcel* that fine grading was "an actual and necessary construction element for rail lines" in part because R.S. Means lists fine grading separately. *Xcel*, 7 S.T.B. at 678.

Bulldozers roughly shape the roadbed section but are not capable of the finer tasks of creating the crown of the roadbed or the shape of the ditches. Bulldozers can compact the slopes of roadbeds prior to seeding but they are only capable of creating grades within several inches. Because of this limitation on the use of bulldozers to achieve the final shape and form of the roadbed, railroad contractors use motorgraders to provide the final shape and smoothness desired on the crown of the roadbed during the final compaction process. Motorgraders operated by experienced personnel are capable of obtaining final subgrade elevations within one inch.[145] The

---

[143] NS Reply WP "SBRR Open Grading_ NS Reply.xlsx," Tab "Unit Costs" and "RSMeans_Scraper&Bulldozer_Crews.pdf" and "Motor grader pictures.pdf" and "RSMeans_Fine_Grading_B-11L_Crew.pdf."

[144] NS Reply WP "RSMeans_Fine_Grading_Item.pdf."

[145] *See* NS Reply WP "NS Reply Fine Grading_2.PDF."

R.S. Means crew selection for bulldozers compared to motorgraders also demonstrates the different accuracies achieved, with the bulldozer crews having only a 0.5 laborer charge while the finish grading's motorgrader has a 1.0 laborer charge.[146] This labor charge is composed of the effort of the laborers and surveyors assisting the equipment operators to achieve desired grade. The laborer assists the operator by comparing the grades staked out in the ground by surveyor to the grades being achieved by the operator. Obviously, the accuracy of the grade of the roadbed is directly proportional to the labor effort with the labor charge of the finish grading being twice the charge of the excavation and borrow grading. Not only is it desirable to obtain the designed subgrade elevation, a smoothly shaped, well-compacted subgrade minimizes the waste when placing the sub-ballast.[147] Failure to achieve a smooth compacted subgrade at the designed elevation would cause major overruns of sub-ballast quantities (and attendant costs) to achieve a uniform aggregate base thickness. NS has provided as workpapers the identical materials that the Board found to be sufficient proof of the need for fine grading in *Otter Tail*. *See* NS Reply WP "SBRR Open Grading NS Reply.xls," Tab "Finish Grading."

SunBelt failed to account for the necessary function of fine grading, apparently assuming fine grading would not be done on the SBRR roadbed. Despite excluding fine grading from its roadbed preparation costs, SunBelt further failed to include the additional sub-ballast quantities and costs that would be necessary to compensate for the lack of fine grading. *See* SunBelt Opening WP "Track Construction Costs.xls," Tab "Track Quantity Calculator," Cells C99 to D102.

---

[146] NS Reply WP "SBRR Open Grading_ NS Reply.xlsx," Tab "Unit Costs" and "RSMeans_Scraper&Bulldozer_Crews.pdf" and "Motor grader pictures.pdf" and "RSMeans_Fine_Grading_B-11L_Crew.pdf."

[147] *See* NS Reply WPs "NS Reply Fine Grading_1.PDF" and "NS Reply Fine Grading_2.PDF."

SunBelt contends that the Trestle Hollow Project finish grading cost is included in its earthwork unit cost. However, the Trestle Hollow Project documents are for a lump sum bid, and do not show whether fine grading was included in the earthwork costs for the project. Moreover, as NS previously demonstrated, the small, isolated Trestle Hollow Project is not representative and cannot be used as a reliable basis for extrapolating the costs that would be incurred to construct a 500-plus route mile rail network such as the SBRR. *See supra* III-F-2 to III-F-2-a. Although NS agrees that some construction projects do include this cost with earthwork, R.S. Means uses a separate cost line item to develop the earthwork unit cost. SunBelt did not use this specific R.S. Means line item to develop its unit cost. NS's Engineering Experts calculated a unit cost for fine grading using R.S. Means. NS's Engineering Experts determined the quantity of fine grading needed using SunBelt's specifications for the dimensions and parameters of single- and double-track roadbed. NS calculated a total cost for fine grading using the R.S. Means unit cost for finish grading of $0.45 and the area to be fine graded. They then used the total amount of earthwork on the SBRR to determine a unit cost of $0.16 per cubic yard of earthwork. NS then added this to the unit cost for each earthwork type.[148]

(iv) Swell

SunBelt also failed to include any adjustment in earthwork unit costs or quantities for swell or shrinkage of material during excavation, hauling, and compaction. In order for embankments to properly support loads sustained from train traffic, soil particles in each lift must be packed tightly using mechanical compaction. The process of excavating, hauling, and backfilling material involves three soil states: bank, loose, and compacted (or embanked), each having a different density. Bank material has a medium density and is generally defined as

[148] NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Finish Grading."

undisturbed earth. Loose material is defined as soil or earth within a hauling vehicle or unconsolidated pile on an embankment (not compacted) and is the least dense soil state. Compacted or embanked material is the densest, even more tightly compacted than original banked soil. To accurately estimate the cost of excavating, hauling, and constructing a roadway embankment, these different soil densities for each phase of the process must be taken into consideration using swell and shrinkage factors.

To quantify equivalent volumes for the three different soil states with varying soil densities, NS's Engineering Experts applied swell and shrinkage factors to the base unit cost of Loose Rock and Solid Rock. When discussing earthwork, Bank Cubic Yard ("BCY") is the base unit (referring to the soil state and density of undisturbed material), which matches the ICC Engineering Reports. The following method was used to apply shrinkage and swell factors: BCY Material is excavated, and in the process unconsolidated (decrease in density); then hauled as Loose Cubic Yard ("LCY"); and then compacted to Embankment Cubic Yard ("ECY") (increase in density). NS's Engineering Experts used typical soil volume conversion factors used to develop earthwork unit costs, taken from Ringwald's "Means Heavy Construction Handbook"[149]:

Table III-F-14

Loose Rock Swell & Shrinkage Factor:			
BCY	to	BCY	1.00
LCY	to	BCY	1.35
ECY	to	BCY	0.90
Solid Rock Swell Factor:			
BCY	to	BCY	1.00
LCY	to	BCY	1.50
ECY	to	BCY	1.30

[149] NS Reply WP "Swell and Shrinkage – Ringwald, Means heavy Construction Handbook.pdf."

It is important to note that blasted solid rock material is never able to consolidate as tightly or densely after excavation. This lesser compaction is reflected in the lower shrinkage factor for solid rock material from ECY to BCY.

An example calculation utilizing swell and shrinkage factors is as follows:

10 CY of Loose Rock earthwork =10 BCY Excavated

10 BCY X (1.35 LCY / 1 BCY) = 13.5 LCY Hauled

10 BCY X (.90 ECY / 1 BCY) = 9 ECY Compacted

The three units utilized in the above methodology correspond with applicable equipment unit costs used by R.S. Means. SunBelt failed to account for such swell and shrinkage in its earthwork equipment costs. For example, R.S. Means lists the cost per unit for a 22 CY hauler as dollars per LCY and not BCY. The density difference for two types of materials is 35% for loose rock quantities (using a 1.35 swell factor). Swell and shrinkage factors are also explained within the R.S. Means text Building Sitework - Site Preparation section, which illustrates how to construct a cost per Cubic Yard of material from equipment and labor per pay item.[150] By neglecting to factor swell and shrinkage into unit costs applied to earthwork quantities, SunBelt significantly underestimated the cost of embankment construction for the SBRR.[151] NS has corrected this error by modifying all of the excavation unit cost to account for swell and shrinkage. *See* NS Reply WP "SBRR Open Grading NS Reply," Tab "Unit Costs Modified," Columns E to P.

---

[150] NS Reply WP "RS Means Site Prep Worksheet – swell and shrinkage factor.pdf."

[151] As noted above, the effects of swell and shrinkage are accounted for in NS's calculation of unit costs for the affected activities (including loose rock excavation, adverse loose rock, and solid rock excavation). *See supra* III-F-2-c-ii.

(e) Subgrade Preparation

NS rejects SunBelt's failure to include cost for subgrade preparation, which includes water for compaction and drying of wet material.

In some prior coal rate cases, the Board excluded water for compaction costs because the railroad failed to provide evidence demonstrating the need for water for compaction. *See, e.g. CP&L*, 7 S.T.B. at 317; *Duke/NS*, 7 S.T.B. at 179-180. However, the Board accepted water for compaction in *TMPA*, where defendant provided USDA Ecosystem Domain maps. *TMPA I*, 6 S.T.B. at 707. There is little doubt that water for compaction is widely used in transportation construction projects.[152] Construction techniques that are actually used are not a barrier to entry—even if they were not used in the original construction. *CP&L*, 7 S.T.B. at 318 (silt fences "modern construction technique" and not a barrier to entry). The Board's prior emphasis has been on the addition of water for compaction, primarily to arid soils typically encountered in the west.[153] There has been an assumption in prior proceedings involving eastern carriers that the east has sufficient water content and that no soil preparation is required.[154] This is a simplistic over-generalization that is inconsistent with real-world construction experience, and it is particularly inappropriate with respect to a SARR traversing nearly 600 miles of varied soils and geography. Soil moisture content varies widely, both with the geographic area and type of soil, and with the season. SunBelt has offered no evidence to support its global assumption that subgrade preparation using water for compaction or additional drying would not be needed in any area or any season during the two-year construction of the SBRR network. In the experience

---

[152] *See, e.g.*, NS Reply WP "Wisconsin Transportation Bulletin – Compaction.pdf."

[153] *TMPA I*, 6 S.T.B. at 707; *WFA I*, STB Docket No. 42088, at 91; *AEPCO 2011*, STB Docket No. 42113, at 97-98.

[154] *Duke/NS*, 7 S.T.B. at 179-180.

and opinion of NS's Engineering Experts, any large-scale construction project conducted year-round across the variety of soils and conditions the builders of the SBRR would encounter would require subgrade preparation, at a minimum for properly placing and shaping the crown of the roadbed.

Soil compaction increases the strength of the soil, which increases the load-bearing capacity of the soil and the stability of embankment slopes. It also reduces the potential for volume change that could occur from soil settlement, swelling due to moisture content changes, and frost heave.

Factors that affect compaction include soil type, particle size, compactive effort, and moisture content.[155] Moisture content plays a very important role in obtaining a desired compaction. Water lubricates soil particles helping them slide into a denser position. Every soil has an optimum moisture content ("OMC") at which it is possible to obtain the maximum compaction.[156] Compaction is measured in terms of a soil's dry unit weight, as measured in pounds per cubic foot, and its moisture content. Moisture content is defined as the weight of water in the soil divided by the weight of the solids in a given volume of soil.[157] A typical compaction curve will show the dry unit weight increases as the moisture content increases up to the OMC. The dry density corresponding to the OMC is called the maximum dry density. Any increase in moisture content beyond the optimum value tends to reduce the dry unit weight.[158]

---

[155] *See generally* NS Reply WP "Soil Moisture for Compaction" (excerpts from leading construction methods text explain role of soil moisture in compaction and need to add moisture in some areas and remove moisture in others).

[156] *See id.*

[157] *Id.*

[158] *See id.*

Project specifications for railroad embankment construction typically require soil to be compacted to at least 95% of the maximum dry density.[159] To achieve this level of compaction, the soil should have a moisture content in a range of +/- 4% of the optimum level.[160] If the soil that is placed as fill does not have a natural moisture content within this range, a minimum of 95% compaction cannot be achieved without moisture conditioning. In this situation, reuse of the soil as fill requires moisture conditioning.

Moisture conditioning involves adding water to the soil if it is too dry for compaction, or drying the soil if it is too wet. Chemical additives can also be used to dry soil with excessive moisture content, but that process is more expensive because it requires mechanical mixing and distribution. The use of such a chemical additive process to reduce soil moisture content would add significant additional costs over and above the costs of mechanical drying methods posited by NS's Engineering Experts.[161]

Adding water to low-moisture content soil involves using a water truck to spray the soil lift, then compacting that soil. For fine-grained clays and silts that don't readily absorb water, the water usually must be mixed into the soil before compacting. In addition to the need to add water when soils are dry, the ability to achieve optimal moisture content to ensure proper compaction requires drying of soils through either the addition of dry soil or aeration.[162] As

---

[159] *See* NS Reply WP "NS Grading Spec.pdf."

[160] *See* NS Reply WP "NS Reply WP Compaction Standard Compaction Curve.pdf."

[161] NS's Engineering Experts developed their subgrade preparation estimates based on the assumption that the builders of the SBRR would use only mechanical drying methods, including discing. *See* NS Reply WP "Equipment Selection-Drying of soil for Compaction.xlsx."

[162] *See* NS Reply WP "Wisconsin Transportation Bulletin – Compaction.pdf."

discussed below, NS's Engineering Experts have studied the soil conditions along the SBRR. The SBRR is located in three states covering multiple physiographic areas and conditions.

The three-tiered physiographic classification of the United States by division, province, and section based on geologic history, rock type, and structure in combination with terrain was developed by Nevin Fenneman in 1946. Physiographic Divisions in the United States consist of several Provinces, each of which in turn consists of several Sections. This classification system continues to be used today and is the basis for NS Reply Exhibit III-F-7 ("SBRR_Physiographic_Geo_map.pdf").

The NS Engineering Experts mapped physiography traversed by the SBRR track route by overlaying the track route onto published USGS physiographic mapping using geographic information system (GIS) shape files. This mapping is necessarily generalized due to the large coverage and limitation of scale and resolution of available data. *See* Exhibit III-F-7. Each of the Physiographic Divisions covers large regions of the country. Each of the Divisions is subdivided into smaller Physiographic Provinces and subsequently smaller Sections. Based on published mapping, the SBRR track route traverses portions of two Physiographic Divisions, two Provinces, and three Sections. Brief descriptions of the Physiographic Provinces and Sections traversed by the SBRR route are provided below:

Atlantic Plain Division:

- Coastal Plain Province: East Gulf Coastal Plain, and Mississippi Alluvial Plain Sections

    - This Province is generally of flat to low topographic elevation and relief with the inland boundary typically defined by the "Fall Line" where rock outcrops are exposed in stream valleys. Geology in this Province is generally a horizontal to slightly inclined, seaward thickening wedge of poorly to unconsolidated sediments. There is an abundance of meandering streams and broad valleys, wetlands, bogs and swamps, and small stream crossings presenting undesirable soil conditions affecting route selection, as well as design and construction of track grade. The abundance of wetlands, bogs and

swamps often reflect close proximity of groundwater to the land surface, or frequently flooded land surface conditions. Landforms and soil map patterns along many of the rivers reflect abandoned ox-bow meanders that have been filled in with sediment and include areas mapped as wetlands. Approaching the southern limit of the SBRR route near New Orleans, the route traverses estuarine emergent wetland.

Appalachian Highlands Division:

- Valley and Ridge: Tennessee Section

    - This Province is part of the Appalachian Mountains and is bounded on the east by the Piedmont Province and on the west by the Appalachian Plateaus Province. Characterized by long, roughly parallel ridges trending generally northeast/southwest and separated by narrow, steep-sided valleys formed from erosion of less resistant rock units. Rock types in this region include Limestone, Dolomite, Sandstone, Shale, and Chert dipping generally to the southeast at low to moderate degrees. High angle faulting, parallel to the valley trends is a common feature based on published mapping. Track south from Birmingham to Wilton and south from Birmingham to Woodstock are included in this Section.

Attempting to characterize the soil moisture conditions on a large-scale, regional basis is difficult. The compaction characteristics of a particular soil typically are evaluated on a very local basis as soil conditions can vary dramatically over short distances and with depth. Information sources that characterize soils on a state or physiographic province scale do not exist. Accordingly, NS's Engineering Experts used other sources to develop more detailed soil moisture characterizations for the areas traversed by the SBRR.

The Natural Resource Conservation Service ("NRCS"), part of the United States Department of Agriculture, has compiled detailed soil information for local areas in much of the United States. Although developed primarily for agricultural purposes, the data includes engineering properties, construction suitability features, and other data. NS's Engineering Experts used two NRCS resources to estimate general soil conditions along the SBRR; the Soil Climate Analysis Network ("SCAN") and the Web Soil Survey ("WSS").

The SCAN system collects soil moisture, precipitation, and other climatic information at specific stations across the U.S. and makes it available in real-time over a website.[163] Within most states traversed by the SBRR, NS has identified at least one SCAN station near the alignment. The SCAN station identification number is presented in table format, along with moisture content values at the depths of 20 and 40 inches. *See* NS Reply WP "SBRR Soil Moisture Content.xls." The moisture content data represent the average natural moisture content ("NMC") of the soil for the 2011 calendar year, or the 2010 calendar year if data were incomplete for 2011. These NMC values are applicable to soil at the specific SCAN station.

NS's Engineering Experts used NMCs from the SCAN data to compare moisture contents obtained from the WSS. The WSS generates soil maps for areas less than 10,000 acres. Individual soil units may cover a few acres or less. Each WSS webpage shows a soil map, individual soil units, and the available physical properties of the soil.[164] These soil maps were overlayed on the SBRR route to determine the soil and moisture content for the SBRR segments.

Two water content values are given in the WSS. These values represent a dry condition (15-bar) and a wet condition (1/3-bar).[165] The water content data from the NRCS are determined using different test methods than the water content used for soil compaction evaluation.

---

[163] http://www.wcc.nrcs.usda.gov/scan/.

[164] http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm.

[165] Free water or gravitational water will drain from a soil until the soil water potential reaches -1/3 bar. This is called field capacity. Gravitational water is not considered available to plants because it is in the soil only a short time and reduces oxygen levels to the point where the plant will not be absorbing water anyway. As the soil continues to dry--or water is used by plants--more and more energy is needed by the plants to remove the water. Eventually a point is reached where the plant can no longer remove water. This is called the wilt point and occurs at -15 bars water potential for most plants. From -1/3 to -15 bars is the zone of available water. *See* http://www.swac.umn.edu/classes/soil2125/doc/s7chp3.htm.

However, in the opinion of NS's Engineering Experts, the NRCS data provides a reasonable representation of the natural moisture content for preliminary analysis.

NS has developed a Table showing the NMC estimated from its experts' comparison of the SCAN and WSS data. *See* NS Reply WP "SBRR Soil Moisture Content.xls." Estimated maximum dry densities and OMC values for the predominant soil types are also shown in the workpaper. These values were taken from correlations in Table 9.7 of the Civil Engineering Reference Manual by M.R. Lindeburg, 6th ed., 1992. The difference between the OMC and the NMC indicates whether the soil may be dryer or wetter than optimal. If the soil is shown to be dryer than optimum, the quantity of water that needs to be added to achieve 95 percent compaction is calculated and shown in the right-most column.

The results of NS's analysis indicate that approximately 69% of the soils along the SBRR alignment are wetter than optimum, and likely would require drying before suitable compaction can be achieved. As discussed below, NS's Engineering Experts applied a drying cost only to those soil areas where it would be most needed, and not to the entire volume of soils that are more wet than optimum.[166]

---

[166] To clarify, NS does not assume that the undercut soils in wetlands would require drying. The soil excavated as part of the undercutting process would be wasted and replaced with rip rap to establish a stable foundation on top of which the SBRR would construct the roadbed. The soils that would require drying are separate and distinct soils used for embankment and other purposes. In wetland areas, such soils would be placed on top of the rip-rap foundation, to build the roadbed up from that stabilized foundation. The soils and materials that require drying are derived from the ICC Engineering Reports -- wet soils that would be excavated as cut that would need to be dried before they could be placed as embankment. In contrast, undercutting quantities cannot be determined from the Engineering Reports, which do not account for undercutting volumes. Because unsuitable soils that are undercut and wasted and excavated materials reported in the Engineering Reports are two separate, distinct, and non-overlapping categories of materials, NS does not include in drying quantities the undercut materials (which would not be dried).

Soils needing added water for compaction. Of the ten major soil types listed in NS's Table, three are drier than optimum and would require added water. *See* NS Reply WP "SBRR Soil Moisture Content.xls." The other seven soil types traversed by the SBRR would not require added water for compaction.

Soils Requiring Drying. NS's Engineering Experts determined that fifteen percent of the soil on the SBRR right-of-way consists of two soil types that have NMC values within 4 percent of optimum. NS assumes the SBRR could achieve adequate compaction of those soils without drying.[167] Adequate compaction of these soils is possible with little to no moisture conditioning. For the remaining five soil types, significant drying would be required. To dry soil after it is excavated; it must be spread and scarified by discing or blading. Repeated discing or blading cycles are required until sufficient water evaporates for the soil to approach optimum moisture conditions. Drying soil often is costly due to the large areas needed to spread the soil, the need for suitable weather condition in which to conduct the drying, and potential construction delays while waiting for the soil to dry.

NS's Engineering Experts evaluated the locations of the soil monitoring stations and sorted SBRR segments based on proximity to stations. ICC Valuation report maps, NS maps and SBRR route maps were all used to assign each route segment a moisture content level based on the closest monitoring station within each state.[168] Based on that soil analysis, NS has determined that approximately 16 million cubic yards of earthwork material will require some

[167] Some of the soils in these two categories might require drying, but to be conservative, NS has assumed the SBRR would not need to dry any of those soils to achieve adequate compaction.

[168] NS Reply Workpaper "SBRR Open Grading NS Reply.xlsx," Tab "Subgrade Preparation."

drying and approximately 770,000 cubic yards will require water for compaction. These represent approximately 56% and 3% of the SBRR total earthwork volumes.[169]

SunBelt did not allow for either drying soil that has a higher moisture content than needed for compaction or applying water to soil that has a lower moisture content than that needed for compaction. SunBelt bases its position on the atypical "Goldilocks" experience of the Trestle Hollow Project where the soil boring reports indicate the existing soil had an optimum moisture content needed for compaction. It is wholly unrealistic to assume—contrary to the evidence—that the moisture content of all of the soil over nearly 600 route miles would be "just right." *See supra* III-F-2 to 2.a for NS's discussion of the reasons the Trestle Hollow costs are inapplicable to this case. The R.S. Means cost, before any distorting manipulation by SunBelt, correctly includes the cost of loading, transporting, and distributing the water in the roadbed material. The primary portion of the roadbed that requires water for compaction is the top 18 to 24 inches of the embankment. This is considered the crown of the roadbed, which must be placed correctly and shaped to the typical section proposed by SunBelt for the application of sub-ballast. NS's Engineering Experts have conservatively applied water for compaction based on the R.S. Means cost data only to the top portion of the roadbed shown to require water for compaction, consisting of only 20% of the applicable common excavation and borrow material quantities.[170]

SunBelt did not apply a cost for drying wet material. For the soil material with a moisture content too high for proper compaction, NS's Engineering Experts have developed a soil drying unit cost from R.S. Means items. NS used from the B-84 Crew an operator and

---

[169] *Id.*

[170] NS Reply WP "Railroad_Engineering_William_Hay-Water and Compaction.PDF" at 306, section 11.

tractor (same as the crew used for clearing) and added a Disc Harrow Attachment for a total cost of $908.48. NS assumed a production rate of 4,000 CY/ day, which is the production rate of 8 scrapers (530 CY/day each). This is a unit cost $0.23 and NS has applied this cost to each CY of Common Excavation and borrow used in the areas with soil that is too wet.[171]

(f) Total Earthwork Cost

The adjustments described above increase the costs associated with total earthwork, (including additional land purchases), for the SBRR to a total of $539.6 million, an increase of more than $350.5 million. *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Summary."

e. Drainage

i. Lateral Drainage

NS accepts SunBelt's use of the ICC Engineering Reports to quantify lateral drainage needed for the SBRR route and its proposed unit costs. NS rejects Sunbelt's quantities of lateral drainage. SunBelt erroneously left out 3,550 LF of French drain from one ICC report.[172] NS has corrected this error by adding this quantity to the lateral drainage totals.[173]

ii. Yard Drainage

NS's Engineering Experts determined that SunBelt did not include sufficient cost estimates for yard drainage structures and only included a cost of $1.5 million for catch basins

---

[171] NS Reply WP "SBRR Open Grading_NS Reply.xlsx," Tab "Subgrade_Preparation"; NS Reply WP "Equipment Selection Drying of soil for Compaction.xlsx."

[172] SunBelt Opening WP "SBRR Open Grading.xls," Tab "Eng Rep_Inputs."

[173] NS Reply WP "SBRR Open Grading NS Reply.xls," Tabs "SBRR – ICC Quantity Errors" & "Other Items."

and drainage pipes for their only proposed hump yard.[174] Proper drainage is required at all yards to ensure continuous service through weather events and to prevent facility damage from, for example, flooding and or washouts.

Based on recent NS yard construction, *see* NS Reply WP "NS Yard Drainage Calc.xls," NS's Engineering Experts formulated a unit cost of $16.56 per linear foot of yard track for drainage structures.[175] This unit cost was derived using bid cost data from new construction of drainage infrastructure at the recently expanded NS Bellevue yard in Ohio. The Bellevue Yard is a fairly typical large yard on the NS system, and yard drainage units costs for a recent project should be representative of costs the SBRR would incur to install proper drainage infrastructure at its yards. NS's Engineering Experts divided total drainage costs at the Bellevue Yard by the approximate length of new track constructed to produce a cost per linear track foot. Typical items included in the yard drainage system estimate consist of multi-diameter drainage pipe, catch basins, and excavation and construction costs.

To determine the cost of yard drainage for the SBRR system, NS's Engineering Experts applied the $16.56 per linear foot of yard track to the total combined yard track length. The total estimated cost of drainage infrastructure along the SBRR yards calculated using the above method totaled $10.3 million along 117.8 miles of new yard track.[176]

f. Culverts

NS rejects SunBelt's proffered culvert unit costs and quantities.

---

[174] *See* SunBelt Opening III-F-16.

[175] *See* NS Reply WP "NS Bellevue Class Yard Drainage.pdf"; "NS Bellevue Drainage Unit Costs.pdf," "NS Yard Drainage Calc.slxs."

[176] *See* NS Reply WP "NS Bellevue Class Yard Drainage.pdf"; "NS Bellevue Drainage Unit Costs.pdf."

i. Culvert Unit Costs

NS rejects SunBelt's culvert unit cost estimates because those estimates either omitted or incorrectly applied costs associated with the installation of culverts. SunBelt also made many calculation errors in its workpapers.

SunBelt posited in its narrative that the SBRR would use Aluminum Corrugated Metal Pipe ("CMP") culverts in all locations on the lines of the SBRR having culverts, as identified in the NS culvert list.[177] That culvert list, however, includes a variety of circular and box shapes of culverts that use a variety of materials, as appropriate for each site.[178] The different shapes and variety of culvert materials have different hydraulic characteristics. In specifying only a single pipe material for the SBRR, SunBelt failed to account for the varying flow characteristics and requirements of the existing culverts. Although accepting SunBelt's CMP culvert specification, NS's Engineering Experts corrected SunBelt's hydraulic flow oversight by sizing each new SBRR culvert to match the hydraulic capabilities of the existing NS culverts. For culvert costs, SunBelt confused its own specification for the type of CMP deployed for the SBRR. Its price quote from ConTech for CMP unit prices are for *Aluminized Steel* CMPs, *not* the Aluminum CMP SunBelt used for culvert material transportation costs. *Aluminized Steel* CMP is less costly than *Aluminum* CMP.[179] The website metalprices.com (last visited November 26, 2012) listed a monthly average spot price of $1,930/ton for aluminum in November, 2012, while the website worldsteelprices.com (last visited November 26, 2012) listed a spot price of $717/ton for steel in the month of October, 2012. This shows Aluminum CMP's raw material cost is about 2.7 times

---

[177] *See* SunBelt Opening III-F-16.

[178] NS Reply WP "Culvert Construction Costs_NS Reply.xlsx," Tab "Active."

[179] *See* NS Reply WP "Contech_Pricing.odf" and "Contech_CMP_Stnd._Specification.pdf."

more costly than Aluminized Steel CMP. Either is adequate for use on the SBRR and NS's Engineering Experts accept the use of lower cost Aluminized Steel CMP. However, SunBelt used the lighter weights of Aluminum CMP for material transportation cost instead of the heavier Aluminized Steel CMP weights that are the basis of the ConTech haulage quote,[180] thus understating transportation costs. *See* SunBelt Opening WP "Culvert Construction Costs.xls," Tab "Unit Costs," Cells B50 to J59. An example of this error is that 24" Aluminum CMP has a weight of 10.8 lbs/Foot while 24" Aluminized Steel CMP has a weight of 33 lbs/Foot for same pipe gauge. SunBelt also uses the wrong 48" and 120" Aluminized Steel CMP weight per lineal foot. Based on the 48" and 120" Aluminized Steel CMP price chart from SunBelt opening workpaper "Contech Pricing.pdf. the gauge number should be 12 and 10 respectively. However, SunBelt uses gauge number 10 and gauge number 8 for the 48" and 120" Aluminized Steel CMP on the pipe weight. NS's Reply evidence corrects this error.[181]

Transportation costs are a constant $0.035/ton-mile, without regard for the type of culvert material, so transportation cost is purely a function of weight.[182] The weight ratio between the two CMP types is 0.33. Because transportation costs are determined by weight, transporting the Aluminum CMP would cost one third the price of transporting Aluminized Steel CMP. To summarize, NS accepts SunBelt's unit cost for Aluminized Steel CMP. NS rejects SunBelt's

[180] SunBelt Opening WP "Contech Pricing.pdf."

[181] *See* NS Reply WP "Culvert Construction Costs_NS_Reply.xlsx," Tab "Unit Costs," Cells J51 to J59.

[182] SunBelt Opening III-F-24.

calculation of transportation charges and increases them by nearly a factor of three to reflect the correct weight of Aluminized Steel CMP.[183]

NS also rejects SunBelt's unit prices for all sizes of CMPs. SunBelt erroneously indexed the 2010 quoted prices from Contech to 2009, when they should have indexed up to 2011, 3rd quarter. NS has correctly indexed the 2010 prices to 2011.

NS rejects SunBelt's unit cost for bedding material. SunBelt used a bedding material unit cost from the inapposite Trestle Hollow Project. As demonstrated, unit costs from the Trestle Hollow Project are not representative of the costs the SBRR would incur. *See supra* III-F-2-d-(i). Therefore, NS's Engineering Experts applied the R.S. Means unit cost of $35.13/CY for bedding material.[184]

NS rejects the R.S. Means unit costs for excavation and trench backfill that SunBelt used in its Opening Evidence. SunBelt erroneously used unit costs from R.S. Means 2009, not R.S. Means 2011. NS has corrected this error and used the correct 2011 unit costs.

ii. Culvert Installation Plans

SunBelt incorrectly calculated culvert installation quantities. Specifically, the culvert installation plan in SunBelt's Opening Evidence and SunBelt's workpapers for trench dimensions are conflicting and confused. In its Opening Evidence, SunBelt states that "the trench for the CMP is excavated one foot wider on each side than the culvert width. The bottom of the excavation is covered with an average depth of 12" of crushed stone bedding material to act as a foundation and cushion for the culvert."[185] SunBelt's culvert spreadsheet, in contrast,

---

[183] *See* NS Reply WP "Culvert Construction Costs_NS_Reply.xlsx," Tab "Unit Costs," Cells K51 to K59.

[184] NS Reply WP "RSMEANS Bedding Unit Price.pdf."

[185] SunBelt Opening III-F-17.

used trench widths that varied from culvert-width-plus-one-foot to culvert-width-plus-two-feet.[186] NS accepts SunBelt's stated specification of a trench width of two feet wider than the culvert width, one foot wider on each side than the culvert width, as described in SunBelt's narrative evidence. NS rejects the unsupported, unexplained, and inconsistent use of narrower widths for some culverts used in SunBelt's workpapers. SunBelt did not consider the space between multiple barrels necessary to allow efficient operation and selection of compaction equipment. NS applied the recommended minimum spacing between pipes on multiple barrels with different sizes of culvert pipe from the National Corrugated Steel Pipe Association Installation Manual.[187]

SunBelt's plan does not specify a trench depth for culvert installation. Without any explanation, or support, SunBelt's culvert spreadsheet applied trench depths that varied from culvert height plus one foot to culvert height plus two feet. NS accepts SunBelt's specified trench height of two feet higher than the culvert height, because it is the only measurement Sunbelt provided that makes sense. Sunbelt provided for 12 inches of crushed stone bedding, which would require one foot below the culvert. The SBRR would also need additional trench depth of at least one foot so that there is room for a minimum of one foot of fill above the culvert. In summary, the culvert trench will be excavated with dimensions one foot wider on each side than the culvert width, a foot below the flow line of the culvert, and a foot above the top of the pipe for cover. The culvert trench on multiple barrels will be excavated with dimensions one foot offset from the side of culverts plus the minimum spacing between the culverts plus culvert widths, a foot below the flow line of the culvert, and a foot above the top of

[186] NS Reply WP "Culvert Pipe Trench by SunBelt.pdf."

[187] NS Reply WP "NCSPA Installation Manual.pdf."

the pipe for cover. NS's Reply Evidence corrects the trench excavation quantities to reflect the correct trench dimensions.[188]

For culvert bedding, SunBelt's Narrative states "[t]he bottom of the excavation is covered with an average depth of 12" of crushed stone bedding material to act as a foundation and cushion for the culvert, providing a means for transferring the load into the ground below the culvert as well as a level surface." SunBelt Opening III-F-17. SunBelt's spreadsheet, however, failed to provide enough bedding material to cover the bottom of the specified culvert width.[189] As described above, SunBelt's Opening Evidence specifies a trench width of two feet (one foot on each side of the culvert pipe) plus the culvert width. The bedding has to cover the bottom of the trench, so it must be sized consistent with the trench specification of two feet plus the width of the pipe for a single culvert and providing minimum spacings between pipes for multiple culverts. SunBelt erroneously calculated the bedding area based only on the culvert width-plus-one-foot, thereby understating the required amount of bedding material.

SunBelt also understated the height of required bedding material by erroneously stopping the bedding material at the flow line at the bottom of the culvert. Bedding material must go to the pipe springline (middle of pipe height).[190] This is standard industry practice, for two reasons. One reason is that this level of bedding is necessary for complete load transfer to the bedding material. The second reason is that earthen backfill material is hard to compact under the pipe between the springline and the flow line while crushed stone, because of its added weight,

---

[188] *See* NS Reply WPs "Culvert Pipe Trench by NS.pdf" and "Multi Barrels Min Spacing By NS.pdf."

[189] *See* SunBelt Opening WP "Culvert Construction Costs.xls," Tab "Unit Costs," Cells E21 to E31.

[190] NS Reply WP "Culvert Pipe Trench by NS.pdf."

naturally fills any voids. The material SunBelt proposed to use for the trench backfill is from the excavation obtained on site and will be highly heterogeneous, not the select material typically used for backfill. With only a one-foot gap between the trench wall and the pipe, only very small compaction equipment can be used. This equipment is far less powerful than the rollers and sheepfoots used for the roadbed and cannot achieve the needed compaction on SunBelt's backfill material. Therefore, bedding material (easily compacted) should be used in the more difficult parts of the trench. NS has calculated the correct quantity of bedding needed.[191]

SunBelt incorrectly calculated trench backfill quantity with the same trench dimension errors as on the previous items. As a check, the bedding quantity should be the exact same as the backfill quantity. This is because the pipe will be in the exact center of trench and the bedding goes from the bottom of the trench to the springline (middle) of the pipe while the backfill goes from the springline to the top of the trench.[192] NS calculated the correct quantity of trench backfill accordingly.[193]

iii. Culvert Quantities

NS's Engineering Experts reject a number of SunBelt's proposed culvert quantities. NS's Engineering Experts also reject SunBelt's substitution of culverts for bridges as infeasible in many instances.

---

[191] NS Reply WP "Culvert Construction Costs_NS_Reply.xlsx," Tab "Unit Costs," Cells E21 to E31.

[192] NS Reply WP "Culvert Pipe Trench by NS.pdf."; *see* Yoo et al., *Bedding and Fill Heights for Concrete Roadway Pipe and Box Culverts*, Auburn University (June 2005) (showing material must extend to springline), copy at NS Reply WP "Yoo_Bedding and Fill Heights.pdf."

[193] NS Reply WP "Culvert Construction Costs NS Reply.xlsx," Tab "Unit Costs," Cells L21 to L31.

There are a number of critical shortcomings with SunBelt's proposed SBRR culvert inventories. For example, SunBelt proposes replacing all culverts smaller than 10 feet wide, no matter their existing material or shape, with CMP culverts. SunBelt's Opening Evidence also seeks to convert 35 bridges that are 20' or shorter to CMP culverts. Eighteen of the shorter bridges (51% of total) that SunBelt proposes to convert to CMP culverts are concrete box culverts and circular storm sewers, and the balance are arches and various types of conventional bridges (beam, deck, and trestle). SunBelt's attempted conversion of these bridges and culverts to CMP culverts is riddled with errors.[194] A critical component of hydraulic design is that the flow capacity of a replacement CMP culvert must equal the flow capacity of the existing culvert or bridge. If not, the SBRR would be exposed to a substantial risk of flooding and a wash out of the entire roadbed due to the water backing up behind the entrance to the culvert.

NS calculated the number of CMP culverts needed to replace the bridges and large box culverts using the standard flow velocity equations that consider the existing and proposed pipe's material composition and the slope necessary to generate the minimum velocity. For the small percentage of bridges and culverts that are very deep, NS assumed flow area as width times the height (width and height are equal in a circular pipe). Most of NS's existing large culverts and bridges carry large flows of 200 CFS – 1,500 CFS, with many carrying flow of 500 to 1,000 CFS. In comparison, one 120" CMP culvert (10 feet in diameter) at a slope of 0.1% can carry about 284 CFS.[195] Most of the culverts and bridges that SunBelt proposed to replace will need to

---

[194] *See* NS Reply WP "Culvert_Field_Pictures.pdf."

[195] Q = (1.49/0.24) x {((10/2)^2)xPI} x {((10/2)^2)xPI)/(2xPIx(10/2))}^0.67 x (0.001^0.5) = 284 CFS. [Manning's Eq.: Flow(Q) = (1.49/n) x Area x (Hyd.Rad. ^0.67) x (Slope^0.5)]; NS Reply WP "Culvert Construction Costs_NS_Reply.xlsx," Tab "IHB."

be replaced with multiple barrels (3-7 pipes) CMPs in order to provide at least the equivalent flow capacity of the existing structures.

Bridges spanning high over waterways cannot be replaced by culverts, particularly on the narrow SBRR rights of way. At a 1.5 to 1 side slope, the SBRR roadbed would extend beyond its 100 foot right of way boundaries if the bridge to be replaced is more than 27 feet above the flow line of the culvert to base of rail in single track, and more than 23 feet above the flow line of the culvert in double track. Also, the SBRR roadbed would extend beyond its 75 foot right of way boundaries if the bridge to be replaced is more than 19 feet above the flow line of the culvert to base of rail in single track.[196]

As shown in NS's workpapers, replacing the bridges and box culverts with CMP carrying the equivalent flow is a more expensive option than using a simple span bridge.[197] NS's Engineering Experts calculated both the cost of replacing bridges and box culverts with CMP culverts and replacing them in kind. When the cost of replacing with CMP exceeded the cost of replacement in kind, NS rejected the replacement with CMP and included costs for replacement in kind. For example, SunBelt converted the 96" x 96" concrete box culvert at mile post 18.9 NO on the Alabama Division to a single 120" CMP culvert. The cross-sectional area of the 96" box culvert is approximately 14 square feet larger than that of the proposed 120" CMP culvert. NS's Engineering Experts corrected this spreadsheet error by using the CMP culvert size that is

[196] NS Reply WPs "100 ft ROW Single ML.pdf" "100 ft ROW Double ML.pdf "and "75 ft ROW Single ML.pdf."

[197] NS Reply WP "Culvert Construction Costs NS Reply.xlsx," Tab "20ft<Bridges Rev.," Columns CS and CT.

equivalent to the box culvert it would replace, which is necessary to prevent flooding/washouts.[198]

SunBelt further erred in assuming that a CMP culvert of the same diameter as a reinforced concrete pipe ("RCP"), ductile iron, or other material pipe, would carry the same flow. This is incorrect: a CMP's corrugations cause turbulence in the flow that reduces the flow volume capacity of a CMP culvert. The same size and shape RCP carries approximately two times the volume as a CMP can carry. So two CMP culverts of the same size and shape would be needed to replace a single RCP. This is demonstrated by the Manning's flow equation,[199] which is used throughout the design industry to calculate flow in a pipe. This equation has been in use since the 1890s and is based on the area of the pipe, the wetted perimeter of the pipe, slope of pipe, and the friction coefficient used in Manning's flow equation. The rougher the material, the higher the friction coefficient. And, the higher the friction coefficient value, the lower the flow capacity of the pipe. Therefore, a CMP with a substantially higher friction coefficient will have a much lower flow capacity than RCP or other alternatives.[200]

Sound engineering practices require that if the hydraulic conditions of an existing culvert are unknown, the replacement culvert should have capacity to carry at least the same flow as the existing culvert. Anything less could restrict the flow and put the railroad and adjacent landowners at risk of flooding or washing out the railroad roadbed.

NS's Engineering Experts have determined that a reasonable simplification to determine flow of the existing pipe is to assume the pipe is flowing full and the slopes for the existing and

---

[198] *See* NS Reply WP "Culvert XSection Drawing 1.pdf."

[199] Manning's Eq.: Flow(Q) = (1.49/n) x Area x (Hyd.Rad. ^0.67) x (Slope^0.5).

[200] NS Reply WP "Roughness coefficient.pdf."

proposed culverts are based on the minimum velocity needed to keep the pipe clean. This minimum velocity is 3 feet per second pipe flow velocity and is a function of pipe size, shape and material.[201] The Manning's velocity equation is used to determine the minimum slope of each culvert necessary to maintain a minimum flow velocity of 3 feet/second. CMP's friction coefficient values range from 0.024 to 0.028.[202] NS assumed a conservative friction coefficient of 0.024 for CMPs in its calculations. Concrete, steel, cast iron, ductile iron, and smooth plastic pipe's friction coefficient values range from 0.011 to 0.013. NS has used an average friction coefficient of 0.012 for all non-CMP. NS's Engineering Experts used these assumptions, Manning's flow equation and the existing pipes' physical properties (size, shape, and the coefficient of friction) to determine existing culverts' flow capacities.[203] For each culvert, NS then determined the equivalent number of CMPs needed to achieve the same flow. Because the top of a culvert pipe is typically placed at the calculated flood level, the proposed replacement pipes must be the same height as the existing pipe to ensure pipes are flowing full. NS has revised the culvert spreadsheet to calculate the additional pipe quantity.[204]

In addition, SunBelt erroneously excluded culverts less than 20' in length, reasoning that such culverts could not span the full width of the roadbed. This rationale is based on a mistaken understanding of the function and use of 20-foot culverts. The shorter pipes are used to extend existing pipes. Extensions are needed when NS widens its roadbed to modern dimensions. For example on the Alabama Division, at mile post 26.1, there are two entries, named sections 1 and

---

[201] NS Reply WP "Lindeburg_Minimum_Pipe_Velocity.pdf."

[202] NS Reply WP "Roughness coefficient.pdf."

[203] NS Reply WP "Culvert Construction Costs NS Reply.xlsx," "Active," Cells M1 to N3, Columns T and U.

[204] NS Reply WP "Culvert Construction Costs NS Reply.xlsx," Tab "Active," Column AF.

2. They are both 18" with the first pipe having a length of 24' and the second pipe 6'. At this location there are not two separate culverts, but one culvert totaling 30' made up of two pipe segments, one 24' and one 6' extension. NS has corrected SunBelt's erroneous exclusion of culvert segments shorter than 20 feet, and included those extensions in the total quantities.[205]

Finally, SunBelt further erred by confusing the spreadsheet column with the number of sections of a pipe (this is a pipe and its extensions) with the number of barrels in a culvert system. Culvert systems with multiple barrels list each barrel separately. For example, on the Alabama Division, at mile post 81.2, there are four culverts, each 60 inches in diameter and 60 feet in length. Here, SunBelt mistakenly dropped the quantities for the extensions as discussed above, but then multiplied the original culvert (which is section 2) length by two, presumably assuming a two barrel culvert at this location. In other words, instead of using the correct pipe total of 240' (4 pipes x 60'), Sunbelt used 600' ({1 x 60'}+{2x60'}+{3x60'}+{4x60'}) of pipe. Though correcting SunBelt's error decreases the quantity of pipe and therefore reduces its cost, NS has fixed these errors throughout the spreadsheet.[206]

SunBelt failed to provide culvert inlet protection during construction. Silt fences are cost-effective culvert protection devices. Silt fence should be located at the inlet to storm sewer culverts to prevent sediment entering, accumulating in and being transferred by a culvert and the associated drainage system prior to permanent stabilization of a disturbed project area. NS's Engineering Experts have used an average of 100 LF silt fence around each culvert inlet on

---

[205] NS Reply WP "Culvert Construction Costs NS Reply.xlsx," Tab "Active," Column AK.

[206] NS Reply WPs "Culvert XSection Drawing 1.pdf"; *see also* "Culvert XSection Drawing 2.pdf" to Culvert XSection Drawing 3.pdf."

either single or multi barrel culverts.[207] The total cost of providing silt fences at culvert outlets is $266,478.[208]

iv. Total Culvert Costs

Based on the foregoing, NS has determined the cost of culverts to be approximately $26.3 million, rather than the $13.7 million calculated by SunBelt.

g. Other

i. Sideslopes

NS accepts SunBelt's average sideslope ratio of 1.5:1.

ii. Ditches

NS accepts SunBelt's specifications of side ditches having trapezoidal sections with cuts two feet wide and two feet deep for all locations.

iii. Retaining Walls

NS rejects SunBelt's retaining wall quantities. SunBelt used retaining wall quantities from the ICC Engineering Reports. The ICC Engineering Reports include cubic yards of masonry, timber walls, and walls made from timber ties and pilings under the category "Protection of Roadway" included in Account 3, Grading. SunBelt states in its opening narrative that rather than construct the masonry or timber retaining walls documented in the ICC Engineering Reports, it proposes to use gabions (galvanized steel mesh boxes filled with rock) for all of its retaining walls. *See* SunBelt Opening at III-F-19; NS Reply WP "Retaining Wall

---

[207] *See* NS Reply WP "Silt Fence at Culvert.pdf"; NS Reply WP "Silt Fence at Multi Barrels.pdf."

[208] *See* NS Reply WP "Silt Fence unit cost.pdf"; "Culvert Construction Costs NS Reply.xlsx," Tab "Silt Fence."

Description.pdf." (describing gabions, their characteristics, and functions).[209] NS's Engineering Experts' Review of SunBelt's workpapers showed that SunBelt's retaining wall cost estimation method and calculations are erroneous. SunBelt assumed that the SBRR would replace all of the masonry, timber, and tie retaining walls with gabions, but that the SBRR would use the same piling retaining walls reported in the ICC Engineering Reports.

NS accepts the use of gabions as replacements for masonry, timber ,and tie retaining walls, but rejects the quantities determined by SunBelt. As discussed below, SunBelt's approach erroneously replaced the cubic yards of masonry wall with equal cubic yards of gabion wall. SunBelt's evidence also failed to include any costs for preparation of the foundation area of the walls, and failed to account for the increased wall heights that would result from increased roadbed width. NS also accepts SunBelt's replacement in kind of piling retaining walls but rejects SunBelt's assumed use of untreated timber piles for timber piling walls.

(a) Retaining Walls Replaced With Gabions

SunBelt made two critical errors in determining the SBRR gabion wall quantities and costs. First, SunBelt used erroneous assumptions to convert masonry and timber retaining wall quantities into comparable gabion quantities. Second, SunBelt failed to account properly for the additional retaining wall quantities necessitated by the increase in the SBRR roadbed from the standards in place in the early 1900s when the ICC Engineering Report quantities were developed, to the wider roadbed assumed for the SBRR.

(i) Conversion of Masonry and Timber Retaining Wall Quantities to Gabions

SunBelt failed to account properly for the difference in weight between masonry retaining walls and gabions, and thus underestimated necessary gabion quantities. Masonry

[209] For further description of gabions, *see* NS Reply WP "Tenn DOT RetainMan.pdf."

walls, timber walls, and gabion walls are gravity structures, meaning that their weight is used to resist sliding, overturning, shear, and other movement due to lateral forces exerted by the soil. In order to resist the same amount of force, a gabion wall must have the same weight as a masonry wall.[210] However, masonry walls are more dense (have a greater weight to volume ratio) than gabions, which are filled with loose rock and have a significant volume of void space (and thus are much less dense). Therefore, it was incorrect for SunBelt to assume that a given volume of masonry wall could be replaced by the same volume of gabions, because the critical factor for such gravity structures is weight.[211] Replacement of a section of masonry wall with an equal volume of gabions wall would reduce soil retention strength, primarily due to lower wall weight. In order to replace a masonry wall with a gabion structure having equivalent load bearing and force resisting capacity, the gabion structure must be larger (wider, taller, deeper, or some combination) than the masonry wall it would replace, necessitating greater volumes of gabions.[212]

NS Reply III-F workpaper "Gabion_Wall_Conversion.pdf" indicates the required cross section of gabion wall necessary to replicate the force resistance exerted by a masonry wall. Where the ICC Engineering Reports list masonry walls, SunBelt substituted only one cubic yard of gabion to replace one cubic yard of masonry.[213] Again, this was a mistake because the retaining power of a gravity-type wall is based on its weight, not volume. A cubic yard of

---

[210] *See* NS Reply WP "Zhou- Geol_Eng – Earth_Retaining_Structures.pdf" at 10.1.1 ("Gravity walls . . . support the soil and, through their weight and stiffness, resist sliding, overturning, and shear.").

[211] *Id.*

[212] *Cf.* SunBelt Opening Workpaper "SBRR Open Grading.xls," Tab "Other Items," Cell K37.

[213] SunBelt Opening WP "SBRR Open Grading.xlsx," Tab "Other Items."

gabion (a rectangular wire basket filled with pieces of stone) weighs significantly less than a cubic yard of masonry (larger chunks of stone kept together with or without mortar). As a result, gabion has a significantly lower load-carrying capacity than masonry. To substitute gabion for masonry, the *weight* of gabion used must equal the weight of the masonry replaced. SunBelt erred by substituting gabions for masonry wall based only on volume.

NS's Engineering Experts corrected SBRR's assumed gabion quantities using the following conversion process and calculations. To determine the correct gabion-to-masonry substitution ratio, it is necessary to determine both the average weight of a cubic yard of masonry and the average weight of a cubic yard of gabion. Masonry walls are composed of units of solid material like that found around the right-of-way. The ICC Engineering Report lists examples of this material, including: blocks of cut stone, cobbles, rubble, and (in some cases) concrete or brick. In the regions that the SBRR traverses, the most common stone that could be used for masonry would be sandstone and soft- to medium-density limestone.[214]

Sandstone and limestone have solid unit weights of 140 pounds per cubic foot and 138 pounds per cubic foot, respectively (averaging 139 pounds per cubic foot).[215] The broken-stone unit weight of both types of stone is 90 pounds per cubic foot. Incorporating all of these factors produces an average of 3,753 pounds per cubic yard of sandstone/limestone masonry. A gabion basket containing one cubic yard of broken sandstone or limestone will weigh only 2,430 pounds.[216]

---

[214] NS Reply WP "USGS AL Limestone.pdf" and "USGS MS Limestone.pdf."

[215] *See* NS Reply WP "Retaining_Wall_Diagram.pdf" drawing "RET_WALL-1."

[216] *See* NS Reply WP "Maccaferri.pdf," Section "Effective weight of a structure made up with gabions."

The quantity of gabion needed to replace all the masonry walls in the ICC Engineering Reports is equal to the ratio between the weight of masonry that is being replaced and the weight of gabion that will be used to replace the masonry (slightly over 1.54:1),[217] multiplied by the total quantity of masonry being replaced. Design charts created by Maccaferri show that the same type of calculation is used when substituting solid stone gabion basket unit weights for broken stone gabion basket unit weights for gravity retaining walls.[218] Applying these calculations, NS's Engineering Experts adjusted the required volume of gabion.[219]

For timber retaining walls, SunBelt miscalculated the conversion quantities to walls made of gabion baskets. SunBelt first converts the reported MBM (a unit of volume equal to 1000 board feet) to square yards, which NS does not dispute. NS rejects SunBelt's subsequent conversion of square yards to cubic yards because SunBelt fails to account properly for the depth of timber retaining walls.

SunBelt's conversion assumes one square yard of timber wall to one cubic yard of gabion wall. This assumes that all square yards of exposed timber wall are directly interchangeable with the exposed gabion surface. However, this assumption is only valid for walls lower than three feet in height that would require only a single course of gabion baskets. The retaining walls actually in service along the alignment retain far more than one three-foot high course of gabion.[220]

---

[217] This calculation is as follows: $3{,}753 \div 2{,}430 = 1.5\overline{4}$. *See* NS Reply WP "SBRR Open Grading_NS Reply.xlsx," Tab "Gabion Retaining Walls."

[218] NS Reply WP "Retaining_Wall_Description.pdf," Section: Effective weight of a structure made up with gabions, Table 2.

[219] NS Reply WP "Retaining_Wall_Diagram.pdf."

[220] *See* NS Reply WP "SBRR Open Grading_NS _Reply.xlsx," Tab "Gabion Retaining Walls."

Gabions were originally developed in Italy by the Maccaferri Company, which is now a major supplier of gabions throughout the world. Their design guidelines indicate that the first layer of gabions in a wall must be sunk into the foundation area by a depth of either one half gabion or one full gabion, based on wall height.[221] The same guidelines indicate that the average gabion wall is nine feet high.[222] NS's Engineering Experts adjusted gabion wall dimensions to conform to the gabion guidelines recommended by Maccaferri. *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Gabion Retaining Walls."

(ii) Additional Retaining Wall Quantities to Accommodate Modern Roadbed Standards

In its Opening Evidence, SunBelt posited that the roadbed width will increase by 5 feet for single track and 7 feet for double track (based on proposed 15 feet track centers) on fills. SunBelt also indicated that the roadbed in cuts will increase by 17 feet for single track and 19 feet for double track. Measuring from the center line of track, this will move the break point of the slope out an additional 2.5 feet for single track and an additional 3.5 feet for double track on fills and will move the break point out 8.5 feet for single track and 9.5 feet for double track in cuts. The effect this would have on retaining walls is very significant. Retaining walls are utilized where there is not enough room to construct the typical roadbed section. An adjacent roadway, building, stream or other obstacle encountered during construction may dictate the need for a retaining wall. Widening the roadbed does not relieve or move the constraint of the obstacle encountered. Therefore the retaining walls would need to be enlarged to accommodate the wider roadbed.

---

[221] *See* NS Reply WP "Maccaferri Gabion Description.pdf."

[222] NS Reply WP "Retaining_Wall_Description.pdf."

For track on fill, using a 1.5 horizontal to 1 vertical sideslope, the widening of the roadbed described above would have the effect of increasing the height of a retaining wall by 1.67 feet for single track and 2.33 feet for double track. For track in cut, the increase is significantly greater; the height of a single track retaining wall increases by 5.67 feet and for double track by 6.33 feet. Analysis of the proposed SBRR construction indicates that of the proposed 578 route miles, 127 miles are double track.[223] Further, the increased roadbed width not only increases the height of the retaining wall, but also lengthens the retaining wall. In some cases that would bring new obstacles in the path of a roadway and require additional roadbed support or additional retaining walls. The result is a greater force pushing on the wall, an increased moment trying to overturn the wall and increased live loads due to modern axle loadings (retaining walls for embankment support the railroad bed). It is standard route design practice to balance cuts and fills, so it is reasonable to assume that half of the retaining walls are in fill sections and half are in cut sections. Further, SunBelt's opening evidence indicates that 22% of the proposed route is double track.[224] Based on these factors, NS's Engineering Experts determined the height of an average wall would increase by 3.8 feet.[225]

---

[223] NS Reply WP "SBRR Open Grading_NS _Reply.xlsx," Tab "Gabion Retaining Walls."

[224] 127/578 = approximately 22 percent.

[225] Assuming that half the route is fill and half the route is cut and that on average 22% of the route is double track results in 39% (50% x (1 – 22%) in single track fill, 11% (22% x 50%) in double track fill, 39% in single track cut and 11% in double track cut. These percentages are multiplied by the average assumed increase retaining wall heights from the expansion of the roadbed to modern day standards of 1.67 feet for single track fill, 2.33 feet for double track fill, 5.67 feet for single track cut and 6.33 feet for double track cut to arrive at an average height increase of 3.8 feet. *See* NS Reply WP "SBRR Open Grading_NS Reply.xlsx," Tab "Gabion Retaining Walls," Cell F13.

NS's workpapers show the increased loadings as they relate to height for a 1.5 horizontal to 1 vertical sideslope on retaining wall.[226] This effect requires a much larger foundation and a more substantial wall. For an average existing wall height of 10 feet, measured from the ground line, a gabion wall requires 1.5 feet of foundation depth, and, at a height to base ratio of 2.0, a base width of 5.75 feet. However, when this height is increased by 4 feet to accommodate the proposed roadbed widths, a 14 ft gabion wall requires 3.0 feet of foundation depth, and a base width of 8.5 feet. These proportions are indicated in the Maccaferri design guidelines. Thus, the increase in height caused by the proposed roadbed width causes an increase in volume of gabion. Photos at various locations along the route indicate that an average wall height of 10 feet is reasonable. For a wall height of 12 feet,[227] the cross section area is 55.5 ft^2, for a wall height of 18 feet,[228] the cross section area is 93 ft^2, a 68% increase. Based on the increases in volume caused by the conversion of masonry to gabions and the increased height of wall required by the increased roadbed width, NS's Engineering Experts determined the cost of the gabions to be $47,782,941.[229]

NS's Engineering Experts used the average existing wall height of 10 feet to develop corresponding retaining wall length. Using the resulting length, the NS Engineering Experts derived a foundation excavation volume of 53,446 cubic yards. They added this excavation quantity to the Common Excavation totals.[230]

---

[226] *See* NS Reply WP "Active Components for Retaining Walls with Broken Slope Backfill.pdf" (from Civil Engineering Reference Manual, Sixth Edition, Michael R. Lindeburg)

[227] *Id.*

[228] *Id.*

[229] *Id.*

[230] *See* NS Reply WP "SBRR Open Grading_NS Reply.xlsx," Tab "EW Costs."

These quantity adjustments, along with the use of treated piles described below, increase the cost for retaining walls from $39,015,289 to $74,522,927.[231]

(b) Piling Retaining Walls

SunBelt did not include the use of treated timber piles for timber piling walls. The International Code Council, which is the source for the state building codes through which the SBRR is routed, requires either treated wood or wood of a species naturally resistant to rot and insect attack to be used in ground contact.[232] Using untreated wood in retaining walls that support track or protect track from slides is a safety hazard that could cause a derailment. NS's Reply uses treated piles, which increases the cost of the piling to $26,739,986.[233]

iv. Rip-rap

NS rejects SunBelt's quantity of rip-rap, but accepts its unit cost. SunBelt's main oversight in construction estimates for rip-rap consists of an essential shoreline protection berm along Lake Pontchartrain. The SBRR route follows the Lake's shoreline for 11.3 miles from MP 177.9 to MP 189.2 in Louisiana. Due to the frequency of extreme weather events such as tropical storms and hurricanes in this area and the exposure of the alignment to the shoreline, protection is required to prevent undermining of the track and to avoid washouts. Preservation of the roadbed integrity from erosion along this stretch of the SBRR is essential for sustained service to and from New Orleans and would be required for any new constructed railway along this alignment. Lack of adequate shoreline protection would result in erosion of embankment, loss of stability, and eventual shutdown of operation until the embankment could be restored.

---

[231] *See* NS Reply WP "SBRR Open Grading_NS _Reply.xlsx," Tab "Summary."

[232] *See* NS Reply WP "Treated Wood and the 2003 International Building Code.pdf."

[233] *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Other Items."

NS's Engineering Experts identified the berm and geometrically analyzed it using photos from high-rail inspection of the 11.3 mile segment, and aerial images. NS's Engineering Experts drafted a typical section of the existing berm using the aerial images, on-site photos, and past engineering design experience, which provided a cross sectional area of 269 square feet per linear foot of berm.[234] The total additional quantity of rip-rap estimated from the analysis is 594,430 CY. This quantity was added to the SBRR rip-rap quantity of 7,406 CY quantified in the ICC reports and 1,907,192 CY rip-rap added for undercutting backfill *(See supra* III-F-2-d-iii), for a total of 2,509,027 CY of rip-rap.

v. Relocating and Protecting Utilities

NS accepts SunBelt's costs for relocating and protecting utilities.

vi. Seeding/Topsoil Placement

NS accepts SunBelt's embankment protection quantities, but rejects SunBelt's use of the Trestle Hollow Project unit cost for seeding due to all the flaws in SunBelt's attempt to extrapolate from that unrepresentative project, discussed above. *See supra* III-F-2. a. NS used the more representative seeding unit cost from R.S. Means to calculate total seeding cost.[235]

vii. Water for Compaction

Water for compaction for dry soils along the SBRR route and drying of wet soils along the route are addressed in Section III-F-2-d-ii-(e), (Subgrade Preparation), *supra.* NS rejects SunBelt's unit cost and quantity of the water needed for compaction, although it agrees that

---

[234] *See* NS Reply WP "Rip_Rap_Berm_Lake_Ponc.pdf."

[235] *See* NS Reply WP "SBRR Open Grading NS Reply.xlsx," Tab "Unit Costs," Lines 162 to 166.

water for compaction is necessary as represented in SunBelt's workpapers, which is consistent with precedent. *See TMPA I*, 6 S.T.B. at 707.[236]

viii. Surfacing for Detour Roads

NS accepts SunBelt's costs for surfacing detour roads.

ix. Environmental Compliance

NS accepts SunBelt's costs of environmental compliance.

x. Lighting for Night Work

SunBelt did not include lighting crew cost for night time work during the seven-month roadbed construction period assumed to occur from October 2009 through April 2010.[237] Night work would be required for the entire grading and construction period. Night work requires lighting in order to meet the aggressive construction schedule. This becomes even more critical during the winter months when available daylight is significantly diminished. This would require a lighting crew at night to move, set up and maintain lights for construction equipment and crews. NS has calculated the total lighting crew cost per day, which includes lights with generators, pickup truck, labor foreman and laborer costs with location factor. Then NS applied the total lighting crew cost per day in 25 days a month for the seven-month construction period to determine $310,703 per crew. One lighting crew should be needed in every 10 miles over the total of 578 route miles for the project. Accordingly, the project would need 58 lighting crews.

---

[236] As demonstrated in Section III-F-2-d-ii-(e), although SunBelt did not apply a cost for water for compaction to its SBRR earthwork quantities, SunBelt's work papers included a unit cost for water for compaction. While this represents a step in the right direction, SunBelt misinterpreted the R.S. Means water for compaction cost selected and failed to provide for the necessary equipment and cost for the distribution of water for compaction.

[237] See SunBelt Opening Workpaper "Exhibit III-H-1.xls" Tab "IDC," Column E.

As a result, the total cost of lighting crews for seven months of grading construction is approximately $18.0 million.[238]

xi. Dust Control Work

During construction, the contractor should provide adequate dust control. Dust control is part of erosion control practices which include mulch, vegetation, minimization of soil disturbance, binding agents, and water spraying. Dust control can prevent air pollution and prevent pollutants from infiltrating storm water. According to United States Environmental Protection Agency (EPA)'s Storm Water Management Fact Sheet Dust Control document EPA 832-F-99-003 and Natural Resources Conservation Service (NRCS)'s Code 373 on Dust control on unpaved roads and surfaces, dust control should always be practiced during construction.[239]

Especially in urban areas, public complaint about dust pollution is always an issue if there are communities located near the railroad and road construction site and traffic volumes are high. Therefore, dust control should always be applied in urban areas to protect public and environmental health.

Water spraying is commonly used for dust control and affords protection for haul roads and other heavy traffic roads. NS applied a B-59 (2011 R.S. Means) with water spraying as a dust control measure in urban areas only. NS calculates the total adjusted cost of dust control Crew B-59 per day which includes 1 truck driver, 1 truck tractor and 1 water tanker costs. Then NS applied the total dust control Crew B-59 cost per day in 25 days a month for the seven-month construction period to derive a cost of $146,370 per crew. One Crew B-59 would be

---

[238] NS Reply WPs "Lighting for Nighttime work.xls" and "Lighting for Nighttime Work Crew.pdf."

[239] NS Reply WPs "Dust Control Work NRCS CODE 373.pdf" and "Dust Control Work EPA.pdf."

needed every 10 miles over a total of 185 urban area miles.[240] The project thus needs 18 crews. The total cost of dust control Crew B-59 work in 25 working days a month for 7 months construction period is $2.7 million.

3. Track Construction[241]

Track construction is the work required to lay track once the subgrade has been completed. This includes both acquiring and placing subballast, ballast, ties, rail, and other track components. SunBelt's opening submission on track construction included a number of conceptual and implementation flaws that understate the SBRR's track construction costs. The NS Track Engineering Experts have corrected these errors on reply. In addition, as described in Section III-B-1, the SBRR as configured by SunBelt did not have sufficient running, siding and yard tracks to serve the SBRR customers. NS therefore increases track construction quantities to account for the necessary additional track mileage set forth above in Section III-B-2. Table III-F-15 below compares SunBelt's opening SBRR track construction costs with the corrected figures included in the NS Reply.

---

[240] NS Reply WP "Dust Control Work.xlsx."

[241] Section III-F-3 of NS's Reply Evidence is sponsored by NS witnesses Michael Baranowski of FTI Consulting, Robert Phillips of STV, and George Zimmerman. Mr. Zimmerman is a Project Manager and Senior Engineer with STV. He has over 30 years of experience in roadway and bridge projects, with a particular expertise in freight planning, design, and construction management. Among his many duties, Mr. Zimmerman provides structural design and plan reviews for NS railway and bridge projects. All of these experts' qualifications are further detailed in Section IV. These experts are collectively referred to herein as the "NS Track Engineering Experts."

Table III-F-15
SBRR Track Construction Cost Comparison
($ millions)

Item	SBRR Opening	NS Reply	Difference
1.Geotextile Fabric	$182	$374	$192
2. Ballast	$74,322	$268,183	$193,861
3. Ties	$108,259	$131,284	$23,025
4. Track (Rail)			
a. Main Line	$152,795	$191,703	$38,908
b. Yard and Other Track	$12,831	$40,528	$27,697
c. Field Welds	$2,217	$2,784	$567
d. Switches (Turnouts)	$34,754	$50,898	$16,144
5. Rail Lubricators	$184	$654	$470
6. Plates, Spikes and Anchors	$54,133	$63,809	$9,676
7. Derails and Wheel Stops	$191	$3,580	$3,389
8. Track Labor and Equipment	$96,804	$116,783	$19,979
9. Total	$536,672	$870,579	$333,907

a. Geotextile Fabric

SunBelt understates the cost of geotextile fabric by failing to provide enough material to cover entire turnouts. SunBelt places geotextile fabric under turnouts and at at-grade crossings. *See* SunBelt Opening III-F-22. For at-grade crossings, SunBelt assumes that the cost for geotextile fabric is included in the cost of the at-grade crossing materials. NS's Track Engineering Experts accept this assumption. But for turnouts, SunBelt systematically understated the volume of geotextile materials needed. Specifically, SunBelt's calculations assume that geotextile fabric is needed only from the frog area to the end of the turnout long ties—or under approximately half of the required length.[242] SunBelt provides no explanation or

[242] That is, SunBelt's evidence placed geotextile under only the frogs and the widening end of turnouts, but failed to include geotextile under the switch portion going back to the frog. In NS's Engineering Experts experience and opinion, it is this latter portion of turnouts for which geotextile is most important.

evidence of why only a portion of the turnout would need geotextile material support. Instead it merely included geotextile quantities in the turnout tabs of SunBelt Opening WP "Track Construction Costs.xls."[243] In fact the full length of the turnout is subject to lateral forces when trains switch tracks and requires additional support, as specified in NS track construction standards produced to SunBelt in discovery.[244] NS corrected SunBelt's geotextile material calculations to provide enough material to extend under the full length of each turnout. NS accepts SunBelt's geotextile material price of $1.20 per square yard. Including all of the additional turnouts required under the NS reply operating plan, the SBRR would require a total of 312,055 square yards of geotextile fabric under turnouts at a cost of $374,467. The total SBRR geotextile quantity calculations are included in the costs of turnouts and grade crossings.[245]

b. Ballast

SunBelt's ballast evidence erred both in its calculation of ballast quantities and in its determination of ballast costs. SunBelt miscalculates ballast quantities primarily because of a mathematical error that led it to use an incorrect weight-to-volume conversion factor. It misstated ballast costs primarily because it failed appropriately to account for the costs of transporting ballast.

---

[243] Having failed to support its evidence on Opening, SunBelt is precluded from doing so on rebuttal. *See SAC Procedures*, 5 S.T.B. at 445-46; *Xcel*, STB Docket No. 42057, at 2 (served Apr. 4, 2003).

[244] *See* NS Reply WP "NS Turnout Geotech Sketch.pdf."

[245] *See* NS Reply WP "SBRR Track Construction NS Reply.xls," Tab "REPLY GEOTEXTILE CALCULATION."

i. Ballast Quantities

SunBelt's basic ballast depth specifications are acceptable. Specifically, for all main tracks, SunBelt's engineers used 18" of ballast and subballast, consisting of a 6-inch subballast layer and a 12-inch layer of clean rock ballast. For yard tracks and set-out tracks, SunBelt's engineers used 10" of ballast and subballast, consisting of a 4-inch subballast layer and a 6-inch ballast layer. The NS Track Engineering Experts accept these specifications.

SunBelt's calculation of ballast quantities is marked by serious errors, however. First, SunBelt miscalculates the weight-to-volume conversion for ballast. While SunBelt claims to use the standard conversion of 1.5 tons of ballast per cubic yard to convert from cubic yard quantities to tons, it did not do so. *See* SunBelt Opening III-F-23. A review of SunBelt's work papers reveals that SunBelt actually used a *lower* conversion factor of 1.35 tons per cubic yard for its ballast, thereby understating the required tonnage. Specifically, SunBelt's track construction spreadsheet assumes ballast weighs 100 pounds per cubic foot.[246] But 100 pounds of ballast per cubic foot equates to only *1.35* tons per cubic yard, as demonstrated below:

$$100 \text{ LBS/CF} = \frac{1.35 \text{ Tons}}{1 \text{ CY}} \times \frac{1 \text{ CY}}{27 \text{ CF}} \times \frac{2{,}000 \text{ LBS}}{1 \text{ Ton}}$$

1.5 tons of ballast per cubic yard equates to 111.11 pounds per cubic foot, as shown here:

$$\frac{1.5 \text{ Tons}}{1 \text{ CY}} \times \frac{1 \text{ CY}}{27 \text{ CF}} \times \frac{2{,}000 \text{ LBS}}{1 \text{ Ton}} = 111.11 \text{ LBS/CF}$$

NS has corrected SunBelt's error by using the proper conversion formula in NS Reply Workpaper "SBRR Track Construction NS Reply.xls," Tab "Track Quantity Calculator" for all

[246] *See*, for example, SunBelt Opening WP "Track Construction Costs.xls," Tab "Track Quantity Calculator," Cell D61 applying 100 pounds per cubic yard in calculating ballast tons per 100 foot of track.

ballast section calculations to properly implement the standard conversion factor of 1.5 tons of ballast per cubic yard as SunBelt intended.

Moreover, SunBelt's calculations of the ballast cross section areas are flawed. Although it includes as part of its workpapers pdfs of proposed ballast cross sections,[247] SunBelt does not provide any computer programs, spreadsheets, or other workpapers indicating how those cross sections were calculated.[248] The NS Track Engineering Experts were unable to replicate SunBelt's calculations, which appear to understate necessary quantities. Because they were unable to verify SunBelt's calculated cross sections with the limited documentation provided, the NS Track Engineering Experts developed scale drawings of SunBelt's proposed ballast cross sections based on AREMA Chapter 1, Section 2.1 standard dimensions,[249] using Microstation engineering software.[250] The detailed calculations supporting NS's ballast cross sections are included in NS's workpapers. Table III-F-16 below compares SunBelt's ballast cross section areas with those calculated by NS's Engineering Experts using AREMA Guidelines and Microstation.

---

[247] *See* SunBelt Opening WP "Ballast Sections.pdf."

[248] Having failed to provide these calculations on Opening, SunBelt is foreclosed from providing them on Rebuttal. *See SAC Procedures*, 5 S.T.B. at 445-46; *Xcel*, STB Docket No. 42057, at 2 (served Apr. 4, 2003).

[249] NS Reply WP "AREMA Section 2.1.pdf."

[250] NS Reply WP "STV Typical Sections.pdf."

Table III-F-16
Comparison of SunBelt and NS Ballast Cross Section Area Calculations
(Square Feet)

TRACK SECTION	SunBelt Opening	NS Reply	Difference
Single Track, Tangent	21.65	21.70	+0.05
Single Track, 0 to 3 degree	22.76	24.43	+1.67
Single Track, 3 deg. and above	25.89	28.18	+2.29
Industrial/Yard Tracks *(All single)	15.11	13.90	-1.21
Double Track, Tangent	43.55	42.25	-1.30
Double Track, 0 to 3 degree	45.61	45.21	-0.40
Double Track, 3 deg. and above	51.51	51.85	+0.34
Triple Track, Tangent	64.91	63.73	-1.18
Triple Track, 0 to 3 degree	67.83	68.90	+1.07
Triple Track, 3 deg. and above	76.42	78.38	+1.96
Single Track and Siding, Tangent	43.31	42.72	-0.59
Single Track and Siding, 0 to 3 degree	43.40	45.36	+1.96
Single Track and Siding, 3 deg. and above	49.10	51.55	+2.45
*Includes all tracks with 6" ballast sections.			

Moreover, most of SunBelt's Opening Workpaper "Ballast Sections.pdf" is pure window dressing, because SunBelt fails to use nine of the thirteen proposed cross-sections in its evidence. SunBelt's ballast quantity calculations use only the single track cross sections set forth in "Ballast Sections.pdf"; the double track, triple track and single plus siding cross sections are never used.[251]

Because SunBelt's cross sections are unsupported and incorrect, the NS Track Engineering Experts use their calculated cross sections and provide the appropriate supporting documentation.[252] NS's Track Engineering Experts have also corrected SunBelt's flawed

[251] SunBelt Opening WP "Ballast Sections.pdf."

[252] NS Reply WP "Track Construction Reply.xls," Tab 'Track Quantity Calculation," Lines 59 to 93.

approach of using only single track cross sections and used the cross sections appropriate for each specific SBRR track configuration.

ii. Ballast Pricing

SunBelt's ballast cost evidence is also skewed, primarily because it underestimates ballast transportation costs. SunBelt derives its ballast unit price per ton from an average of NS supplier prices. The NS Track Engineering Experts reject this approach. NS Track Engineering Experts prepared a map of the SBRR route, with the NS ballast supplier locations plotted (the "SBRR Ballast Distribution Map").[253] That map shows that many of NS's current suppliers of ballast are a significant distance from the SBRR and, because of prohibitive transportation costs related to distance, could not efficiently supply ballast for the construction of the SBRR. In reality, only the NS suppliers nearest the SBRR are in a position to cost-effectively provide ballast. Further, as the SBRR Ballast Distribution Map indicates, all of NS's current ballast sources are east of the proposed SBRR route and could cost-effectively deliver materials only to the eastern terminus of the SBRR. Because of both physical and logistical barriers, including significant bridges, long duration low level bridges such as the Lake Ponchartrain Bridge near New Orleans, and SunBelt's assumption of seven separate track construction packages, another SBRR construction railhead to receive ballast is needed at Hattiesburg, MS.

The NS Track Engineering Experts determined that three existing NS suppliers located in Columbus, GA, Macon, GA, and Enka, NC could reasonably supply ballast for the SBRR construction. In addition to the NS ballast suppliers, SunBelt's opening workpapers indicate that SunBelt contacted other potential suppliers of ballast, but did not include these potential additional suppliers in determining the average ballast price. Specifically, SunBelt's workpapers

---

[253] See NS Reply Workpaper "SBRR Ballast Distribution Map.pdf."

include several in western Georgia that could also be considered as near enough to the SBRR to be included. Using SunBelt's workpaper list of additional potential suppliers, NS's Track Engineering Experts determined that the Martin Marietta Quarry in Dallas, GA could also supply ballast to the SBRR and added a price quote obtained from that supplier to the calculation of the average SBRR ballast price.

The ballast cost used by the NS Track Engineering Experts in reply is the average of the four suppliers listed below, each of which is located within reasonable transportation distance to the SBRR route:

Vendor	**Quarry Location**	**2011 Cost (per ton)**
Aggregates USA	Macon, GA	$ 9.64
Vulcan Materials Co.	Columbus, GA	$ 9.27
Vulcan Materials Co.	Enka, NC	$ 9.45
Martin Marietta	Dallas, GA	$13.50
Revised average price		$10.47 per ton

iii. Ballast Material Transportation to the SBRR Railheads

To obtain the ballast it purchases from various suppliers, the SBRR would be required to use other railroads to transport the ballast to the SBRR's railheads. From the railheads, the SBRR would transport the ballast to the locations where the ballast is needed. The SBRR would therefore incur two separate kinds of costs: (1) the cost to have third-party railroads transport ballast to the SBRR railheads; and (2) the cost to move ballast from the SBRR railheads to the locations where it would be placed. However, SunBelt's ballast material transportation costs are predicated on an assumption that all ballast would be transported an average of 100 miles at a single flat rate of 0.035 cents per-ton mile. These assumptions are unsupported and unrealistic.

This section addresses the proper calculation of transportation distances. Section III-F-3-b-v. addresses transportation costs.

The SBRR network itself cannot be used for transporting ballast during construction. *See Otter Tail*, STB Docket No. 42071, at D-26 ("We have found that it would not be proper to assume that a SARR could transport materials over the very lines that the SARR would need to build.") Under the SAC construction plans, the SBRR would be built rapidly and simultaneously over a wide geographic range. But there will be gaps in the SBRR network until near the end of construction, both because of the fact that the SBRR is being built in seven separate track construction packages and because construction will involve many time-consuming projects such as long low level bridges like the Lake Pontchartrain Bridge near New Orleans. These lengthy construction projects will render the SBRR route unavailable for on line shipment of materials from suppliers to the construction railheads. Therefore, the lines of the SBRR cannot be used to transport ballast from the source quarries to the construction railheads. The residual NS lines and the lines of other railroads must be used for the delivery of ballast to the SBRR. Construction issues aside, railroads in the real world must pay to transport ballast.[254]

SunBelt recognizes the need for ballast transportation to the railheads, *see* SunBelt Opening III-F-24, but it fails to perform any analysis of the cost of such transportation. Instead, SunBelt arbitrarily assumes an average transportation distance of 100 miles for ballast delivery from the suppliers to the SBRR railheads. Nowhere in the ballast narrative or the supporting workpapers does SunBelt explain how it derived the 100 mile transportation distance. This

---

[254] *See, e.g.* NS Reply WP "Progressive Railroading Ballast Article," *available at* http://www.progressiverailroading.com/csx_transportation/article/Class-I-MOW-Executives-In-Their-Own-Words--13196 (comments of FEC MOW executive that railroad that cannot use its own trains to transport ballast "must pay the going freight rates to and from our ballast source").

unsupported guess is not reliable evidence, and as demonstrated below, it underestimates the average mileage over which the SBRR would need to transport ballast.[255]

The NS Track Engineering Experts conducted a detailed analysis to identify the ballast sources and transportation alternatives to each of the SBRR railheads. The NS Track Engineering Experts then calculated an average transportation distance from these sources to the railheads. This analysis is detailed in NS's Reply workpapers and is described briefly below.[256]

The ballast suppliers listed in the chart at III-F-3-b-ii will supply the SBRR. Transportation from these suppliers will be provided by the residual NS system and from foreign line carriers to reach the SBRR railheads at New Orleans, LA, McIntosh, AL, and Hattiesburg, MS.

Based on the above ballast sourcing assumptions, the NS Track Engineering Experts calculated the average quarry to railhead transportation distance as 349.9 miles, not counting distribution along the SBRR. *See* NS Reply WP "Offline Ballast Shipping.pdf." NS uses this 349.9 mile distance in its calculation of costs for ballast transportation by third parties.

iv. Ballast Material Distribution Along the SBRR Right-of-Way

In addition to the off-SBRR transportation from the source quarries to the construction railheads, ballast needs to be moved along the SBRR lines from the construction railheads to the location in the track where the ballast will be placed. SunBelt provides no separate costs for

---

[255] Having failed to provide any support for its mileage estimate, SunBelt is precluded from doing so on Rebuttal. *See SAC Procedures*, 5 S.T.B. at 445-46; *Xcel*, STB Docket No. 42057, at 2 (served Apr. 4, 2003).

[256] *See* NS Reply WP "SBRR Ballast Distribution Map"; NS Reply WP "Track Construction Reply," Tab "BALLAST REPLY COST" (On SBRR portions of mileage are listed on lines 9 to 16); NS Reply WP "Off Residual NS Ballast Transportation Mileage Maps" and NS Reply WP "Ballast Transportation mileage to SBRR from Quarries.xls"(Off SBRR portions of mileage are broken down in this file).

transportation along the SBRR right-of-way, however, and instead suggests that it obtained a quote for ballast distribution that included on-line transportation. But a review of the quote on which SunBelt relies reveals that it did not include on-line transportation costs.[257] Specifically, in the Track Labor and Equipment section of its Opening Evidence, SunBelt states that it received a quote for track construction labor and equipment costs from Queen City Railroad Construction. SunBelt provided limited workpapers showing some of the details of its quote request. In its request to Queen City for the quote,[258] SunBelt specifies that "[a]ll material will be provided by the owner" *i.e.*, by the SBRR, and that Queen City has responsibility only to "[d]istribute ballast from hoppers or ballast cars." Based on SunBelt's instructions, the quote provided by Queen City assumes that Queen City would have the ballast delivered to it in railroad hoppers or ballast cars *at the point of placement* and that Queen City would be required only to empty the ballast from the car and place it in the track.[259] The quote, by definition, does not include the cost of transporting the ballast from the construction railhead to the point of placement. The NS Track Engineering Experts correct SunBelt's omission and add the cost to transport ballast materials from the construction railheads to where it will be placed in the track.

To determine the ballast transportation cost from the construction railhead to placement in track, the NS Track Engineering Experts looked at the seven rail construction contracts assumed by SunBelt for the SBRR and calculated the average number of route miles assumed to

---

[257] NS Reply WP "Queen Labor Quote Page 4 of 6 Ballast Analysis.pdf."

[258] SunBelt Opening WP "Queen Labor Quote.pdf."

[259] Contractors performing work for large Class I railroads typically are supplied ballast in rail cars to be deposited in the track structure once it arrives at the site. At that point the contractor spots the cars at locations it determines need additional ballast. The contractor then unloads the ballast, directing the train crew to move ahead at speeds that will deposit the ballast in a way that allows the contractor to place it as efficiently as possible. *See* files in NS Reply WP Folder "Ballast Car Pictures" for pictures of ballast trains and cars.

be covered by each contract. Over the 578 route mile SBRR, the seven rail construction contractors will average 82.6 route miles each. *See* NS Reply WP "Track Construction Reply," Tab "BALLAST REPLY COST." NS experts then assumed that ballast would have to be transported an average of 41.3 miles—one-half the distance covered by each contract. *See* NS Reply WP "SBRR Track Construction NS Reply," Tab "BALLAST REPLY COST." Ballast would need to be distributed over this full 82.6 miles—with some transported a short distance and some transported the full distance—but the average distance that ballast materials would have to be transported from the railhead to placement in track is half the 82.6 miles, *i.e.*, 41.3 miles. *See* NS Reply WP "Track Construction Reply," Tab "BALLAST REPLY COST."

At the current size of the SBRR, the total ballast delivery includes the 349.9 miles of off-line delivery plus the on-line delivery of 41.3 miles for a total of 391.2 miles.

v. Material Transportation Cost for Ballast

SunBelt also understates ballast transportation costs by using an estimate of on-line transportation costs to approximate off-line transpiration costs. SunBelt uses a unit price of $0.035 per ton-mile to calculate off-line rail transportation costs, on the grounds that that price was "a transportation charge from *AEPCO.*" SunBelt Opening III-F-24. This claim is seriously misleading, because while the $0.035 per ton mile price is "from" *AEPCO* in the sense that the number appeared in the decision, it was not accepted by the Board as a price for off-line rail transportation. In *AEPCO*, the complainant proposed "an on-line (ANR system) shipping cost of $0.035 per ton mile, and a hardcoded unit price for the off-line transportation costs." *AEPCO 2011*, STB Docket No. 42113, at 99 (emphasis added). While the actual unit price proposed by the complainant for off-line transportation was highly confidential, it is clear that the Board did not accept use of the $0.035 cost for off-line transportation. Indeed, in responding to the defendant's evidence, the decision noted that a $0.035 estimate would be "a conservative cost,"

because it represented "the cost a railroad would charge itself for shipping on its own lines, when the [SARR] would need to ship ballast over other carriers' lines." *Id.* at 100. It is also worth noting that the $0.035 per ton mile transportation cost is outdated—it is based upon a 1994 price first used by the Board in *Arizona Public Service Co. v. Atchison, Topeka & Santa Fe Railway Co.* Because it reflects cost to move railroad materials over its own lines and because it is from 15 years ago, the $0.035 per ton mile transportation cost is certainly not a reliable estimate of the SBRR's off-line ballast transportation costs. SunBelt provided no evidence of current costs for transporting ballast on NS or on third party railroads, and accordingly may not do so on Rebuttal. *See SAC Procedures*, 5 S.T.B. at 445-46.

Because its rail lines have not been built, materials assumed to move by rail have to be transported from the source to the construction railheads using third party (i.e., not SBRR) rail service over either the residual NS or another carrier. *See Otter Tail*, STB Docket No. 42071, at D-26 ("We have found that it would not be proper to assume that a SARR could transport materials over the very lines that the SARR would need to build."). To determine the actual cost that the SBRR would incur shipping its ballast on the lines of the residual NS and over the lines of other carriers, the NS Track Engineering Experts contacted aggregates supplier Vulcan Materials Company to obtain the rate for transporting ballast materials. *See* NS Reply WP "Scanned Vulcan Transportation Information.pdf." Based on the price per ton and length of haul provided by Vulcan for shipping a carload of ballast, NS engineers determined that the per-car cost for transporting ballast in a 100-ton open-top hopper car is $0.074 per ton mile indexed to 2011 levels. *See* NS Reply WP "SBRR Track Construction NS Reply," Tab "BALLAST REPLY COST."

For the portion of the ballast transportation from the railhead to the placement in track, which would be accomplished by moving carloads of ballast over the unfinished SBRR track structure, the NS Track Engineering Experts adopt SunBelt's $0.035 per ton-mile. This results in a weighted average price per-ton mile of $$0.070 per ton-mile applied to the total ballast transportation distance of 391.2 miles.[260]

vi. Subballast

(a) Subballast Quantities

SunBelt specifies a subballast section of 6" on all mainlines, single and multiple tracks, 4" on yard tracks and 4" on set out tracks. The NS Track Engineering Experts accept these assumptions. SunBelt assumes further that subballast consists of similar parent materials crushed to provide a well-graded, dense layer of crushed rock similar to road base material and that it would be supplied from the same locations as the ballast. As explained in more detail below, the NS Track Engineering Experts accept SunBelt's general specifications for subballast but reject SunBelt's assertion that subballast will only be sourced from the same locations as those supplying ballast, because that assumption is inconsistent with the need to deliver subballast by truck.

As with ballast, SunBelt developed subballast area cross sections. It provided a pdf of proposed cross-sections but did not provide any of the inputs or the calculation programs themselves. *See* SunBelt Opening WP "Typical Sub-ballast.pdf." The NS Track Engineering Experts again ran SunBelt's proposed subballast specifications through Microstation and determined that for mainline single, double, and triple track its results matched closely to those provided by SunBelt. The NS Track Engineering Experts therefore accept SunBelt's calculated

[260] *See* NS Reply WP "Track Construction Reply," Tab "BALLAST REPLY COST," Lines 32 to 36.

subballast cross sections for mainline track. For yard and other siding track, even though SunBelt's narrative specifies a four inch subballast section, its work papers compute the cross section area based on a six inch depth. Because it accepts the subballast cross section specified by SunBelt for yard and siding tracks of four inches, NS corrects SunBelt's error and computes the SBRR subballast cross section area as 7.83 square feet based on that standard and uses the results in its reply.[261]

Also similar to its approach on ballast, SunBelt explains that it uses the standard conversion factor of 1.5 tons per cubic yard to convert subballast area cross sections into tons, yet its work papers use an adjustment factor of 100 pounds per cubic foot, which converts to only 1.35 tons per cubic yard.[262] The NS Track Engineering Experts correct SunBelt's work papers to match is stated assumption of 1.5 tons per cubic yard. *See* NS Reply WP "Track Construction Reply," Tab "Track Quantity Calculator," Lines 98 to 109.

(b) Subballast Material Costs

SunBelt relies solely on the Trestle Hollow Project for its unit price of subballast. SunBelt asserts that this unit price includes both the cost of transportation and placement in the roadbed. *See* SunBelt Opening III-F-24. As discussed previously, SunBelt's Trestle Hollow Project unit prices are unsupported and generally untethered to the lump sum contract bid quote. *See Supra* III-F-2-a. The NS Track Engineering Experts reject SunBelt's proposed unit costs. As detailed below, the NS Track Engineering Experts have developed subballast material and transportation costs from third party quotes.

---

[261] *See* NS Reply WP "SBRR Track Construction NS Reply," Tab "Track Quantity Calculation" at cell M99.

[262] *See* explanation of this calculation error above at Section III-F-3-b-i.

To determine subballast unit prices that reflect the prices the SBRR would actually be required to pay, the NS Track Engineering Experts identified suppliers from various locations along the proposed SBRR route and obtained both material and transportation price quotations from each supplier. *See* NS Reply WP "Sampling of Subballast Pricing.pdf." The NS Track Engineering Experts used an assumed 40 mile average delivery distance, which would allow for there to be a potential approved supplier every 160 miles along the SBRR.[263] The average SBRR price for subballast material and transportation is $24.47. *See* NS Reply WP "SBRR Track Construction NS Reply," Tab "SUBBALLAST REPLY COST," Cell F25.

SunBelt assumes that the SBRR's subballast would be supplied by the same quarries supplying ballast to the SBRR. Although this is a reasonable assumption in theory, the quarries supplying ballast cannot supply subballast because they are too far from the SBRR route to economically truck those materials and it is not practical to transport subballast by rail. Moving subballast by rail means that the contractor would have to offload the subballast at the SBRR railhead site and then reload it into trucks to deliver for placement on the subgrade. This transload process is neither efficient nor cost-effective, in part because subballast is a prepared material that can be degraded by excessive handling. Moreover, rail transportation itself can degrade subballast quality. For example, long transit distances in rail hopper cars exposed to rain can cause the subballast to compact inside the car due to vibrations in transit. When this occurs, the materials have to be "re-excavated" out of the cars. When subballast materials become excessively degraded and out of specification because of excessive handling, the

[263] NS's Engineering Experts used a 40 mile average distance to allow for the practical use of trucks making 4 round trips in an average 8 hour day. If trucks average 40 mph and take little time to actually dump at the spreader box they can make around 4 trips per day. This assumption is based on NS's Engineers' experience with maximum haul distances in the road and railroad construction industry.

supplier or contractor must re-blend the material before use on the roadbed. *See* NS Reply WP "Scanned AREMA Subballast Segregation, Degradation Sections.pdf" and "Scanned INDOT Certified Aggregate Technician Manual Excerpts.pdf".

In a typical placement of subballast, the prepared subballast aggregate is delivered to the project by trucks that dump the material directly into a spreader box that delivers a uniform layer of uncompacted subballast to the roadbed. Immediately after placement the material is compacted, and water added if necessary to obtain the specified compaction. Final shaping is completed and the top of the subballast finish rolled to seal out water. To obtain final acceptance the materials must be placed with limited handling.

In short, subballast materials need to be delivered to the installation location by truck in order to ensure product quality and to reduce costs. The scope of the SBRR means that there needs to be a wide range of subballast suppliers within reasonably close proximity to the SBRR roadbed. Because subballast is similar to the crushed stone used for highway road base material, NS's Engineering Experts assumed that suitable subballast suppliers will be available along the SBRR route.

(c) Subballast Material Placement Costs

Once the subballast materials are received at the construction railheads they must be transported by truck over the finished roadbed and then dumped, shaped and compacted. The SBRR track labor quote from Queen City does not provide for such transportation and other services,[264] so the NS Track Engineering Experts developed the required costs from Means.

For the subballast depth of 6," the R.S. Means costing for the typical stone base placement is found in Section 32 11 23.23 2021. Included is a crew B-36 for placement of the

[264] *See supra* at III-F-3-b-iv.

materials at 815 tons per day.[265] Since the material is being priced separately the bare costs for labor and equipment plus overhead and profit to transport, dump, shape, and compact the subballast based on a square yard measure is computed as follows:

2011 R.S. Means labor and equipment for 32 11 23.23 2021 per Ton would be[266]:

Labor	$1.92
Equipment	$1.61
O & P	$0.40
Total	$3.93 per Ton

c. Ties

Crossties for the SBRR are described on III-F-24 of SunBelt's Opening Evidence as Grade 5 wood ties spaced at 20.5 inches apart for all main track, passing sidings, and branch lines consistent with the railroad industry for mainline tracks. For yard and set-out tracks, the SBRR engineers used a spacing of 24 inches. The NS Track Engineering Experts accept SunBelt's proposed tie type and spacing. Using the AREMA Guidelines, the subgrade pressures were verified for the various rail and tie combinations and found acceptable in the use of 136# and 115# rail for the maximum mainline and yard and siding speeds specified by SunBelt for the SBRR.

SunBelt's calculated weights for crossties are unsupported and incorrect. SunBelt's Opening Workpaper "Track Construction Costs.xls" uses 223.125 pounds for the weight of a single crosstie. SunBelt provided no workpaper support or reference for this estimated weight. The NS Track Engineering Experts contacted the Railroad Tie Association ("RTA") to develop

[265] See NS Reply WP "2011 RS Means Base placement.pdf."

[266] See NS Reply WP "SBRR Track Construction NS Reply.xlsx," Tab "SUBBALLAST REPLY COST."

information on tie weights. The RTA "Tie Guide" indicates that the untreated weight of a hardwood crosstie is 218 pounds—before accounting for creosote treatment and moisture content. *See* NS Reply Workpaper "RTA Tie Material Properties.pdf." The head of the RTA indicated that creosote treatment and average moisture content respectively would add approximately 25 and 12.5 pounds to the tie weight, which means that the average weight per crosstie would be 255.5 pounds. *See* NS Reply Workpaper "RTA Tie Information.pdf." The NS Track Engineering Experts used this weight when calculating transportation costs.

SunBelt's unit costs for crossties were based on a quote from Tangent Rail as the supplier with transportation costs added using an average assumed distance of 430.9 miles to the railheads at $0.035 per ton-mile. While SunBelt's methodology is acceptable at the conceptual level, it made three critical errors, one relating to unit price, one to estimating the transportation miles, and one to shipment costs.

First, within the "Ties" tab of SunBelt's Opening Workpaper "Track Construction Costs.xls," the item for Tangent Rail's tie cost shows a price that does not correspond with the quote provided in SunBelt's workpapers. SunBelt's summary spreadsheet claims a "Tangent Rail June 2009 Quote" of $40.00 per tie,[267] but the Tangent Rail price quote in SunBelt's workpapers is a Tangent Rail June 8, 2010 quotation of $44.50 per tie.[268] SunBelt's workpapers do contain a "Missouri_Tie_Quote(1)" file indicating a $40.00 price per tie, but it provides no information as to the source of this number. It derives from a spreadsheet with no company logo, no information as to who prepared it, and no identification save for the ambiguous

[267] *See* SunBelt Opening WP "Track Construction Costs.xls."

[268] *See* SunBelt Opening WP "Tangent Tie Quote.pdf."

"Missouri_Tie_Quote(1)" file name.[269] Accordingly, SunBelt's proffered cost is inadequately supported, and must be rejected. SunBelt may not provide additional evidence in its rebuttal to attempt to shore up its deficient case-in-chief. *See SAC Procedures,* 5 S.T.B. at 445-46. Correcting the Tangent Rail price quote to $44.50 and indexing it forward to third quarter of 2011 results in $47.98 a higher unit price than the next lowest tie price quote in SunBelt's workpapers, a price of $41.89 each from a June 1, 2009 quote from McCord Tie and Timber which converts to $45.17 at 2011 levels.[270] Following SunBelt's approach to selecting the lower available bid price for the SBRR, NS's Engineering Experts based the SBRR reply tie unit price on the McCord Tie and Timber quote indexed to 2011 levels.

Second, SunBelt computes average transportation distances from four potential tie suppliers to various SBRR locations, but then picks the tie price from a single supplier. SunBelt includes in its workpapers an average 430.9 transportation mileages from the various crosstie producers to the SBRR in its track costing workpaper.[271] The mileages used to develop the averages are hardcoded into the spreadsheet and otherwise unsupported. The NS Track Engineering Experts include the appropriate calculations in NS Reply WP "Track Construction Reply.xls," Tab "Mileage Matrix for Supplier," Cell H9.[272]

Lastly, SunBelt's use of a $0.035/ton-mile proxy for crosstie transportation costs is unreasonable for the reasons detailed in the discussion of ballast material transportation cost. *See* III-F-3-b-v. Crosstie transportation requires the use of specialized railcars. The NS Track

---

[269] *See* SunBelt Opening WP "Missouri Tie Quote.xls."

[270] *See* NS Reply WP "Track Construction Reply.xls," Tab "Ties Running," Line 15.

[271] *See* SunBelt Opening WP "Track Construction Costs xls," Tab "Mileage Matrix for Supplier," Cell G14.

[272] See NS Reply WP "SBRR Falkville AL to Railheads on Non SBRR Routes.pdf."

Engineering Experts calculated the cost of crosstie transportation by obtaining a quote from McCord Tie and Timber of $6,000 per car for a 590-mile delivery of crossties in 61' Center Beam gondola cars with a maximum load of 840 crossties per car. *See* NS Reply Workpaper "McCord Timber and Tie Transportation Information.pdf." After indexing this cost to the third quarter of 2011, the NS Track Engineering Experts calculated the cost of crosstie shipping to be $0.0902 per ton/mile. *See* NS Reply WP "Track Construction Reply.xls," Tab "Ties Running," Cell H19.

d. Rail

i. Main Line and Yards and Siding

SunBelt proposed rail sections for the SBRR are 136-pound Continuous Welded Rail ("CWR") for most of the main tracks and passing sidings (20 Million Gross Ton ("MGT")/year or greater), with premium rail used on curves 3 degrees or greater. On light density portions of the SBRR (less than 20 MGT/year), SunBelt proposes to use new 115-pound CWR. In yards and for helper and set out tracks SunBelt proposes to use 115-pound CWR. NS accepts these specifications.

ii. Rail Pricing

SunBelt obtained rail price quotes from various rail suppliers and from the NS 2010 R-1 Report. To develop its rail price, SunBelt chose a cost of $889 per ton derived from NS's 2010 R-1 and indexed to third quarter 2011 as the lowest-priced option.[273] But in doing so, SunBelt overlooked a key distinction between the rail cost reflected in NS's R-1 and the rail costs that the SBRR would receive: namely, the R-1 cost does not include any transportation costs for haulage

[273] The 2011 NS R-1 Report, Schedule 724 did not include any 136# new rail (only reflected 136# relay rail). Sunbelt used 2010 NS R-1, which included new 136# rail purchases and indexed that amount to 3Q 2011. *See generally,* NW Reply WP "2011 R-1 Schedule 724.pdf."

over NS's own lines. Schedule 724 of the R-1 plainly instructs that "[t]he cost of unloading, hauling over carrier's own lines, and placing the rails in tracks and of train service in connection with the distribution of the rail should not be included in this schedule." NS 2010 R-1 at 89. NS obtains substantial amounts of rail from suppliers located on and near its lines, and the average rail costs reported on Schedule 724 of its R-1 do not include any of the costs of transporting that rail over the NS system, despite the fact that the Board has repeatedly recognized that a SARR must pay to transport rail. *See, e.g.*, *AEPCO 2011*, STB Docket No. 42113, at 104-05. Therefore NS accepts SunBelt's use of an $889 per ton unit price for rail, but adds a cost for transporting rail from the manufacturer to the railheads. *See* NS Reply WP "SBRR Track Construction NS Reply.xls," Tab "RAIL REPLY COSTS."

The SBRR will not have tracks over which rail could be transported during the construction phase, and it would have to pay an additional cost to transport rail from the supplier to the construction railheads. *See Otter Tail*, STB Docket No. 42071, at D-26 ("We have found that it would not be proper to assume that a SARR could transport materials over the very lines that the SARR would need to build."). In *AEPCO 2011*, the Board rejected the complainant's transportation plan for rail for failing to provide a plan on Opening that accounts for this limitation, and the Board should similarly reject SunBelt's transportation "plan" for rail here. *See AEPCO 2011*, STB Docket No. 42113, at 104-05 (rejecting complainant's transportation plan for rail and rejecting complainant's new evidence presented on rebuttal).

SunBelt includes a small cost for rail transportation, but it is hopelessly understated. Specifically, SunBelt proposes that the SBRR would source all its rail from the Steelton, PA rail manufacture, just south of Harrisburg, PA. The plant location is serviced by the Steelton and Highspire Railroad. The Steelton and Highspire Railroad connects with the NS system in

Harrisburg, PA, 3.9 miles north of the Steelton plant. SunBelt, however, failed to include any distance for transportation of rail in its estimate. It included neither the acknowledged 3.9 miles from Steelton to the NS line nor the cost of transporting rail to the many distant SBRR railheads using the residual NS. The NS Track Engineering Experts calculated mileage to ship the rail using the residual NS and foreign carriers. *See* NS Reply WP "SBRR Steelton PA to Railheads on Non SBRR Routes.pdf." (As explained, the SBRR itself would not be available for shipping the rail during construction).

SunBelt's proposed transportation cost per mile is unsupported and unreliable. SunBelt uses a cost of $0.035 per ton-mile, but provides no backup or support for that figure. Instead, SunBelt's only justification for using it is a claim that it was "based on a transportation charge from *AEPCO*." SunBelt Opening III-F-24. As explained in Section III-F-3-b-v, this claim is completely unfounded.

The NS Track Engineering Experts obtained a quote for rail delivery from L.B. Foster, a major rail supplier, for full trains of CWR. L.B. Foster quoted a price of $5,067 per car (plus a fuel surcharge of $0.41/car mile) for fully loaded 30-car rail trains carrying 80,000 linear feet of 136-pound rail. *See* NS Reply WP "Rail Transportation Memo to File.pdf." After adjusting this quote to the third quarter of 2011, the additional transportation cost for rail amounts to $8.24 per track foot. *See* NS Reply WP "SBRR Track Construction NS Reply.xls," Tab "RAIL REPLY COSTS," Cell B34.

iii. Rail Unloading Costs

SunBelt's rail unloading costs are flawed because they omit the cost of locomotives and crews to operate rail trains. The SBRR would need specially outfitted road trains to deliver the rail from the supplier to the railhead. An example of one of these trains is depicted below.

Table III-F-17
Specially Outfitted Road Trains



Continous Welded Rail Train

The SBRR's road train crews would operate the train from the railhead to the contractors work area as in any general freight movement. Once the train arrives at the contractor's site for unloading, the SBRR contractor will provide the labor and equipment to attach a cable to the end of the strand of continuous welded rail ("CWR") and pull the rail onto the prepared roadbed ahead of the rail delivery train. The train must stop at each quarter mile point for the contractor

to skeletonize the track sufficiently to slowly advance the rail train to the next quarter mile point. The process will be repeated until all rail strands are removed from the rail train.

Although SunBelt's rail construction labor contractor includes a line item for unloading in its quote,[274] it does not include the cost of the rail train locomotives and the crew. Using SunBelt's proposed schedule of building one-half mile of track per day, the rail train would advance at the same pace. Should any other materials need to be delivered to the construction area, the rail train would have to move to a siding and allow other equipment to pass. Therefore the train must be fully crewed at all times in anticipation of such a movement.

The NS Track Engineering Experts determined the cost of a rail train and crew as follows. A rail train carrying fifty-five 1,440 foot strings of CWR contains approximately 40,000 track feet, or 7.58 track miles, of rail. Accepting SunBelt's assumed track construction rate of 0.5 miles per day, it will take 15 days to unload a rail train at the rail head, or 2.5 weeks working six days a week. Assuming that a rail train can complete a cycle from the railhead to the welding plant for reloading and return to the rail head in two weeks, it will take one rail train approximately one month to complete a cycle. The NS Track Engineering Experts obtained a third-party quote to rent a 30 car rail train for $27,000 per month plus a daily cost of $1,700 after delivery to the unloading location, with five free days for unloading. *See* NS Reply WP "Holland Rail Welding Proposal." This gives a cost per track foot for use of a rail train of $0.74 per track foot for monthly train rental and a cost per track foot of $0.46 for unloading days. The combined cost for rental of a rail train for transport and unloading is $1.20 per track foot. *See* NS Reply WP "SBRR Track Construction NS Reply.xls," Tab "RAIL REPLY COSTS," Cells B48 and B70.

---

[274] *See* NS Reply WP "Queen_Labor_Quote page 4 of 6.pdf."

Once the rail is delivered to the railhead by a road crew, a work train crew would assume operation of the train for the duration of the unloading. The NS Track Engineering Experts used documents made available to SunBelt in discovery to determine a cost for work train service including crew costs, fuel, and equipment rental that amounts to $0.96 per track-foot.[275] *See* NS Reply WP "SBRR Track Construction NS Reply.xls," Tab "RAIL REPLY COSTS," Cell B57.

In total, therefore, the additional cost per track-foot for handling of the rail from the welding plant through unloading at the rail head is $2.16.

iv. Field Welds

SunBelt understates the number of field welds required for the SBRR by only counting the welds needed to weld together 1,440 foot rail sections, 18 welds per panel turnout, and 4 welds per grade crossing. Field welds are also required for other track construction related activities including cutting in road crossings (included above), insulated joints, diamond crossings, and turnouts, and the final assembly of the individual panels that make up the completed panelized turnouts (included above). The NS Track Engineering Experts have computed the number of field welds by counting a field weld at the end of each rail strand, plus a set amount for each track item that must be assembled or cut into the track. NS's inventory count is set forth in NS Reply WP "Track Construction Reply.xls," Tab "Summary," Cells D24 to D28.

The NS Track Engineering Experts accept SunBelt's field weld unit price.

[275] *See* NS Reply WP "CSXT AFE Work Train Labor Line 606.pdf."

v. Insulated Joints

Consistent with the approach used by SunBelt, the NS reply discussion of insulated joints is included in the signals and communications portions of the reply narrative. *See* III-F-6-a-iii *infra*.

e. Switches

The NS Track Engineering Experts generally accept SunBelt's approach to switches (*i.e.*, turnouts). SunBelt based its estimated costs for turnout installation along the SBRR on quotes from various suppliers and contractors, as shown in SunBelt's opening workpaper "Track Construction Costs.xls." SunBelt includes all the required cost elements for turnouts, namely materials cost, delivery charges, and installation labor,[276] but makes several mistakes in its calculation of these elements for individual turnouts, primarily in connection with SunBelt's calculations of shipment costs. NS describes these errors and its corrections below.

At the outset, all the turnout deliveries must be by rail, because SunBelt posits that the SBRR will be purchasing panelized turnouts. SunBelt's labor installation cost is based on a quote by Queen City Railroad Construction for labor to install "[p]aneled" turnouts. *See* SunBelt Opening WP "Queen Turnout Quote.pdf" (including "Paneled and no switch machines" notation with quote for installing turnouts). Panelized turnouts cannot be shipped by truck, but must be loaded onto special rail cars and shipped to the SBRR by rail. *See* http://www.akrailroad.com/panelized-track (noting that panelized turnouts are shipped in custom panel cars). Indeed, a panelized turnout is too large to be transported any other way, as is shown in the following photograph.

---

[276] For each turnout the geotextile underlayment is included. Geotextile costs are discussed above in Section III-F-3-a.

Table II-F-18
Panelized Turnout



First, NS corrects transportation costs to incorporate the proper shipping weights of the panelized turnouts. SunBelt lists shipment weights in its "Track Construction Costs.xls" workpaper, but neither there nor anywhere else in its workpapers does it provide any support for these shipment weights. Nor do SunBelt's SBRR turnout standard drawings contain any reference to the weight of the turnouts. NS's Engineering Experts developed shipment weights for each of the SBRR's turnouts by consulting publicly available UP/BNSF turnout standards, which contain panel weights for various turnouts. *See* NS Reply WP "UP_BNSF Turnout Common Standards for Turnouts.pdf."[277] Because the UP/BNSF Common Standards only

[277] *See* http://www.uprr.com/aboutup/operations/specs/attachments/amended/turnouts_std.pdf.

include panel weights for No. 9, No. 11, and No. 15 turnouts, NS's Track Engineering Experts made the following adjustments to calculate panel weights for each of the SBRR turnouts:

- **SBRR No. 10 Turnout.** The average weights of a No. 9 and No. 11 turnout were used to replicate the SBRR No. 10 turnout for shipping purposes only.

- **SBRR No. 14 Turnout.** The 51.84 ton turnout weight for No. 15 turnouts was used, with a proportional reduction in shipping weight to account for the shorter No. 14 turnout. This reduction lowered the shipping weight for No. 14 turnouts to 49.75 tons.

- **SBRR No. 20 Turnout.** The 51.84 ton turnout weight for No. 15 turnouts was used, with a proportional increase in shipping weight for the fact that No. 20 turnouts are approximately 61 feet longer than No. 15 turnouts. This increase resulted in a shipping weight for No. 20 turnouts of 71.44 tons.

In addition, because switch stands are not included in the panelized turnout weights on the BNSF/UP combined standards,[278] an additional 500 lbs. per stand has been added to account for shipping the stands with the panel turnouts. A summary of shipping weights follows:

Table III-F-19
Turnout Shipping Weight by Turnout Size (in tons)

Turnout type	Shipping Weight	Shipping Weight With Stand
#10 Turnout	39.13	39.38
#14 Turnout	49.75	50.00
#20 Turnout	71.44	71.69

NS corrects the transportation costs for turnouts, which SunBelt once again based on an outdated $0.035/ton-mile proxy for which it provided no documentary support. The NS Track Engineering Experts obtained a quote from A&K Railroad Materials for delivery of panelized turnouts in gondola cars for $4,000 per car for a 500 mile delivery. *See* NS Reply WP "AK

[278] *See* http://www.uprr.com/aboutup/operations/specs/attachments/amended/turnouts_std.pdf.

Turnout Transportation.pdf." Indexing these costs to the third quarter of 2011 produced a cost per ton-mile of $0.084.[279]

Second, NS corrects transportation distances from the turnout plant in Decoursey, KY to the SBRR railheads using non-SBRR routes.[280] *See* III-F-3-b-iii *supra*.

NS accepts SunBelt's other turnout construction costs, including its costs for switch heaters.

f. Other

i. Rail Lubricators

SunBelt's evidence of the number and cost of rail lubricators is flawed in several respects. First, SunBelt's experts underestimated the quantities of rail lubricators needed by the SBRR. SunBelt's experts claim to have placed rail lubricators "as warranted by track conditions," SunBelt Opening III-F-26, but their workpapers are devoid of any evidence that SunBelt considered specific track conditions and operating needs when placing rail lubricators. On the contrary, SunBelt's workpapers reveal that its rail lubricator quantities are predicated entirely on an arbitrary metric of one lubricator for every 20 route miles. This metric is unsupported by any evidence and is untethered to the real-world needs of the SBRR, and it should be rejected. NS's Track Engineering Experts developed rail lubricator quantities for the SBRR by considering specific track conditions and the placement of lubricators on the NS lines

[279] *See* NS Reply WP "SBRR Track Construction NS Reply.xls," Tab "No. 20 Turnouts," Cells F24 to G33.

[280] See NS Reply WP "SBRR Decoursey KY to Railheads on Non SBRR Routes.pdf."

replicated by the SBRR.[281] NS's rail lubricator count is set forth in NS Reply WP "Track Construction Reply.xls," Tab "Lubricators – Reply."

Second, SunBelt's proposed unit price for rail lubricators and drum pumps omits the cost of transportation. NS accepts SunBelt's proposed lubricator cost (which is based on a June 17, 2009 quote from L.B. Foster), but that quote is for the rail lubricators and drums to be shipped FOB from the L.B. Foster facility in Niles, OH. The quote therefore does not include the cost of shipping lubricators and drum pumps to the various railheads of the SBRR. The NS Track Engineering Experts determined that the rail lubricators and drum pumps would be shipped by truck to the various railheads, and calculated an average highway mileage to the SBRR railheads of 929.9 miles. Shipping costs were determined through UPS pricing, considering the combined shipping weight of 285 Lbs. *See* NS WP "Scanned lubricator shipping costs.pdf" and "Scanned Rail Lubricator weight memo.pdf." The total delivery cost adjusted to 3Q11 is $240.59 for each lubricator.

Third, a protective mat must be added to the cost of the rail lubricator in order to protect the ballast in the area of the rail lubricator. This protective mat allows any rail lubricant that is thrown off the train wheel to be captured before it can contaminate the ballast section.[282] Protective mats include three sections: one for the area between the rails, and two field side pieces. Because many of the lubricators will be located at remote sites, the NS Track

---

[281] See NS Reply WP "Pertinent Scanned track charts with lubricators marked.pdf" and "Scanned SBRR Exhibits with rail lubricators marked.pdf."

[282] According to NS's Track Engineering Experts, if grease is not captured and contained, it falls into the ballast section and fills the voids in the ballast with both the grease and whatever sticks to the grease. This blocks the ballast from drainage water, allowing it to be trapped in the ballast section which requires cleaning or extra maintenance to hold proper surface and alignment. This would create a future maintenance problem and hazardous working conditions as this grease would get everywhere, causing slip and trip hazard. It also would require environmental cleanup and accompanying costs.

Engineering Experts selected a large absorbent capacity mat to minimize maintenance costs. The total cost per lubricator location for the necessary mats plus shipping is $636.75. *See* NS Reply WP "Scanned Lubricator mat prices and shipping weights.pdf." Supporting calculations are set forth in NS's workpapers.

Finally, SunBelt neglected to include labor costs for installation of the rail lubricator and the initial track mat protection required during the construction of the SBRR. The NS Track Engineering Experts estimated that each lubricator and accompanying mats could be installed in four hours. Using 2011 R.S. Means Crew B-14 costs for installation of a car bumper as a reasonable proxy for lubricator installation costs, the total installation costs for a rail lubricator, drum pump, and track mat is $1,030.

The total costs for rail lubricators, including transportation, protective mats, and installation costs is therefore approximately $654,000, compared to the SBRR's assumption of approximately $184,000.

ii. Plates Spikes and Anchors

NS accepts SunBelt's basic specifications and unit costs for other track materials including plates, spikes, and anchors. But once again SunBelt has miscalculated transportation costs for these track materials, both by misstating the transportation distances and using an unsupported transportation cost.

First, SunBelt ignores the need for materials transportation from the railhead to the actual construction locations. The NS Track Engineering Experts calculated the average on-SBRR

shipping distance for other track materials and added this distance to the off-SBRR distances to obtain a total transportation distance.[283]

Second, SunBelt once again uses an unsupported $0.035/ton-mile shipping cost for other track materials. For the reasons described above at III-F-3-b-v, this unsupported number is not a reasonable proxy for transportation costs. The NS Track Engineering Experts have obtained a real-world estimate of other track material delivery costs that amounts to $0.934 per ton-mile, and assumes that the SBRR would use highly efficient bulk loading in 100-ton gondola cars. *See* NS Reply WP "Scanned OTM Transportation calculation.pdf." The NS Track Engineering Experts used this price to calculate transportation costs for other track materials.

iii. Derails and Wheel Stops

(a) Derails

SunBelt's evidence of derails for the SBRR contains several errors. First, SunBelt has not proposed an adequate derail for main line tracks. SunBelt proposes to use Aldon One-Way Retractable Derails with a tall switch stand with a target for all main line and yard derails. But this retractable derail is not designed to operate on main line tracks. Indeed, the Aldon Company website warns that this derail is only to be used in areas where "cars and locomotives [are] operating at SLOW SWITCHING SPEEDS." NS Reply WP "Aldon Derail Caution" ("CAUTION: Install derails on exposed rail track only. Derails are designed for cars and locomotives operating at SLOW SWITCHING SPEEDS."). The speed of an errant car or locomotive can easily dislodge or jump over the type of derail proposed by the SBRR, and it therefore cannot be used on SBRR main lines.

---

[283] *See* NS Reply WP "Track Construction Reply," Tab "Mileage Matrix for Supplier," Lines 6 and 7; NS Reply WP "SBRR Lancaster SC to Railheads on Non SBRR Routes.pdf"; NS Reply WP "SBRR Newport AR to Railheads on Non SBRR Routes.pdf."

Double switch point derails are required in order to properly protect the mainline track from cars rolling onto the mainline. These double switch point derails are used along the NS track being replicated by SBRR. *See* NS Reply WP "Scanned Double Switch Point Derail MP 162.2 AGS.pdf"(photograph of double switch point derail near Birmingham, AL). As can be seen in NS Reply workpaper "NS Double Switchpoint Derail detail.pdf" the switch points actually direct the wayward car or locomotive away from the mainline.

The NS Track Engineering Experts accept SunBelt's proposed retractable derail for SBRR yard locations, and its proposed unit price. For mainline locations, however, the NS Track Engineering Experts have substituted the double switch point derail.[284] The NS Track Engineering Experts developed a cost for double switch point derails from SunBelt's own evidence—specifically a June 4, 2010, quote from Progress Rail Services for Double Switch Point Derails that SunBelt included in its evidence.[285] The Progress quote was for Double Switch Point Derails at $15,000 each, fully panelized. This quote is a reasonable starting point, but it does not include (1) the switch stand or switch box for the derails; (2) installation costs; or (3) transportation costs.

First, the Progress quote does not include the switch stand necessary for this type of derail, a 51A Switch Stand with rod and bow handle. *See* NS Reply WP "NS-DP-HC-038536-38537 Switch Stand 51A Cost.pdf." NS plan showing details for the double switch point derail. NS produced information to SunBelt in discovery about its own costs for switch stands, and those costs were used by NS's Track Engineering Experts. *See* NS Reply WP "090876 (NS-DP-

[284] NS's Engineering Experts also have increased the number of derails to reflect the track configuration set forth in section III-B.

[285] SunBelt Opening WP "Progress Rail Quote.xlsx" located in subfolder III-F-3-f.

HC-38401 to 38402).pdf" also produced in discovery. Adding the switch stand cost to the Progress rail price and indexing to 3Q11 produces a total materials cost of $14,302.

Second, for installation the NS Track Engineering Experts developed a prorated price from the $23,599 Queen City Railroad Construction labor quote used by SunBelt for turnout installation. Double point switch derails are 34% as long as turnouts (40 feet vs. 117 feet), and the relative panel length is a reasonable proxy for installation costs. Multiplying the turnout installation cost by 34% produces a labor quote for double switch point derails of $8,068.

Finally, transportation for the panelized double switch point derail would need to be added from the Progress Rail yard at Decoursey, KY to each of the railheads along the SBRR. The transportation weight for double point switch derails reasonably approximates to the shipping weight found for Panel Number 1 on the BNSF/UPRR Common Standards for a No. 11 Turnout, for similar lengths and materials produce similar shipping weights. The shipping weight for this panel is 20,000 pounds, and the cost is $0.084 per ton-mile.[286]

(b) Wheel Stops

The NS Track Engineering Experts accept SunBelt's unit costs for wheel stops. NS makes changes to the quantities of wheel stops consistent with the additional track set forth in Section III-B, and adds wheel stops at the end of set-out tracks where SunBelt neglected to include them.

iv. Crossing Diamonds

SunBelt appears to have entirely ignored the need for hard rail crossings, or diamonds, in the construction of the SBRR. By failing to include necessary at grade cross-over structures along the SBRR alignment, SunBelt's proposed network would prevent existing opposing non-

[286] *See* NS Reply WP "Track Construction Reply.xls."

SBRR railroad traffic from crossing SBRR's lines. This is plainly unreasonable, particularly for a network that intersects with other carriers as frequently as the SBRR's network does.[287] To correct SunBelt's error, NS's Track Engineering Experts developed an inventory of required crossing diamonds and reasonable least-cost prices for those diamonds.

NS's Track Engineering Experts compiled a list of all at grade rail crossings (diamond crossings and slip switches) along the NS lines replicated by the proposed SBRR alignment that are necessary for SBRR system operation. *See* NS Reply WP "SBRR Crossing Diamonds NS Reply.xls." NS's Engineering Experts categorized these diamond crossings into eight types based on American Railway Engineering and Maintenance-of-Way Association (AREMA) 2004 Portfolio of Trackwork Plans geometric crossing plan numbers 700F through 700J. The nine diamond crossing types categorized were determined by interior angles of the structures. The SBRR proposed alignment will require:

- 8 diamond crossings with interior angles between 90 to 60 degrees;
- 1 diamond crossing with interior angles between 60 to 50 degrees;
- 6 diamond crossings with interior angles between 50 to 40 degrees;
- 1 diamond crossing with interior angles between 40 to 35 degrees;
- 3 diamond crossings with interior angles between 35 to 25 degrees;
- 1 diamond crossing with interior angles between 14 to 11 degrees;
- 3 diamond crossings with interior angles between 11 to 9 degrees; and
- 5 crossings with interior angles less than 9 degrees.[288]

---

[287] Having failed to provide any evidence of crossing diamond costs on Opening, SunBelt is precluded from doing so on Rebuttal. *See SAC Procedures*, 5 S.T.B. at 445-46; *Xcel*, STB Docket No. 42057, at 2 (served Apr. 4, 2003).

[288] *See* NS Reply WP "NS Reply Crossing Diamonds1.xls," Tab "Construction Output."

Crossings required with angles of nine degrees or less will require a double switch slip per AREMA 2004 Portfolio of Trackwork Plan Number: 814-02.

Material costs per diamond crossing were determined from original NS order cost data and industry vendor estimates. In order to investigate cost estimates for the wide variety of crossings required in the SBRR system, an analysis was performed to determine the average angle of crossing for all eight AREMA diamond types listed above. The simple analysis resulted in eight different diamond crossing angle samples, 82 degree, 58 degree, 44 degree, 39 degree, 27 degree, 12 degree, 10 degree, and 7 degree. Diamond layouts representing the eight crossing types were then submitted to vendors for price quotes. An independent vendor at Progress Rail[289] estimated a cost of $100,000 to $125,000 for the total range of diamonds and an estimate of $215,000 for a #8 double slip switch (used for crossing angles with less than 9 degrees). To determine conservative estimates per diamond angle type, the NS Track Engineering Experts used a prorated cost method derived from the vendor's quote adjusted to 3Q2011 dollars.

[289] *See* NS Reply WP "Diamond Crossing Quote – Progress Rail.pdf."

Table III-F-20

Diamond Costs Derived from Progress Rail Quote					
AREMA Type (degree of angle)	Average Angle (degrees)	Cost Range: $100K to $125K Quote (2012)	Cost in 2011 3Q Dollars (Price Index = .9856)	Number of Diamonds	Cost of diamonds
90 to 60	81	$100,000	$98,557	7	$689,899.00
60 to 50	58	$103,571	$102,077	1	$102,076.89
50 to 40	44	$107,143	$105,597	6	$633,580.73
40 to 35	39	$110,714	$109,117	1	$109,116.68
35 to 25	27	$114,286	$112,637	3	$337,909.73
25 to 14	0	$117,857	$116,156	0	$0.00
14 to 11	12	$121,429	$119,676	1	$119,676.37
11 to 9	10	$125,000	$123,196	3	$369,588.78
9 or less (Slip Switch)	7	$215,000	$211,898	6	$1,271,385.30
			TOTAL	28	**$3,633,233.48**

The NS Track Engineering Experts recognize that installation of diamond crossings throughout the proposed SBRR system would eliminate sections of planned track. The total length of each diamond crossing type was measured from AREMA specifications (2004 Portfolio of Trackwork Plan Number: 814-02) to determine total track feet replaced. Lengths of each crossing type ranged from approximately 14 track feet for 90 to 80 degree crossings to 63 track feet for 14 to 9 degree crossings. Track removed by the new diamond crossings totals 1,402 feet or 0.27 miles. NS has deducted 0.27 miles from the total track mileage and associated OTM costs to reflect the addition of crossings along the SBRR system.

The NS Track Engineering Experts determined that the labor and equipment for the installation of the diamond crossings is similar to the efforts to install a track turnout, and therefore NS used the same labor quote used by SunBelt for turnout installation as the cost of labor to install all diamond crossings.

(a) Materials Transportation

Like SunBelt, NS has addressed the specific transportation costs of each item with the total cost for that item, so no additional transportation costs have been added under this heading.

(b) Track Construction Labor

SunBelt requested and received a quote for Track Construction from Queen City Railroad Construction for the construction of the track and placement of the track turnouts (switches) for the SBRR. In its request for quotation, SunBelt instructs Queen City to assume the size of the rail construction project to be 50 miles. The NS Track Engineering Experts accept this assumption. The key assumption for the quote is that the owner of the project would provide the required track materials at the point at which they are assumed to be placed in the track. *See* NS Reply WP "Queen_Labor_Quote Page 4 of 6 Ballast Analysis.pdf." As discussed in the sections above, the NS Track Engineering Experts have added the necessary costs to transport track materials from the construction railheads to the locations for placement in track and to unload rail.

4. Tunnels

There are no tunnels on the SBRR.

5. Bridges

The bridges on the SBRR proposed by SunBelt bear little resemblance to the real NS bridges that they purport to replicate. Some of this is to be expected, because SunBelt is proposing to construct the SBRR bridges using its own "standard" bridge types, which differ from the bridges' original design and construction. This alone is not a point of contention. However, there are many corrections to be made other than typical span type in order for SunBelt's evidence to represent feasibly and accurately the relevant attributes of the bridges in the real world that currently carry NS traffic. The corrections NS has made are not matters of "least cost" to build the structures. Rather, they are physically necessary to ensure that the proposed SBRR bridges would geometrically fit into the real world topography, have the same functionality as the existing real world bridges, and have adequate substructure capacity. To take

one illustrative example, SunBelt assumes a bridge height of 11 feet for Bridge N203.30 in Alabama. *See* SunBelt Opening workpaper SBRR Bridge Construction Costs.xls, Tab "Only Active Bridges," Lines 458-459, Column T. That bridge is actually 60 feet high [NS Reply WP "Norfolk Southern Bridge List.xls," Tab "Active_Bridge_List," Lines 4702-4703, Column L]. The myriad shortcomings and inadequacies in SunBelt's bridges evidence are discussed in more detail in the sections that follow, along with appropriate measures taken to correct the inadequacies.

NS's evidence regarding bridge costs for the SBRR is sponsored by NS witnesses Willie Benton III and Dave Magistro. Mr. Benton is a consultant for Scott Bridge Company and president of B-3 Engineering. Mr. Benton joined NS's predecessor in 1972 and stayed with the railroad until 2009, rising to Engineer, Structures, Western Region. Prior to that, Mr. Benton served as a Bridge Engineer for NS. Mr. Magistro is a Senior Engineer and Project Manager for STV. He has almost 15 years of experience with structural design, focused on movable bridges and railroad structures. These experts' qualifications are further detailed in Section IV (Messrs. Magistro and Benton are sometimes referred to collectively hereinafter as "NS's Bridge Engineering Experts.").

NS's Bridge Engineering Experts have corrected the errors in SunBelt's development of SBRR bridge costs and conclude properly developed SBRR bridge investment to be approximately $486 million as summarized in the following table.

Table III-F-21

Category	NS Reply
Bridges with Only Type I Spans	$6,186,752
Bridges with Only Type II Spans	$1,631,178
Bridges with only Type III Spans	$184,824;860
Bridges with Mixed Span Types	$19,206,562
Major Non-Movable Structures over Navigable Waterways	$37,731,675
Movable Bridges	$235,272,325
Highway Overpasses	$815,977
Total SBRR Bridge Cost	**$485,669,330**

Source: NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "NS Cost Summary."

a. Bridge Inventory

The bridge inventory proposed by SunBelt is fairly accurate with respect to the location of required bridges on the SBRR compared to where they are located in the real world. However, simply having bridges in the same location as they exist today does not mean that other material parameters and attributes of the SBRR bridge inventory are correct. In fact, there are numerous significant corrections that must be made.

The most notable error in SunBelt's opening bridge evidence is that it simply assumed values for bridge heights that bear no relation to their actual, required heights. This error was completely avoidable: SunBelt made the error because it ignored readily available data that NS furnished in discovery. This surprising error demonstrates an inept and indolent approach to

replicating NS's real world structures on the SBRR. That approach also drastically underestimates SBRR bridge costs.

NS furnished maximum bridge height data in discovery,[290] but SunBelt chose to ignore that data. According to SunBelt's opening narrative, it disregarded the available bridge height data entirely because it deemed that data not "complete and detailed"[291] because it contained "only maximum height." Based on this cryptic and unexplained criticism, SunBelt ignored NS's *actual* bridge heights and instead fabricated self-serving criteria for estimating SBRR's bridge heights. *See* SunBelt Opening III-F-30. The bridge height "estimates" generated by SunBelt's criteria fall far short of the actual NS bridge heights. Because SunBelt failed to account for actual bridge height requirements for the bridges replicated by the SBRR, SunBelt's proposed SBRR bridges would not function in the manner necessary to create a workable railroad.

For at least two reasons, the Board should reject SunBelt's fabrication of hypothetical bridge heights. *First*, in its discovery requests to NS, SunBelt's Request for Production number 121 asked for NS bridge lists providing specified information for each NS bridge. Subpart j. of that request asked for "Height." In response, NS provided its available bridge height information from its records, reflecting the maximum height of each of the bridges for which data is available.[292] Despite more than ample opportunity during a lengthy discovery period, SunBelt

---

[290] NS Reply WP "Norfolk Southern Bridge List.xls," Tab "Active Bridge List," Column L.

[291] SunBelt Opening III-F-30.

[292] There are some bridges for which height was not included in the NS bridge data. Approximately 12.5 percent of the bridges in the list produced by NS contain a value of 0 in the "Max Height" column (*See* NS Reply WP "Norfolk Southern Bridge List_NS Reply.xls," Tab "Active Bridge List," Cell L14529). For the minority of bridges in NS's Bridge List that were missing height data, NS's Reply uses the height assumed by SunBelt in its evidence. SunBelt did not, however, complain about missing bridge heights, but rather that the bridge heights provided stated "only the maximum height." In any event, missing height data for a small minority of

did not advise NS during discovery that it believed the bridge height data NS provided to be incomplete, nor did it ask for any additional bridge height data. SunBelt makes no attempt whatsoever to explain what additional height information it sought. SunBelt cannot run from its own discovery request, and is estopped from asserting for the first time in its case-in-chief that NS's production of maximum bridge heights in response to SunBelt's request for bridge "height" is somehow insufficient. Thus, despite its assertion that "bridge height is an essential aspect of the cost of a bridge," SunBelt declined to use actual bridge heights and instead fabricated different bridge height assumptions that are wholly untethered to the actual bridge height data NS produced in discovery, and that substantially understate bridge costs.

Second, SunBelt's rationale for establishing new bridge height criteria is nearly identical to the position Complainant took in *Seminole v. CSXT*, STB Docket No. 42110, a case involving different parties, a different railroad network and completely different bridge data. In *Seminole,* Complainant Seminole Electric retained the same expert, Harvey Crouch, to sponsor its stand-alone railroad bridge plan and develop bridge costs. In that proceeding, Mr. Crouch developed a methodology for estimating bridge heights. The bridge height approach used by Mr. Crouch in the *Seminole* proceeding is exactly the same as the approach he used for the SBRR.[293] In the *Seminole* case, however, CSXT did not produce bridge height information in discovery, which necessitated an alternative approach for calculating SARR bridge heights. Here, in contrast, NS *provided* responsive *bridge height information* in the form maintained by NS in its ordinary course of business. While it was undoubtedly convenient and easier for Mr. Crouch to recycle

---

bridges cannot justify ignoring actual bridge height data produced for the vast majority of NS bridges.

[293] SECI Opening, *Seminole*, STB Docket No. 42110, at III-F-59 to III-F-60 (Jan. 25, 2010).

his *Seminole* template and woodenly apply it to this case, the fact that NS supplied actual bridge height data eliminated any justification for use of the approach Mr. Crouch used in *Seminole.*

It is not surprising that SunBelt prefers Mr. Crouch's manufactured hypothetical bridge height categories to the actual heights reported in the NS bridge list. Consider the bridge height criteria proposed by SunBelt:

Highway / Interstate	16.5' (AASHTO – Interstate Requirements)
Other Roads	14.5' (AASHTO – Other Highways)
Navigable Waterways	USCG Clearance Requirements
Other Waterways	11'

When these criteria and heights are compared to the actual bridge height data furnished by NS in discovery, the real reason for SunBelt's unexplained substitution of the foregoing hypothetical heights for actual bridge heights is exposed. SunBelt's minimal default heights systematically understate actual bridge heights. Take for example, Bridge NO104.90 in Mississippi, which has a maximum height of 47 feet.[294] Ignoring this actual height, SunBelt assigned the bridge a height of just *11 feet,* because it falls under SunBelt criterion number four—a bridge crossing a non-navigable "other" waterway.[295]

There are dozens of bridge locations where SunBelt's artificial and ill-fitting bridge criteria produced bridge heights that are lower than the actual bridge heights furnished by NS. Several of the height understatements are of similar magnitude to those described above, where actual bridge heights ranging from 20 feet to up to 60 feet are purportedly "replicated" by SunBelt's assumed SBRR bridge heights between 11 feet and 16.5 feet. Clearly, these

[294] NS Reply WP "Norfolk Southern Bridge List.xls," Tab, "Active Bridge List," Cell L310.

[295] SunBelt Opening WP "Bridge Construction Costs.xls," Tab "Only Active Bridges," Cell U2560.

hypothetical bridges are not tall enough to connect the track they purport to connect. In this Reply Evidence, NS's bridge experts have accounted for actual bridge heights by using the data furnished by NS in response to SunBelt's discovery requests.

The maximum bridge heights furnished by NS are entirely appropriate for developing bridge abutment and pier costs for most bridges at issue in this proceeding, which NS has categorized into Types I, II, and III SBRR bridges. For these "standard" bridges in the Types I, II, and III SBRR bridge categories, the average number of spans is low enough that there are zero or one piers on the vast majority of these bridges as set forth below. Therefore, the maximum bridge height data furnished by NS in discovery is a very accurate representation of the bridge heights that should be considered for these bridges. Pier heights are typically at maximum somewhere near the center of the length of the bridge, and gradually decrease in height as the bridge approaches the abutments at the ends of the bridge. But if there is only single pier, the uniform height of the bridge is the same as its "maximum height."

Type I Bridges – Average Number of Spans = 1.57[296]

Type II Bridges – Average Number of Spans = 1.00[297]

Type III Bridges – Average Number of Spans = 2.45[298]

In exceptional circumstances where longer bridges with multiple spans may not maintain maximum height over the entire length of the bridge, as described above, NS's bridge experts developed graduated substructure costs to reflect the decreasing pier heights, and did not use

---

[296] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Bridges – Type I Spans Only," Cell X64.

[297] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Bridges – Type II Spans Only," Cell Y27.

[298] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Bridges – Type III Spans Only," Cell AA310.

standard Type I, II, and III bridges. In such cases, the pier heights and material quantities are calculated in NS's Reply workpapers.[299]

In addition to design problems with the Type I, II and II bridge types, SunBelt's SBRR bridge inventories frequently calculate the wrong bridge lengths for NS bridges comprised of a combination of different span types. This error produces a substantial overstatement of SunBelt's SBRR bridge lengths and therefore its bridge investment costs. For example, according to the bridge list and track charts furnished to SunBelt in discovery, Bridge Number 229.00 in Alabama has a real world total bridge length of 6,690 feet. However, SunBelt's bridge costs spreadsheet for the SBRR shows a length of 13,303 feet for this bridge *See* SunBelt Opening Workpaper "SBRR Bridge Construction Costs.xls," Tab "Only Active Bridges," Lines 77-83, Column N. This and similar length overstatements are the result of careless errors in the costing spreadsheet formulas SunBelt used to calculate total bridge lengths. Specifically, the NS bridge list includes two separate fields reflecting bridge length information, labeled "Length" and "Total Length." For bridges with a single uniform span type, only the "Total Length" field is populated, and the "Length" field is blank. For bridges consisting of more than one type of span, the NS bridge list contains an entry in the "Length" field for each type to span. The "Total Length" field in the bridge list identifies the combined total length of the bridge in the first line entry for each bridge, and reports the same value as in the "Length" field for the remaining bridge span types. Instead of adding the entries in the "Length" field to determine total bridge length, SunBelt incorrectly summed all entries in the "Total Length" field, which adds the total bridge length reported in the first line entry with the lengths of the subsequently reported span types, overstating the bridge length.

[299] NS Reply WPs "NS Special Bridges_Movable.pdf," and "NS Special Bridges_Non Movable Over Navigable Waterways.pdf."

SunBelt made this error to its own detriment in several bridge locations. Although accepting SunBelt's repeated error would favor NS, in the interest of accuracy NS has corrected SunBelt's overstatements of bridge lengths. The corrected cells are highlighted in NS reply work papers and NS's bridge experts have attached a comment to each highlighted cell indicating the correction they made.

SunBelt's bridge inventory also included another error that resulted in substantial understatement of SBRR bridge costs, the omission of two movable bridges. Bridges 229.00[300] and NO172.20[301] were listed by SunBelt in its standard bridge inventory rather than the "Special" or movable inventory. The NS bridge inventory clearly identifies those bridges as moveable spans. SunBelt offered no justification for omitting those structures from the movable bridge list, or for its failure to assign to those bridges costs commensurate with a movable span.[302] NS's Reply Evidence restores those bridges to their proper status as movable bridges.

A further bridge inventory error is SunBelt's assignment of costs to the SBRR for one bridge that is not actually owned by NS. Bridges NO190.60 on the Alabama Division is actually owned by the N.O. Dock Board, not NS. To correct for the resulting overstatement of bridge costs, NS has removed the construction costs for this structure from the SBRR inventory, despite the fact that this correction works to SunBelt's advantage.

---

[300] NS Reply WP "Norfolk Southern Bridge List.xls," Tab "Active Bridge List," Cell G158.

[301] NS Reply WP "Norfolk Southern Bridge List.xls," Tab "Active Bridge List," Cell G362.

[302] In previous rate cases, SunBelt's witness sought to justify removing movable bridges based on a simplistic and erroneous rationale that if a movable span is operated infrequently, it must not be necessary. This notion is mistaken, as discussed below in the movable bridges section.

SunBelt made a variety of other errors throughout its SBRR bridge inventory. All errors that NS identified and corrected are noted in the NS reply bridge cost spreadsheet.[303] Those specifically discussed above were particularly significant errors.

b. Bridge Design and Cost Overview

SunBelt's bridge design and cost narrative is short and simple. *See* SunBelt Opening III-F-29 to III-F-33. Scrutiny reveals SunBelt's approach to be simplistic and infeasible. SunBelt's superficial and unexamined approach is fundamentally unsound and unworkable: it omits and glosses over fundamental physical requirements, fails to account for numerous essential elements of bridge engineering and design, and does not present a complete, integrated, workable bridge design plan. Below, NS discusses the fundamental flaws in the design and implementation of SunBelt's bridge plan. NS also describes the changes and adjustments it has made in this Reply Evidence to correct the flaws, errors, and omissions in SunBelt's case-in-chief regarding bridge design and corresponding costs.

i. Cost Overview

NS accepts the base unit prices used for bridge components on the SBRR system, with the exception of movable bridges.

SunBelt's bridge component unit costs are substantially lower than specific costs that would be obtained from any one contractor's integrated bid. This is because SunBelt "cherry-picked" the lowest cost available for each bridge component from a number of bids and other sources. SunBelt assumes that each of these individual components' "least costs" from various different bids will be available for the SBRR to selectively aggregate into an artificial low overall bridge cost. This is an unrealistic assumption that produces an understatement of unit

[303] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "All Bridges Complete Inventory."

costs of constructing the SBRR bridges. Bridge contractors frequently offer lower prices on some components of a job while making up for such "loss leaders" by charging higher prices for other components. Construction bids are offered as an integrated package, not as an ala carte menu from which the buyer may select individual components. It is one thing to allow a Complainant to select the lowest overall project bid it can find and use all of the component unit costs from that bid. It is an entirely different—and wholly unrealistic—matter for a Complainant to assume it could cherry-pick the lowest individual line items from different contractors' integrated bids for every individual component of SARR bridge construction projects. No real world contractor would agree to such an approach.

Solely because the Board has accepted Complainants' cherry picking approach in past SAC proceedings, NS very reluctantly accepts SunBelt's cherry picked bridge component unit prices here. However, NS urges the Board to reconsider the fundamentally unrealistic, cost-distorting, and unfair nature of permitting SAC Complainants to use such an approach.

NS generally rejects the quantities used by SunBelt to estimate SBRR bridge costs, largely because of SunBelt's abject failure to accurately take into account and address bridge heights. However, NS will discuss specific items in more detail in the sections below that address the individual bridge types. For movable bridges, NS rejects not only the unit costs, but also the cost share that SunBelt assigned to each structure. NS has developed an appropriate unit cost from real cost data for movable bridges that were actually constructed. NS's development of unit cost and its reasons for correcting the cost share are explained below in the section on Movable Bridges.

SunBelt's workpapers show that it substantially understated the cost of constructing the bridges on the SBRR.[304] This is because, while SunBelt came up with acceptable unit costs for material, it failed to develop feasible substructure designs. The lack of feasible designs, in turn, led to inaccurate estimates of quantities for SunBelt's SBRR bridge inventory. Additionally, SunBelt failed to accurately reflect a reasonable cost to replicate special bridges, including movable bridges and a bridge over a major river and navigable waterway. NS's Engineering Experts have corrected the errors in SunBelt's development of SBRR bridge costs and conclude properly developed SBRR bridge investment to be approximately $486 million as summarized in the following table.

[304] SunBelt Opening III-F-1.

Table III-F-22
Comparison of NS' Estimate of Bridge Costs With SunBelt's Estimate of Bridge Costs

Category	SunBelt Opening Cost	NS Reply Cost
Bridges with Only Type I Spans	$296,667,985	$6,186,752
Bridges with Only Type II Spans		$1,631,178
Bridges with only Type III Spans		$184,824,860
Bridges with Mixed Span Types		$19,206,562
Major Non-Movable Structures over Navigable Waterways		$37,731,675
Movable Bridges	$19,493,444	$235,272,325
Highway Overpasses	$58,938	$815,977
Total SBRR Bridge Cost	**$316,220,367**	**$485,669,330**

ii. Bridge Design

In order to address all of the shortcomings with SunBelt's proposed bridge designs for the SBRR inventory, it is useful to break the discussion into two categories: superstructure and substructure. "Superstructure" refers to the horizontal members, or spans, that actually carry the rail traffic. Superstructure includes pre-stressed box beams, steel deck girders, and through plate girders. The superstructure spans are supported by substructure units, which are vertical members that transmit the superstructure loads down to the ground. The substructure units consist of piers and abutments.

(a) Superstructure Design (Spans)

SunBelt claims that it developed standard bridge types for the SBRR. Implicit in the term "bridge type" is the development of superstructure and corresponding abutments and piers designed for each of the standard bridge types. In reality, however, SunBelt designed and developed costs for standard superstructure span types, uniform standard substructure piers, and a single uniform standard abutment. SunBelt developed costs for each bridge by combining its uniform costs for each standard component. In other words, based on the way SunBelt developed its bridge costs, bridges with spans of all lengths crossing over non-navigable waterways always have the same 11 foot high pier design and same abutments, regardless of the length of the bridge span. Because span length drives the load capacity requirements of the abutments and piers, SunBelt's approach results in mismatches between bridge superstructures and substructures that would render the SBRR bridges infeasible and in many instances unsafe.

To correct SunBelt's use of unrealistic "one-size-fits-all" bridge designs, NS separated the SBRR bridge inventory into multiple categories, assigning each bridge to one of the following categories: Type I Bridge, Type II Bridge, Type III Bridge, Bridges with Multiple Span Types, or one of two types of Special Bridges. This allows for substructure parameters to be matched with the type of superstructure they must support.

While NS rejects the methodology that SunBelt used to assemble the bridges in the SBRR inventory and how the superstructure spans are combined with the substructure units, it accepts the superstructure span designs proposed by SunBelt for all of the Type I, Type II, Type III, and Type IV spans. Specifically, the precast double void box beam shown in SunBelt's opening workpaper "Type 1_Photos and Plans.pdf" could carry the standard 286,000 pound car loads for the span lengths covered by the Type I span. Similarly, the steel deck girder span shown in SunBelt's opening workpaper "Type II_Photos and Plans.pdf" adequately could carry

the standard 286,000 pound car loads for the span lengths covered by the Type II span, the prestressed concrete I-beam span shown in SunBelt's opening workpaper "Type III_Photos and Plans.pdf" could carry the standard 286,000 pound car loads for the span lengths covered by the Type III span and the steel through plate girder shown in SunBelt's opening workpaper "Type IV_Plans and Photos.pdf" could carry the standard 286,000 pound car loads for the span lengths covered by the Type IV span.

NS does not take exception to an approach that matches individual span types with different standard substructure units within individual bridges. This sort of cafeteria approach is reasonable if it is executed properly. Proper execution of such an approach, however, is complicated and requires that each of the standard substructure units (piers and abutments) have the load capacity necessary to support the various superstructure span types that might be paired with them. Further, each of the superstructure span types must fit geometrically onto each substructure that might possibly be utilized to support them. SunBelt fails to satisfy these essential requirements. Consider, for example, Bridge 205.70 in Alabama.[305] SunBelt proposed to use its standard Type III span superstructure[306] in conjunction with its standard 11-Foot tall pier substructure.[307] The pier cap dimensions for the standard 11-Foot tall pier proposed by SunBelt for the SBRR are 12' wide x 3' deep. However, the Typical Section for a Type III span shown in SunBelt's workpapers[308] clearly shows that a Type III girder would not

---

[305] SunBelt Opening WP "SBRR Bridge Construction Costs.xls," Tab "Only Active Bridges," Lines 62.

[306] SunBelt Opening WP "SBRR Bridge Construction Costs.xls," Tab "Only Active Bridges," Cells Y62.

[307] SunBelt Opening WP "SBRR Bridge Construction Costs.xls," Tab "Only Active Bridges," Cells T62.

[308] SunBelt Opening WP "Type III_Photos and Plans.pdf" at 15.

fit on a pier cap that is only 12 feet wide. The footprint of the beams takes up a width of exactly 16 feet.

All structural design codes require maintenance of a minimum edge distance, such that the top surface of the pier cap or abutment is larger than the actual footprint of the beams it is supporting. For example, to meet AREMA guidelines, the edge of the concrete must be at least 6 inches away from the edge of the bearing supporting a superstructure beam.[309] Following AREMA's guidelines, the pier cap would have to be a minimum of 17 feet wide. Additionally, the anchor bolts that are positioned on the outside of the two exterior beams will be outside the limits of the pier cap on the standard 11-foot tall cap.

In addition to Sunbelt's failure to match superstructure and substructure components, its bridge designs omit spans used over major waterways and navigable waterways that would meet USCG horizontal and vertical clearance requirements. Consider, for example, Bridge 249.00 over the Tenn-Tom Waterway on the Alabama Division. The United States Coast Guard requires a horizontal clearance of 300 feet in this location.[310] NS's bridge data shows that this bridge contains a 480-foot long through-truss over the waterway, which meets the USCG horizontal clearance requirement. However, SunBelt proposes to replace this superstructure with Type III spans where the maximum horizontal clearance only would be approximately 90 feet, which obviously fails to satisfy the United States Coast Guard's horizontal clearance requirement.[311]

---

[309] NS Reply WP "AREMA Bearing Edge Distance.pdf."

[310] NS Reply WP "USCG_Clearance_Guide_Excerpt_Tenn-Tom Waterway.pdf."

[311] *See id.*

SunBelt's evidence assumed that some combination of its standard spans could be assembled into a bridge that could be used to cross this regulated waterway. As demonstrated, however, that assumption is invalid. To correct these deficiencies, NS's Reply estimates quantities for a long span truss that could be used over this navigable waterway, designs rest piers sufficient to support the long span trusses, and then assigns costs for these quantities based on the unit prices proposed by SunBelt. Specific details of NS's approach are discussed in the section covering special bridges. *See infra* III-F-5-b-viii.

(b) Substructure Design (Piers and Abutments)

SunBelt's substructure designs and details are infeasible in the manner that SunBelt has attempted to apply them to the entire SBRR bridge inventory. SunBelt's approach has two fatal flaws: one is that the standard pier details do not properly account for bridge height; and the second is that the standard pier details proposed by SunBelt do not account for differing span lengths. The root cause of these fundamental errors is SunBelt's failure to perform any engineering calculations specific to the bridges they are proposing to assemble in this inventory.

The two core problems with SunBelt's standard pier designs mentioned above each have a profound impact on the costing of the bridges in the SBRR inventory. As SunBelt asserts, bridge height is an essential feature of bridge design, and it has a large effect on the cost of bridges. *See* SunBelt Opening III-F-30. Essentially, the taller a pier structure is, the less weight it can support. Consider an example. Suppose a 2X4 piece of lumber that is two feet long standing on-end as a column can support a weight of 400 pounds before it fails or buckles. A 2X4 piece of lumber that is 10 feet long standing on end cannot support that same 400-pound weight unless it is heavily braced. If the same 400 pounds needs to be supported at a height of 10 feet, it makes more sense to use larger dimension lumber. Even large dimension lumber may still require bracing. The load capacity of a given post or pier at a particular height cannot be

known until the engineering analysis is performed. The foregoing principles of physics and engineering mean that NS cannot correct SunBelt's pier design errors by merely using the standard pier details posited by SunBelt and "stretching" them to account for the correct bridge height. Rather, the pier dimensions and capacity needed for taller bridge heights must be analyzed and re-calculated. NS's bridge engineering experts undertook this analysis and recalculation, as discussed in more detail below.

The second fundamental problem with SunBelt's standard pier designs -- its failure to account for differing span lengths—also boils down to inadequate load capacity. For example, a Type I span that is 32 feet long will require much less substructure support than a Type IV span that is 150 feet long. The shorter span has less dead load, or self weight: there are only 32 feet of beam, track, ties, and ballast, as opposed to 150 feet of beam, track, ties, and ballast for the Type IV span. Additionally, the shorter span is required to support only 32 feet of a train's length, rather than 150 feet, so there is much less live load that needs to be supported for the shorter span. But SunBelt did not account for span length in defining the standard piers, so the 32-foot Type I span and the 150-foot Type IV span both utilize the same standard pier in SunBelt's bridge cost spreadsheet. The standard pier and abutment that SunBelt used for the both types of spans is far more suitable to support a Type I span than it is a Type IV span.

NS has evaluated SunBelt's standard pier details as SunBelt proposed to apply them in the SBRR inventory. Based on that evaluation, NS will accept the 11-foot, 14.5-foot and 16.5 foot standard piers to the extent that they can be used on structures with only Type I or Type II spans. The standard pier designs for this range of heights can support the loads imposed by Type I and Type II superstructure spans up to the heights specified.

However, it was also necessary for NS's Bridge Engineering Experts to design additional piers to be used with Type I and Type II spans for the heights exceeding 16.5 feet to address column buckling and slenderness effects discussed above, as well as pile loads. As SunBelt pointed out, and NS's analysis confirmed, the taller piers require more stability and more material than a shorter pier to support the same weight. *See* NS Reply WP "NS Type II Bridge.pdf." Also, NS had to design entirely new piers to be used with Type III and Type IV spans for the entire range of pier heights: NS's bridge experts' analysis concluded that SunBelt's standard pier details are not adequate to support the larger dead loads and live loads imposed by the longer Type III and Type IV superstructure spans for any bridge height. *See* NS Reply WP "NS Type III Bridge.pdf."

For this Reply, NS has designed piers in a range of heights between 11 feet and 65 feet to be used with each of the Types I through IV superstructure spans. This means that in NS's Reply Evidence, a 20-foot tall pier that supports a Type I span will be unique to the loads imposed by a Type I span, and necessarily different from a 20-foot tall pier that supports a Type III span. The bottom line is that SunBelt did not develop pier details that were specific to the length of the superstructure span they would be required to support, and also failed to account accurately for the true heights of the bridges. To remedy this deficiency, NS produced a matrix of pier designs that can be assigned to each bridge in the inventory based both on the actual length of the superstructure span they are supporting and the true height of the bridge.[312]

For SBRR bridge abutments, SunBelt developed a cost for a single standard abutment and assumed the design would be applicable to all SBRR bridges. But SunBelt also proposed to replicate bridges with a variety of types of spans. And as discussed above regarding span

[312] *See* NS Reply WPs "NS Type I Bridge.pdf," NS Type II Bridge.pdf," and "NS Type III Bridge.pdf."

lengths, an abutment that is suitable to support the load of a Type I span is not necessarily suitable to support the load of a Type III span due to the differences in length. Therefore, NS rejects this one-size-fits-all approach and instead designed and developed costs for abutments tailored to the specific superstructure characteristics of each SBRR bridge category.

iii. Type I Bridges

Type I bridges proposed by SunBelt for the SBRR are described in its Opening Evidence as being made up of Type I spans ranging from 20 feet to 32 feet in length. NS accepts this designation.

SunBelt's Opening Evidence proposes the use of *six* HP14x73 piles as the foundation for the Type I bridge abutment.[313] SunBelt's bridge cost spreadsheet, however, clearly uses a standard *CSXT* stub abutment, which utilizes only *four* piles rather than six, as a basis for its abutment cost.[314] Because the standard CSXT stub abutment with its four piles would be adequate to support Type I spans on the SBRR, NS corrected this quantity for abutment piles to be used with Type I bridges on the SBRR.[315]

For Type I piers, NS determined that the 11-foot, 14.5-foot and 16.5-foot standard pier details furnished by SunBelt in its opening workpapers are adequate for supporting superstructure for the SBRR Type I spans up to the specified heights. However, the significant number of enough Type I bridges on the SBRR with pier heights exceeding 16.5 feet cannot be ignored. To remedy SunBelt's failure to account properly for these structures taller than 16.5 feet, NS had to design piers in a range of heights greater than 16.5 feet to address the various pier

---

[313] SunBelt Opening III-F-32.

[314] SunBelt Opening WP "CSXT Standard Stub Abutment.pdf" at 6.

[315] *See* NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Abutment Piles," Cell F6.

heights exhibited by Type I bridges. Based on bridge height data for the bridges NS classified as Type I, it developed and designed new piers for bridge heights of 20 feet, 25 feet, 35 feet, 45 feet, 55 feet and 65 feet.[316] Each Type I bridge was assigned pier costs for the standard Type I pier height (in the range developed by NS's bridge engineering experts) that was closest to the actual height of the bridge. For example, a Type I bridge with pier height of 37 feet would be assigned pier costs for a 35-foot standard Type I pier, because 37 feet is less than the point halfway between the two NS proposed standard pier heights on either side of the pier height in question, 35 feet and 45 feet. Similarly, a Type I bridge with pier height of 42 feet would be assigned pier costs for a 45-foot standard Type I pier, because 42 feet is greater than the halfway point between the NS proposed 35-foot and 45-foot standard pier heights.

To develop the new NS Type I standard pier design, NS's Bridge Engineering Experts began with details substantially similar to those proposed by SunBelt for its standard piers, with the only difference being the height of the pier. NS retained the cap dimensions, footing dimensions, pile size, and pile quantities proposed by SunBelt for the new pier designs unless physical requirements or deficient load capacity dictated a change. NS's more detailed approach ensures that the various pier heights are designed based on real design loads that are consistent with the proportions and parameters of the bridges in question. The breakdown of heights ranging from 20 feet to 65 feet creates a reasonable spread in pier heights to ensure that the pier quantities are not overstated for any given pier height. NS's pier designs and quantities can be found in its workpapers.[317]

---

[316] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Type I Spans Only," Column T.

[317] *See* NS Reply WP "NS Type I Bridge.pdf."

Even though SunBelt's pier details for the 11-foot, 14.5-foot, and 16.5-foot standard piers are acceptable for use with Type I spans from a design strength standpoint, the concrete quantities for these standard piers required correction. SunBelt proposed pier dimensions for which the pier height exactly matches the required vertical clearance. This assumption would require the bottom of the pier footing to be resting directly on top of the ground. In practice, these footings must be buried, such that the top of the footing is at least two feet below the ground line. The assumption by NS of two feet of cover over the top of the pier footing is quite conservative. Standard design codes and design guideline resources require pier footings to be covered, with the cover ranging between 5-10 feet, depending on soil properties in the specific geographic location. *See* NS Reply WP "AREMA Frost Penetration.pdf." NS chose to use a very conservative value so that it could be applied to every Type I bridge, and to avoid the need to assign a specific pier footing depth and corresponding concrete quantities for every bridge in the inventory based on regions. NS also assumed footings two feet below the ground line for its pier designed for supplemental heights. The result of this conservative approach is that NS's Reply concrete quantities understate the actual concrete quantities that would be needed to construct piers for Type I bridges on the SBRR.

iv. Type II Bridges

NS largely accepts SunBelt's Type II bridge design and designations. SunBelt describes the Type II bridges it proposes as consisting of Type II spans ranging from 32 feet to 45 feet in length. NS accepts this designation. NS's abutment design for Type II bridges will be the same as the abutments for Type I bridges so the modifications to the abutment design discussed for the Type I bridge above also apply to Type II bridge abutments.

All of the SBRR bridges designated as Type II bridges by SunBelt are single span bridges. In accepting SunBelt's Type II bridge designations, NS did not change the SBRR

bridges assigned to the Type II category, so the NS reply Type II bridges are also single span. Because single span bridges require only abutments and no piers, NS has not designed bridge piers of varying heights for Type II bridges.

v. Type III Bridges

Type III bridges proposed by SunBelt for the SBRR are described in its Opening Evidence as consisting of Type III spans ranging from 60 feet to 92.5 feet in length. NS accepts this designation.[318]

NS developed Type III standard piers for the same range of heights as exhibited for Type I spans: 11 feet, 14.5 feet, 16.5 feet, 20 feet, 25 feet, 35 feet, 45 feet, 55 feet, and 65 feet. But each of these standard Type III piers, while exhibiting the same height as the standard Type I piers, have different details and quantities. These details and quantities are specifically tied to the design loads for a Type III span that ranges from 60 feet to 92.5 feet in length, rather than the 32-foot maximum span length of a Type I span. In other words, the standard Type III pier that is 35 feet tall must have substantially more load capacity than the standard Type I pier of the same height, due to the length of superstructure span and resulting design loads that each is required to support.

SunBelt furnished conflicting information regarding abutments for Type III bridges on the SBRR. SunBelt's Opening Evidence suggests the use of eight HP14x73 piles as the foundation for the Type III bridge abutment. *See* SunBelt Opening III-F-33. SunBelt's bridge cost spreadsheet, however, clearly uses the standard CSXT stub abutment as a basis for its

[318] SunBelt has assumed SBRR bridges with span lengths between 45 and 60 feet would be replaced with multiple Type I bridges. NS has reviewed the SBRR bridges falling into this span length range and accepts SunBelt's assumption in this proceeding.

cost.[319] As previously noted, there is a discrepancy between the cost calculations in the spreadsheet using the standard CSXT abutment, which uses only four piles as compared to the description of an eight pile abutment SunBelt's narrative claims to have used. *See* SunBelt Opening III-F-33. But in the case of Type III bridges, there is a larger and even more significant error: the standard CSXT stub abutment SunBelt relied upon would not be adequate to withstand the loading imposed by a SBRR Type III span, regardless of whether it is used with four piles or six piles.[320] Spans with lengths up to 92.5 feet require more support than can be provided by the standard CSXT stub abutment. The typical Type III bridge details that SunBelt furnished actually support NS's Bridge Engineering Experts' determination that the standard CSXT stub abutment is inadequate for the Type III span loads. The bridge that SunBelt used to exemplify its Type III bridge category for the SBRR, a bridge that was actually designed and constructed, uses a significantly more substantial abutment.[321]

Because the standard CSXT stub abutment is inadequate to carry SBRR Type III spans, and SunBelt's narrative did not fully describe its intended Type III abutment attributes, NS evaluated the adequacy of the abutment details for a bridge that SunBelt used as to exemplify Type III bridge abutments. *See* SunBelt Opening III-F-333, nn.91-92; NS Reply workpaper "NS Type III Bridge.pdf." NS's bridge experts' analysis in this workpaper showed that the HP12x53 piles represented in SunBelt's example plans were overstressed when supporting a Type III span. NS retained the pile layout and number of piles represented in SunBelt's illustrative Type III

---

[319] SunBelt Opening WP "SBRR Bridge Construction Costs.xls," Tab "Abut Concrete – Piling," Cell C5. SunBelt's narrative evidence does not disclose its use of CSXT bridge data and specifications, let alone why it used that data or how it is appropriate for SBRR bridges.

[320] NS Reply WP "NS Type III Bridge.pdf."

[321] *See* SunBelt Opening WP "Type III_Photos and Plans.pdf" at 16-17.

abutment details, but determined that larger HP14x73 piles would be required to carry the loads resulting from a Type III span.

The difference between the HP12x53 and the larger HP12x73 piles is in the depth of the pile cross section, and the weight per foot of the pile. The HP12x53 section is nominally 12 inches deep and weighs 53 pounds per foot with a cross sectional area of 15.5 in^2. The HP14x73 section is nominally 14 inches deep and weighs 73 pounds per foot with a cross sectional area of 21.4 in^2. The HP14x73 pile has 38% more steel area to carry the loads imposed upon it than does the HP12x53 pile. In design and analysis, pile sizes are determined by limitations on pile stress imposed by design codes. For instance, AREMA guidelines prescribe a maximum basic allowable stress of 27,500 pounds per square inch (psi) for compression members. That allowable stress translates to a maximum load for the piles discussed above as follows:

HP12x53: 15.5 square inches x 27,500 psi = 426,250 pounds

HP14x73: 21.4 square inches x 27,500 psi = 588,500 pounds

NS adjusted the quantities of concrete,[322] steel piling,[323] and pile tips[324] for Type III abutments on the SBRR based on NS's own Type III abutment calculations.[325] NS revised the costs for Type III bridges on the SBRR using these new abutment quantities and the same unit

[322] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Abut. Concrete – Piling," Cell F6.

[323] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Abutment Piles," Column G.

[324] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Abut. Pile Tips," Column G.

[325] NS Reply WP "NS Type III Bridge.pdf."

costs proposed by SunBelt. Updated quantities and abutment costs are shown in NS's workpapers.[326]

Abutment design is not the only shortcoming with SunBelt's proposed Type III bridge details. Type III piers proposed by SunBelt are also insufficient, for the same reasons discussed in the previous sections: pier parameters were not tailored to Type III spans, and SunBelt did not account for the bridge heights properly. In order to correct these problems, NS designed an array of Type III piers. These Type III piers were designed for the same range of pier heights discussed in the section on Type I bridges: 11 feet, 14.5 feet, 16.5 feet, 20 feet, 25 feet, 35 feet, 45-feet, 55 feet, and 65 feet. However, NS specifically designed these Type III piers for the design loads imposed on the piers by the Type III spans. The bridges in the SBRR inventory that NS delineated as Type III bridges on reply were evaluated in the same manner as described for the Type I bridges in order to design these standard Type III piers. The number of spans used in the analysis of the standard Type III pier design of each of the respective heights was determined by averaging the number of spans found on Type III bridges in the height range in question.[327] NS then assigned to each Type III bridge costs for standard piers of the appropriate height based on the bridge height data NS produced in discovery. NS used the same method that it used with Type I bridges to determine the standard Type III bridge height it assigned to each Type III bridge.

The foregoing adjustments made by NS's bridge experts ensure that the revised standard Type III piers it uses in this Reply are designed to handle real design loads imposed by Type III

---

[326] *See* NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Combined Bridge Component Costs," Cells B72-E78.

[327] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Type III Spans Only," Cells AA310.

superstructure spans. Additionally, use of a range of heights for standard Type III piers ensures that quantities, and therefore costs, are not overstated for any of the standard Type III piers. NS adjusted the quantities of concrete,[328] steel piling,[329] and pile tips[330] for Type III Bridge piers on the SBRR, based on its adjusted designs of standard Type III piers.[331] The costs for Type III bridges on the SBRR were updated using these new pier quantities, and the same unit costs proposed by SunBelt. Updated quantities and pier costs are shown in NS's workpapers.[332]

vi. Type IV Bridges

After sorting through the SBRR inventory proposed by SunBelt and pulling out the bridges that NS classified as Type I, Type II, or Type III, as discussed above, there were no bridges remaining that were made up solely of Type IV spans. There was one bridge containing Type IV spans, but it also contained Type III spans. Bridges made up of more than one type of span are discussed in the next section.

vii. Bridges with Multiple Span Types

As discussed above, NS segregated the bridges in the SBRR inventory such that all bridges SunBelt proposed to replicate with a single superstructure span type were grouped together. This was done so that the substructure elements (abutments and piers) could be

---

[328] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Pier Concrete Quantifies," Cells N12-R136.

[329] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Combined Bridge Component Costs," Cells N95, N103, N111, N119, N127, N135, N143, N151 and N159.

[330] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Combined Bridge Component Costs," Cells N96, N104, N112, N120, N128, N136, N144, N152 and N160.

[331] NS Reply WP "NS Type III Bridge.pdf."

[332] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Combined Bridge Component Costs," Cells L90-O162.

accurately evaluated with respect to the type of superstructure span that would be placed upon them and the resulting load that they would be supporting. Additionally, there are extraordinary bridge structures that NS has addressed separately as "special bridges." In addition to the single-superstructure span type and special bridges, there still remained a collection of bridges that SunBelt proposed to replicate with more than one superstructure span type. These multiple-span-type bridges are shown in the NS Reply bridge costs spreadsheet in a separate tab.[333]

In order to address the complexities attributable to multiple span type bridges, NS evaluated each bridge individually. NS determined the appropriate number and type of abutments and piers by looking at the specific span composition proposed by SunBelt for each bridge in question. For example, consider Bridge 181.40. SunBelt proposed to replicate this bridge with one Type I span and one Type III span, supported by their standard abutment at each end of the bridge with a standard 11-foot tall pier between the two spans.[334] On reply, NS assigned a Type I abutment to support the end of the Type I span and a Type III abutment to support the end of the Type III span.[335] The single pier between the two spans was designated as a Type I pier, which is the smaller of the two adjoining spans that rest upon it. Alternatively, a Type III pier could have been designated, but this would have resulted in an overstatement of the cost required for a pier to support the Type I span. So the smaller of the two possible pier selections was designated to be conservative with the construction cost. The Type I pier height was designated based on the "Max Bridge Height" data, which came from NS's discovery

---

[333] *See* NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Multiple Span Types."

[334] SunBelt Opening WP "SBRR Bridge Construction Costs.xlsx," Tab "Only Active Bridges," Line 51.

[335] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Multiple Span Types," Line 18.

material.[336] For this bridge, NS used the 35-foot Type I pier because the 38-foot actual bridge height falls between the standard 35-foot and 45-foot pier heights, but is closer to the 35-foot value.

Evaluating each of these multiple span type bridges individually ensured that the superstructure design and costs are in line with their substructure design and costs.[337]

viii. Special Bridges

There are a number of bridges that must be replicated for the SBRR that do not fit into the criteria that define any of the four standard bridge types. These bridges have been classified by NS as "Special Bridges," and include two subgroups: Movable Bridges and Non-Movable Bridges over Navigable Waterways. SunBelt's attempt to replicate these complex structures on the SBRR with standard bridges was wholly inadequate. Below, NS addresses why SunBelt's proposed standard bridge components are inadequate for these special bridges, detailing how the costs were corrected for each subgroup.

(a) Movable Bridges

SunBelt's attempt to replicate the movable structures on the SBRR is riddled with flaws and errors. Correcting SunBelt's failed attempt requires a great deal of explanation and clarification, in part because its narrative evidence was conspicuously silent regarding movable

---

[336] NS Reply WP "Norfolk Southern Bridge List.xls," Tab "Active Bridge List," Cell L123.

[337] Note that in the NS spreadsheet tab dedicated to multiple span type bridges there is one location where there are two lines of data representing two separate bridges for a given mile post location, presumably side-by-side in double track territory. *See* NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Multiple Span Types," Lines 47 and 48." SunBelt elected to replicate one of these bridges all with the same type of superstructure span, but then used a different type of superstructure span for the other bridge at the same location. These bridges could have been separate such that one of them was included in the Type III bridge tab and the other in the Type IV bridge tab. However, NS elected to keep both lines for this mile post location together on the same tab. As such, they are shown on the multiple span type tab, even though all of the spans within each of the bridges are the same type.

bridges. Given the import of moveable bridges, their impact on total bridge costs, and SunBelt's failure of proof with respect to those structures, NS will detail SunBelt's apparent costing approach.

First, the list of movable structures proposed by SunBelt for the SBRR was inaccurate. There are movable bridges that SunBelt included as part of the general bridge inventory rather than in its calculation of movable bridge costs. Also NS does not own one of the movable bridges included in the SBRR movable bridge inventory. NS has corrected these errors in its Reply Evidence.

Second, the unit costs for movable bridges proposed by SunBelt are unsupported and understated. SunBelt did not provide any data or documentation to back up the unit costs it proposed for the movable bridges on the SBRR. Instead, its workpapers obliquely referenced a rebuttal narrative, sponsored by its engineering witness Harvey Crouch *in a different rate case*.[338] SunBelt's approach does not come close to meeting the Board's standard for providing supporting work papers and documentation, and SunBelt is precluded from attempting to cure this inadequacy in its case-in-chief in its rebuttal submission. *See SAC Procedures*, 5 S.T.B. at 445-46; *Xcel*, STB Docket No. 42057, at 2 (served Apr. 4, 2003). SunBelt's wholly inadequate movable bridges presentation required NS to develop its own movable bridge cost evidence.

NS's approach renders moot SunBelt's machinations from its referenced rebuttal narrative attempting to reduce movable bridge costs to reflect costs it contends the SBRR would not incur. First, modern movable bridges are typically built off-site and floated into position on barges.[339] The primary reason for doing this is that the United States Coast Guard requires that

---

[338] SunBelt Opening WP "Moveable Span Cost.pdf."

[339] NS Reply WP "AMTRAK Niantic River Bridge.pdf," "BNSF Burlington Bridge Cost.pdf," and "Vertical Lift Bridge Value Engineering Report.pdf."

the navigation channel remain clear and unobstructed throughout construction of the bridge. This would be true whether the bridge was being built as new or being replaced. Because the off-site movable span erection is so common, the preponderance of modern movable bridge spans construction is performed both in the absence of rail traffic and in an area that is much easier to work in than the physical bridge location itself. The reason for this is that the construction staging areas and "lay-down areas" are specially selected for convenience, ready access, and ease of construction. Importantly, they are on land, rather than over water. This modern construction approach eliminates the need to reduce the actual real-world observed construction costs by some unsubstantiated factor to address the notion of cost savings associated with building bridges in the absence of rail traffic, because the portion of the cost attributed to the movable span already accounts for the bridge being built in the absence of rail traffic.

The other reduction factor SunBelt employed in the prior case it referenced is intended to ensure that its construction costs account for only the portion of cost attributable to the movable span, and not to the replacement of existing spans and structures. NS negates that concern through careful analysis of the data and careful calculation of reply unit costs. In the development of the movable bridge unit costs, NS excluded all of the line items devoted to demolition, removal of old structure, modification of existing structure, and similar tasks from the real world movable bridge construction project used for unit costs, so such costs are not used to calculate NS's Reply movable bridge unit costs. Therefore, the unit cost for movable spans proposed by NS on reply is derived only from costs that are associated with the movable span. The costs that NS proposes for the fixed approach spans on Reply are based on calculations that were specifically developed for the fixed approach spans, irrespective of the movable spans.

NS's Reply movable bridge unit costs are based on construction of a real movable bridge. For the vertical lift bridges, data was taken from vertical lift movable bridge costs detailed in a Value Engineering report,[340] published by a reputable movable bridge engineering firm, and publicly available on the consultant's website.[341] The data used to generate the unit cost for vertical lift bridges is unassailable, because it breaks down the bids into categories where the movable bridge line items can be delineated from the non-movable bridge line items. Further, because the data is furnished as part of Value Engineering study, the VE firm revised several unit costs and quantities to a lower value than what the contractors bid on in an effort to reduce the overall project cost. For these line items, NS used the Value Engineering data, so it is truly the lowest conceivable cost for a vertical lift movable bridge span. All of this data can be found in NS's workpapers in the form of both the original VE report and as used by NS.[342]

For bascule span unit costs, NS accepts the unit cost proffered by SunBelt before it applied the reduction for an assumed 10% cost share.[343] The reason that the 10% cost share is erroneous is discussed below.

However, before proceeding to the topic of cost share, it is important to debunk an erroneous claim that has been raised by complainants in prior rate cases. Some complainants have sought to dismiss movable bridge cost data in prior rate cases based on the irrelevant claim that the bridge in question was funded in whole or in part by some source other than the bridge

---

[340] NS Reply WP "Vertical Lift Bridge Value Engineering Report.pdf."

[341] *See* www.hntb.com (last visited June 13, 2012).

[342] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Movable Bridge Unit Cost."

[343] SunBelt Opening WP "SBRR Bridge Construction Costs.xlsx," Tab "Special Bridges," Cells C9-F9.

owner. This is a non-sequitur and a red herring: the unit *costs* of building a movable bridge are in no way related to *who pays* for the project. Concrete and steel cost the same regardless of who is paying for them. The issues of (i) movable bridge unit costs; and (ii) the percentage of the total cost of that movable bridge paid by the owner are two entirely different and analytically distinct issues that should be addressed separately. NS has identified and developed unit costs that do not depend on who funded the projects. A 10% cost share assumption is indefensible, regardless of who funds the bridges in question.

NS takes exception to SunBelt's 10% railroad cost share that SunBelt implicitly assumed for all movable bridges on the SBRR. Conspicuously, SunBelt's evidence made no attempt whatsoever to justify or support its approach of attributing only 10% of the movable bridge cost to the SBRR. Instead, without any explanation whatsoever, SunBelt's movable bridge cost calculations apply a 10% factor to estimate the proportion of the total movable bridge cost that it posits the SBRR would pay. *See* SunBelt Opening WP "SBRR Bridge Construction Costs.xls," Tab "Special Bridges," Cell E9.

A possible unstated rationale for SunBelt's assumption that the SBRR would pay only 10% of the cost of movable bridges over navigable waterways might be gleaned indirectly from its "documentation" of movable bridge costs, evidence submitted in a prior rate cases that stated *"However, to be conservative, and consistent with the approach used for overhead bridges, SECI has included 10 percent of the cost of building the movable structure . . ."* SECI Rebuttal, *Seminole*, STB Docket No. 42110, at III-F-105 (April 15, 2010). The notion, proffered in a prior rate case that was settled before a Board decision, that a *highway* overpass structure is even remotely analogous to a movable bridge over a navigable waterway is fantastic and utterly unsupportable.

In any event, SunBelt utterly failed to meet its burden of proof with respect to its tacit assumption that the SBRR would pay only 10% of the cost of movable bridges. SunBelt fails to offer any argument or support to show its 10% figure is reasonable or justified; how a factor developed for overhead *highway* bridges built over an existing rail line (even if it were valid for such structures) would somehow apply to movable spans over navigable waterways; or why an estimate developed for a prior case should apply in this case, which involves a different railroad, different structures, and a much different SARR network. Because SunBelt failed to even *attempt* to justify, explain, or support its 10% cost share approach for movable bridges on the SBRR in its Opening Evidence, its proposal should be rejected for failure to meet—or even attempt to meet—complainant's burden of proof. This is the sort of failure of proof in the complainant's case-in-chief that may not be "remedied" by a new argument or rationale offered for the first time on rebuttal. Although SunBelt may not attempt to "remedy" this failure of proof in its rebuttal presentation,[344] below NS nevertheless discusses rationalizations complainants have offered to attempt to support a similar gambit in prior rate cases.

In previous cases, plaintiffs have argued that movable bridge owners may not be required to pay for the entire cost of some movable bridges because the Federal Government sometimes subsidizes the construction of movable bridges. *See, e.g.* SECI Rebuttal, *Seminole*, STB Docket No. 42110, at III-F-105 (April 15, 2010) (Complainant stated "However, . . . movable spans are generally not paid for by the railroad when they are installed over navigable waterways . . . Indeed, the projects that CSXT used for its unit costs were all government funded.") The "government funded" bridges that Seminole's engineer referred to were bridges funded by the Truman Hobbs Act. *See* 33 U.S.C. §§ 512-516. 523. This is the only government funding

[344] *See SAC Procedures*, 5 S.T.B. at 445-46.

mechanism currently in place for the sole purpose of aiding bridge owners with the replacement of movable structures. The notion that movable bridge spans are generally funded by the federal government, however, is belied by Coast Guard data reporting that, from the inception of the Truman Hobbs Act in 1940 until July 2012, Truman Hobbs Act funding has been used for only 27 bridges. *See* Department of Homeland Security Bridge Alteration program description at 3 (Coast Guard has completed 27 bridge alteration projects under Truman Hobbs Act), available at *http://www.fedprogramsearch.com/cfds/bridge_alteration.htm* (visited July 11, 2012). Moreover, there is no fixed percentage cost sharing specified by the Truman Hobbs Act. Instead, the Act specifies that costs should be apportioned in accordance with the benefits that accrue to the bridge owner relative to the benefits that accrue to navigation and the public. *See* 33 U.S.C. § 516; *see also* 33 C.F.R. § 116.50 (specifying formula for determining appropriate share of costs for each Truman Hobbs Act bridge alteration). However, even if in some instances cost apportionment for a Truman Hobbs Act project resulted in assignment of a 10% cost share for *alteration* of a particular movable bridge, that cost share would be inapplicable to the initial *construction* of a SARR. A SAC analysis assumes the construction of a stand-alone railroad from scratch in an area where there is no existing railroad infrastructure in place. Truman Hobbs Act funds are authorized only for use in the *replacement* of *existing structures*. *See* 33 U.S.C. §§ 512-516, 523; 33 C.F.R. Part 116. This clearly eliminates the Truman Hobbs Act as a possible funding source for *new* bridges constructed on the SBRR. The movable bridges constructed on the SBRR would not be replacing lawfully constructed bridges that at one time satisfied the needs of navigation, but no longer satisfy those needs.[345] Nor is there any evidence that any of

[345] The Coast Guard web site summarizes the Truman Hobbs Act and program "The act provides for federal funding to alter lawfully constructed railroad or publicly owned bridges that allowed for the reasonable needs of navigation at the time of construction, but no longer do because the

those bridges obtained any Truman Hobbs Act funding or any other government payment to subsidize the cost of their construction.

Absent any contrary evidence, a SAC analysis must assume that the railroad owner bore the full cost of constructing the movable bridge when the structure originally was built. That bridge is what the SARR must replicate. Because the incumbent railroad presumptively bore the full cost of constructing its movable bridges, requiring the SARR to bear 100% of the cost of a movable bridge is not a barrier to entry for the SARR, it is exactly what the original bridge owner had to pay to construct the movable span. If SunBelt wished to persuade the Board to reach a different conclusion, they would have to produce evidence showing the railroad did not pay 100% of the cost for its movable bridges when they were originally built. SunBelt produced no such evidence, and therefore it is precluded from contending that the SBRR would pay anything less than 100 percent of the cost of those bridges.

Although it is SunBelt's burden to show that NS or any of its predecessors paid less than the full cost of movable bridges as part of its original construction, and NS is not obliged to "disprove" a wholly unexplained and unsupported assumption that the federal government (or some other unidentified source) paid for 90 percent of the cost of those bridges, NS has nonetheless conducted further inquiry to determine if any of the movable bridges at issue received federal funding. NS's bridge experts reviewed data and information for all movable bridges on the SBRR system that might theoretically have been eligible for Truman Hobbs Act funding. In the first instance, because Truman Hobbs was enacted in June 1940, any movable bridge built or modified before that time could not possibly have received funding under that

---

character of navigation has changed. Under the T-H Act, USCG issues an Order to Alter to owners of bridges that are unreasonable obstructions to navigation" NS Reply WP "Purpose of Truman Hobbs Act.pdf."

Act. Second, as previously explained, Truman Hobbs funds are available only for replacement or renovation of existing bridges over navigable waterways. Thus, bridges on the SBRR that have not been replaced or renovated also would not have been eligible for Truman Hobbs Act funding. Based upon NS bridge experts' review of NS records, these two limitations eliminate the vast majority of the movable bridges on the SBRR from eligibility for federal government funding under the Truman Hobbs Act.

NS's exhaustive search of its records found only one bridge on the SBRR route that appears to have received federal funding. That bridge project is the alteration/relocation of an existing bridge near Epes, Alabama that NS's predecessor railroad (the Alabama Great Southern Railroad Company), performed at the request of the federal government as part of the Tennessee-Tombigbee Waterway Project. NS has located a contract indicating that the federal government would pay the full cost of that alteration and relocation, estimated to be approximately $19,700,000. *See* NS Reply WP "Epes Bridge Agreement.pdf." NS does not have record of the actual cost of the project, or how much the federal government reimbursed NS for the project. Regardless, because NS's predecessor constructed the bridge in the first instance and the federal government appears simply to have paid for alteration and relocation of the bridge, the SBRR would be required to pay the cost of constructing the original bridge.

The preceding discussion addresses the specific cost of the actual movable spans. However, in every case where there is a movable span on the SBRR, there is also some length of fixed approach spans leading up to that movable span. The approach spans were evaluated using whichever superstructure span type that SunBelt had proposed in its original bridge cost

spreadsheet. In every case it was SunBelt's Type III span.[346] However, while SunBelt's specific proposal for the superstructure types on the approach spans to movable bridges may be feasible, the piers had to be designed from scratch. The previous sections on bridge design demonstrate that SunBelt's standard piers were insufficient for anything other than Type I or Type II spans and bridge heights less than 16.5 feet tall.

NS evaluated the needs for the substructure units specific to the approach spans for these movable bridges. Since there were typically a number of fixed approach spans, NS could not use the maximum bridge height data furnished in discovery to design the approach span piers. Instead, NS used that data to determine the tallest piers, which were located immediately adjacent to the movable span and navigation channel. Then, NS developed a layout where the structure height tapered back to the abutments. NS's bridge experts then evaluated the approach span piers as a range of pier heights.[347]

In the case of the movable bridges, the maximum bridge height in the NS bridge inventory is not the same as the maximum pier height. The maximum bridge height represents the height of the structure above land or water. This value does not include the water depth, which necessarily adds to the required pier height. When the water depth could be verified by reliable sources, NS added water depth to the maximum bridge height to arrive at the actual pier height. When the actual water depth could not be confirmed, a reasonable and conservative assumption was made. Those assumptions are shown in NS's workpapers.[348] NS's pier designs also can be found in the same workpaper file. Using the quantities from these pier designs, NS

---

[346] SunBelt Opening WP "SBRR Bridge Construction Costs.xls," Tab "Special Bridges," Column AA.

[347] NS Reply WP "NS Special Bridges_Movable.pdf."

[348] NS Reply WP "NS Special Bridges_Movable.pdf."

adjusted the cost of the approach span piers at movable bridge locations[349] using SunBelt's unit costs.

(b) Non-Movable Bridges over Navigable Waters

There is an additional structure on the SBRR that reasonably could not be replicated using SunBelt's prescribed standard piers and spans. This bridge is a non-movable structure over a navigable waterway that currently provides horizontal clearance far in excess of what could be achieved with SunBelt's standard spans. Bridge 249.00 provides horizontal clearance over the Tenn-Tom Waterway using a 480-foot long truss.[350] SunBelt has proposed to replicate this structure on the SBRR with Type III spans that have a maximum span length of just 92.5 feet.[351] This proposal falls well short of U.S. Coast Guard requirements, and would not allow for the same navigational activity on the Tennessee River as the existing bridge.

To remedy the failure to provide adequate horizontal clearance to accommodate existing water traffic, NS proposes to replicate the long truss span for this bridge. NS assumes the remainder of the bridge length would be constructed with standard superstructure spans all the way back to the ends of the bridge. With this approach, the SBRR structure would have a span over the navigational channel that provides the same clearance as exists today, which would preserve the existing bridge's functionality. NS's Engineering Experts developed steel quantities for the long span truss using a straight-forward procedure of calculations that estimates the

---

[349] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Combined Bridge Component Costs," Cells Q90 – T162.

[350] NS Reply WP "Norfolk Southern Bridge List.xls," Tab "Active Bridge List," Line 173.

[351] SunBelt Opening WP "SBRR Bridge Construction Costs.xls," Tab "Only Active Bridges," Line 97.

required steel weight based on span length.[352] To validate this approach as both reasonable and accurate, NS used this calculation approach to estimate the weight of steel for an existing long span truss where the steel weight was known. The results given by the estimating procedure are within 9.6% of the actual steel weight on the design plans for the example bridge.[353] This exercise demonstrates that the method NS used to estimate steel weight on these long truss spans yields accurate results.

The truss weight estimating procedure discussed above only addresses the main river span. The approach spans leading up to the main long truss span for the bridge were assembled and costed in the same manner described for the movable bridges above. The details of this special bridge, its specific make-up, and all of the associated costs can be found in NS's workpapers.[354] The quantities were updated based on NS's design analysis, and the bridge costs were tabulated using SunBelt's proposed unit costs, with one notable exception. Nowhere in SunBelt's work papers was there a unit price for the structural steel that would be required to build these long span trusses. That being the case, NS's Engineering Experts used the lowest unit cost for "Truss Steel" found in the value engineering report referenced in the section above on movable bridges.[355] The unit cost used by NS in this Reply is actually lower than the value engineering unit cost proposed by the firm that performed the study, to ensure that it is the lowest possible cost approach for constructing a truss for the SBRR.

---

[352] NS Reply WP "NS Special Bridges_Non-Movable Over Navigable Waterways.pdf."

[353] NS Reply WP "NS Special Bridges_Non-Movable Over Navigable Waterways.pdf."

[354] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Special Bridges – Non Movable."

[355] NS Reply WP "SBRR Bridge Construction Costs NS Reply.xlsx," Tab "Vert. Lift Movable Unit Cost," Cell K23.

c. Highway Overpasses

NS accepts the unit cost proposed by SunBelt for the one highway overpass on the SBRR, which is expressed as a cost per square foot of bridge deck area.[356] However, the manner in which the unit cost is applied to the highway overpass is not acceptable. SunBelt attempted to generically assign a bridge deck area for the bridge based on a formula.[357] Applying a formula might be a reasonable approach to estimate the bridge deck area if the actual bridge deck area data were not available. However, this generalization and formulaic approach is not necessary in this case, because the actual bridge deck area is publicly available from the Louisiana Department of Transportation. Not only is the artificial formula unnecessary, the formula used by SunBelt underestimates actual bridge deck areas reported in real-world data, so the generation of an estimate using a formula is inaccurate in addition to being unnecessary. Consider that the "Average Square Footage" for 1-Span and 2-Span bridges[358] is a mere fraction of the actual deck areas of the bridges SunBelt used to arrive at their "Average Cost/Sq Foot" value.[359] To correct this error, NS simply applied SunBelt's unit cost to the actual real-world deck area of the bridge to come up with a cost. NS accepts SunBelt's assumption that the SBRR would be responsible for a 10% cost share of the bridge, and thus applied a 10% factor in the final calculation.[360]

---

[356] SunBelt Opening WP "SBRR Over Head Bridge Construction Costs.xls," Tab "OH Bridge Double Track Cost," Cell F17.

[357] SunBelt Opening WP "SBRR Over Head Bridge Construction Costs.xls," Tab "OH Bridge Double Track Costs," Cells A2-E6.

[358] SunBelt Opening WP "SBRR Over Head Bridge Construction Costs.xls," Tab "OH Bridge Double Track Costs."

[359] SunBelt Opening WP "SBRR Over Head Bridge Construction Costs.xls," Tab "OH Bridge Double Track Costs."

[360] NS Reply WP "SBRR Over Head Bridge Construction Costs NS Reply.xlsx," Tab "OH Bridges."

6. Signals and Communications[361]

SunBelt's evidence of the cost of SBRR signals and communications systems is fraught with both conceptual and implementation errors. SunBelt's most fundamental error is its assumption that the SBRR could begin operations with a Positive Train Control ("PTC") system in July 2011—even though the components to operate a PTC system have not yet been developed today, over a year after the SBRR would begin operations. This plainly impossible assumption is just the beginning of SunBelt's errors.

SunBelt's inventory of signals equipment for the SBRR is irreconcilable with its proposed SBRR track configuration and undercounts the total amount of signals that the SBRR would need to operate. Its calculations of signal unit costs flatly misstate the unit cost quotes included in its own workpapers and omit many necessary signal components, such as foundations, battery/charger sets, and grounding equipment. And its estimates of PTC and crossing signal costs substantially understate the total costs that the SBRR would incur. Below, NS's Engineering Experts explain the errors in SunBelt's signals and communications evidence and detail their estimate of the SBRR's signals and communications costs. Table III-F-22 compares SunBelt's Opening Evidence to NS's Engineering Experts' estimate of the costs of SBRR signals and communications.

---

[361] NS's evidence regarding the costs to the SBRR for signals and communications is sponsored by NS witnesses Richard Ray and Dick Smith. Mr. Ray is the founder of RR Rail Hwy Crossing Consultants, which provides consulting services to railroads and governments concerning rail/highway crossings. Mr. Ray has over 40 years of experience, including 39 years at NS where he worked as the Administrator of Highway Grade Crossing. Mr. Smith is a consultant with XORail and has over 35 years of experience in railroad operations. Prior to his retirement, Mr. Smith was Chief Engineer, Communications and Signals for the Northern Region at NS. These experts' qualifications are further detailed in Section IV.

Table III-F-23
Comparison of SBRR Signals and Communication Costs

Item	SunBelt Opening	NS Reply	Difference
Non PTC Components			
CTC-Based Signal System (Not Incl. Xing Share)	$28.6	$97.0	$68.4
Crossing Protection Share of Sig Costs		$4.5	$4.5
Microwave Communications	$23.4	$24.5	$1.2
PCS for Hump Yards	$-	$24.8	$24.8
Non PTC Subtotal	**$52.0**	**$151.9**	**$100.0**
PTC Components			
PTC - 2011 Deployment	$1.6	$-	$(1.6)
PTC – 2011 Signal Investment	$5.6	$-	$(5.6)
PTC - 2011 Loco Radios Investment	$33.1	$-	$(33.1)
PTC - 2012-2014 Development	$-	$6.2	$6.2
PTC - 2015 Deployment	$-	$18.9	$18.9
PTC – 2015 Signal Investment	$-	$16.8	$16.8
PTC - 2015 Loco Radios Investment	$-	$5.7	$5.7
PTC Subtotal	**$40.3**	**$47.7**	**$7.4**
Total	**$92.3**	**$198.5**	**$106.2**

Source: "SunBelt C&S Estimate NS Reply.xlsx"

a. Centralized Traffic Control

i. The SBRR Could Not Install PTC In 2011.

SunBelt is correct that during its existence, the SBRR would have to install PTC. That system is required solely because of the presence of TIH traffic on the SBRR—a large portion of which is SunBelt's issue movements of chlorine. SunBelt posited in its case-in-chief that "the SBRR will install PTC at the beginning of SBRR operations."[362] That proposal is impossible, because critical PTC components still do not exist. SunBelt's claim that it could reduce

[362] SunBelt Opening III-B-7; III-F-35.

"investment expenditures" by "installing a PTC system from the outset" is irrelevant obviously it would not be feasible for the SBRR to install a PTC system before any functional system existed.[363] Instead, the SBRR will be required to construct a Centralized Traffic Control ("CTC") system for the beginning of operations in 2011 and then overlay a PTC system by December 31, 2015. This two-step process is consistent with both the real world—in which NS and all other Class I railroads are required to overlay their CTC systems with PTC—and with the Board's holding in *AEPCO 2011* that the SARR would be required to install PTC as an overlay to CTC in 2015.[364]

SunBelt's assumption that the SBRR would use PTC from the outset of its operations in 2011 is not feasible, because essential PTC technology and systems did not exist in 2011.[365] Indeed, today PTC is still in the development stage, and a number of unresolved implementation obstacles persist. A recent FRA report to Congress noted that "significant technical and programmatic issues" made it unlikely that most railroads could complete full implementation of PTC by December *2015*.[366] These issues include communications spectrum availability, final radio design and availability, design specification interoperability, back office server and dispatch system availability, track database verification, and installation engineering.[367] The idea

---

[363] *Id.*

[364] *AEPCO 2011*, STB Docket No. 42113, at 33.

[365] This discussion of the current challenges for PTC implementation is sponsored by NS witness Gerhard Thelen.

[366] Federal Railroad Administration, Report to Congress on Positive Train Control Implementation Status, Issues, and Impacts at 1 (August 2012) (included as NS Reply WP "2012 FRA PTC Report").

[367] *See id.*

that the SBRR could have installed PTC in July 2011—over a year before the FRA's Report on the significant issues that may delay the implementation of PTC by 2015—is fantasy.

For example, the SBRR could not develop and install the necessary interoperable private radio network needed for PTC by 2011. The railroad industry has been required to obtain radio spectrum and create a private radio frequency network to transmit and receive the data necessary to support an interoperable PTC network.[368] After purchasing the spectrum, rail carriers have had to design and develop a completely novel type of radio to use this frequency for PTC purposes.[369] Indeed, a report issued at the end of 2010 by the Government Accountability Office ("GAO") found that essential PTC technology had not yet been developed, tested, and implemented. As GAO summarized at the end of 2010,

> Railroads currently expect that key PTC components will be available by 2012, but there is uncertainty regarding whether this can be achieved, given the delays in developing the interoperability standards and current lack of software for PTC components . . . If the railroad industry is unable to develop fully functional components within the expected time frame, it is possible that testing and installation of these components could not be completed by the 2015 deadline.

GAO Report: Rail Safety: Federal Railroad Administration Should Report on Risks to the Successful Implementation of Mandated Safety Technology, at 21 (December 2010). GAO listed the following essential elements of a PTC system that had yet to be developed:

- Data and communication radios for locomotives and wayside units, essential for PTC communication on new radio spectrum purchased by rail carriers for PTC;
- Tested wayside unit hardware;

---

[368] *See* AAR, *PTC Implementation: The Railroad Industry Cannot Install PTC on the Entire Nationwide Network by the 2015 Deadline* at 8 (January 18, 2012). (NS Reply WP "PTC Implementation Report").

[369] *Id.*

- PTC software "to perform all train control functions, including determining a train's location and calculating a train's braking distance." Development and implementation of such software is essential to a working PTC system, because "PTC systems cannot be tested and implemented until software is finalized";

- Implementation of interoperability standards to allow rail carriers' equipment to have PTC functionality on foreign carriers' systems.

Id. at 17-21. Plainly, technology and systems that are essential to a functioning interoperable PTC system did not exist at the end of 2010 and those issues were not magically resolved seven months later in mid-2011. Therefore, a working PTC system that would meet applicable requirements was not available when the SBRR commenced operations in July 2011.

More recently, rail carriers submitted a report to the FRA demonstrating that significant development, technology, and integration challenges remain even in 2012. In January 2012, the Association of American Railroads submitted a report to the FRA demonstrating that it was unlikely that rail carriers would be able to meet the Rail Safety Improvement Act mandate for a full nationwide interoperable PTC network by December 2015.[370]

That PTC Implementation Report described numerous development, technology, integration, testing, and implementation work, challenges, and delays, affecting every major component of PTC systems that then remained to be addressed before carriers could implement an operating PTC system that meets federal regulations.[371] One example of an essential and time-consuming PTC development task is the ongoing development and implementation of numerous interoperability standards. A number of interoperability standards are still in

---

[370] *See* AAR, *PTC Implementation: The Railroad Industry Cannot Install PTC on the Entire Nationwide Network by the 2015 Deadline* (January 18, 2012) (NS Reply WP "PTC Implementation Report").

[371] *See* PTC Implementation Report at 1-14.

development. In August 2012, FRA estimated that interoperability standards would not be finalized until late 2012.[372]

Once these interoperability standards have been promulgated, they must be implemented and tested on the numerous PTC system components on each rail network that will install PTC.[373] Thus, according to FRA's current estimate, interoperability standards would not be available for testing and implementation until at least a full year after the July 2011 commencement of SBRR operations. The difficulties and complexities of interoperability standards and implementation are discussed in more detail in a 2012 study by the Transportation Technology Center.[374] These interoperability issues would be a major issue for the SBRR because it would be connect with every other Class I railroad except CP. *See* SunBelt Opening at III-B-3. SunBelt cannot reasonably assume a PTC system that the SBRR would attempt to fully deploy in 2011 would be interoperable with those connecting railroads once those other railroads develop and implement their own PTC systems, four years later.

The SBRR's inability to use technology that did not yet exist in 2011 is not an impermissible barrier to entry. Rather, it is a real-world limitation that is faced by existing railroads, including NS. Just as a SARR must incur the same costs that the incumbent would incur in building new rail lines through territory in which no rail line presently exists, so it must face the same technical challenges, limitations, and costs that real-world carriers faced in 2011 and through the 2015 implementation deadline. *See, e.g., BNSF v. S.T.B.*, 114 F.3d 206, 214 (D.C. Cir. 1997) ("[T]he Board defined barriers to entry as those 'costs that a new entrant must

---

[372] *See* NS Reply WP "2012 FRA PTC Report" at 23.

[373] *See id.* at 14-15.

[374] *See* NS Reply WP "2012 TTCI Report.pdf" (advocating phased implementation of PTC to account for the complexity of interoperability).

incur that were not incurred by the incumbent.'") (citing *West Texas*, 1 S.T.B. at 670). These are actual costs and technological limits faced by NS and the other Class I railroads in developing and implementing PTC. Basic economic and SAC principles do not allow the SBRR to assume the existence of PTC technology before it exists. For example, the SBRR cannot assume that it would purchase locomotives that are more efficient or otherwise superior to the locomotives that exist in the real world. SARR operations, configuration, and road property investment must be *feasible*. It is not feasible to assume that the SARR would implement PTC technology before that technology exists.

The Board has held that requiring a SARR to install PTC at the time it is available does not constitute a barrier to entry.[375] In *AEPCO 2011*, carrier defendants included the cost of implementation of PTC in 2015. The complainant argued that PTC costs should be excluded from the calculation of SARR road property investment.[376] The Board rejected AEPCO's argument, finding that the SARR—like real world rail carriers—would incur PTC costs in accordance with the law requiring installation of PTC by the end of 2015.[377] Significantly, although AEPCO assumed its SARR would commence operations in 2008-09, neither the parties nor the Board assumed that the SARR would be able to implement the technology in 2011. Instead, they assumed the SARR would implement PTC in 2015.[378] Nothing in the Board's decision suggests that the inability of the SARR to implement (non-existent) PTC technology prior to 2015 constituted an impermissible barrier to entry.

---

[375] *See AEPCO 2011*, STB Docket No. 42113, at 33.

[376] *See id.* at 33-34.

[377] *Id.* at 34.

[378] *See id.*

Because installation of PTC at the commencement of SBRR operations in 2011 would not be feasible,[379] NS's Engineering Experts substitute the realistic assumption, consistent with existing legal requirements, that the SBRR would install a CTC system that would be operational at its 2011 commencement of operations. The SBRR would then be required to overlay the system with PTC by the December 31, 2015 statutory deadline.[380] These costs are described below in section III-F-6-b.

ii. SunBelt's Inventory of Signals Components Is Unreliable

A second fundamental problem with SunBelt's signals evidence is that the signals it proposes to build have no relation to the actual SBRR track configuration. SunBelt claims to have developed signals inventory by considering "the layout of the SBRR as manifested in the SBRR stick diagrams and the track charts provided by NS in discovery." SunBelt Opening III-F-35. While this would have been a reasonable approach, it is not what SunBelt actually did. The SunBelt workpaper listing its inventory of SunBelt's signals components is a spreadsheet entitled "SunBelt C&S Estimate.xls." The "Page Counts" tab of that workpaper references pages from SunBelt's SBRR stick diagrams and sixteen undisclosed "Supplemental" pages[381] and purports

---

[379] As noted above, the SBRR's PTC system would need to be interoperable with systems implemented in 2015 by other carriers with which the SBRR would interchange traffic. Thus, even if the SBRR were to incur costs necessary to conduct all of the research and development required to develop a stand-alone PTC system prior to July 2011, it still would not be able to make such a system interoperable with other carriers' systems, which are not required to be operational until the end of 2015.

[380] The SBRR would thus be required to incur the initial expenses of installing a CTC signaling system to be operational in July 2011. Over the course of the next four years, the SBRR would be required to make capital expenditures and investments necessary to overlay that system with a PTC system, in order to meet the December 2015 statutory deadline.

[381] SunBelt Opening Workpaper "SunBelt C&S Estimate.xlsx," Tab "Page Counts," Column A Rows 13 – 21 and 27 – 33.

to include counts for such signal items as interlocking huts, signals, switches, and track circuit ends. But SunBelt's signal item counts and associated interlocking component inventories are irreconcilable with the SBRR stick diagrams or the undisclosed supplemental source material. Having not received the "Supplemental" Pages previously referred to in the SunBelt's papers, NS Signal Engineering Experts relied on the SunBelt Page Count of their C&S Estimate for evaluation of the SBRR proposed signal system and found it to be no more reliable than their Stick Diagram.

In this Reply evidence, NS sets forth an evaluation of five sections of the SBRR with comments describing the inconsistencies between SunBelt's signal inventory, its stick diagram, NS's Track Chart (with the actual signals equipment on the NS tracks) and NS Signal Engineer's detailed estimate of SBRR signal requirements based on the SBRR stick diagrams. *See* NS Reply workpaper "NS Reply SBRR Signal Evaluation.pdf." For example, on the Birmingham-New Orleans Route between milepost 139.08 and 142.76, SunBelt's count of Switches (1W) showed seven (7) switches in their C&S Estimate and three (3) switches on their Stick Diagram. Further, NS's Signal Engineering Experts could not find any direct link to SunBelt's use of the NS Track Charts in SunBelt's C&S Estimate for preparation of its proposed signal system. In developing NS's own SBRR signal inventory, NS Signal Engineering Experts used the NS track charts as a supplemental source to derive the operating functionality of the signal system and to develop a more accurate count of equipment.

Indeed, SunBelt's inventory count omitted three of the five crossings at-grade interlockings with other railroads. SunBelt's evidence considered only two at-grade crossings. One of those railroad crossings is located within an existing NS control point at milepost 141.70, and the other is located within an existing CN control point at milepost NO-85.40. SunBelt's

evidence did not show or reference the other three crossings at grade. For example, SunBelt failed to include an at grade railroad crossing with the AGR at milepost 242.50 (AGS South). In this Reply, NS added a control point with no switch on Row 169 of the "Reply Signal Layout" tab of the NS Reply workpaper "SunBelt C&S Estimate NS Reply.xls" to account for the missing rail crossing interlocking. Based on their review, NS's Signal Engineering Experts also added two other control points with no switches to account for the other missing railroad at grade crossing interlockings on the SBRR.

Sunbelt also omitted five movable bridge spans over navigable waterways on the SBRR. For example, Sunbelt failed to include a signal interface with the movable bridge equipment on the bridge over the Warrior River at milepost 88.20 MB. NS on Reply added a control point with no switches on Row 20 of the "Reply Signal Layout" tab of the NS Reply workpaper "Sunbelt C&S Estimate Reply.xls" to account for this control point at the movable bridge span. Based on a similar review, NS Signal Engineering Experts added four other control points with no switches to account for missing movable bridge spans on the SBRR.[382]

The inconsistencies in SunBelt's signals inventory are exacerbated by its failure to provide any documentation of the milepost locations of either (1) any of the automatic signals (AS1- AS4) locations on the SBRR; or (2) 13 crossover tracks.[383] It is impossible to assess the adequacy of SunBelt's proposed signals network without knowing precisely where it proposes to place these network elements. For example, SunBelt's failure to identify the locations of automatic signals (AS1-AS4) or crossover tracks for rail/highway grade crossings could mean

---

[382] See NS Reply WP "NS Reply SBRR Interlocking and Bridge Inventory.pdf."

[383] Through detailed review of the SBRR stick diagrams, NS's Engineering Experts were able to associate 12 of these 13 crossover tracks with likely defined locations. The locations of the remaining crossover tracks are not ascertainable from any of the workpapers SunBelt provided.

the omission of additional unidirectional detection equipment, (described *infra* at III-F-6-d) needed to provide adequate warning to the public of an approaching train. More generally, site-specific information is essential to locate a control point, which governs placement of other equipment such as automatic signals and additional detection equipment for rail/highway crossing signals.

In short, SunBelt utterly failed to provide documentation of its signals inventory or any reliable evidence that SunBelt's proposed signals configuration would be adequate for the SBRR. While omission of mileposts for crossover tracks, railroad at grade crossings, automatic signal locations, and the like may seem insignificant to SunBelt's plan and estimate development, it has a significant impact when developing accurate plans for a signal system for both train operations and crossing signals and their associated costs. NS's Signal Engineering Experts therefore developed their own count of required signals based on the proposed SBRR network, using site-specific criteria and industry-accepted signal practices. NS's Signal Engineering Experts developed their analysis in light of the SAC principles that the SARR would be a least-cost, most-efficient operator, but must nonetheless have a feasible infrastructure that is consistent with the requirements of real-world railroading. In many cases NS's Signal Engineering Experts' approach resulted in less signals equipment on a segment than SunBelt posited—in other cases SunBelt clearly omitted necessary equipment.

The first step employed by NS's Signal Engineering Experts was to determine the least-cost, most-efficient signal design for the SBRR. NS's Engineering Experts developed test buildouts of four different signal system designs for a hypothetical 20 mile segment sample. The alternatives evaluated were: (1) cab signaling supplemented with wayside signals; (2) cab signaling with no wayside signals; (3) the signal configuration currently in use over the former

Norfolk & Western ("N&W") territory; (4) and the signal configuration currently in use over the former Southern Railway ("Southern") territory.[384] This analysis showed that the most efficient signal configuration was the configuration currently in use over the former Southern territory, which is slightly less costly than the one in place over the former N&W territory and approximately one-third less costly than either of the cab-based systems.[385] Under the selected design, controlled signals have either two or three signal heads. Wayside intermediate signals throughout the block[386] will have either one or two signal heads. The signal spacing throughout the block is roughly 2.0 to 2.5 miles depending on terrain, sight lines, and estimated train stopping distances, with no block being longer than 3.0 miles. These block distances were chosen to maximize the efficiency of train operations by expediting following train moves and signal equipment utilization.[387]

NS's Engineering Experts next used SunBelt's SBRR stick diagrams to identify the specific signal requirements for each turnout, interlocking, rail crossing and junction for the SBRR. Specifically, NS's Engineering Experts identified for each individual signal site the count of associated interlocking components for that site. (For example, an end of siding ("EOS") on the SBRR stick diagram would require components including one EOS hut, two 2-headed signals, one 3-headed signal, one grounding kit, one 12-volt battery, one 24-volt battery, and various cables). NS provides a list of typical interlocking components for each type of site

---

[384] *See* NS Reply WP "Typical Signal System Costs to Install CTC.pdf."

[385] *See id.*

[386] A CTC signal block is the track distance between two signal control points.

[387] Track circuit lengths are generally kept at less than three miles maximum to allow for varying track conditions.

identified on the SBRR in NS Reply WP "SunBelt C&S Estimate Reply.xlxs," Tab "Reply Signal Typicals."

Since the SBRR signal foundation is a CTC system for wayside signal control, all movements over power operated switches must be governed by controlled signals. NS's Engineering Experts assumed that all switch turnouts on the SBRR stick drawings marked as #20 and #14 were power operated and that turnouts marked as #10 are hand thrown and equipped with electric locks. For other turnouts not identified by size in the SBRR stick diagrams, where possible NS's Engineering Experts used where possible existing NS track charts to determine milepost and the type of turnout.

NS's Engineering Experts reject SunBelt's unprecedented proposal to use a "scaling factor" to convert a variety of complex signal component counts into a plain vanilla standard end of siding interlocking as a surrogate for designing and costing larger, more complex and challenging interlockings.[388] SunBelt provides no explanation for how it derived its "scaling factor," and its calculations of that factor have transparent flaws.[389] Moreover, while it is true that the amount and type of interlocking components vary based on site needs, there is no reason why larger interlocking models cannot be costed directly. Indeed, quotes from SunBelt's own workpapers provide much of the necessary support for costing larger interlockings. NS's Engineering Experts' site-specific approach and rejection of SunBelt's "scaling" methodology caused them to identify more component types than were used by SunBelt for interlocking huts (NS Reply WP "SunBelt C&S Estimate NS Reply," Tab "Reply Signal Typicals," Rows 8 – 14

---

[388] *See* SunBelt Opening III-F-36.

[389] For example, SunBelt fails to include all equipment at a standard EOS. SunBelt's scaling workpaper claims that there are three track circuits per EOS; however, there are actually five track circuits: one for each of the three approach tracks and two within the control point.

& 16 – 17"), signal configurations, (NS Reply WP "SunBelt C&S Estimate NS Reply," Tab "Reply Signal Typicals," Rows 28 – 33 and NS Reply WP "Different Signal Configurations") and electric lock cases, (NS Reply WP "SunBelt C&S Estimate NS Reply," Tab "Reply Signal Typicals," Rows 18 – 19, showing components) as detailed below.

- Interlocking Huts. SunBelt proposed one interlocking hut type for all the different configurations for control points on the SBRR, and proposed to use its scaling methodology to account for more complex configurations. In contrast, NS's Engineering Experts developed four additional huts. These new items and their unit costs are set forth in NS Reply WP "SunBelt C&S Estimate NS Reply," 'Reply Components & Tabulation' Tab, Rows 8 through 14. Labor installation costs were obtained from Interrail. *See* NS Reply WP "Interrail Labor 081012.pdf"

- Signal Configurations. SunBelt used one signal with mast and two heads to cover all the different configurations for signals at control points and automatic signal locations on the SBRR. NS experts added six different signal configurations, which accurately reflect signals needed at control points and automatic signal locations. These new items and their unit costs are set forth in NS Reply WP "SunBelt C&S Estimate NS Reply," Tab "Reply Components & Tabulation," Rows 28 through 33. Labor installation costs were obtained from Interrail. *See* NS Reply WP "Interrail Labor 081012.pdf"

- Electric Lock Cases. SunBelt used only one type of electric lock case. However, there are locations on the SBRR that have more than one electric lock that must be operated out of the lock case. Therefore, NS's Engineering Experts added an electric lock hut - 2 track. This new item and its unit costs are set forth in NS Reply WP "SunBelt C&S Estimate NS Reply," Tab "Reply Components & Tabulation," Rows 18 & 19. Labor installation costs were obtained from Interrail. *See* NS Reply WP "Interrail Labor 081012.pdf"

The specifics of the NS reply signal inventory by milepost and component are set forth on the "Reply Signal Layout" tab of NS Reply WP "SunBelt C&S Estimate NS Reply.xls." Table III-F-24 compares the signal component inventory developed by NS's Engineering Experts with that presented in SunBelt's opening. NS's site-specific methodology resulted in a lower overall number of Control Huts and a lower number of signal masts and heads.

Table III-F-24
Comparison of NS Reply Signal Component Inventory to SunBelt Opening

Category	SunBelt Opening	NS Reply	Difference
Interlockings 1/	129	118	-11
Double track automatic signal hut	16	6	-10
Single track automatic signal hut	197	160	-37
Electric lock case 2/	30	132	102
Single track failed equipment detector 2/	15	47	32
Dragged Equipment Detector	15	52	37
Signal, two head (three aspects each) 3/	802	733	-69
Power mainline switch machine: 24VDC	154	155	1
Manual mainline switch mechanism	30	147	117
Battery/charger set 12V 400AH.	430	1137	707
Commercial power drop	430	888	458
Foundation - Signal Mast	*n/a*	*1312*	*1312*
Battery/charger set24V 400AH	*n/a*	*159*	*159*
Grounding Kit for Signal Equipment Shelter	*n/a*	*898*	*898*
Track Connections - Near and Far Rail	*n/a*	*2732*	*2732*

1/ - NS adds four new types of huts tailored to control point needs
2/ - Double track versions added when applicable
3/ - NS replaces generic signal with six specific signal types that vary in heads and aspects

iii. SunBelt's Unit Costs For Signals Components Are Incorrect.

SunBelt's approach to estimating the costs for signals components is as flawed as its approach for determining signals inventory. SunBelt's primary error is a failure to account for all of the parts necessary to construct complete and functional signals components. As demonstrated below, SunBelt omits fundamental items like foundations, battery power, and grounding kits for its signals components. SunBelt also misstates the costs for two signal components.

SunBelt's omissions of necessary signal component equipment are detailed below:

BCP and MCP interface control equipment. SunBelt's proposed CTC System failed to include any remote control equipment between the Control Office in Birmingham, AL and the field control points across the SBRR operating system. This equipment is necessary for the communication link to interface between the Control Center and equipment in the field. To remedy this oversight NS's Signal Engineering Experts have supplied the SBRR with appropriate equipment currently being used on the Norfolk Southern System such as the BCP (Base Communications Package) at the Microwave sites and MCP (Mobile Communications Package) at each field control point. NS engineering experts added these two items to the "Sunbelt C&S Estimate NS Reply.xls", under the 'Reply Components and Tabulation' Tab, Rows 55 & 56.

Foundations. SunBelt's opening evidence did not include the cost of signal foundations needed to erect signals at control points, approach signals, intermediate signals, and crossing signals. SunBelt used quotes from Safetran to obtain unit costs for these components, but Safetran has confirmed that foundations are not normally included in its quotes for either signals or crossing signals. *See* NS Reply WP "Email - Safetran Foundations.pdf." NS's Engineering Experts developed the cost of signal foundations from an NS AFE made available to SunBelt during discovery[390] and developed labor costs for installation from Interrail.[391]

Electronic Locks. SunBelt's materials package for its electronic lock locations did not include insulated joints, pipeline material, or labor to connect to the hand throw switch at the

---

[390] *See* NS Reply WP "NS AFE – F11158.pdf."

[391] *See* NS Reply WP "Interrail Labor 072612.pdf."

electric lock or track connections. Therefore, NS's Engineering Experts added insulated joints for electric locks to the overall SBRR insulated joint count.

Track Connections. SunBelt also omitted Track Connections (Near& Far) for all track circuits. Track Connections are necessary to make the physical connection between the rail and underground (track) cable as part of the track circuit. NS's Engineering Experts included track connections for all track circuits (*i.e.*, signals, crossing signals and electric locks). NS's Engineering Experts developed the cost of track connections from an NS AFE made available to SunBelt during discovery,[392] and developed labor costs for installation from Interrail.[393]

Battery/Chargers. SunBelt also omitted a number of 12 volt battery/charger sets, which are required to provide DC power to wayside equipment such as control points, intermediate signals, electric locks, detectors, crossing signals, and AEI locations. NS's Engineering Experts added these sets where a 12 volt power supply is required to operate signal circuitry using a 12 volt source. This change is shown in NS Reply WP "SunBelt C&S Estimate NS Reply," Tab "Components & Tabulation," Row 41, Columns D & E.

SunBelt also did not include material and labor cost for 24-volt batteries and chargers for 24-volt battery systems, which are necessary to provide 24-volt power to switch machines and hot box detectors. NS's Engineering Experts added these costs using a materials cost from SunBelt's own workpapers, "Radios", Page 16, and used the same labor costs as SunBelt used for installing the 12-volt batteries and chargers in SunBelt WP "SunBelt C&S Estimate," Tab, "Components & Tabulation," Row 42, Columns D & E."[394]

---

[392] *See* NS Reply WP "NS AFE – F10635.pdf."

[393] *See* NS Reply WP "Interrail Labor 072612.pdf."

[394] *See* SunBelt Opening WP "SunBelt C&S Estimate."

Cables. SunBelt did not include the correct cable for connecting AC Power between the service drop and the equipment shelter. AC Service drops are wired for 240 volts, which requires a three conductor cable to hook up the two phases and the ground tap. NS's Engineering Experts therefore used 3C#6 cable. NS's Engineering Experts developed the cost of cables from an NS AFE made available to SunBelt during discovery[395] and used the same labor cost that SunBelt used for cabling.

Grounding Kits. SunBelt also did not include grounding kits for signal equipment shelters. Grounding kits are necessary to ground the signal shelter and protect railroad personnel from electrical shock and to protect electronic equipment from damage due to lightning strikes or power surges. It is critical that the signal equipment shelters have excellent grounding, because the electronic equipment that will be required for the SBRR's signals is susceptible to damage by foreign current causing failure of the signal or crossing signal system. NS's Engineering Experts developed the cost of grounding kits from an NS AFE made available to SunBelt during discovery[396] and developed labor costs for installation from Interrail.[397]

Derails. SunBelt asserts that the derails of the SBRR are pipe connected[398] to the main line switch, but does not include material and labor for those pipeline connections. Pipeline connections represent old and unsafe technology that is not feasible for safety reasons and maintenance cost, therefore NS began elimination of pipeline connections back to the main

---

[395] *See* NS Reply WP "NS AFE – F10635.pdf."

[396] *See* NS Reply WP "NS AFE – F11056.pdf."

[397] *See* NS Reply WP "Interrail Labor 072612.pdf."

[398] Pipe connected or pipeline is a system of pipe and pivot points connecting two or more pieces of movable equipment to act as one, so, when the primary piece of equipment is moved the other pieces move in unison.

switch many years ago and started replacing them with a separate switch stand and signal circuitry. This decision was driven by the many injuries to railroad personnel when throwing a switch on the mainline that was connected to the derail by a pipeline located approximately 350 feet from the switch. The obsolescence of pipeline connections to derails is confirmed in SunBelt's derail workpapers which do not include either material or labor costs for the derail pipeline connection (SunBelt opening WP "SunBelt C&S Estimate"). SunBelt also misstated the material unit costs for two items. Specifically, material unit costs for Power Mainline Switch Machine 24VDC were shown as $15,126, and Manual Mainline Switch Machine were shown as $16,890, which Sunbelt indicated were prices obtained from Alstom. *See* "SunBelt Cost Estimate" under the 'Components and Tabulation' Tab, Rows 17 &18. NS's review of SunBelt's "Radios" workpapers did not find the foregoing amounts in the Alstom Quotes at pages 17-18. Those workpapers do show, however, price quotes of $26,000 for the Power Mainline Switch Machine 24VDC and $21,000 for the Manual Mainline Switch Machine. NS's Reply evidence uses those corrected costs from SunBelt's opening workpaper "Radios," Page 19. *See* NS Reply WP "SunBelt C&S Estimate NS Reply."

b. PTC

i. PTC Wayside System

As discussed, SunBelt is correct that the SBRR would have to install a PTC system during the SBRR's life. That system is required solely because of the presence of TIH traffic on the SBRR—a large portion of which is SunBelt's own issue traffic. As further demonstrated above, however, SunBelt's assumption that the SBRR would begin operations with PTC is impossible and plainly infeasible. *See* III-F-6-a, *supra*. Instead, the SBRR would begin operations with a CTC system and overlay PTC by December 31, 2015 as required by the Rail

Safety Improvement Act. NS's Engineering Experts developed PTC installation costs as follows.

NS's Engineering Experts developed costs for a PTC integrated system to be installed at all wayside control points, wayside signals, and tunnels. Moveable span bridges would be outfitted in the same way as control points, because from a signals perspective, those bridges are the same as control points. Details of NS's Engineering Experts' proposed signal configuration for the SBRR are set forth in NS's Reply workpapers.[399] NS's workpapers also include unit costs for new components and correct outdated unit costs used by SunBelt. SunBelt made a number of unexplained and unsupported adjustments to the NS cost estimates that reduced the costs of both materials and installation. For example, although the NS PTC cost detail provided to SunBelt in discovery contained cost estimates for both standard control points and more complex and expensive control points at double crossovers, SunBelt used only the lower cost for standard control points. SunBelt also excluded necessary antenna tower costs for PTC radio equipment at wayside interfaces and arbitrarily reduced installation labor by 75 percent.

[399] *See* NS Reply WP "SBRR Sticks Signal System Design Mark Up.pdf", "SunBelt C&S Estimate NS Reply.xls," Tabs "Reply Signal Layout" and "Reply Signal Typicals."

Table III-F-25
PTC Costs

Table -- Comparison of NS and SBRR Wayside PTC Unit Costs					
Equipment Item	**NS Quoted Cost for PTC Per Typical Single Interlocking**	**SunBelt Open Cost Share**	**SunBelt Open Cost**	**NS Reply Cost Share**	**NS Reply Cost**
WIU	$8,000	100%	$8,000	100%	$8,000
WIU KIT	$1,500	100%	$1,500	100%	$1,500
GPS	$400	100%	$400	100%	$400
RADIO	$3,800	100%	$3,800	100%	$3,800
TOWER 60'	$4,400	0%	$0	100%	$4,400
ANTENNA / KIT	$7,500	100%	$7,500	100%	$7,500
ENGINEERED PLANS	$8,000	100%	$8,000	100%	$8,000
LABOR	$25,000	25%	$6,250	100%	$25,000
TOTAL	**$58,600**		**$35,450**		**$58,600**

Source: "SunBelt C&S Estimate NS Reply.xlsx"

Where appropriate, NS corrected SunBelt's unsupported unit cost adjustments for components that would be deployed in the SBRR PTC system. For those components that have been more recently developed, NS Engineering Experts obtained from vendors more current quotes for newer PTC components. All PTC component prices are indexed to the third quarter of 2015, using vendor-provided price adjustments when possible and otherwise using a forecast of the AAR's Material and Supplies Rail Cost Recovery Index.

ii. PTC IT Costs

NS provided to SunBelt in discovery its estimates of the cost for the information technology components of the PTC system, which are shown in Table III-F-26 below.

Table III-F-26

{{

}} NS's Signal Engineering Experts reject both adjustments. First, SunBelt's "UTCS adjustment per Phil" is arbitrary, unsupported, and unwarranted. Second, unlike wayside costs which vary by the number of miles of PTC installed and the number of wayside components outfitted with PTC capabilities, the IT back office costs are lump sum estimates that are largely fixed and unaffected by the route miles deployed. The lone exception is the cost for the 802.11 buildout, which involves outfitting points along the right of way with PTC communication capabilities. NS

[400] SunBelt assumes the SBRR will install PTC over 578 route miles while NS estimates its actual deployment as 10,904 route miles.

Engineering Experts assume the SBRR would incur the same costs as NS for all PTC IT deployment elements except the 802.11 buildout, which has been scaled by the relative SBRR route miles of PTC versus NS's planned deployment. The SBRR PTC IT Deployment costs are summarized in Table III-F-27.

{{

}}

iii. PTC Locomotive Costs

SunBelt assumes that the SBRR will incur a cost of approximately {{ }} to outfit each locomotive with PTC capability. NS Engineering Experts accept this figure and apply it to the number of SBRR locomotives calculated using its reply operating plan.

iv. PTC Development Costs

Because it is a nationwide mandate, a critical aspect of PTC deployment is interoperability across railroads, which involves the communications links between wayside equipment, locomotive, and the network office. Effective PTC deployment requires that various

types of equipment owned by many different railroads must be able to communicate on any track equipped with PTC. Class I railroads have spent considerable time and other resources coordinating on various aspects of PTC deployment to ensure interoperability. Radio frequency, for example, must be settled in advance so that radio receivers and network equipment can be standardized for use by all railroads. To that end, PTC-220 LLC, a consortium of the UP, NS, CSXT, and BNSF railroads, has purchased licenses to some frequencies in the 220 MHz range and is actively pursuing acquisition of additional spectrum for operation in congested areas. In addition, in 2008 BNSF, CSXT, NS, and UP signed an agreement to establish PTC interoperability standards for a number of critical aspects that include:

- Development of PTC Standards
  - Uniform interface standards
  - Messaging format
  - Wireless protocol
  - Braking algorithm
  - Track database format
- Interoperable Hardware Platforms
  - Waysides
  - Base stations
  - Locomotives
- Infrastructure Sharing
- Utilization of 220MHz frequency spectrum

NS also has initiated its own pilot test project on different sections of existing track segments on its Piedmont Division. The project began in 2005 and currently is in the development and design phase, although some components are being tested. Since 2005, NS has

been able to test and validate various communications components, wayside interface units and switch monitors, initial locomotive computer design, the track database formatting, and communications coverage. In the office, NS has tested design versions of software for the Back Office Server and for UTCS enhancements as well as some of the UTCS enhancements for train tracking.

The NS PTC development effort is substantial and ongoing. Table III-F-28 summarizes NS's estimated PTC development cost, both incurred to date and forecast over the remainder of the projected deployment period.

Table III-F-28

{{

}}

Table III-F-29 shows that NS has spent and plans to spend over one-half billion dollars on PTC development and related costs in addition to the actual field, back office, and locomotive

cost deployment. As a new entrant without a variety of legacy signal and communications technologies to upgrade or retrofit, the SBRR would not need to incur all of the development costs of the residual NS, but it would still encounter substantial development costs.

Table III-F-29

{{

}}

As Table III-F-29 shows, of the {{ }} in PTC development cost estimated to be incurred by NS in addition to its actual PTC deployment cost, the SBRR would be required to incur nearly {{ }} or approximately {{ }}

1. C&S PTC Project Costs: The TC Green, Poleline and ECII/Trakcode projects represent expenditures required to upgrade and/or modify the NS legacy signal systems to accommodate PTC. Because the SBRR is assumed to build a new CTC system with which to begin operations in 2011, it will not be required to upgrade or modify any legacy systems and will not incur any of these costs.

2. Other PTC Related Projects: OBN stands for On Board Network and is the communication system package required for the locomotive on board communication hardware to interface with the PTC based communication network. These costs will vary directly with the number of locomotives that are PTC equipped and are in addition to the approximately {{ }} to outfit each locomotive with PTC capability discussed above under Section III-F-6-b-iii. The NS actual OBN costs of $63 million were divided by the 3,411 locomotives NS anticipates outfitting for PTC[401] to derive an OBN cost per unit of approximately $18,700. This cost is multiplied by the number of locomotives required for the SBRR.

   Leader costs represent the costs NS incurred to equip 500 locomotives with a prototype version of PTC train management computers. The earlier vintage train management computers represent the same type of equipment that will be installed for each locomotive that is covered by the approximately {{ }} to outfit each locomotive with PTC capability discussed above under Section III-F-6-b-iii so the SBRR will not be required to incur any additional development cost for this item.

3. Other PTC Related Projects: GIS is the Geographic Information System component of PTC that keeps track of the track curve and grade information along the train route of movement as input to the PTC braking algorithms. NS has incurred or projects to incur $18 million in operating expenses to gather and upload the GIS data into the PTC related systems for its planned PTC deployment miles. The SBRR would be required to incur the same expenses for its relative share of PTC related mileage.

4. PTC Related Subsidiaries: PTC 220 LLC and MCC LLC are companies formed by a consortium of railroads, of which NS is a part, to obtain the required communications radio spectrum for PTC operations. The SBRR as a replacement to NS is stepping into NS's shoes regarding participation in these organizations. The SBRR contribution is calculated based on the relative miles of SBRR proposed PTC deployment versus NS's planned deployment.

5. PTC Pilot/Development AFE's: PTC is still in the development stages. In order to test and refine the PTC technology, NS developed two PTC pilot programs on portions of its network. The NS pilot programs began in 2005 and covered a 114 mile non-signaled line from Charleston, SC to Columbia, SC and a 108 mile signaled

[401] See NS Reply Workpaper "2011-02-10 PTC Cost Estimate NS Reply.xlxs," Tab "C&S Deployment Cost."

line from Columbia, SC to Charlotte, NC.[402] Because PTC is not yet available off the shelf, the SBRR would also be required to incur costs for a PTC pilot program, but would likely not commence the program until after railroad operations begin in July 2011. Because of the later start date, NS in its reply assumes that the SBRR would incur one-half the cost NS has incurred and is expected to incur on its own pilot program. Also, because the SBRR is a much smaller network than NS, a mileage related adjustment based on the relative portion of NS miles included in the pilot program to the NS overall planned PTC deployment was made.

v. PTC Expenditure Schedule

FRA mandates that PTC deployment be completed by December 31, 2015. In its Reply NS assumes that the SBRR will meet the FRA mandate and that all PTC-related expenditures except development costs will be incurred in the year 2015. NS assumes SBRR PTC development costs would be spread equally over the period from January 1, 2012 through December 31, 2014. In addition, even though NS treats certain of the PTC development costs as operating expense, NS conservatively assumes all PTC related costs will be capitalized by the SBRR.

c. Detectors

SunBelt's evidence of the SBRR's signals investments is further flawed by its substantial understatement of the need for failed equipment detectors ("FEDs").

SunBelt proposes to place FEDs 35 miles apart. This spacing is too great and is inconsistent with modern railroading. SunBelt's claim that its spacing is "consistent with the current industry standard" is incorrect. SunBelt Opening III-F-36. SunBelt's only support for that claim is a citation to a superseded AREMA Manual from 2001. *Id.* at n.100. The 2007 AREMA Manual removed the spacing guidance on which SunBelt relies.

---

[402] NS Reply Workpaper "2011-01-16 PTC overview (NS-DP-HC-38350 to 38371).pdf," Slide 8.

Current AREMA standards suggest that FED placement and spacing requires consideration of a number of relevant factors, including the type of defect to be detected, the characteristics of the train traffic, and the available locations that are suitable for the installation of detectors.[403] Other factors specific to each line segment would impact the line segment's exposure factor and could be used to focus the detector type and placement best suited to a given line segment. Some typical elements are:

- Passenger Density
- Freight Traffic Density – Gross Ton Miles
- Line Speed
- Hazardous Material Mix
- Environmental Impact Exposure
- Adjacent Property Use
- Past Rolling Stock Problems
- Physical Characteristics, Curves, Grades, etc.

NS's current spacing standard for FEDs is 15 miles, a standard that NS developed based on its experience with FED equipment performance and previous history of derailments.[404] NS's Signal Engineering Experts believe this spacing provides for the maximum use of equipment while still maintaining the safest operation. While no specific spacing of FEDs can guarantee that a journal bearing will not fail, closer spacing increases the likelihood of detection before a

---

[403] *See* NS Reply WP "AREMA Section 5.3.1 – FED."

[404] SunBelt is well aware of this standard, which NS disclosed to SunBelt in discovery. *See* NS Reply WP "Criteria and cost (NS-DP-HC-18430).pdf." ("Historically NS and predecessor roads used 20 mile nominal spacing for hotbox detectors employing inboard scan. However, in recent years, 15 mile nominal spacing was adopted, with this spacing believed to provide the best balance between the risk of bearing failure and installation/maintenance cost.").

failure becomes a derailment. NS's Engineering Experts selected to use the actual FEDs located on NS as shown by the NS Track Charts. This adoption was driven heavily by the supreme importance of ensuring the safety of the public and of train crews, particularly for trains on a SARR that would carry significant volumes of hazardous materials and other chemicals.

NS corrects the inventory of FED equipment in NS Reply WP "SunBelt C&S Estimate NS Reply.xls," Tab "FED Locations."

d. Crossing Signal Equipment

SunBelt's evidence of the SBRR's crossing signal investment is characterized by the same flaws as its other signals evidence. SunBelt both inaccurately calculates the quantities of crossing signals required for the SBRR and omits essential equipment. NS's Engineering Experts have corrected these errors as explained below.

First, SunBelt's inventory of SBRR crossings is inaccurate.[405] SunBelt omitted many existing NS crossings from the lines the SBRR is replicating, without any explanation or justification for doing so. For example, SunBelt failed to include 173 crossings on the lines being replicated by the SBRR. See NS Reply WP "SunBelt C&S Estimate NS Reply.xls," Tab "Total Crossings," Row 2, Column AD. Also, the SunBelt included 69 crossings which should not have been on their list. See NS Reply WP "SunBelt C&S Estimate NS Reply.xls," Tab "Total Crossings," Row 2, Column AC. Additionally, Notes are located at the bottom of the "Total Crossings List" starting at Row 360, which provide comments under Column "B" titled as 'COM' for crossings requiring additional information. SunBelt also incorrectly included a crossing from another railroad line that the SBRR is not building. See NS Reply WP "SunBelt C&S Estimate NS Reply," Tab "Total Crossing," Row 275. Note, many of the 69 crossings

[405] This inventory can be found in SunBelt Opening WP "C&S Estimate.xls," Tab "Crossings."

eliminated from the "Total Crossings" list were removed due to the crossings being either grade separated or a crossing without active warning devices as denoted under 'COM' Column 'B' of NS Reply WP "SunBelt C&S Estimate NS Reply.xls," Tab "Total Crossings."

NS's Signal Engineering Experts corrected the errors in SunBelt's crossing inventory. The additions and deletions made by NS's Signal Engineering Experts are set forth in NS Reply WP. "SunBelt C&S Estimate NS Reply," Tab "Total Crossing." NS's Signal Engineering Experts based their corrections on review of information produced to SunBelt in discovery (including a crossing inventory and track charts) and publicly available data (such as the FRA Inventory Database and satellite imagery). In some limited instances the crossing inventory maintained internally by NS and produced to SunBelt in discovery did not contain sufficient detail to determine the precise makeup of the crossing protection components; in those limited instances, review of track charts and public information enabled NS's Engineering Experts to identify specific crossing components more accurately. In short, SunBelt's engineers appear to not have performed due diligence in determining the number, type or location for crossings with active warning devices on the proposed SBRR lines, most of which could have been identified with a review of the NS Track Charts.

Second, SunBelt omits essential equipment from its crossing design. Most significantly, SunBelt ignored the costs for unidirectional equipment, understated the necessary flashing light pairs, and omitted cantilever signals.

Unidirectional Equipment: SunBelt's first major equipment design error is its omission of unidirectional equipment at locations where train signal insulated joints are present within the approach to the crossing. Because detection equipment track circuitry from the crossing terminates at the insulated joints, using ordinary crossing equipment at locations near train signal

insulated joints would unacceptably reduce the approach distance to the crossing and shorten the warning time. For this reason, another piece of detection equipment usually referred to as a 'unidirectional' must be installed on the opposite side of the insulated joints from the crossing. The unidirectional completes the approach circuitry to the termination shunt and allows the crossing signal approach circuitry to be extended to the necessary length to provide sufficient warning. Unidirectional equipment is mandated by FRA Regulations. *See* NS Reply WP "FRA Regulations 234.223 & 234.225.pdf" (Unidirectional equipment provides the necessary functionality to facilitate mandated FRA regulations requiring a minimum warning time of 20 seconds for Rail/Highway Grade Crossing Warning Systems and that gates shall assume the horizontal position at least five seconds before arrival of a normal train movement through the crossing). Construction of unidirectional equipment typically involves installation of another shelter with electronic detection equipment, circuitry, and batteries. A track connection is made between the unidirectional detection equipment and track to complete the necessary approach distance for the crossing. Track detection information is calculated at the unidirectional location and a circuit is sent back to the main crossing detection equipment at the crossing via underground cable so the grade crossing warning devices can be activated to provide the appropriate required warning time.

NS's Engineering Experts developed material costs for single-track and multi-track unidirectional locations from AFEs made available to SunBelt in discovery[406] and developed labor costs from SunBelt's own estimate for predictor hut installation.[407] In an effort to minimize the number of unidirectional shelters, when a group of crossings were in close

---

[406] *See* NS Reply WPs "NS AFE – F10635.pdf" and "NS AFE – F10460.pdf."

[407] *See* SunBelt Opening WP "SBRR C&S Estimate," Rows 12 & 13, Columns D & E.

proximity to each other with overlapping approaches, NS's Engineering Experts would select a unidirectional for the affected crossing farthest from the insulated joints and use one shelter to provide unidirectional circuitry for all crossings between it and the insulated joints. Also, where possible, an effort was made to include the wiring of the unidirectional into the shelter at the crossing to eliminate the use of another shelter.

Flashing Light Pairs: As detailed in NS Reply WP "SBRR Crossings NS Reply, Tab "Total Crossings' Z," a significant portion of the crossing signal locations are required to have several flashing light pairs to provide warning to vehicles approaching the crossing from differing approach directions as determined by the Road Authority with regulatory or jurisdictional authority. *See* 49 C.F.R. § 234.5 (discussing flashing lights on active highway-rail grade crossing warning systems). SunBelt's C&S Estimate provided for only a single Front and Back Flashing Light unit in those locations, and this reduction in grade crossing protection equipment is not supportable. NS's Engineering Experts developed material costs for this item from an NS AFE made available to SunBelt during discovery[408] and developed labor costs for installation from Interrail.[409]

Cantilever Signals: Many of the crossing signals on the NS routes replicated by the SBRR are cantilever signals. SunBelt failed to account for this fact, even though the crossing inventory produced by NS in discovery plainly identified cantilever locations.[410] The existing NS cantilever signal arms on the SBRR routes range in length from approximately 14 feet up to 40 feet. Rather than using numerous extensive site visits to ascertain the specific length of each

---

[408] *See* NS Reply WP "NS AFE – F11158.pdf."

[409] *See* NS Reply WP "Interrail Labor 072612.pdf."

[410] *See* NS Reply WP "Crossing Inventory" at 'FLASHOVR' Column 'AD.'

cantilever arm, NS's Engineering Experts derived a 26 foot cantilever arm as an conservative average. *See* NS Reply WP "SunBelt C&S Estimate NS Reply." NS's Engineering Experts developed material costs for the cantilever signal from an NS AFE made available to SunBelt during discovery,[411] material costs for the cantilever foundation from another AFE made available during discovery,[412] and labor costs for installation of the foundation and signal from Interrail.[413]

Underground conduit: SunBelt also did not include conduit for running underground cable under roads or track to protect the cable and allow for easier installation or replacement. Conduit is necessary to protect underground cable when installing cable under tracks or roads because cable in these areas is subject to significant vibrations and additional weight. Over time, cable that is exposed to these additional forces can be damaged by rocks or sharp objects in direct contact with the underground cable, causing a failure or a misrepresented signal indication. Moreover, most road authorities will not allow the road or highway to be cut to install cable; therefore, it is standard practice for conduit to be pushed under a road when cable is installed under that road.[414] Conduit also is used when cable crosses trestles or bridges. In the experience of NS's Engineering Experts, if conduit is not used in these areas, then additional clean fill or sand has to be acquired to be placed below and over the cable before back filling. NS's Engineering Experts developed material costs for conduit from an NS AFE made available to

[411] *See* NS Reply WP "NS AFE – F10051.pdf."

[412] *See* NS Reply WP "NS AFE – F11056."

[413] *See* NS Reply WP "Interrail Labor 072612.pdf."

[414] *See* NS Reply WP "Conduit Declaration.pdf."

SunBelt during discovery[415] and used SunBelt's labor costs for installing cabling as a reasonable proxy for installing conduit. It should be noted that if SunBelt chooses to not use Conduit then additional labor and material will need to be added for permitting, cutting, repairing and providing traffic control at each road crossing where cable will need to be installed through the crossing.

Termination Shunts: SunBelt also ignored the need for termination shunts for crossing predictor equipment. Termination shunts are necessary to terminate electronic train detection circuitry for crossing signals and to establish the approach distance, as required by FRA regulations. Termination Shunts usually are ordered separately due to variance of frequencies. SunBelt similarly ignored the need for (1) track connection kits for termination shunts, which are necessary to make the physical connection between the termination shunt and the rail; and (2) termination shunt cover assemblies, which are necessary to protect the termination shunt located between the tracks at the end of the approach. NS's Engineering Experts developed material costs for termination shunts, track connection kits, and termination shunt assemblies from NS AFEs made available to SunBelt during discovery,[416] and developed labor costs for installation of these components from Interrail.[417]

Cabling: Cable for crossing signal equipment was estimated on a typical cable run between the Equipment Shelter and outside equipment. A breakdown for the typical cable run is listed in the NS Reply WP "SunBelt C&S Estimate NS Reply.xls," Tab "Reply Signal Typicals," Lines 46 to 53.

---

[415] *See* NS Reply WP "NS AFE – F10635.pdf."

[416] *See* NS Reply WPs "NS AFE – F10051.pdf" & "NS AFE – F10460.pdf."

[417] *See* NS Reply WP "Interrail Labor 072612.pdf."

e. Communication System

NS accepts SunBelt's costs for material and installation for the SBRR Communications and Microwave Systems.

f. Hump Yard Equipment

The hump yard located on the SBRR will require integrated switching and control to perform its required functions. NS Signal Engineer's relied on actual NS costs for a fully operational hump yard switch system at Bellevue, OH and scaled the costs to represent the SBRR's hump yard. Details are set forth in NS Reply WP "SBRR Reply Hump Yard Equipment.xlsx." *See* NS Reply WP "Bellevue OH Proposed PCS for Additional 38 Class Tks Signal Costs (AFE-11-5992).pdf" and ""Bellevue New Yard Material Pricing.xls." The total cost to equip the hump yard with integrated switching is $24.7 million.

7. Buildings and Facilities

Based upon their review of SunBelt's Opening Evidence Section III-F and related workpapers (including SunBelt Opening WP "SBRR Facilities Cost.xlsx"), NS's Engineering Experts have found that the cost and size of the buildings and facilities that SunBelt proposes often are difficult or impossible to determine or verify because of numerous ambiguities, discrepancies, obvious errors, incorrect spreadsheet formulas, or missing pertinent information. Additionally, the cost estimates included in SunBelt's opening workpaper "SBRR Facilities Cost.xlsx" are unorthodox in organization and logic (*i.e.*, they do not follow industry standards), making them difficult to comprehend. Nevertheless, NS's Engineering Experts reviewed SunBelt's Opening Evidence and determined that the buildings' and facilities' designs and costs are inadequate and erroneous for a number of reasons explained below. NS's Engineering Experts developed costs for those same buildings and facilities to correct SunBelt's errors.

The type, size, and dimensions of many of the SBRR's reply buildings and facilities were determined by the operating plan developed by NS for the SBRR (the "Operating Plan"), and provided to NS's Engineering Experts by the NS Operating Witnesses. NS's Engineering Experts then built out the relevant buildings and facilities to include all of the necessary cost and design features, based on historic sample projects, price quotes from suppliers, R.S. Means cost data and other standard and reliable sources. For buildings and facilities that were not directly derived from the Operating Plan, NS's Engineering Experts independently designed the respective buildings and facilities to meet the SBRR's needs, and built out the buildings and facilities with the necessary cost and design features, again based on historic sample projects, price quotes from suppliers, R.S. Means cost data and other reliable data sources. Whether the design of a particular building or facility was dictated by the Operating Plan or independently designed by NS's Engineering Experts, and whether the cost data was derived from historic sample projects, price quotes from suppliers, or R.S. Means cost data, is indicated in each respective section below. All cost data were indexed to appropriate 2011 costs and are supported by work papers as referenced in each section.

NS's evidence regarding the cost of the SBRR's buildings and facilities is sponsored by NS witness Mark Peterson. Mr. Peterson is a Vice President and Architect at STV with more than 25 years of experience in the design and oversight of new and renovated transportation facilities. His transportation work has included master planning, programming, and design for all types of facilities for Class I railroads and transit agencies. Mr. Peterson's qualifications are further detailed in Section IV.

a. Headquarters Building

NS rejects SunBelt's design and costs for its headquarters building as fatally flawed and unsupported. In its narrative, SunBelt explains that the SBRR headquarters building, assumed to

be in Birmingham, AL, is a two story structure with a total of 19,365 square feet. SunBelt states that the square foot cost for the building is derived from the R.S. Means on line square foot calculator "for building structures of this kind" and references its opening workpaper "SBRR Facilities Cost.xlsx," Tab "HQ Bldg." SunBelt Opening at III-F-40. SunBelt underestimated the number of SBRR employees that would occupy the headquarters building. The SBRR headquarters in Birmingham would need to accommodate 180 SBRR employees. These include 67 operating management and supervisory personnel, 89 general and administrative personnel, and 24 engineering headquarters personnel.[418] To develop the headquarters building size needed to accommodate all of the SBRR headquarters personnel, NS calculated SunBelt's average square footage per headquarter employee based on SunBelt's assumed opening headquarter staff of 51 and its calculated headquarter size of 19,365 square feet, which is 380 square feet per employee. NS multiplied that figure by the SBRR headquarters personnel count determined in Reply sections III-C-3 and 4 of 180 SBRR employees to arrive at a headquarters building size of 68,400 square feet.

As with all buildings designed for the SBRR based on square footage needs, NS's Engineering Experts started with R.S. Means Square Foot Costs 2012 edition and selected the building type most closely resembling the building type in question. Using the R.S. Means "Costs per square foot of floor area" table associated with each building type, NS's Engineering Experts selected a square foot cost based on the requisite size of the building, footprint and perimeter linear feet, number of stories, and story height. NS's Engineering Experts then adjusted the base square foot costs by adding or deducting cost factors, as is recommended by R.S. Means. For example, NS's engineering experts deducted the architect's design fee from the

[418] NS Reply Workpaper "HQ Staff.xlsx."

square footage costs dictated by R.S. Means because NS's evidence applies a separate architect's design fee. NS's Engineering Experts also added specific cost items to the estimates that the R.S. Means Square Foot Costs table did not include. For example, R.S. Means Square Foot Costs tables do not include lockers or fixed furnishings such as corkboards and white boards. NS's Engineering Experts did not add costs to the R.S. Means square footage costs to the extent such costs were separately accounted for elsewhere in NS's evidence, such as mobilization costs and other costs for contractor's general conditions.

For the headquarters building, NS's Engineering Experts used R.S. Means M.460 "Commercial/Industrial/ Institutional – Office, 2-4 story" square foot cost data to determine the cost of a 68,400 square foot building and used the following design parameters: a 3-story building with equal square feet per floor, an approximate footprint of 100 feet by 232 feet , a concrete block structure with face brick cladding, and steel joists. This type of structure is extremely durable[419] yet more economical than a steel frame structure. Specific and critical cost items were then added to the estimate, such as closed circuit television ("CCTV") systems, computer access flooring, a back-up generator, upgraded and redundant HVAC, a waterless fire suppression system (such as FM200) in sensitive areas, uninterruptable power supply (UPS)[420], and lockers.

---

[419] As recommended by AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, section 1.3.4, this type of structure is extremely durable and requires relatively minimal maintenance. For example, this proposed building would not need to be tented and fumigated for termites, causing extreme disruptions to RR operations, as opposed to a wood framed building. The proposed construction type is also common.

[420] NS has provided the headquarters with specific and critical items as recommended by AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6. See sections 2.4.2 & 11.4.5 for computer access flooring; sections 2.7.1 & 11.4.6 for electrical considerations; section 11.4.3 for HVAC considerations; and sections 2.8.2 & 11.4.4 for fire protection.

In general, NS accepts SunBelt's site construction unit costs for the headquarters building. However, SunBelt understated or omitted the cost of certain site construction items. NS's Engineering Experts started with SunBelt's site construction unit costs and added the understated or omitted items. For example, SunBelt assumed that the headquarters building would require a single fire hydrant. However, based on the headquarters building's 100 feet by 231 feet footprint and typical hose-pull limits of 150 feet in any direction, four fire hydrants would be required to fully cover the headquarters building and comply with the applicable fire code. SunBelt also excludes costs for other site items such as gates, electrical transformer and pad, and parking lot striping for the 110 stalls that they provide. Using R.S. Means cost data, NS's Engineering Experts developed costs for these additional items.

Through the process outlined above, NS's Engineering Experts developed a total cost of the headquarters building of $9.4 million. See NS Reply WP NS Reply WP "SBRR Building Unit Costs," Tab "Headquarters" and NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 9-14 for details.

b. Fueling Facilities

i. Fueling Platforms

SunBelt assumed that the SBRR hump yard in Birmingham will have a fixed fueling facility, capable of fueling only one locomotive at a time. At smaller facilities, SunBelt assumed locomotive fueling by truck directly to locomotives. Based on the Operating Plan, however, the SBRR would require two fixed fueling facilities, one at the Birmingham hump yard and the other at the New Orleans flat yard. *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Cost," Columns V and W.

Although SunBelt provides little support for its assumed components and list prices, NS accepts SunBelt's base cost for a single locomotive fueling station of just over $350,000 as a

starting point,[421] with the addition of specified costs for missing components using bid costs from locomotive fueling projects in Stockton, California; San Bernardino, California; and Tacoma, Washington (see NS Reply workpapers "Schedule of Quantities and Prices - Flintco Revised.pdf," "EMF Bid Comparison.xls, and "Basis of Design Report.pdf" respectively).

For example, SunBelt did not include hose reels for fuel delivery at the SBRR fueling stations. Hose reels would be required to allow for the manipulation of the size and weight of required hoses and to prevent tripping hazards. SunBelt also excluded overhead service platforms required to distribute fuel, lube oils and other utilities to the fueling platform. Overhead service platforms are a cheaper and, therefore, preferable alternative to double-walled pipe that otherwise would be required to run hydrocarbon liquids underground, which SunBelt also failed to provide for. SunBelt also failed to include platform mounted fuel cranes and fuel management systems required to track fuel consumption at the fueling stations. All of these required elements were costed and added to the cost per locomotive fueling station developed by SunBelt. *See* NS Reply WP "SBRR Shop Unit Costs.xls," Tab "Fueling Platform".

c. Locomotive Repair Facilities

SunBelt assumes the SBRR will have a locomotive repair facility at its Birmingham yard,[422] and presented a cost of $700,000 for the facility including facility tools.[423] NS agrees that this facility would be required but, rejects the designs and costs proffered by SunBelt because the facilities and equipment specified by SunBelt would be inadequate to service the SBRR's locomotives.

---

[421] A fueling "station" is a spot along the fueling platform that can accommodate one locomotive.

[422] SunBelt Opening at III-F-41.

[423] SunBelt Opening Workpaper "SBRR Facilities Cost.xlxs," Tab "Major," Cell J50 + J51.

Locomotive repair facilities generally cost in the range of $350 to $400 per square foot, not the $11.94 per square foot[424] assumed by SunBelt.[425] In general, SunBelt's costs for the SBRR's locomotive repair facilities were derived from values and sources that are incomplete and not representative of the structures required to accommodate heavy locomotives and shop equipment. NS's Engineering Experts, on the other hand, derived the size and design of the SBRR's locomotive repair facility based on the requirements of the Operating Plan and based on industry standards for length and configuration of repair tracks and activities performed on each such track. *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Cost," Column X. The locomotive repair facility was then outfitted with necessary utility systems, equipment and architectural, structural, and industrial systems to create a fully functional shop. NS's Engineering Experts based the SBRR's locomotive repair facility on NS's Locomotive Shop in Linwood, which is typical of a smaller shop sized to the needs of the SBRR.

The proposed shop is 140' x 60' or 8,400 square feet. Locomotives would be serviced on two tracks, one of which includes a drop table. The shop floor area is covered by a 10-ton bridge crane to facilitate movements of heavy components. Shop work includes scheduled FRA maintenance and heavy repairs. The shop would not perform wheel truing services.

SunBelt's proposed locomotive shop design was derived from a proposal by a pre-engineered building manufacturer that clearly states it provides the building *superstructure only* (frame and siding) with framed openings for doors and windows, but no doors or windows

---

[424] SunBelt Opening Workpaper "SBRR Facilities Cost.xlsx," Tab "Major," Cell F50 ($12.03/SF) multiplied by cost index to 3Q11 of 0.992.

[425] *See, e.g.,* NS workpapers "Schedule of Quantities and Prices - Flintco Revised 09.29.11.pdf," "EMF Bid Comparison.xls, and "Basis of Design Report.pdf" respectively.

themselves.[426] SunBelt's proposed eave height of 25 feet also is inadequate to accommodate overhead cranes required to lift and move heavy locomotive components and instead would have to be at least 44 feet to accommodate these cranes.[427] The shop footprint dimensions proposed by SunBelt also are too small to efficiently work on locomotives. Engineering standards for locomotive shop design dictate that track lengths for locomotive shops should be based on locomotive length plus 15 feet at either end. This added clearance on both ends anticipates that locomotives often will be equipped with front and rear end assemblies that also require maintenance, as well as allowing room for mechanical crews to access the front and rear of the locomotive for work on coupler and air brake components and to allow forklifts and other equipment to pass on either side of stationed locomotives.

The foundation for a major locomotive shop typically constitutes the single largest expense for construction of the facility due to the need to accommodate extreme locomotive weights, the complexity of constructing the various service and equipment pits, and the number of embedments required to support tracks and other equipment in the building. The cost for track in each facility as assumed by SunBelt does not take into account these requirements, nor does it take into account that approximately 50% of the track necessarily would be very expensive elevated pedestal track or direct fix or embedded rail.

According to NS's Facilities Engineering Experts, supporting two spots for heavy locomotive maintenance would require the aforementioned drop table at one end of the repair track, with the balance of the track in a pit configuration with pedestal track to allow for access to all locomotive components. The second track in the shop would be embedded rail and would

---

[426] SunBelt Opening Workpaper "Locomotive Shop.pdf."

[427] *See* NS Reply WP "Crane Height in Loco Shop.pdf."

serve as a material supply track and for the storage of trucks, wheelsets and combos. NS's Engineering Experts developed costs for drop tables of approximately $1.8 million each, installed, not including pit costs.[428]

SunBelt also failed to provide lighting, power, compressed air, and fluid storage and distribution (water, engine oil, compressor oil, journal oil, various heavy weight greases) for the SBRR's locomotive repair shop. In addition, SunBelt omitted costs for toilet dumps, as well as costs for mechanical systems for heating, cooling, ventilation (HVAC) and exhaust equipment required by code for locomotive exhaust.[429] (*See* NS Reply workpaper "SBRR Shop Unit Costs.xls," Tab "Locomotive Shop" and the International Mechanical Code which requires six changes of air per hour). The pre-engineered metal building (PEMB) quote relied upon by SunBelt contains no interior finishes or improvements for offices, parts storage and warehousing, restrooms, locker rooms, training/safety briefing rooms, lunch areas, nor any of the complex outfitting required for back shops for trucks, electronics, machining, etc. *See* SunBelt Open WP SBRR Facilities Cost.xlsx. Further, there is not enough detail in the materials provided by SunBelt to understand how it assumes locomotive trucks, combos, and wheelsets would be moved around the locomotive shops. This typically is accomplished using several jib cranes and in-floor turntables and track to move the trucks from the locomotive to the back shops. *See* NS Reply WPs "SJRRC Floor Plan.pdf" and "Schedule of Quantities and Prices – Flintco Revised.pdf" at 9. SunBelt provides for none of this in its evidence. SunBelt also failed to provide for any facilities or equipment for pressure washing various components prior to repair,

---

[428] NS Reply WP "SBRR Shop Unit Costs.xls," Tab "Locomotive Shop," Lines 28 to 30.

[429] *See* NS Reply WP "ASHRAE Handbook Excerpt.pdf." Having failed to provide evidence of these costs in its Opening Evidence, SunBelt is precluded from doing so on Rebuttal. *See, e.g.*, *SAC Procedures*, 5 S.T.B. at 445-46; *Xcel*, STB Docket No. 42057, at 2 (served Apr. 4, 2003).

or for a trainwasher, which based on Mr. Peterson's experience typically includes separate equipment, track and utility distribution costs. *See* NS Reply WPs "SJRRC Floor Plan.pdf" and "Schedule of Quantities and Prices – Flintco Revised.pdf" at 4. NS's Engineering Experts developed costs for the addition of all of these required elements. *See* NS Reply WP "SBRR Shop Unit Costs.xls," Tab "Locomotive Shop."

d. Car Repair

i. Major Car Repair Facility

SunBelt assumes that all freight cars would be acquired through full service leases and that the SBRR would not need car repair facilities. This assumption fails to consider the SBRR's responsibility to repair cars owned by foreign carriers that are bad ordered while on the SBRR system. In some early SAC cases, the Board declined to include costs for car repair facilities on SARRs, instead assuming that the SARRs exclusively would use cars serviced by others. In most of those early cases, the SARRs at issue were coal-only carriers, and many of the coal cars were privately owned. However, the SBRR provides extensive carload service in interchange with NS and all other Class I carriers, meaning that a significant number of foreign cars will move over the SBRR network. In fact, the SBRR's interchange agreements (*i.e.*, NS's interchange agreements that the SBRR would assume), as well as AAR standards, would require the SBRR to repair foreign carriers' cars to the extent necessary while on the SBRR network. Car repair shops would be essential for the SBRR to discharge this responsibility.

Based on the Operating Plan's requirements, the SBRR will require a major freight car repair facility at Birmingham. To determine the cost of this major car repair facility, NS's Engineering Experts reviewed NS's car repair facilities to determine appropriate size parameters for the SBRR and determined that NS's Kansas City car repair facility would be appropriate (*See* NS Reply WP "Kansas City Car Repair Facility Template for SBRR Birmingham Car Repair

Facility.pdf"). The Kansas City car repair facility is roughly 25,000 square feet with three through tracks and one release track and is supported by 6,000 square feet of office, welfare and warehouse space.[430] Using these dimensions, NS's Engineering Experts selected a pre-engineered building as the basis for the SBRR car repair facility, with insulated metal panel siding, concrete block protection and a height of nine feet. Car repairs within the car repair facility would be performed on three tracks facilitated by a system of portable jacks on thickened concrete slabs, overhead and jib cranes, and associated tools. One of the three tracks will be fitted with fall protection to permit repairs when a worker is elevated more than six feet above the floor surface, as dictated by industry standards for safe car repair operations. *Cf.* 29 C.F.R. § 1926.501(b)(2) (requiring fall protection for employee walking on a surface six feet or more above a lower level)

Both the car repair facility itself and the associated warehouse area employ high-bay structures to provide clearance for crane lighting ventilation equipment and high-bay storage common in car repair facilities. *See* NS Reply WP "SBRR Shop Unit Costs.xls," Tab "Car Repair."

ii. Freight Car Repair Tracks

SunBelt assumes that the SBRR would include repair-in-place ("RIP") tracks at four yard locations. SunBelt Opening Workpaper "SBRR Yard Matrix.xlxs." In contrast, NS developed individually the number, location, and length of each RIP track as dictated by the needs of the Operating Plan. NS Reply Workpaper "SBRR Yard List NS Reply.xlxs."

Although SunBelt included cost for the track itself, it did not include other necessary costs for tools and parts storage, pole mounted work lighting, welding outlets, or compressed air

[430] *See* NS Reply WP "Kansas City Car Repair Facility Template for SBRR Birmingham Car Repair Facility.pdf").

stations, or a canopy for covered work areas. Based on the Operating plan, NS's Engineering Experts developed costs for a 540 lineal track feet canopy required for Birmingham and a 180 lineal track feet canopy required for the three other RIP track facilities identified in the NS reply yard list. To allow efficient movement of parts, tools and personnel, RIP tracks need paved roadways on each side of the track. Concrete jacking pads to 6 feet wide on each side of the track are provided to lift and service the cars when needed. Details of these RIP track elements are set forth in NS Reply WP "SBRR Building Unit Costs.xls," Tab "RIP Canopy;" NS Reply WP "12 STV Facilities Cost Exhibits_.pdf" at 23-28.

e. Crew Change Facilities

NS rejects the number of crew change facilities proposed by SunBelt and replaces it with a number of facilities derived from the Operating Plan. Accordingly, crew change facilities were developed at all hump and six additional flat yards where SBRR crew changes would occur. *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Cost," Columns J and K.

SunBelt developed two separate costs for SBRR crew change facilities, one for a minor facility comprising 1,400 square feet and one for a major facility comprising 2,240 square feet. NS accepts the proposed sizes of SunBelt's crew change facilities, but rejects SunBelt's costing assumptions and calculations. SunBelt's building costs are based on only a prefabricated metal building shell with no interior walls. See SunBelt's Opening Workpaper "Yard-Crew Building.pdf." Critical and costly omissions from SunBelt's crew change facilities include toilet facilities, showers, storage and file rooms, interior lighting, electrical outlets and switches, data and phone outlets and cabling, HVAC systems, office partitions and drywall, interior and exterior doors, ceilings, and interior finishes, such as carpet, rubber base, sheet vinyl, tile, paint, windows, and simple cabinetry. SunBelt also omitted furnishings, fixtures, and equipment (FF&E) items such as mini-blinds, cork boards, dry-erase boards, refrigerators, and microwaves,

that are typical for such facilities. Beyond the building shell itself, SunBelt's proposed foundation costs are unrealistically low, and do not provide costs for an electrical transformer serving the building or for concrete equipment pads for the transformer and AC condensers.

To determine the cost of SBRR minor and major crew change facilities, NS's Facilities Engineering Experts used R.S. Means M.455 "Commercial/Industrial/ Institutional – Office, 1 story" square foot cost data assuming the buildings to be constructed of wood stud, wood truss, and wood siding. Crew change facilities can be constructed of different materials, including a PEMB as SunBelt proposes, or the common concrete block type buildings used at many railroad yards. NS compared the costs for a typical crew change facility constructed with wood frame, PEMB and concrete block and determined that the concrete block construction typically used by Class I railroads is the most costly per square foot. It is also the most durable. The comparison showed that the cost for both wood frame and PEMB structures were comparable, with the wood frame cost slightly below that of the PEMB. As a result of this comparison, NS Facilities Engineering Experts adopted the use of wood frame structures. See NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 49-56 for cost comparison. Similar to the headquarters building, the cost for both the minor and major crew buildings was derived using the R.S. Means "Costs per square foot of floor area" table for calculating a base square foot cost, adjusted as described in the discussion of the headquarters building. Specific and critical cost items added to the NS cost estimate include lockers, break room appliances[431], and others itemized on NS Reply WP "SBRR Building Unit Costs.xls," Tab "Crew Change," in conjunction with NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 15-17.

[431] NS has provided the certain common welfare spaces and amenities as recommended by AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, sections 2.3.5.

The NS Reply operating plan specifies the need for a separate structure similar to the major crew change facility at the Birmingham hump yard to accommodate locomotive and freight car mechanical staff. Requirements for mechanical staff are similar to those for crews and include lockers, showers, break rooms and other facilities. Therefore, NS Engineering Experts add a second major crew change facility at Birmingham to accommodate the mechanical personnel[432]. *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Cost," Columns J and K.

f. Yard Offices

SunBelt used the same design and cost assumptions for SBRR yard offices it used for SBRR crew change facilities. Accordingly, NS's criticisms of SunBelt's crew change facility costs apply equally to SunBelt's yard office costs. Unlike crew change facilities however, NS's Facilities Engineering Experts also reject SunBelt's proposed sizes for yard offices as inadequate to support SBRR operations under the Operating Plan. Instead, NS's Engineering Experts base yard office sizing on facilities existing on the NS system today, which NS's Operating Witnesses determined to be appropriately sized for efficient SBRR operations. *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Cost," Columns G and H.

NS's Engineering Experts determined the NS yard office building at Croxton Yard, Jersey City, NJ, at 6,800 square feet, is representative of the typical major yard office that would be required by the SBRR. For minor yard office buildings, NS's Engineering Experts determined that the NS yard office building at Gang Mills, NY, at 3,300 square feet, is representative of the typical minor yard office that would be required by the SBRR. The NS

[432] AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, sections 1.2.6.6 acknowledges that different uses and operations require distinct separation. This separation can also be achieved by completely separate buildings, which NS proposes and which is common with many railroads. There are advantages to separate buildings as inferred by section 2.2.1.

reply operating plan requires a major yard office facility at the Birmingham hump yard and minor yard offices at Meridian, New Orleans, Selma, and McIntosh flat yards,

As with crew change facilities, NS's Engineering Experts used R.S. Means M.455 "Commercial/Industrial/ Institutional – Office, 1 story" and the associated "Costs per square foot of floor area" table, to determine the cost data The same approach was used to add and deduct costs based on size, perimeter, etc. Refer to NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 15-17, in conjunction with NS Reply WP "SBRR Building Unit Costs.xls," Tab "Yard Office," for documentation of these costs.

g. MOW Buildings

Similar to NS's criticisms of the crew change facilities, SunBelt's costs for the MOW buildings entirely neglects the interior build-out. Accordingly, NS rejects the costs proposed by Sunbelt. The following are additional reasons why NS rejects Sunbelt's cost and design assumptions of the MOW buildings.

SunBelt's narrative states that its MOW buildings for the SBRR are similar in office space and design to the crew change facilities with a smaller interior and with additional area for garaging certain vehicles and storing MOW supplies. SunBelt Opening at III-F-42. NS's Engineering Experts were, however, unable to find any cost details of SunBelt's development of maintenance of way buildings in its workpapers.[433]

SunBelt assumed a 1,400 square foot structure would be sufficient to: (i) house maintenance of way crews; (ii) garage MOW vehicles; and (iii) store materials, equipment, and parts. But there simply would not be enough space in a 1,400 square foot structure to

[433] Having failed to support its evidence of these costs on Opening, SunBelt is precluded from doing so in its Rebuttal Evidence. *See, e.g.*, *SAC Procedures*, 5 S.T.B. at 445-46; *Xcel*, STB Docket No. 42057, at 2 (served Apr. 4, 2003).

accommodate all of that equipment, materials, crews and activity. NS's Engineering Experts compared SunBelt's proposed 1,400 square foot structure with NS's existing maintenance of way building in Mount Vernon, IL, which is designed and used solely to house MOW crews (no storage). The Mount Vernon building for maintenance crews alone is 1,530 square feet. Vehicle, material, and equipment storage is provided in a separate building. , Plainly, SunBelt's MOW building sizing is inadequate and infeasible. Combining the crew and storage area to accommodate all of the necessary MOW crews, equipment, parts and materials dictates that each SBRR maintenance of way facility would have to be in the range of 3,000 to 3,500 square feet.

Moreover, in the experience of NS Facilities Engineering Experts, it is standard practice for rail carriers to provide storage areas for maintenance of way track gangs separate and apart from storage areas for communications and signals maintainers, in order to protect the sensitive electronics equipment of the communications and signals department from heavy-duty track materials used by maintenance of way track gangs.[434] This separation requires additional space. *See* Two-Person Signal Maintainers Building, *infra* at Section III-F-7-i-e.

Although an adequately sized MOW building for the SBRR should be at least 3,000 square feet, NS Engineering Experts conservatively assume a 2,240 square foot MOW building.[435] This is the same size used by SunBelt for major crew change facilities.[436] NS's Engineering Experts used the same R. S. Means base square foot costs used for the major crew

---

[434] AREMA guidelines recommend that electronic parts be located in a secure and separate area. See AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, sections 9.3.11.d.

[435] Similar to major crew change facilities, NS's Facilities Engineers have used R.S. Means M.455 "Commercial/Industrial/ Institutional – Office, 1 story" square foot cost data to determine the cost of maintenance of way facilities based on the following design scenario: Wood construction of a 2,240 SF building with a 35'x64' footprint.

[436] See SunBelt Opening at III-F-42.

change facilities. Refer to NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 15-17, in conjunction with NS Reply WP "SBRR Building Unit Costs.xls," Tab "MOW field," for documentation of these costs.

Site Costs: Some of the MOW buildings are located in yards, and therefore the corresponding site costs are covered in their accompanying corresponding yard estimates. However, as indicated in the Operating Plan, some MOW buildings will be located on the railroad system as standalone facilities not associated with a yard. *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Cost," Column M. Such stand-alone MOW locations would require site development, and therefore site cost estimates. NS Engineering Experts have developed costs for such additional site development. *See* NS Reply WP "SBRR Building Unit Cost.xls," Tab "MOW." Because SunBelt has neglected to include a cost for site development, the NS site estimate is derived from SunBelt's headquarters site cost estimate.[437]

In addition to a standard MOW building, NS's Engineering Experts developed additional costs for one other type of necessary MOW building: mechanic facilities to service MOW high rail vehicles, small machines, and other mechanical tools and equipment.[438] This is a significant item and is required for a fully functional MOW department, but SunBelt failed to account for such necessary facilities. *See, e.g.*, 49 CFR §§ 214.531 & 214.533. The Operating Plan determined the number of MOW vehicle mechanic shops that the SBRR would require. *See* NS Reply WP "SBRR Facilities List NS Reply.xlsx," Tab "Facilities Costs," Column O. NS's

---

[437] SunBelt's headquarters building assumes a site construction cost to accommodate 110 parking stalls. Its MOW building is based on 10 parking stalls - spaces for the personal autos of 4-6 staff, plus 4 MOW vehicle parking. Therefore the MOW site base cost is 9% (10/110) of the headquarters site cost.

[438] See AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, sections 9.1.1, 9.1.3, & 9.1.6.

Engineering Experts have provided a cost for these necessary shops based on R.S. Means M.290 "Garage, Repair" and the associated "Costs per square foot of floor area" table.[439] For this building type, specific R.S. Means additive items have been included to account for the service hoist, air compressor system, lube dispenser, and other items needed for a fully functional mechanic shop.[440] *See* NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 18-19 for details. For site costs related to these buildings, the same basis as is used for the MOW building described above is provided. *See* NS Reply WP "SBRR Building Unit Costs.xls," Tab "MOW Mech," for details.

Because of the deficiencies and omissions discussed above, NS's Engineering Experts developed costs for MOW facilities that would be adequate to meet the needs of the SBRR.

h. Wastewater Treatment

SunBelt includes a cost of $0.9 million for oil/water separators to handle runoff from various work by-products (*e.g.*, oil) before reaching the public sewer system. According to SunBelt, under this arrangement the SBRR would send effluent to an oil/water vaporizer which would produce a dry powder for easy disposal. SunBelt's description and estimate of costs of handling these by-products is insufficient. As noted in SunBelt's opening evidence (SunBelt WP Oil-Water Evaporator.pdf), the oil/water separators proposed by SunBelt can only handle ten gallons *per hour* of effluent. In comparison, the volume of runoff from shop industrial processes often is substantially more than ten gallons *per minute.*[441] This is particularly true when

---

[439] NS cost is based on a 1-story, 2,400 square foot building with a 40 foot by 60 foot footprint. This will allow 2 adjacent service bays at 20'x40', plus one additional bay at 20'x40' for a small office, parts storage, and large tools area.

[440] These are typical items in a small MOW mechanic facility. See AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, sections 9.2.1, 9.2.4, 9.3.5.

[441] *See* NS Reply WP "Pressure Washer Outflow.pdf."

locomotive or car components are being washed prior to repair. Adequate water quality must be achieved before effluent water may be discharged to any public or private sewer system. This includes effluent from shop processes and those from trainwashers and stormwater runoff from unprotected areas such as locomotive fueling and service platforms. To determine the cost of SBRR wastewater treatment facilities, NS's Engineering Experts considered the number of locomotives in a shop, the wastewater output from trainwashers, and the uncovered areas at locomotive fueling and service areas, and matched them to oil/water separator systems that could manage the volume of effluent water that SBRR facilities would generate. Because of the pollutants found within these industrial areas, these units employ filtration media and other technologies specifically designed to assure water quality at the point of discharge. *See* NS Reply WP "SBRR Shop Unit Cost.xls," Tab "Locomotive Shop," Lines 49 to 54.

i. Other Facilities/Site Costs

The "other facility" and "site" costs category includes a variety of site preparation, drainage and other infrastructure and accessories costs for yards and other facilities. The Operating Plan determined the SBRR would need various yard and facility types, consisting of one hump yard, six classification yards (three small and three medium), fifteen industrial support facilities, two small intermodal facilities, and one small auto facility. Each of these yard and facility types was based on an existing NS yard or facility that met the size dimensions required by the Operating Plan.[442] *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Cost," Columns Z to AD.

---

[442] Templates developed by Operating Witnesses for all buildings and facilities are in NS Reply WP III-B-Folder "Building and Facility Templates" and NS Reply III-F-7 WP Folder. Including among those templates are the typical **yard configuration for small and medium flat switch yards, industrial sidings and hump yards** – "Yard_Template_1_Small_Flat.pdf", "Yard_Template_2_Medium_Flat.pdf", "Yard_Template_3_Hump.pdf", "Industrial Support Typical.pdf"; **Intermodal facilities** – "Small Intermodal Facility.pdf"; **Autoramp facilities** –

SunBelt understated the amount of paving that would be required for the SBRR facilities. SunBelt assumed the SBRR would pave only the access to the yard leads and the public way. SunBelt's evidence thus failed to provide for paving for parking lots necessary for yard, shop, and transportation employees. NS's Engineering Experts have developed quantities and associated costs for perimeter roadways at typical flat and hump yards of varying sizes by referencing the proxy, template yard types as shown in NS Reply workpaper "09 Yard Lighting and Roadway Quantities.pdf."

Using aerial photos of the template yards and facilities, NS's Engineering Experts developed perimeter roadways, parking lots at facility buildings, inspection cart paths, and thickened concrete for intermodal cranes, as would be appropriate and typical for a given yard type. Paving material volumes were then derived using average soil types and average volume and type of traffic anticipated for a particular roadway based on the experience and expertise of NS's Engineering Experts. Those Experts determined that an adequate depth of aggregate base (AB) would be six inches thick under cart paths, eight inches thick under roadways in automotive, classification, and hump yards, and 11 inches thick under intermodal roadways and crane paths. An adequate depth of asphalt concrete (AC) was determined to be three inches thick for cart paths, five inches thick for roadways in hump, classification, and automotive yards, and seven inches thick for roadways in intermodal yards. An adequate depth of Portland Cement

---

"Small Auto Center.pdf" **Locomotive shop** – "Linwood Loco Ship Template for SBRR Birmingham Loco Shop.pdf"; **Car repair shop** – "Kansas City Car Repair Facility Template for SBRR Birmingham Car Repair Facility.pdf"; **Pavement/Light for all above facilities:** "09 Yard Lighting and Roadway Quantities.pdf";**Yard size/TF/acres** - "SBRR Yard List NS Reply.xlsx," Tabs: "Calc Template- Sm and Med", "Calc Template- Hump". **Building/Pavement/Lighting Requirements** - "SBRR Facilities List NS Reply.xls" – The "Main Yards and Facilities" and "Facilities Costs" tabs list building/lighting/paving costs for each yard and facility at Columns Z to AD. Diagrams of the actual yard layouts on the SBRR are included in "SBRR Yard Sticks NS Reply" and details are provided in "SBRR Yard List NS Reply.xlsx."

Concrete (PCC) was determined to be 24 inches thick under crane paths along the strip tracks in intermodal yards. In order to convert AC volume to tonnage, the industry standard density of 1.89 ton/cubic yard was used. *See* NS Reply WP SBRR Lighting and Paving Unit Costs.xls"; *see also* Concrete Asphalt Density, Acqua-Calc, http://www.aqua-calc.com/page/density-table/substance/Concrete-coma-and-blank-Asphalt.

The same aerial yard and facility photos were used to quantify approximate yard lighting needs. NS's Engineering Experts based the yard lighting systems on 100 foot steel poles with "stadium" lighting, which is widely used in the railroad industry. Common practice employs light stanchions every 500 feet, which provides enough overlap to maintain safe lighting levels at ground level Illuminating Engineering Society of North America (IESNA) lighting standards for parking lots were used as the basis of this development.[443] The photometric footprints of these lighted areas were superimposed on maps in order to determine the minimum number of light poles needed to light each yard, as is the standard practice for determining lighting requirements. Each light pole would require two pull boxes, one for power and one for CCTV/communications. These pullboxes are required at the base of each pole to facilitate splicing of both electrical and communications wires. Additionally, all model electrical codes prohibit making concealed splices in electricial conductors (wires). Pull boxes and junction boxes are employed to comply with code. CCTV is commonly employed at rail yards to provide observation for security and operations personnel. Additionally, given the size of many of the yards, a communications backbone running over fiber optic and copper lines is distributed along light poles to boost wireless communications networks. Duct banks containing four conduit pipes each were drawn to connect light poles to a power source located outside the yard. *See* NS Reply WPs "SBRR

[443] *See* NS Reply WP "iasna light levels.pdf."

Lighting and Paving Unit Costs.xls" and "100 foot high mast with 6 ea with 6 1000 w MH each" and "Elec_Comm Pullboxes.pdf."

SunBelt provided no detail supporting its proffered cost of site lighting (foundations/height of pole/type of fixture) or for the infrastructure required to power the lights (ductbank/cabling/vaults). SunBelt provided for only 2,000 feet of electrical conduit per yard, ranging in size from three-quarters of an inch to two inches in diameter. It is standard for railroad yards to utilize three-phase power, and each phase must be in its own conduit as required by the National Electrical Code. *See* National Electrical Code §§ 300, 310 (2005). Conduits typically are four inches in diameter to allow for cable size and heat dissipation. Conduits form a ductbank and the ductbank is sealed in concrete for protection. Additional conduits and ductbanks would be included for CCTV, communications, and other low voltage needs.[444] NS's Engineering Experts designed the lighting system based on 480 volt, three-phase power to optimize the balance between conductor size and voltage drop. Three four-inch conduits are dedicated to the lighting power while a forth is for communication distribution. Costing also included concrete foundations, which are required to support 100-foot light poles and require additional collision protection at their base.

SunBelt also failed to include a cost for the main electrical switchgear for each large yard and locomotive shop. Such a switchgear would be necessary to provide site power, and would cost roughly $800,000 for a large yard or for a locomotive shop. *See* NS Reply WP "SBRR Shop Unit Costs.xls," Tab "Locomotive Shop," Line 42. SunBelt failed to include any cabling whatsoever for distribution of power. NS's Engineering Experts have developed quantities and costs for power and communication duct banks containing the above mentioned conduits and

[444] *See* NS Reply WP "Elec_Comm Pullboxes.pdf."

cables as well as associated pull boxes for each yard type and size. *See* NS Reply WP "SBRR Lighting and Paving Unit Costs.pdf."

SunBelt provided for 25 bollards in major yards and six bollards in minor yards. Bollards are short vertical posts used in numerous locations around yards and shops and within shop buildings, principally to provide protection against moving equipment. For example, each yard air connection is typically protected by at least two bollards set in a roadway allowing workers to connect air hoses to the compressor and to the train. This alone requires at least four bollards per yard track. Bollards also provide a place to coil and hang the air hose used to provide air to the train. Additionally, bollards are provided for protection of lighting stanchions, intra-yard crossing gates, fire hydrants, and building corners and at vehicular entrances to buildings (often four per door opening). NS's Engineering Experts determined a conservative estimate of 200 bollards per yard based on the average number of features per yard requiring bollards, as discussed above.

NS's Facilities Engineering Experts developed adequate fire hydrant system requirements for each yard category using the aerial yard and facility photos described above. Each yard was assumed to have one double backflow preventer. A system of PVC pipe connecting hydrants to a source in the local right-of-way was drawn on the photographs. Primary lines were quantified with a diameter of 10 inches and a depth of four feet. Angle arms of 6 inch PVC pipe were determined to serve each hydrant at a lateral offset of five feet from the primary lines. Hydrant placement was determined from aerial photographs in a layout that would provide full yard coverage based on an assumption of a 150 foot hose pull length per typical fire code

requirements.[445] A yard valve was assumed to accompany each hydrant. *See* generally, NS Reply "SBRR Lighting and Paving Unit Costs.xls," Tabs "Unit Costs" and "Summary" at Columns V to AH.

i.a – Guard Booths

SunBelt did not provide for guard booths at the entrance of any yards to prevent theft and property damage.[446] Consistent with industry standards, NS's Engineering Experts provided for guard booths at the entrance of the two SBRR intermodal facilities to prevent theft of expensive commodities, and at the one automotive facility to prevent theft and vandalism of vehicles. Each intermodal and automotive facility is provisioned with a single guard booth based on a single point of entry and exit.[447] A real world example of two guard booths is NS's Titusville, FL auto yard, which NS used as a template for an auto yard. Costs of each guard booth includes the guard booth itself, plus the additional costs for a concrete pad, and power, data, phone and utilities. NS's Engineering Experts developed costs for the necessary guard booths using an eight foot-by-eight foot prefabricated shelter. A cost estimate was obtained from a supplier, FS

---

[445] *See, e.g.,* NS Reply WP "International Fire Code 2012 Table C105 1.pdf" *See also* NS Reply WP "2009 – INSTRUCTIONS FOR BUILDING PLAN REVIEW SHEET_RevisionM (2).pdf" at 6.

[446] *See* Norman West et al., College of Urban Planning and Public Affairs, University of Illinois Chicago, Planning Considerations for Projected Intermodal Rail Yards in Chicago Region Studied by Key-Informant Interviews (2005) available at http://www.trforum.org/forum/downloads/2005_PlanningConsiderations_paper.pdf (detailing security and terrorists concerns for intermodal facilities and the necessity of applying enhanced security measures "to the gate areas of entry and dispatch"); State Police Unit Cracks Down on Cargo Theft, Herald News, Sept. 24, 2012, http://heraldnews.suntimes.com/news/4932331-418/state-police-unit-cracks-down-on-cargo-theft.html ("Every year, between $15 billion and $30 billion worth of merchandise is stolen out of cargo trailers, intermodal facilities, railroad yards and warehouses across the United States.").

[447] Indeed, SunBelt failed to provide for intermodal and auto yards altogether. It is thus not surprising that it failed to provide for guard houses and other necessary facilities and equipment for such excluded yards.

industries. That cost includes a 24-inch overhang for sun protection, an HVAC wall unit, delivery, sales tax of 8%, and general contractor markup of 10%. *See* NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 29-31, in conjunction with NS Reply WP "SBRR Building Unit Costs.xls," Tab "Guard Booths," for documentation of these costs.

i.b – Mechanic Repair Shops

SunBelt's evidence did not provide for mechanic repair shops at any of the SBRR yards. These shops would be necessary for the railroad to maintain and repair yard hostlers and forklifts. Examples of this are the mechanic shops located at NS's Shelbyville, KY and Austell, GA yards. A mechanic's shop building is taller than a standard one-story crew building or yard office to allow for hostlers to be hoisted. At a minimum, a mechanic repair shop includes repair bays with mechanical lifts, oversized roll-up doors, a small mechanic's office, concrete foundations, pressure washer, an eyewash station, storage for parts, shelving, an air compressor system, sufficient lighting, HVAC equipment, and an adequate ventilation system for vehicle exhaust.[448] Such facilities also require standard electrical outlets and switches, interior lighting, data and phone outlets and cabling, office partitions and drywall, interior doors, ceilings, and interior finishes, such as carpet, rubber base, sheet vinyl, tile, paint, as well as furnishing items such as mini-blinds, cork boards, and dry-erase boards. NS's Engineering Experts provided for the construction of these mechanic repair shops in accordance with the requirements of the Operating Plan. *See* NS Reply "SBRR Facilities List NS Reply.xls," Tab "Facilities Costs," Column R.

In developing costs for these buildings, NS's Engineering Experts used R. S. Means M.290 "Garage, Repair" and the associated "Costs per square foot of floor area" table, to

[448] This facility is similar in function to the MOW mechanic facility. See AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, part 9 for general requirements.

determine the square foot cost data based on a one-story, 2,400 square foot building with a 40 foot-by-60 foot footprint.[449] Similar to the MOW vehicle mechanic facility, the NS Engineering Experts included cost items to account for the service hoist, air compressor, lube dispenser, and other items needed for a fully functional repair shop. *See* NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 18-19 in conjunction with NS Reply WP "SBRR Building Unit Costs.xls," Tab "Mech Shop," for calculations of these costs.

i.c –Observation/Yard Master Tower

SunBelt's evidence did not include any observation building or yard master towers. Such towers are required for monitoring certain rail yards, including the auto yard on the SBRR.[450] Like the guard booths at yard entrances, the yard towers provide security to prevent theft and allow visual monitoring of the entire yard, and may facilitate switching at certain yards.[451] NS's Engineering Experts provided for the construction of these observation towers in accordance with the requirements of the Operating Plan. For locations, refer to NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Costs," Column I.

Yard towers may be constructed as an appendage of another yard building, or as independent structures.[452] For SBRR, NS proposes each of these towers is an independent, stand-alone, prefabricated steel structure that is erected on site, typical of many railroad yards

---

[449] Identical to the size of the MOW mechanic facility, this would allow two adjacent service bays at 20 feet-by-40 feet each, plus one additional bay at 20 feet-by-40 feet for a small office, parts storage, and large tools area.

[450] For example, NS has such observation buildings in its yard template for Titusville, FL auto yard, and its Petersburg, VA auto yard.

[451] *See* AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, part 10, FOREWORD.

[452] *See* AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, sections 10.2.1.

across the nation. The observation towers were designed to a height of 30 feet with a steel staircase, full wrap-around glass windows, roof overhangs to protect from the sun and glare. Concrete pad footings provided for the tower support columns and a toilet is included on the ground for staff use[453]. To determine the costs of the yard observation towers, NS's Engineering Experts obtained a quote from a reputable observation tower supplier. See NS Reply WP "SBRR Building Unit Cost.xls," Tab "Observation," and NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 35-40 for additional information.

i.d –Storage & Warehouse Buildings

SunBelt's evidence did not provide for any storage or warehouse buildings on the SBRR. These buildings are required throughout the railroad for several purposes. For example, they are required by railroad departments for storage of parts, equipment, and materials.[454] Storage buildings are also required for the maintenance of way and other departments to protect large parts, tools, and equipment. An example of an adequately sized storage building is the 24,000 square foot warehouse at the Columbus, OH TBT yard. NS's Engineering Experts developed the number of such buildings and their locations based on the requirements of the Operating Plan. *See* NS Reply WP "SBRR Facilities List NS Reply.xls," Tab "Facilities Costs," Column P.

NS's Engineering Experts developed the cost of these warehouses and storage based on R.S. Means M.690 "Warehouse" for the large warehouse.[455] *See* NS Reply WP "SBRR Building

---

[453] These are typical design components of an observation tower. See AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, sections 10.1.1, 10.3.1, 10.3.2, & 10.4.2.

[454] Warehouses are a key feature of managing materials for a railroad. See AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, part 7 for a complete design guidelines section devoted to this type of facility.

[455] NS cost is based on a 24,000 square foot warehouse with a 120 foot by 200 foot footprint, concrete tilt-up construction with steel roof structure and columns, 24 foot hi-bay storage area, with additive items such as dock levelers and pallet racks. This type of construction is the most

Unit Costs.xls," Tab "Storage Buildings." The R.S. Means "Costs per square foot of floor area" table for each warehouse is included in NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 20-22.

i.e Two-Person Signal Maintainers Building

SunBelt did not provide for the housing of signal maintainers. The Operating Plan requires that signal maintainers be stationed throughout the SBRR system in 10 separate two-man crews, with each provided a small building. Based on NS's Bluffton, Indiana facility, an appropriate size for this building is approximately 32- feet-by-18 feet, with a single, unisex restroom, a small office area, and a separate storage area. *See* the Maintenance of Way Buildings section, *supra* at 7.g (discussing the need for a separate storage area). NS engineers have used the actual NS AFE costs of $61,000 for these facilities, *See* NS Reply WP "12 STV Facilities Cost Exhibits.pdf" at 32-34. The AFE has been adjusted for location factor and Third Quarter 2011 historic cost index. *See* NS Reply WP "SBRR Building Unit Costs.xls," Tab "2-Person Sig Maint" (showing adjusted price calculation).

---

economical according to R.S. Means M.690 "Warehouse" and meets the durability and impact resistance recommendations set forth in AREMA Manual for Railway Engineering 2011 edition, vol 3, ch.6, section 1.2.6.3.b.

8. Public Improvements[456]

a. Fences

NS accepts SunBelt's general assumption that the vast majority of SBRR right-of-way would not be fenced. However, fencing is included at key MOW and signal facilities and is discussed in the appropriate sections. *See supra* III-D-4.

b. Signs and Road Crossing Devices

SunBelt's Opening Evidence included cost estimates for what it calls a "standard package" of railroad signs, including milepost, whistle post, yard limit, and cross buck signs and posts for a total cost of $8 million. *See* SunBelt Opening III-F-44. NS's Engineering Experts have determined that SunBelt's "standard package" is insufficient due to the omission of Emergency Notification Signs ("ENS") that are required by FRA's Rail Safety Improvement Act 2008 – Section 205[457] and due to insufficient installation costs for RR crossbucks. The costs referenced in the SBRR's opening evidence do not take into consideration additional tasks and measures required to install signage on RR right-of-way and around at-grade crossing locations.

i. Advance Warning Signs and Crossbucks

SunBelt's support for sign costs[458] reflect material and labor costs based upon the Tennessee Department of Transportation's railroad advance warning highway signage (e.g. MUTCD W10-1, *see* FHWA's Manual on Uniform Traffic Control Devices – 2009 Edition), but

---

[456] NS's evidence on the cost of public improvements to the SBRR is sponsored by NS witness Randall Frederick. Mr. Frederick is a Project Manager and Senior Engineer with STV and has over 30 years of experience managing construction engineering and inspection services for highway and railway bridges and tunnels. Prior to joining STV, Mr. Frederick was a Principal Engineer with CSXT. Mr. Frederick's qualifications are further detailed in Section IV.

[457] NS Reply WP "FRA Rail Safety Improvement Act 2008 – Section 205.pdf."

[458] SunBelt Opening WP "Advance Warning Sign Price.pdf."

not railroad crossbuck signage (i.e. MUTCD R15-1). Moreover, SunBelt's proposed costs[459] did not take into consideration additional measures required to install signage on SBRR right-of-way and around at-grade crossing locations (e.g., additional labor to locate underground railroad utilities which are not included in a standard utility locate request).

Therefore, NS's Engineering Experts have quantified railroad crossbuck sign installation using cost data from actual NS projects, which NS produced in discovery. This cost information is referenced in SunBelt's opening Track Construction Cost spreadsheet (Tab "CROSSBUCK – 'NSR Price'"), but SunBelt apparently decided not to use it. Therefore NS's Reply evidence increases the cost to install crossbucks at all crossings by $506,885 to reflect actual documented labor and material costs. *See* NS Reply WP "SBRR Track Construction NS Reply," Tab "Crossbuck;" "Crossing Surface Cost - NS Discovery NS-DP-HC-025627.pdf"

ii. ENS

ENS are now a requirement for railroads, based upon FRA's Rail Safety Improvement Act 2008 – Section 205.[460] In 1994, based upon a demonstrated need for an Emergency Notification System for Class I railroads, Congress directed the Secretary of Transportation to pursue a pilot program for a toll-free notification system at all at-grade rail/highway crossings (both public and private). The National Transportation Safety Board, in conjunction with the FRA, recommended implementation of an ENS system on all Class I railroads. A key component of this system is two ENS at each at-grade rail/highway crossing communicating the following information: "1-800 Telephone Number and Grade Crossing Identifier." ENS was made mandatory by the Rail Safety Improvement of Act 2008 - Section 205. NS's Engineering

[459] SunBelt Opening WP "Track Construction Costs.xls."

[460] NS Reply WP "FRA Rail Safety Improvement Act 2008 – Section 205.pdf."

Experts added costs of compliance with the ENS requirement for all crossings (both public & private). *See* NS Reply WP "Track Construction Reply," Tab "ENS Cost – Reply."

The SBRR would include a total of 580 at-grade crossings. Therefore, NS's Engineering Experts have determined that 1,160 ENS are needed to comply with the FRA requirement, thereby increasing SBRR crossing costs by $117,056.[461] *See* NS Reply WP "Track Construction Reply," Tab "Summary."

c. Grade-Separated and At-Grade Crossings

i. Grade Separations

Because all of the SBRR's referenced grade-separated crossings are highway overpasses, these costs are addressed in a separate section. *See supra* III-F-5-c (Highway Overpasses).

ii. At-grade Crossings

The SBRR would build all at-grade crossing surfaces and pay 100% of material costs. *See* SunBelt Opening III-F-44. NS's Engineering Experts have confirmed the number of crossings identified along the hypothetical SBRR route and accept that number. NS's Engineering Experts also accept SunBelt's rubber and asphalt/rail-seal crossing surface configuration as a general surface type.

However, NS's Engineering Experts take exception to SunBelt's proposed grade crossing construction cost of $582 per track foot. Review of SunBelt's supporting grade crossing surface estimates shows that its bid costs range widely from $305 to $1,100 per track foot.[462] Further, several of the estimates lack sufficient supporting information to show compliance with Class I railroad crossing standards. Documents NS provided to SunBelt in discovery clearly

---

[461] NS Reply WP, "ENS Sign Costs.pdf."

[462] SunBelt Opening WP "Bayline Turnout Bid.pdf."

document its at-grade crossing surface materials and labor costs which reflects a 2Q09 per track foot cost of $753.[463] NS's Engineering Experts therefore , have indexed these costs to 3Q11 construction costs to reflect these actual documented material and labor costs, thereby increasing the total stated Grade Crossing cost by $2,879,376 million for a new total of $10,394,160.[464]

iii. At-grade Crossing Detours

SunBelt's Opening Evidence does not include any costs associated with roadway detours and signage required while the roadway is closed for construction of SBRR track and at-grade crossings. These costs include, but are not limited to, identification of the detour route, signs denoting the detour route, barricades at the crossing, and advance notices of the road closure(s) in local publications. A typical detour, based upon the federal Manual on Uniform Traffic Control Devices (MUTCD)[465] requires a full complement of signs and barricades. The signage configuration and associated costs are quantified in the NS Reply workpapers.[466] Based upon the construction of 580 at-grade crossings identified on the SBRR, the total cost for detour signage increases SBRR construction costs by $ 3.92 million. *See* NS Reply WP "Track Construction Reply," Tab "Crossing Detour Cost – Reply."

iv. At-grade Crossing Vegetation Removal

The Sight Triangle at highway rail crossings, which provides vehicles traveling at the legal speed limit with an adequate view of approaching trains[467] at highway-rail at-grade

---

[463] NS Reply WP "Crossing Surface Cost – NS Discovery NS-DP-HC-025627.pdf."

[464] NS Reply WP "SBRR Track Construction Costs NS Reply.xlsx."

[465] NS Reply WP "MUTCD Detour Signage.pdf."

[466] NS Reply WP "Detour Signage Costs.pdf."

[467] *See* NS Reply WP "FHWA Sight Distance Diagram.pdf."

crossings, is paramount for the safety of the motoring public. Both the Federal Highway Administration and the Federal Railroad Administration have guidelines and requirements for establishing and maintaining the Sight Triangle at highway-rail crossings. Additionally, the Federal Railroad Administration's, Compilation of State Laws and Regulations Affecting Highway – Rail Grade Crossings[468] reflects the railroad's state law responsibility for vegetation control at highway-rail crossings.

In compliance with safety guidelines of the Federal Highway Administration's Railroad-Highway Grade Crossing Handbook,[469] NS regularly conducts a Grade Crossing Quadrant Clearing Program on each of its operating Divisions. This program consists of a comprehensive vegetation removal program for each at-grade crossing. The standard NS clearing areas are illustrated in the NS Reply workpapers.[470] NS provided documentation of its vegetation removal costs to SunBelt in discovery.[471] The NS Engineering Experts have included additional costs for vegetation clearing at the time of the initial construction at each at-grade crossing on the SBRR, based upon a total of 580 at-grade crossings.[472]

In sum, NS's Engineering Experts estimate total public improvement costs for the SBRR at $16.7 million, or $8.7 million more than SunBelt's opening evidence estimate.

---

[468] FRA Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossing – 5th Edition, NS Reply WP "FRA Compilation of State Laws and Regulations - Ch12.pdf."

[469] FHWA Railroad-Highway Grade Crossing Handbook – Revised Second Edition August 2007 (excerpt), NS Reply WP "FHWA Site and Operational Improvements.pdf."

[470] NS Reply WP "NS Vegetation Cut Pattern. pdf."

[471] NS Reply WP "GCOC Crossing Clearing and Maintenance Summary 2004-2011.xlx."

[472] NS Reply WP "NS Reply WP III-F-249.pdf."

9. Mobilization

NS accepts SunBelt's mobilization cost factor of 2.7 percent applied to all SBRR road property investment accounts except land. It is well-established in SAC cases that the standard mobilization factor is not applied to land costs. As demonstrated below, however, there also would be significant additional initial costs associated with acquisition of nearly 7,300 acres of land in a relatively short period of time. SunBelt's evidence did not account for this cost, and thereby understated SBRR road property investment costs. NS's experts have developed a reasonable estimate of the additional costs associated with the acquisition of land for the SBRR, and this Reply evidence adjusts SBRR road property investment costs to account for the acquisition costs omitted by SunBelt's evidence.

9.1 Real Estate Acquisition Costs[473]

Although the SBRR would need to purchase approximately 7,300 acres of land for its right-of-way, communication facilities, and yards, *see supra* Section III-F-1, SunBelt did not provide for any additional costs to the SBRR for acquiring this real estate. Such an omission understated SBRR land acquisition costs because, in the real world, a railroad purchasing real estate must pay not only the purchase price of the land, but also the associated transaction costs of acquiring that land, including title work, surveys, appraisals, negotiations, and closing costs.[474] Indeed, the costs that accompany any land acquisition are particularly significant for right-of-

[473] This section is sponsored by Mark D. Mathewson, Owner of Mathewson Right of Way, who is an expert in right-of-way acquisition. Mr. Mathewson is a licensed attorney in the State of Illinois. His company provides land acquisition services for governmental and private sector clients. Over the last 25 years, Mr. Mathewson has overseen the acquisition of more than 10,000 parcels of property throughout the State of Illinois. Mr. Mathewson's qualifications are further detailed in Section IV.

[474] When condemnation proceedings become necessary, railroads also must pay the associated litigation costs. These costs are ignored for purposes of this analysis, as it is assumed that the SBRR would be able to purchase the land without the need for eminent domain.

way acquisitions, because such acquisitions typically involve purchasing land that is not presently on the market and require labor-intensive efforts to identify and negotiate with landowners. These costs are separate and apart from the Across-the-Fence valuation of the land to be acquired by the SBRR, and NS's appraiser specifically excluded these costs from his appraisal report.[475]

According to the SBRR construction schedule, the SBRR would acquire the approximately 7,300 acres of land necessary for its operations during the seven month period between June and December 2009. *See* SunBelt Opening WP "Complete Construction Schedule.xls." In order for the SBRR to be able to purchase that quantity of land in that time period, the SBRR must engage contractors to perform the necessary title work, surveys, appraisals, and landowner negotiations. This work cannot be performed by SBRR Real Estate employees, who will not yet be employed by the SBRR at the time of real estate acquisition in June 2009. However, even assuming that SBRR Real Estate employees could oversee this effort, the scope of the acquisition still would require the use of outside resources because SunBelt does not even propose to have a dedicated Real Estate staff in its opening evidence, instead providing for a single Director of Real Estate & Security, who would be the *only* person responsible for real estate functions, on top of his responsibilities to oversee security. That single person could not possibly acquire approximately 7,300 acres in seven months. *See supra* III-D-113 to III-D-114.

---

[475] *See* NS Reply Exhibit III-F-3 at 36 to 37 ("The following acquisition costs are disregarded: brokerage fees; legal and accounting fees; insurance; surveys; appraisals; title search; transfer taxes; landowner association fees; special assessments; permits for non-conforming use; subdivision fees; condition assessments and surveys; demolition, relocation or rehabilitation of improvements on abutting parcels; severance damages; and damages for creating any landlocked parcels not included in the acquisition.").

Indeed, despite NS's Real Estate Department of over forty people, NS itself uses real estate consultant services, including those provided by Mr. Mathewson, as well as brokerage services, for real estate transactions that pale in comparison to the scope of the SBRR acquisition and that are completed over a much longer period of time.[476] Because right-of-way acquisition involves purchasing land that is not presently on the market, there is considerable work involved in identifying, contacting, and negotiating with landowners, in addition to the other tasks, such as title work, surveys, and appraisals, which cannot be performed in-house as they require specific skill sets and certifications.

Mr. Mathewson has developed a conservative estimate as to what the SBRR would have to pay for real estate acquisition costs on a per parcel basis.[477] First, Mr. Mathewson conservatively assumes that the SBRR consists of 725 parcels, which is about ten acres per parcel. By comparison, the average acreage of the valuation units Mr. Hedden used in valuing the SBRR ROW was 9.25 acres,[478] so Mr. Mathewson's assumption conservatively attributes approximately one parcel per valuation unit. Second, Mr. Mathewson calculates costs for essential tasks that the SBRR or a contractor would need to perform in order to acquire each parcel. These costs and tasks are set forth in Table III-F-30.

---

[476] *See, e.g.*, NS Reply WP "Exclusive Representation Agreement.pdf" (contract for brokerage services for the acquisition of a small number of parcels in Jefferson County, Alabama).

[477] Pricing for right-of-way services are often calculated on a fixed fee basis, including on a per parcel basis. *See, e.g.*, NS Reply WP "Right of Way Consultant Contracts.pdf."

[478] *See* III-F-1-b, *supra* (741 valuation units for 6,852 acres of ROW).

Table III-F-30
SBRR Real Estate Acquisition Costs[479]

Cost Category	Category Description	Per parcel cost
Title Work	Title research resulting in a commitment for title insurance; this fee includes updates required during the acquisition process	$500
Survey	A boundary survey indicating the precise property to be acquired, including an area calculation	$4,000
Appraisal[480]	An expert opinion of the value of the property or real estate interests to be acquired	$2,000
Negotiations	Negotiations with landowners over the cost of the property	$2,500
Closing Costs[481]	Closing costs include recording fees, title insurance, escrow fees, document preparation fees, mortgage payoff fees and attorneys' fees; amount will vary largely based on cost of property	$2,356
	Total Per Parcel Cost	**$11,356**
	Total Estimated Cost for SBRR	**$8,233,100**

This estimate is founded on conservative assumptions regarding the costs the SBRR would incur to acquire the necessary land based upon Mr. Mathewson's extensive experience in

[479] *See* NS Reply WP "SunBelt Real Estate Acquisition Costs.xls." This estimate does not include costs for environmental studies or permitting.

[480] This estimate does not include an appraisal review, which is sometimes required in ROW acquisition projects.

[481] To be conservative, Mr. Mathewson has only included in his estimate the costs of title insurance, closing fees, and recording fees. All other closing costs, including attorneys' fees, have been omitted.

the field of right-of-way acquisition. Accordingly, the SBRR would incur $8,233,100 in expenses for real estate acquisition separate and apart from the cost of the land itself.

10. Engineering

NS accepts SunBelt's engineering additive.

11. Contingencies

NS accepts SunBelt's contingency factor.

12. Construction Schedule[482]

Under the Board's theory of unconstrained resources, NS accepts SunBelt's proposed 30 month construction schedule for the SBRR but makes adjustments where appropriate to the SBRR construction costs to account for the real world effect of lost production due to rainfall.

The SBRR covers the region around Mobile and New Orleans on the Gulf Coast. The summer season in the southeast can be extremely hot and humid. In addition, seasonal climatic events such as hurricanes, droughts, and heavy rains that cause flooding can and have occurred.[483] Category 4 hurricanes have hit the Gulf Coast not only causing extensive damage along the shoreline but also causing inland flooding. Major flooding along the Mississippi River has occurred. A railroad bridge over the Mississippi River at Hannibal, MO was almost wiped out by flooding. Weather is a real factor in costing any construction that relies on good weather to accomplish the work.

The original builders of the many lines that make up the SBRR also had the challenge of coping with weather related events. SunBelt ignores these challenges and adverse events when

---

[482] NS's evidence regarding the SBRR construction schedule is sponsored by NS witness Robert Phillips, Vice President of the Rail Division of STV, who has over 35 years of construction management of rail projects. Mr. Phillips' qualifications are further detailed in Section IV.

[483] NS Reply WP "NS Climatic Data Sunbelt Worksheet.xlsx," Tab "Weather Events."

costing the property investment to build the SBRR. R.S. Means Construction Cost Data and the associated production rates are based on good weather and site conditions.[484] NS's Engineering Experts observed many roadbed repairs and installation of preventative measures along sections of the SBRR route constructed over the years due to slides and washouts caused by extreme weather events. It is expected that many such events will occur during a three year construction schedule involving SBRR rail lines. In addition typical seasonal weather events that occur annually such as rain and extreme hot temperatures will slow production. During extreme weather events some roadbed, culverts and even bridges will have to be repaired or completely rebuilt due to damages incurred.

NS's Engineering Experts looked at the days lost to rain to determine lost production that results in higher construction costs. As pointed out by SunBelt in Opening Evidence a majority of the SBRR has a classified "Climatic Zone" of either "Humid," or "Moist Sub-Humid."[485] Annual rainfall in these areas range from 53 to 63 inches. Although the rain is spread out over the year, there are many days that work cannot be performed or rain slows production. Some areas of roadbed could even be permanently impacted causing complete rework or repair. NS's Engineering Experts also obtained annual weather information for major cities along the SBRR route.

SunBelt Opening Workpaper "Complete Construction Schedule.xls" reveals each construction phase and the duration of that phase in months. The schedule indicates that construction will begin February of 2009 and end May of 2011. The schedule also indicates that earthwork and drainage will take seven months (October 2009-April 2010); bridge construction

---

[484] NS Reply WP "RS Means Pages_IX&X.pdf."

[485] SunBelt Opening WP "SBRR Route average rainfall.pdf."

will take 13 months (February 2010-April 2011); and track construction 12 months (also May 2010-April 2011). Overall, the construction that is most subject to weather and outside activities that depend on good weather occur over a 19 month period.

NS's Engineering Experts have identified two sources that document the productivity losses due to inclement weather as well as other environmental factors. They are:

- Productivity Improvement in Production (NS Reply WP "Human Time Study-Env Aspect.pdf");
- Construction Law Library's "Calculating Lost Labor Productivity in Construction Claims" (NS Reply WP "Productivity Losses-Weather.pdf").

Each of the above cited workpapers reference studies that have documented and measured lost productivity caused by weather.

a. Additive to Compensate for Days Lost to Rain Events

Continuous rain and especially heavy rain will quickly shut down outside construction activities. During grading and drainage related construction soil turns to mud. Drainage ditches and live streams fill with flowing water. In addition, erosion control measures are quickly strained while bare slopes often erode. Heavy rains can cause newly installed culverts to fill with sedimentation or completely washout. Haul roads become slick if not impassable. Too much water can cause compaction efforts to fail requiring material to be dried or replaced. Excessive rainfall could completely prevent access to some of the low lying swamps and marshes found along the SBRR route. Use of cranes while building bridges becomes a safety concern. Bridges that require the construction of piers in low lying areas become flooded or the ground becomes saturated preventing heavy lifting by cranes. In many cases, structural concrete cannot be placed or concrete trucks cannot reach the bridges. Track work is also slowed. Sub-ballast cannot be setup (compacted) properly during heavy rain or wet periods. Although track

construction on previously compacted sub-ballast is not an issue, labor and material handling are slowed by rain events.

To quantify lost labor and production due to rain, NS's Engineering Experts determined the number of rainy days and annual rainfall for the region of the SBRR. From this data the number of days lost to rain was determined based on the lower of 50% of rainy days or 80% of the total annual rain fall in inches to reflect the fact that not all rain events result in work stoppages. NS determined from the weather data that 47 days a year would be lost to rain. Contractors (both union and non-union) generally pay crews a "reporting" time even if the crews are not able to work due to weather conditions.[486] That time averages payment of two hours pay for reporting each day that weather prevented work from being accomplished.[487] To develop the reporting time pay rates NS's Engineering Experts divided the labor amount shown in R.S. Means Cost Data for each item by four to calculate the pay for two hours from a standard eight hour day. In situations where R.S. Means cost data were not used NS's Engineering Experts identified similar cost components from R.S. Means to determine percent of labor and then divided that cost by four. Once two hour cost of all labor[488] was derived, the quantified cost was then multiplied by the number of days lost to rain events. Because lost rain days is determined based on annual rainfall, the days lost to rain were based on the number of months of construction for earthwork and drainage, bridge construction, and track construction (# of month/12 X annual days lost to rain).

---

[486] NS Reply WP "Contractor Inclement Weather Policies.pdf."

[487] *Id.*

[488] Again, crews are typically paid for two hours of labor on days that weather prevents them from working. *See* NS Reply WP "Contractor Inclement Weather Policies.pdf."

Because bridge construction requires a more complicated approach to develop Means costs and associated production rates, NS's Engineering Experts separately addressed weather-related costs for bridge construction. SunBelt would have to construct approximately 270 linear feet of bridge per day in order to meet the proposed 15-month bridge construction schedule. NS's Engineering Experts have evaluated the bridge quantities data to determine what sort of man power would be necessary to achieve that goal.

Because there are a number of different types of structures of varying lengths and heights, NS's engineering experts first had to determine some typical proportions upon which to base the bridge construction production rate. Fortunately that was a relatively easy task, because over 67% of the bridges built on the SBRR are Type III bridges.[489] The average Type III bridge is 227 feet long, 16.5 feet tall, and made up of 2.45 spans.[490] Given that these are the average proportions of the most common type of structure found on the SBRR, they are a realistic representation upon which to base the required bridge-construction man power. With this data in mind, it is fairly simple to determine how much manpower it would take to build one of these "typical" bridges.

The NS Bridge Engineering Experts calculates the number of piles and length of piles for Type III Piers and Abutments, as well as the volume of concrete needed for a 16.5-foot tall pier on a Type III bridge. *See* NS Reply WP "SBRR Weather Costs NS Reply," Tab "Bridge Crew Production Rate," Cells C21 to C26. NS's Engineering Experts used R.S. Means to determine which crews would be required and how much work they could accomplish per day. From there they determined how much manpower it would take to build the bridges at a rate that

[489] "SBRR Bridge Construction Costs_NS Reply.xlsx," Tab "NS Cost Summary," Column E.

[490] "SBRR Bridge Construction Costs_NS Reply.xlsx," Tab "Type III Spans Only," Cells N310, U310, and AA310.

would meet the proposed 15-month bridge construction schedule. Together, these data indicate that the SBRR would need to simultaneously employ **nine** concrete crews, **three** pile-driving crews and **one** steel crew in order to complete the bridge construction within the 15-month schedule SunBelt has proposed. The details of how these numbers were derived are shown in the NS Reply work papers.[491]

Altogether, accounting for bridges, earthwork, and track construction, total labor cost lost to rain over the construction period would amount to approximately $7.0 million. NS Reply WP "SBRR Weather Costs by Division NS Reply.xlsx."

[491] "SBRR Winter Costs by Division NS Reply.xlsx," Tab "Bridge Crew Production Rate."

Table of Contents

Page

III. STAND-ALONE COST III-G-1

G. DISCOUNTED CASH FLOW ANALYSIS III-G-1

1. Cost of Capital III-G-1

2. Inflation Indices III-G-4

3. Tax Liability III-G-5

4. Capital Cost Recovery III-G-5

III. STAND-ALONE COST

G. DISCOUNTED CASH FLOW ANALYSIS

SunBelt's discounted cash flow ("DCF") model contains a number of invalid inputs and assumptions, ranging from overreaching and flawed assumptions regarding the availability of bonus depreciation to overly aggressive assumptions regarding future inflation. Each of the issues is discussed in detail below.

1. Cost of Capital

SunBelt has followed the Board's approved and preferred approach in developing capital costs for the SBRR. For 2009, 2010, and 2011 SunBelt employs the industry average costs determined by the Board in its annual cost of capital proceedings. SunBelt uses the railroad industry cost of capital to calculate the capital recovery charges for all road property investment. NS accepts SunBelt's use of the Board determined railroad industry cost of capital as the starting point for the SBRR. NS makes one correction to SunBelt's SBRR cost of capital calculations.

Specifically, NS corrects SunBelt's development of the SBRR cost of capital to add equity flotation costs for the SBRR that were omitted by SunBelt. Equity flotation costs are the fees charged by investment bankers when a company raises external equity capital, and they can amount to between 2% and 7% of the total amount of equity capital raised, depending on the type of offering.[1] Until 2007, the Board had rejected arguments by railroad defendants in SAC cases that the costs of raising the equity necessary to finance the construction of the SARR must be included in the SAC cost analysis. The Board's rationale was that there was not sufficient evidence of the "existence and size of equity flotation fees associated with equity issuances of a similar size." *Xcel*, 7 S.T.B. at 659. However, in 2007, the Board changed its approach. In the

[1] *See* NS Reply WP "III-G Cost of Raising Capital.pdf."

SAC case involving AEP Texas, AEP Texas objected to the evidence submitted by BNSF on the size of an appropriate equity flotation fee and argued that the best evidence of the existence and size of an equity financing fee for a major railroad project was set forth in the ICC's railroad industry cost of capital determination for the year 1991, in which the ICC acknowledged that the Burlington Northern Railroad had incurred equity flotation costs of about 3.9 percent in 1991 in connection with the issuance of over 10 million shares of new common stock. *See* Rebuttal Evidence of Complainant AEP Texas North Company in *AEP Texas*, STB Docket No. 41191 (Sub-No. 1), at III-G-4 (filed July 27, 2004). However, AEP Texas argued that the Board should treat that evidence of equity flotation fees in the SAC analysis the same way those fees were treated in the 1991 cost of capital determination, *i.e.*, by spreading the impact of the equity flotation fees across the entire railroad industry. *Id.* The Board agreed with AEP Texas. *See AEP Texas*, STB Docket No. 41191 (Sub-No. 1), at 108.

More recently, in *AEPCO*, the Board rejected Defendants' addition of equity floatation costs that would have to be borne by the SARR for three reasons:

1. Unlike AEP Texas, the parties did not agree that a separate equity flotation cost is warranted.

2. The Board previously has explained that flotation fees already are included

3. in the Board's cost-of-capital computation. *Duke/CSXT*, 7 S.T.B. at 433.

4. The Board has opined that, to include such a fee separately, there would have to be evidence of the existence and size of equity-flotation fees for stock issuances of a similar size as that needed by the SARR. *Xcel*, 7 S.T.B. at 659.

In *AEPCO 2011*, STB Docket No. 42113, at 137-138, the defendant carriers contended that equity flotation costs should be based on a 1991 stock issuance of unspecified size by Burlington Northern (a predecessor of BNSF), as the best available evidence of a railroad's

stock-flotation cost. According to the Board, that 1991 figure, 3.9%, rounds to the equity-flotation figure that the Board rejected in *AEP Texas*: *i.e.*, 4%. The Board thus concluded that even if it were to allow a separate equity-flotation cost, it had already indicated that a 3.9% figure would be too high.

The SARR's cost to raise equity is a cost that is borne directly by the SARR, just like other direct costs associated with construction of the SARR. The fee that must be paid to underwriters to raise the necessary financing is no different in kind from the fee that the SARR must pay to its engineers to design the SARR. It is a cost incurred by a new entrant to construct and operate a major railroad project, and it should be reflected in the SAC analysis. Because railroads have not recently incurred costs to raise new equity—although they have most certainly incurred costs related to raising capital through debt—there are no equity flotation costs included in the Board's 2006 through 2011 railroad cost of capital determinations.[2] Although NS believes that the 3.9% cost to raise equity incurred by BNSF in 1991 is in the middle of the range that would be experienced by the SBRR for raising its equity,[3] it recognizes that the Board has expressed discomfort with that figure. Therefore NS looked for other recent capital raising efforts for indications of market level equity flotation costs.

Based on SunBelt's opening DCF calculations, the SBRR would need to raise approximately $1.4 billion in equity.[4] Capital generation demands of that magnitude do not occur frequently. However, in May of 2012, Facebook completed an initial public offering

---

[2] The Board's railroad industry cost of capital determinations do include debt flotation costs, as explained in the AAR cost of capital submissions to the Board in *Ex Parte No. 55.*

[3] *See* NS Reply Workpapers "III-G Cost of Raising Capital.pdf" and "III-G Stock Market Liquidity and the Cost of Raising Capital.pdf."

[4] This figure is derived from the approximately $1.8 billion in SBRR construction and interest during construction costs estimated by SunBelt and an average equity weighted capital structure of 75.91 percent.

("IPO") and issued and sold 180 million shares of Class A common stock at a public offering price of $38.00 per share. According to Facebook's second quarter 2012 Form 10-Q, Facebook received net proceeds from the IPO of $3.8 billion.[5] According to the 10-Q, Facebook incurred underwriting discounts and commissions of $75 million and other offering expenses of approximately $6 million, for a total cost of $81 million or 2.1 percent of the capital raised. NS has therefore relied upon the Facebook experience to add equity flotation costs for the SBRR of 2.1 percent.[6]

2. Inflation Indices

SunBelt used actual AAR cost indices and Global Insight's March 2012 forecasts to calculate annual inflation forecasts.[7] NS does not dispute SunBelt's road property asset and operating expense DCF inflation indexes derived from these sources and, consistent with Board precedent, NS updates those indices in circumstances where new actual index and forecast values have become available. NS Reply inflation index forecasts for the SBRR as based on Global Insight's September 2012 forecast.[8]

NS does take issue with SunBelt's inflation index for land, however. SunBelt assumes land values will rise an average of 7.0 percent annual from the third quarter of 2011 through the end of the 10-year SBRR DCF period. NS real estate expert Michael Hedden explains that SunBelt's real estate inflation assumption is overstated, and he has developed an estimate of

---

[5] See NS Reply WP "Facebook 2Q2012 Form 10-Q.htm" at 8.

[6] Given the very large demand for Facebook stock – demand which there is little reason to assume would be equally robust for SBRR shares, meaning likely higher equity flotation costs for the SBRR – NS' reliance on flotation costs at the same level as those for Facebook is a quite conservative assumption.

[7] SunBelt Opening at III-G-7.

[8] *See* NS Reply Workpaper "rcaf20123Q.pdf."

annual inflation for SBRR real estate of 2.39 percent through 2019.[9] NS uses Mr. Hedden's inflation estimate in place of SunBelt's overstated forecast.

3. Tax Liability

SunBelt's DCF incorporates three errors affecting the calculation of SBRR income tax liability. First, as discussed in Section III-H-1-f, SunBelt misapplied the guidelines relative to bonus depreciation by assuming this temporary measure would apply to SBRR assets at the time of their replacements. Second, as also as discussed in Section III-H-1-f, SunBelt used the wrong tax life for certain of the SBRR road property assets. Third, as discussed in Section III-H-5, SunBelt improperly changed the longstanding and critical assumption in the DCF model that because the SBRR cost of debt is locked in at the debt rate in place during the SBRR construction period, the SBRR debt is amortized over an assumed 20-year financing term. NS corrected these shortcomings as explained in the referenced Sections. NS accepts SunBelt's calculation of the weighted average SBRR state income tax rate.

4. Capital Cost Recovery

SunBelt calculated the capital recovery cost of SBRR's property using a 10-year DCF period in accordance with the Board's decision in *Major Issues*, Ex Parte No. 657 (Sub-No. 1).[10] NS accepts SunBelt's capital recovery calculations except as set forth in other Sections of NS's III-G and III-H Reply Narratives.

---

[9] *See* NS Reply WP "NS SUNBELT Inflation Indices.docx."

[10] SunBelt Opening at III-G-8.

Table of Contents

Page

III. STAND-ALONE COST III-H-1

H. RESULTS OF SAC ANALYSIS III-H-1

1. Results of SAC Analysis III-H-1

a. Cost of Capital III-H-1

b. Road Property Investment Values III-H-2

c. Interest During Construction III-H-2

d. Amortization Schedule of Assets Purchased With Debt Capital III-H-2

e. Present Value of Replacement Cost III-H-4

f. Tax Depreciation Schedules III-H-5

g. Average Annual Inflation in Asset Prices III-H-8

h. Discounted Cash Flow III-H-8

i. Computation of Tax Liability – Taxable Income III-H-11

j. Operating Expenses III-H-11

k. Summary of SAC Analysis III-H-12

2. If The Board Were to Find That The SBRR Revenues Exceed SAC Costs Over The 10-Year DCF Period, It Must Administer Its Internal Cross-Subsidy Test to Ensure Traffic on the Birmingham to New Orleans Segment Would Not Subsidize Traffic on the McIntosh to Burstall Segment III-H-13

a. Background III-H-15

b. The Board's Internal Cross-Subsidy Test is Essential to Prevent Subsidization of the Issue Traffic by Other Shippers Who Do Not Benefit from Facilities Used By the Issue Traffic. III-H-16

c. Application of the Threshold Cross-Subsidy Test Would Demonstrate That This Case Must Be Dismissed Because the Evidence Fails to Demonstrate That SunBelt's Traffic Is Cross-Subsidizing Other Traffic on the NS System. III-H-19

3. Maximum Rate Calculations III-H-20

a. Any MMM Analysis Conducted in this Case Should Properly Allocate Unique Costs of TIH Traffic Solely to that Traffic III-H-21

b. The Board Should Apply the Trainload Adjustment Advocated in AEPCO 2011 to Shipments Moving In Single Trainload Service Over the SBRR III-H-28

c. If It Applied MMM, the Board Would Also Need to Correct SunBelt's Two Other Clear Implementation Errors. III-H-29

III. STAND-ALONE COST

H. RESULTS OF SAC ANALYSIS

In this Section, NS discusses the results of its Stand Alone Cost ("SAC") analysis and the application of the Board's Maximum Markup Methodology ("MMM") and cross-subsidy tests to the evidence in this case.

1. Results of SAC Analysis

NS identified several problems with SunBelt's discounted cash flow ("DCF") model in Section III-G. There are other problems with SunBelt's DCF inputs and assumptions that logically could have been discussed in Section III-G. However, because SunBelt discussed these other issues in Section III-H of its Opening Evidence, for the sake of consistency NS addresses them in Section III-H as well. The DCF implementation problems discussed here include SunBelt's improper change to the Board's standard debt amortization pattern; its unrealistic assumptions about the extent to which bonus depreciation would be available to the SBRR; its extension of the benefits of bonus depreciation to the replacement cost of assets as they reach the end of their useful lives; and its use of the wrong tax depreciation lives for certain SBRR road property assets. NS's corrected DCF analyses are set out in NS Reply Exhibit III-H-1.

a. Cost of Capital

The cost of capital for the SBRR (NS Reply Ex. III-H-1 at Table A) reflects the Board's annual cost of capital determinations for 2009 through 2011. The SBRR's cost of debt for years 2009 to 2011 (the SBRR's construction period) is assumed to equal the railroad industry average cost of debt for each specific year in the construction period. For years 2011 through 2021, the SBRR's cost of debt equals 4.71 percent and reflects the weighted average of the construction years' debt costs used through the remaining years of the DCF model. The SBRR's cost of common equity for the years 2009 through 2011 is assumed to equal the railroad industry cost of

common equity for each specific year. As explained in section III-G, SunBelt's calculation of the SBRR average cost of capital does not include equity flotation costs, which NS adds.

b. Road Property Investment Values

NS's calculations for road property investment values are detailed in Table C of NS Reply Exhibit III-H-1. NS replaced SunBelt's road property investments with those specified above in Section III-F. NS accepts SunBelt's proposed SBRR construction schedule.

For land investments, SunBelt's land valuation witness estimated 2011 land values and discounted those values back to the SBRR construction period using an index that does not reflect the correct time frame for the SBRR's land acquisition. As explained in Section III-G-3, NS corrected the index to reflect properly the change in land values over the relevant time period. In addition, the "Investment" tab of NS Reply Exhibit III-H-1 was modified to treat the land investment as a 2009 value.

c. Interest During Construction

NS calculated interest during construction on construction funds outstanding during the assumed SBRR construction period using the same methodology as SunBelt.

d. Amortization Schedule of Assets Purchased with Debt Capital

In its opening, SunBelt proposes to change the Board's longstanding practice of amortizing SARR debt over 20 years. However, SunBelt improperly assumes that the SBRR could be financed with a single debt instrument that has a 20-year term, while also assuming that the terms of the instrument would reflect the railroad industry cost of debt, which is calculated based in part on instruments with much shorter intervals to maturity and correspondingly lower yields.

As justification for its proposed change, SunBelt asserts that a SARR's debt capital would mirror the type of debt instruments issued by U.S. Class I railroads included in the

Board's annual cost of capital determination.[1] SunBelt also suggests that nearly 90% of the railroad industry debt consists of corporate bonds, notes, and debentures that incorporate coupon payments of interest, rather than periodic payments with principal and interest components.[2]

SunBelt's emphasis on the type of debt instrument creates a disconnect with its assumption that SBRR's cost of debt would reflect the railroad industry's cost of debt. When the Association of American Railroads ("AAR") calculates the railroad industry cost of debt for the Board's annual cost of capital determination, it calculates the average yield of the bonds, notes, and debentures that were traded during the year. These bonds, notes, and debentures include instruments with relatively short intervals to maturity and correspondingly lower yields, and those with longer intervals to maturity and correspondingly higher yields. Table III-H-1 below segregates the 2010 traded debt instruments—the last full year of the SBRR construction period—that the AAR used in its calculations between those with yields below the 2010 calculated average yield of 4.56% and those with yields above the average.

Table III-H-1
Breakdown of AAR 2010 Cost of Debt
Between Those With Yields Below and Above the Average Yield
($ millions)

2010 Instruments	Count	Market Value	Weight	Avg. Yield	Maturity Range	Avg. Years to Maturity
Below Avg.	11	$3,831.4	33.56%	2.69%	2012-2017	3.6
Above Avg.	22	$7,585.3	66.44%	5.51%	2020-2105	26.0
Average	33	$11,416.7	100.00%	4.56%		18.5

Source: NS Reply Workpaper "AAR 2010 Cost of Capital Debt Details Worksheet.xlsx."

Table III-H-1 shows that 11 of the 33 debt instruments used by the AAR to determine the 2010 railroad industry average cost of debt have yields below the average, with an average yield

[1] SunBelt Opening III-H-2.

[2] *Id.* at III-H-3.

of 2.69%, and that these instruments will mature and be paid in full in an average of 3.6 years. If, as SunBelt suggests, the SBRR were financed with a single note with a 20-year term with a maturity date of 2031, then the interest rate would have to be recalculated to reflect the longer term nature of the financing. By contrast, the long-standing assumption in the DCF model that debt will be amortized over a 20-year period (rather than that the principal will be paid in full at maturity) incorporates the concept that the cost of debt will reflect a mix that includes some instruments with shorter terms until maturity. In other words, SunBelt's decision to use the railroad industry's average cost of debt and the accompanying mix of short and long term maturities is consistent with the long-standing assumption in the DCF model that debt will be amortized throughout the 20 year period, not with an assumption that SBRR could be financed with a note under which no principal would not be paid for 20 years.

The current debt amortization schedule in the DCF was first introduced by the Interstate Commerce Commission in its 1990 decision in *Coal Trading Corp. v. Baltimore & Ohio R.R.*, 6 I.C.C.2d 361 (1990). That amortization assumption is consistent both with the AAR's calculation of the average debt yield and with the maturity schedules of the underlying instruments. NS corrects SunBelt's approach by applying Board precedent both for the amortization of debt on the initial SBRR investment and for the debt amortization on the replacement cost of SBRR assets as they reach the ends of their useful lives.

e. Present Value of Replacement Cost

NS makes four corrections to SunBelt's calculation of the replacement cost of SBRR assets. NS corrected the tax depreciation lives for certain SBRR assets from 15 to 20 years and corrected SunBelt's incorrect assumption that bonus depreciation would be available at the time the SBRR assets are scheduled to be replaced as discussed in Section III-H-1. f. below. NS also reestablished the 20-year debt amortization schedule for future asset replacement. Finally, NS

aligned the replacement cost discounting assumptions with those used for the initial SBRR investment by correcting the discount factor used to compute the present value of the asset replacement costs to the average SBRR cost of capital instead of the average railroad industry cost of capital used by SunBelt.

f. Tax Depreciation Schedules

SunBelt's tax depreciation schedules contain three errors. The first is that SunBelt assumes that the SBRR would take full advantage of the bonus depreciation benefit for all road property assets. SunBelt assumes a whopping $880 million of the SBRR's road property investment, or over 60 percent of the SBRR depreciable investment, would be written off in the first year of SBRR operation as bonus depreciation. In its opening, SunBelt acknowledges the skepticism expressed by the Board in *AEPCO 2011* as to whether bonus depreciation allowed under the prior and current tax law should be allowed in SAC presentations. *See* SunBelt Opening at III-H-6. SunBelt argues that not allowing a shipper to avail itself of the bonus depreciation provisions taken and used by railroads would create a barrier to entry and place the shipper at a distinct disadvantage relative to the incumbent railroad. *See id.* But in fact it is SunBelt's assumption that the SBRR would avail itself of the bonus depreciation benefits for virtually all of the SBRR's road property investment that would inappropriately place the SBRR at a distinct *advantage* relative to the incumbent NS. That is because, unlike the SBRR, which benefits from the stand-alone assumption of unconstrained resources that allows for all of the SBRR construction to occur during the limited bonus depreciation tax window, NS built its system and periodically replaces components of its system over many years. As such, its ability to take advantage of the limited window of opportunity for bonus depreciation is constrained. To allow the SBRR to maximize its benefit from a temporary tax shelter because of a simplifying stand-alone cost assumption would result in a reverse barrier to entry that would bestow cost

savings to a new hypothetical entrant that were not available to the incumbent. This is precisely the sort of abuse of bonus depreciation that has concerned the Board. *See AEPCO 2011*, STB Docket No. 42113, at 141-42.

NS corrects this abuse by assuming that the SBRR should be allowed to enjoy the benefits of bonus depreciation only to the extent that NS itself has been able to enjoy such benefits. Specifically, using NS tax returns produced to SunBelt in discovery, NS calculated that it enjoyed system-wide $455.6 million in bonus depreciation benefits in 2009 and $610.3 million in bonus depreciation benefits in 2010. Because the SBRR replicates 3.7% of the NS network on a route-mile basis,[3] NS limits the amount of bonus depreciation available to the SBRR to 3.7 percent of NS's total 2009 and 2010 benefit of $1.07 billion, or $39.4 million.

Second, contrary to its statement on opening that its DCF model limits the bonus depreciation taken by SunBelt to only the assets placed into service in 2009 through 2011 (*see* SunBelt Opening III-H-6 to III-H-7), SunBelt assumes the bonus depreciation benefit, which is not applicable to assets placed in service after January 1, 2013, will be available in perpetuity.[4] Specifically, SunBelt modified the "Replacement" tab of the Board's DCF model to apply 50 percent bonus depreciation to assets replaced at the end of their projected useful lives. The shortest lived SBRR road property asset—public improvements—has an average service life of 13 years. The DCF assumes that SBRR will incur the investment required to replace its public improvements in the year 2024, well after the bonus depreciation benefit is scheduled to expire. NS therefore has removed the bonus depreciation benefit from the asset replacement tab of the DCF in its reply.

---

[3] The SBRR is assumed to replace NS for 578 of its 2009 total route miles of 15,676, or 3.7 percent of the full NS network.

[4] *See* SunBelt Opening WP "Exhibit III-H-1 errata.xlsx," Tab "Replacement," Cell AN64.

The third error is that SunBelt's tax depreciation schedules use the wrong tax depreciation lives for certain of the SBRR's road property assets. Specifically, SunBelt assumed certain accounts qualify for 15-year lives when under IRS rules they actually qualify as 20-year properties. Internal Revenue Code § 168(e) specifies the rules for the classification of property for purposes of computing the cost recovery allowance provided by the Modified Accelerated Cost Recovery System ("MACRS")—the tax depreciation system used in the United States. Property is classified according to class life as determined in Revenue Procedure 87-56 unless statutorily classified otherwise in § 168.[5] There are no exceptions to this rule. The following assets are specifically listed under asset class 40.2, each carrying a 20-year tax life.

- Account 6 - Bridge & Trestles
- Account 13 - Fences & Roadway Signs
- Account 17 - Roadway Buildings
- Account 19 - Fuel Stations
- Account 20 - Shops & Enginehouses
- Account 39 - Public Improvements

Further confirmation that NS treats these accounts as 20-year properties for tax depreciation purposes can be found in NS bonus depreciation documents for 2009 and 2010 produced to SunBelt in discovery.[6] These documents show that less than one percent of property placed in service in 2009 and 2010 was classified as 15-year property, while almost 17 percent of the property placed in service in those years was classified as 20-year property.[7]

---

[5] NS Reply WP "Rev. Proc. 87-56 – 5.rtf."

[6] NS Reply WPs "Depreciation and Amortization 2009.pdf" and "Depreciation and Amortization 2010.pdf."

[7] *See* NS Reply WP "15 and 20 year property.xlsx."

For each of these asset categories, NS changed the depreciation period from 15 years to 20 years and updated the depreciation percentages to comply with the proper 20-year MACRS table.[8]

g. Average Annual Inflation in Asset Prices

NS accepts SunBelt's inflation assumptions for assets other than land and, as discussed in Section III-G-2, updates the indexes to use more recent actual index values where available and updates the forecast indexes based on the more recent Global Insights September 2012 report.

h. Discounted Cash Flow

As explained above in Section III-G-4, NS accepts generally SunBelt's proposal to calculate the terminal value after year 10. In its opening, SunBelt claims to have identified an additional flaw in the STB's model. SunBelt observes that the DCF model explicitly assumes that the SARR's capital structure will remain constant in perpetuity. This means that the amounts of common equity and debt carried on the SBRR's financial statements will remain the same forever. However, the STB's DCF model assumes that after year 20, and until the first assets are replaced in the replacement level of the DCF model, the railroad has no debt and no tax shielding interest payments. Stated differently, the model assumes, from a tax payment perspective, that the railroad is 100 percent equity financed after year 20 and before its first replacement cycle. According to SunBelt, this creates an irreconcilable mismatch between the SBRR's cost of capital and its cash flows. The cost of capital assumes that the SBRR is carrying debt and its associated interest payments, but the cash flows reflect no benefits from the interest tax shields.

[8] NS Reply WP "MACRS tables.pdf."

SunBelt proposes to correct the perceived mismatch by assuming, contrary to long established Board precedent and contrary to its own explicit assumption that the term of the SBRR debt is 20 years, that interest payments would continue beyond year 20 and in perpetuity.

The mismatch "discovered" by SunBelt has been a mainstay of the Board's DCF model since *Coal Trading* and *McCarty Farms*. And it was affirmed by the Board in *Major Issues* where shippers' proposal to change to the amortization of debt assumptions in the DCF model was rejected by the Board as beyond the scope of the proceeding.[9] SunBelt's improper attempts to again raise the issue in the context of this proceeding should be similarly dismissed.

Further, contrary to its assertion, SunBelt's proposed solution to extend the SBRR interest payment into perpetuity does not remedy its perceived mismatch. As discussed above in section III-H-1-d, the SBRR cost of debt is locked in at the rates in place during the SBRR construction period and the rates are based on a collection of short and long term debt instruments. SunBelt's assumption that these rates will remain in effect in perpetuity creates a new mismatch between the interest rate and the debt term.

If the Board were so inclined, the correct way to eliminate the mismatch issue raised by SunBelt is to revert back to *Coal Trading* and recalculate the SBRR capital structure as the debt is amortized.[10] In that decision the ICC agreed with defendants' position that the DCF debt to equity ratio would not remain constant and that as the SARR amortized debt, the debt to equity ratio will change, resulting in a greater portion being equity capital.[11] This approach would maintain both the relationship between the locked in debt rate and the terms associated with those rates and make the capital structure consistent with the debt amortization schedule. A

---

[9] *Major Issues*, STB Ex Parte No. 657 (Sub-No. 1), at 65.

[10] *Coal Trading Corp. v. Baltimore & Ohio R.R.*, 6 I.C.C.2d 379 (1990).

[11] *Id.*

version of the DCF model implementing such a change is included in NS's workpapers. *See* NS Reply WP "Alternative DCF.xlsx."

NS made one other necessary change to the DCF model. The SBRR PTC development, IT and wayside deployment costs will not be incurred by the SBRR until after commencement of operations. As such, special accommodations need to be made to the DCF to recover PTC related investment only after that investment has been incurred. This was accomplished in a manner generally consistent with the approach taken in the DCF for the replacement of assets as they reach the end of their useful lives. Specifically, a new tab "PTC" was created in the DCF that functions similarly to the "Replacement" tab that calculates future replacement costs. SBRR PTC investments for the years 2012 through 2015 were input to the new tab where the tax benefits from accelerated depreciation and tax deductible interest are calculated and deducted from the PTC investment. The present value of future PTC investments as the original equipment reaches the end of its useful life is also computed for each investment vintage.

The PTC investments net of tax benefits and the present value of future replacements are carried to the "Investment SAC" cash flow tab. The model is first run with no future PTC investment to establish the base line capital recovery. Then, beginning with 2012, each year's PTC investment is added to the investment total and the model rerun. To prevent recovery of PTC investment before the actual PTC expenditures take place, the model results are locked down for the prior year before the model is rerun with the next year's PTC investment. For example, before the 2012 run is made, the annual capital recovery for the last portion of 2011 is saved as values and included as part of the 2012 run outputs. Details of these calculations are set forth in the "PTC" and "Investment SAC" tabs of NS Reply Exhibit III-H-1.

i. Computation of Tax Liability – Taxable Income

NS accepts SunBelt's assumed federal tax rate of 35% and calculated composite state income tax rate for the SBRR.

j. Operating Expenses

NS updated the base year operating expenses as detailed in Section III-D. For the annual adjustment of operating expenses, SunBelt used ton miles instead of the Board's accepted use of tons to take into consideration the shifting nature of the SBRR traffic. SunBelt Open III-H-11. NS rejects SunBelt's use of ton miles and indexes SBRR operating expenses based on annual changes in car miles. Use of ton-miles to index changes in SBRR operating expenses overweighs changes to coal traffic volumes—which NS (and others) forecast to decrease—and underweights intermodal—the lightest traffic—for which the highest volume growth is projected. SBRR car-miles provide a more accurate metric than ton-miles for adjusting operating expenses for changes in volume for a SARR with such a diverse traffic base that has very different forecasted volume growth. In using car miles, NS relies upon the flat-car miles for intermodal shipments, which tempers their impact more than if containers were used.

NS made two other corrections to SunBelt's SBRR operating expenses. First, NS corrected SunBelt's distribution of SBRR startup and training expenses to include all startup and training costs. In the "Operating SAC" tab of SunBelt's Exhibit III-H-1 SunBelt added SBRR startup and training costs to the year 1 (2011) general and administrative expenses. The problem with this is that, because the SBRR is assumed to commence operations July 31, 2011, only approximately five-twelfths of the full year 2011 operating expenses are applied to the SBRR, including startup expenses. SBRR provides no explanation of why the startup costs should be reduced—and indeed there is none. NS has corrected SunBelt's DCF to treat startup and training costs as an annual operating expense spread over the first full year of SARR operations,

consistent with prior Board precedent. *See Xcel*, STB Docket No. 42057, at 75. NS divided the annual startup and training expense by twelve months and spread the monthly expenses evenly over the first twelve months of SBRR operations.[12]

Second, SunBelt capitalized rail grinding expenditures in the DCF. NS Maintenance of Way Expert David Hughes explains that the NS accounting policy is to expense rail grinding expenditures. *See infra* at III-D-198. Because the average asset lives used in the DCF are the NS average asset lives which are based on NS accounting policies, to be consistent with those lives rail grinding is not capitalized and is included instead as a maintenance of way operating expense.

k. Summary of SAC Analysis

NS's stand-alone costs and revenues for SBRR are presented in Table L of Exhibit III-H-1 on a quarterly and annual basis and summarized in Table III-H-2 below.

[12] *See* NS Reply Workpaper "Exhibit III-H-1 NS Reply SB.xlsm" tab "Operating SAC" Cells U15 – U 19.

Table III-H-2
NS Reply SBRR SAC Results
($ millions)

Year	SARR Revenue Requirement	SARR Revenues	Overpayments (Shortfalls)	Present Value
2009	$250.7	$150.1	($100.6)	($100.6)
2010	$606.1	$384.6	($221.5)	($199.5)
2011	$623.5	$419.5	($204.1)	($165.7)
2012	$647.6	$455.0	($192.6)	($140.9)
2013	$683.4	$495.3	($188.1)	($124.0)
2014	$712.3	$549.6	($162.7)	($96.6)
2015	$743.8	$596.9	($146.9)	($78.6)
2016	$777.1	$650.9	($126.2)	($60.8)
2017	$811.1	$708.2	($102.9)	($44.7)
2018	$843.5	$762.2	($81.3)	($31.8)
2019	$504.9	$473.7	($31.2)	($11.3)
Cumulative Net Present Value				**($1,054.6)**

The results in Table III-H-2 show that SAC costs exceed the revenues available to the SARR by a total of $1.05 billion. SunBelt's SAC analysis therefore fails to demonstrate that the challenged rate is unreasonable.

2. If The Board Were to Find That The SBRR Revenues Exceed SAC Costs Over The 10-Year DCF Period, It Must Administer Its Internal Cross-Subsidy Test to Ensure Traffic on the Birmingham to New Orleans Segment Would Not Subsidize Traffic on the McIntosh to Burstall Segment.

NS's Reply Evidence shows that under reasonable assumptions for traffic and revenue forecasts, a properly developed operating plan that serves all SBRR customers and construction costs that account for the conditions that will be encountered by the builders of the SBRR, stand-alone revenues exceed stand-alone costs over the 10-year DCF period. If the Board were to determine otherwise, however, it would be required to conduct its cross-subsidy test on the eastern segment of the SBRR network running between McIntosh and Burstall, AL to ensure that segment covers the costs attributable to serving that traffic and is therefore not receiving an

impermissible cross-subsidy from traffic moving over only the New Orleans to Birmingham segment of the SBRR.[13] If an analysis of the McIntosh to Burstall segment demonstrates an improper cross-subsidization, this case must be dismissed. *See, e.g., Otter Tail*, STB Docket No. 42071, at 23-30; *PPL Montana*, 6 S.T.B. at 297-300. But even if the Board disagrees with that conclusion, and further determines (contrary to NS's SAC evidence) that overall projected SBRR revenues for the McIntosh to Burstall segment exceed that segment's revenue requirements, then the internal cross-subsidy analysis would limit the amount of rate relief the Board could prescribe. *See Otter Tail,* STB Docket No. 42071, at 10-11.

Unlike in *AEPCO 2011*, NS has provided a template for conducting an internal cross-subsidy analysis. . *AEPCO 2011*, STB Docket No. 42058, at 15-16 & n.19 (declining to conduct cross-subsidy analysis because defendant failed to provide templates to perform internal cross-subsidy analysis). If the Board determines—contrary to NS's sound and well-supported evidence—that SAC revenues exceed SAC costs (*i.e.*, SAC revenue requirement) for the SBRR, it must conduct an internal cross subsidy analysis on the McIntosh to Burstall segment using the revenues and costs the Board has determined. NS has provided a cross-subsidy determination template for the Board's use should such an analysis become necessary.[14] *See* xxx [cite to workpaper folders for III-A, III-D, III-F, III-H]

---

[13] Witness Michael Baranowski sponsors the cross-subsidy analysis described in this Section of NS's Reply Evidence. *See infra* at IV.

[14] Specifically, cross-subsidy templates for traffic and revenues calculations have been provided within NS III-A Reply workpapers "Gen Freight Traffic and Revenue Forecast Reply.xlsx" and "IM-Coal Traffic and Revenue Forecast Reply.xlsx." Templates for cross-subsidy calculations of operating expenses, road property investment, and the consolidated cross-subsidy analysis are provided within the "Cross Subsidy" subfolders in folders III-D, III-F, and III-H of NS's Reply Workpapers.

a. Background

The SBRR, as designed by Complainant, consists of two distinct segments joined at their northerly end. The western segment (referred to here as the "Birmingham-New Orleans Segment") is a high density line that replicates NS's mainline from Birmingham, Alabama through Mississippi to New Orleans, Louisiana. Traffic moving on that high-volume main line includes the bulk of NS system traffic moving to and from New Orleans, as well as substantial volumes of traffic that move east and west from Meridian, MS, over the "Meridian Speedway." The Birmingham-New Orleans Segment also includes part of NS's Crescent Corridor that runs between New Orleans and New Jersey, carrying heavy volumes of intermodal and other traffic. The Birmingham-New Orleans Segment also carries large volumes of traffic moving to and from Atlanta, Memphis, and Chattanooga. By contrast, the eastern segment of the SBRR (referred to here as the "McIntosh-Burstall Segment") replicates a much lower density intrastate segment of the NS system running from McIntosh to Burstall, Alabama.[15] The McIntosh-Burstall Segment is an indispensable segment of the SBRR because the single issue movement—high-value and higher-risk tank cars of chlorine—originates at the southern end of the McIntosh-Burstall Segment (SunBelt's McIntosh plant), and travels along that segment north to Burstall. Only after the issue traffic completes its journey over the lower-density McIntosh-Burstall Segment does it turn south and west, moving over the Birmingham-New Orleans Segment to the Crescent City, where it is interchanged with another carrier.

SunBelt has selected its traffic group and designed its SARR to rely heavily on the higher-density Birmingham-New Orleans Segment to generate the revenues necessary to cover the SBRR SAC revenue requirement. To achieve this aim, the SBRR includes large volumes of

[15] These are the same "two line segments" comprising the SBRR identified by SunBelt in its evidence. *See* SunBelt Opening at I-43 & III-B-1.

traffic on the Birmingham-New Orleans Segment that do not share or benefit from the McIntosh-Burstall Segment's line and facilities. Fully 84% of all SBRR traffic volumes, accounting for 70% of its revenues, move exclusively on the Birmingham-New Orleans Segment. In contrast, the McIntosh-Burstall Segment accounts for only 16% of the total SBRR traffic volume. Thus, while the McIntosh-Burstall Segment accounts for approximately 37% of SBRR network route miles, only 16% of SBRR's total volume of traffic moves on it. If the Board does not accept all of NS's reply SAC evidence and finds SBRR revenues exceed costs, given the significantly lower densities on the McIntosh-Burstall Segment, it is likely that the available revenues from that traffic would be insufficient to meet its SAC revenue requirement.

b. The Board's Internal Cross-Subsidy Test is Essential to Prevent Subsidization of the Issue Traffic by Other Shippers Who Do Not Benefit from Facilities Used By the Issue Traffic.

The Board's internal cross-subsidy test, first applied in *PPL Montana,* is designed to ensure that a complainant's SAC analysis does not rely upon cross-subsidization of the issue traffic by other traffic that does not use facilities needed by the issue traffic. As the Board explained, the *Coal Rate Guidelines* and Constrained Market Pricing proscribe "both cross-subsidization by and *cross-subsidization of" the issue traffic*. *PPL Montana*, 6 S.T.B. at 295 (emphasis added). A prohibited cross-subsidy arises when any traffic would be required to pay for facilities that it does not use or when that traffic would pay costs that are attributable to other traffic. *Id.* at 295-96. As the Board has further explained, a complainant may not prevail in a SAC case "by shifting responsibility for paying for facilities it uses to other shippers who do not benefit from those facilities." *Otter Tail*, STB Docket No. 42071, at 24 (quoting *PPL Montana,* 6 S.T.B. at 757-78).

The threshold internal cross-subsidy test "flows naturally from the economic theory of contestable markets, upon which the SAC test rests":

> If the revenues from traffic using one part of a system are less than the costs attributable to that traffic, there would be no economic incentive for a SARR to enter the market to serve those shippers. And when the existing rates are less that the sustainable rates in a contestable market, those rates do not exceed the maximum reasonable level established by the SAC test.

Id. If, based on an internal cross-subsidy analysis, the Board determines that challenged rates do not exceed the maximum reasonable level established by the SAC test, the case must be dismissed. *See id.,* at 30.

The fact that a challenged rate may generate a relatively high R/VC ratio is neither relevant to a cross-subsidy analysis nor inconsistent with a finding that a segment of a SARR is cross-subsidized by other traffic that does not use that segment. As the Board has made clear, it is entirely appropriate and consistent with CMP and contestable markets theory that a solely served shipper whose traffic moves on a relatively light density line may be required to bear a larger portion of the costs of that line than it would have to bear if were located on a more heavily used line. *See Otter Tail,* STB Docket No. 42071, at 25 ("a captive shipper may well have to bear a greater portion of the costs of the infrastructure required for a lightly used line. But . . . it would 'turn the CMP principle against cross-subsidization on its head to protect a captive shipper from subsidizing other traffic, while at the same time allowing that shipper's rates to be subsidized by other traffic.'"). Particularly where, as here, a shipper of a high value, high risk commodity derives great benefit from the rail service it enjoys, sound rail economics and differential pricing principles require that shipper to pay commensurately higher rates than shippers on different lines, with different traffic, or in different circumstances.

The question in an internal cross-subsidy analysis is not whether the rates in question are, judged by some subjective standard, "high," it is whether revenue generated by the challenged rate, in combination with revenue from other SARR traffic sharing the same facilities, exceeds

the attributable costs of serving that group of shippers. If the answer is no, then the traffic using the facilities in question is impermissibly cross-subsidized by other traffic that does not use those facilities, and the Board must dismiss the rate complaint. *See Otter Tail*, STB Docket No. 42071, at 24-25; *PPL Montana,* 6 S.T.B. at 296 (the internal cross-subsidy test determines "whether there is a readily identifiable subset of traffic that would not cover the collective attributable costs associated with serving the traffic.").

After the Board has determined that a SARR's revenues exceed its costs, the Board's internal cross-subsidy test analyzes "whether there is a readily identifiable subset of [SARR] traffic that would not cover the collective attributable costs of that traffic." In order to make that determination, the Board: (i) calculates SARR stand-alone costs (road property investment and operating costs) attributable to the identified set of traffic; (ii) determines the expected SARR revenues attributable to that traffic; and (iii) compares (i) and (ii) using a discounted cash flow analysis. If the present value of standalone costs of the identified traffic set exceeds the present value of the revenues from that traffic, then the identified traffic relies on an impermissible cross-subsidy from other traffic. If the cross-subsidized traffic group includes the issue traffic, then the complainant has failed to demonstrate it is paying more than necessary for efficient service or that it is cross-subsidizing other parts of the defendant carrier's network, and the rate complaint must be dismissed. *See Otter Tail,* STB Docket No. 42071, at 25-30.

A second application of the internal cross-subsidy test is as a limit on potential rate relief. In a case in which the Board does not identify a proscribed internal cross-subsidy and its SAC analysis determines that SAC revenues exceed the SAC revenue requirement, the Board must ensure that any rate prescription does not itself create an impermissible cross-subsidy. *See Otter Tail,* STB Docket No. 42071, at 10-11. In order to avoid creating such a cross-subsidy in the rate

prescription process, the Board must again compare the costs and revenues attributable to the identified subset of SARR traffic, and ensure that any rate prescription process does not reduce the difference between attributable costs and attributable revenues to less than zero, which would mean that other traffic would be required to subsidize the identified subset of traffic. Thus, in cases resulting in a rate prescription, the internal cross-subsidy analysis may also act as a cap on the amount of rate reduction the Board may order.[16]

c. Application of the Threshold Cross-Subsidy Test Would Demonstrate That This Case Must Be Dismissed Because the Evidence Fails to Demonstrate That SunBelt's Traffic is Cross-Subsidizing Other Traffic on the NS System.

As discussed, the SBRR includes the relatively low density McIntosh-Burstall Segment between McIntosh, AL, to just south of Burstall, AL—a critical segment for the SBRR because it is the line on which SunBelt's plant (the only issue traffic origin in this case) is located. Although NS's Reply Evidence shows that a proper application of the Board's stand-alone cost procedures produces total costs for the SBRR that exceed available revenues by a comfortable margin, if the Board were to find that revenues exceeds costs, then the Board's internal cross-subsidy test would have to be administered to determine whether there were sufficient revenues available to the McIntosh-Burstall Segment to cover the costs properly attributable to that Segment.

NS developed as part of its Reply evidence a cross-subsidy analysis template that the Board could use to administer its internal cross-subsidy test in the event it finds that SBRR revenues exceed its costs. The template is populated with relevant inputs from NS's Reply Evidence calculations for the full SBRR reply evidence and, like the results of the full-SBRR

[16] Of course, the amount of rate relief that may be awarded is also limited by the 180% R/VC ratio floor on rate prescriptions, but that limit is not directly at issue in the cross-subsidy analysis.

SAC analysis, the cross subsidy template shows that costs for the McIntosh to Burstall segment of the SBRR exceed available revenues and that the segment fails the cross subsidy test. In building the cross-subsidy template, NS applied the procedures and assumptions that the Board used in *Otter Tail*. NS first estimated the road property investment that is attributable to the McIntosh-Burstall Segment. NS then estimated the portion of each operating expense category that should be attributed to that segment, using a bottom-up approach to calculate direct operating expenses,[17] and an URCS-based approach to calculate indirect operating expenses,[18] just as the Board did in *Otter Tail* (NS did not make any further refinements to the Board's approach). *See Otter Tail*, STB Docket No. 42071, at 25-29.

In short, even if the Board were to conclude that the SBRR's revenues exceeded its costs, it is highly likely that the SBRR would rely on improper cross-subsidization of the traffic on the McIntosh to Burstall segment, which includes SunBelt's own traffic. NS has provided the Board with detailed templates that permit it to perform a cross-subsidy analysis if one should be necessary.

3. Maximum Rate Calculations

NS's Reply Evidence shows that the Board should have no reason to apply the Maximum Markup Methodology ("MMM"), both because the SBRR's costs exceed its revenues by a significant margin and because the SBRR contains an improper internal cross subsidy which mandates that the complaint be dismissed. However, if the Board were to apply MMM, it should correct two errors in SunBelt's proposed application. First, the Board should account for the unique costs imposed by TIH traffic by applying MMM in a two-step process that distributes

[17] *See* NS Reply WP "SBRR Operating Expense NS Reply XSub.xlsx."

[18] *See* NS Reply WP "NS Reply Exhibit III-H-1 XSub.xls." tab "Indirect Opex."

costs attributable to handling TIH traffic only to the SBRR TIH traffic and allocates the remaining non-TIH costs to over the entire SBRR traffic group. Because the MMM analysis proposed by SunBelt did not allocate TIH-related costs only to TIH shipments, it therefore would understate the MMM R/VC ratios for TIH shipments. The two-step process NS proposes would correct much of that understatement by allocating TIH-related costs entirely to TIH traffic. Second, to properly align MMM costs of non-TIH traffic with the service provided by the SBRR the Board should apply the trainload adjustment it developed in *AEPCO 2011* to all traffic moving in single trainload service over the SBRR. Third, the Board should index URCS costs for future years using RCAF-A, in accordance with governing precedent, and reject SunBelt's proposal to use a different approach used in different contexts and for different purposes.

a. Any MMM Analysis Conducted in this Case Should Properly Allocate Unique Costs of TIH Traffic Solely to that Traffic

In the event that application of MMM becomes necessary, it is important that the Board properly allocate the unique variable costs of TIH transportation solely to the TIH movements. NS does not think that an MMM determination is likely given that the SBRR's costs exceed its revenues, a substantial amount of cross-over traffic should be omitted, and the SBRR suffers from the fatal, impermissible cross-subsidy. However, in the off chance that there is any application of MMM to this case, the unique costs and risks associated with TIH transportation must be borne by that traffic.

Having found that the common carrier obligation encompasses TIH commodities, the Board has prominently exposed the question that must now be resolved in this case—how will the Board rate regulatory regime acknowledge and incorporate the risks associated with these shipments? Independent experts in the Harvard Report have determined that the Board must

confront this issue.[19] A logical place for the Board to address the costs and risks specific to TIH traffic in a rate case is in the application of MMM. Through the MMM process, the Board can ensure that the costs that the SBRR must incur solely because it must transport TIH (including insurance, PTC costs, excess risks, and operations expenses) are borne by TIH traffic—including all of the issue chlorine traffic. Otherwise, the TIH traffic is simply being cross-subsidized by the non-TIH traffic.

As the Board recently determined, for MMM purposes, variable costs should be calculated in accordance with the operating characteristics of the movements on the SARR for the selected traffic group. *See AEPCO 2011,* STB Docket No. NOR 42113, at 2 (served June 27, 2011). Similarly, the unique variable costs associated with the SBRR TIH traffic should be attributed to that TIH traffic (whose "actual operating characteristics" are the sole cause of those costs), not distributed over the entire SBRR traffic group (including non-TIH traffic) as they would be if the Board used NS operating characteristics to allocate those costs.[20]

The Board developed MMM to "allocate the total SAC costs among all of the movements in the traffic group to determine if the challenged rate is unreasonably high, and if so by how much."[21] The allocation of SAC costs is based on each movement's "relative share of service

---

[19] *See* Lewis M. Branscomb et al., Rail Transportation of Toxic Inhalation Hazards: Policy Responses to the Safety and Security Externality, at 14-15, 72 (hereafter "Harvard Report"). Copies of all studies cited in this section are included in NS's Reply Workpapers.

[20] The MMM variable cost approach discussed in this section concerns the proper attribution and allocation of NS system-average URCS costs, *not* calculating new average URCS costs for the SBRR traffic group. Thus, this method would continue to use NS system average URCS costs, but distribute them in a way that more accurately reflects the actual costs of TIH and non-TIH movements. An alternative way to approach the attribution of the unique variable costs of TIH traffic would be to make direct adjustments to NS system average URCS costs for all TIH movements before conducting the MMM process.

[21] *Major Issues*, STB Ex Parte No. 657 (Sub-No. 1), at 9.

provided, as measured by URCS variable costs."[22] MMM generates a maximum revenue-to-variable cost ratio that limits the contribution from any single movement to a prescribed ratio based on each movement's "share of service provided."

Logically, each movement's share of service provided should be based on the SARR's costs, because MMM is allocating the costs of service provided by the SARR. In *AEPCO*, the Board recognized that a "mismatch" occurs where a complainant posits a SARR that would move traffic in trainload service, but then calculates the variable costs for that traffic using defendant's URCS costs associated with traffic moving in carload and multi-car service.[23] To correct this mismatch, the Board ordered the parties to revise their variable cost calculations for carload and multi-car shipments to account for the efficient, low-cost characteristics of those movements over the portion of the movement replicated by the SARR.[24]

Here, SunBelt designed its SARR to carry shipments of TIH commodities. Because URCS does not yet assign TIH related expenditures only to TIH traffic, if the Board were to reach the MMM phase in this case, it should apply MMM in a manner that corrects the mismatch between the URCS costing detail and the unique costs of rail movement of TIH commodities.

To date, the Board has not decided whether or how to take into account the unique variable costs of transporting TIH traffic.[25] NS believes there is even more justification for including unique TIH costs in variable costs calculations for any application of the MMM rate

---

[22] *Id.* at 14.

[23] *AEPCO 2011*, STB Docket No. 42113, at 2.

[24] *Id.*

[25] As a general matter, the Board stated in *Major Issues* that the MMM approach should use unadjusted URCS to calculate variable costs. *See Major Issues*, STB Ex Parte 657 (Sub-No. 1), at 14. The Board has not had occasion prior to this case to address how the unique costs of TIH transportation—which are not accurately accounted for under the existing USOA and URCS system—should be accounted for in calculating variable costs for purposes of application of MMM.

prescription mechanism than for determination of the jurisdictional threshold. The Board expressly acknowledged, however, that unadjusted URCS costs do not attribute to TIH movements the unique costs of those movements to carriers:

> There may be unique operating costs associated with the transportation of hazardous materials . . . that URCS does not attribute to those movements. For example, transportation of hazardous materials may require the carriers to pay higher insurance premiums.

Class I Railroad Accounting and Financial Reporting – Transportation of Hazardous Materials, STB Ex Parte No. 681 (served Jan. 5, 2009). Because URCS "system average" costs do not take into account significant unique costs of TIH transportation, and fail to accurately allocate others, the Board should recognize that such URCS costs do not provide a reasonable or reliable proxy for the variable costs of moving TIH commodities. Accordingly, at least until it develops an URCS methodology that adequately accounts for unique TIH costs, the Board should include an adjustment to URCS system average costs when calculating the variable costs of TIH movements for purposes of implementing MMM. [26]

Although the Board has decided that it will no longer make movement-specific adjustments to system average URCS variable costs for purposes of determining the jurisdictional threshold in rate reasonableness cases, the rationale for that decision does not apply in the SAC analysis that includes MMM. *See Major Issues*, STB Ex Parte No. 657 (Sub-No. 1), at 50-51. A primary rationale for the Board's general decision to disallow adjustments to system average URCS for jurisdictional threshold calculations was that Congress and the Board intended

[26] The Board has not yet taken further official action in Ex Parte 681. NS filed comments in that proceeding, urging the Board to act to ensure that its rate reasonableness determinations fully factor in the unique costs of transporting TIH commodities, including the risk of a catastrophic accident. *See Class I Railroad Accounting and Financial Reporting – Transportation of Hazardous Materials*, Ex Parte 681, NS Comments (Feb. 4, 2009).

quantitative market dominance to be a relatively quick and inexpensive threshold determination. *See, e.g., id.* at 51. In contrast, the MMM process is more consequential and not intended to be simple. MMM analysis and results effectively prescribe rates (in the form of maximum R/VC ratios) for a full 10 years. Thus, accuracy and reliability in this process is considerably more important than it is in determining "an administratively quick and easy-to-determine regulatory safe harbor" for rail rates generating R/VC ratios of 180 percent or less. *See id.* Indeed, MMM replaced a substantially more simple methodology the Board had used for decades (the percent reduction method), showing that simplicity is not a primary goal of the Board's rate-reduction methodology.

In order to accomplish the appropriate allocation of costs for MMM purposes, NS proposes that the Board conduct a two-step variable cost allocation process. The annual stand-alone requirement for TIH costs (both capital and operating expense, as calculated in the DCF model) should be subtracted from the annual revenue requirement that is used as a primary input to the MMM model. The MMM model would then spread non-TIH SAC across all moves, including TIH moves, based on their variable costs. When standalone revenues exceed SAC, the MMM model would produce a maximum MMM R/VC ratio for non-TIH costs (*see* NS Reply WP "SBRR MMM Reply.xlsx.")

Specifically, NS identified three categories of costs that the SBRR would incur entirely as a result of handling TIH traffic and that can be allocated to TIH movements. These are the costs that would be subtracted from the annual revenue requirement in the first step:

Positive Train Control. The SBRR would carry no passenger traffic, and it would be required to construct a PTC system solely by virtue of the fact that it carries TIH traffic. The costs of PTC construction are set forth in Section III-F-6-b above. Because the SBRR's PTC

costs are entirely due to its TIH traffic, those costs can be entirely attributed to its TIH traffic. It would distort the MMM analysis to spread the significant costs of PTC across non-TIH traffic that did not trigger those costs. Because there may be some minimal benefits that other traffic realizes from PTC (albeit benefits that are far outweighed by PTC costs), NS has only allocated 90% of SBRR PTC costs to its TIH traffic. Because as discussed in Section III-F-6 the SBRR PTC system will be an overlay to an existing CTC system there is no reason to assume that any benefit beyond those already provide by the CTC system will accrue to shipments moving over the SBRR. The assumption that benefits of PTC would amount to 10% of the overall cost of PTC system is optimistic. The FRA's analysis suggests that the costs of PTC will outweigh PTC benefits by a ratio of 22-to-1, which makes NS's 90% allocation conservative. *See* NS Reply WP "FRA PTC Cost-Benefit Analysis."

Insurance. The SBRR's large proportion of TIH traffic is also responsible for its significant risk of liability for a TIH release, and thus for SBRR's need to purchase more insurance than a railroad with a less risky traffic mix. The additional catastrophic insurance expense of $4.98 million set forth above in Section III-D-7 is entirely attributable to the SBRR's TIH traffic and should be allocated to that traffic in the MMM analysis.

Excess Risk. The SBRR's TIH traffic is also the cause of its uninsurable risk of a catastrophic TIH release exceeding $1 billion. The costs of this excess risk are discussed above in Section III-D-9. That additional excess risk cost should be allocated to SBRR TIH traffic in the MMM analysis.

Additional Operating Costs. As detailed above in Section III-C and III-D, the SBRR's TIH traffic causes significant operational complications and create significant additional costs, from speed restrictions to secure handoffs to the need for additional security and environmental

personnel. However, these costs are not easily segregated from costs for non-TIH traffic. For this reason, NS has not attempted to allocate TIH-specific operating costs to TIH traffic. This approach is extremely conservative, and as a result NS's approach significantly understates the amount of SBRR costs that are properly attributable to TIH traffic.

The second step would allocate the incremental annual TIH stand-alone costs requirement to the SARR's TIH traffic only. This allocation would be based on each move's variable costs consistent with the usual MMM procedure. To demonstrate this approach, NS used the STCCs available in the waybills for Chemicals traffic to identify the TIH moves in the MMM model. NS calculated the total SARR variable costs for TIH traffic in each year. Then, using the TIH stand-alone costs requirement as the numerator, NS calculated the annual ratio of TIH SAC to TIH variable costs. (*see* NS Reply WP "TIH Allocation.xlsx.") This ratio is then added to the MMM R/VC ratio in each year to determine the maximum R/VC ratio for TIH moves.

The MMM R/VC ratios for TIH movements that are developed in step two and the non-TIH MMM R/VC ratios developed in the first step would be used in the MMM application.

Applying a two-step process such as that described above would more properly and accurately allocate the unique costs of moving TIH traffic. This, in turn, would result in MMM R/VC ratios that more accurately represent the relationship between a rail carrier's costs and returns associated with handling TIH traffic. In sum, the Board should ensure that—for any application of MMM at the very least—its variable cost calculations reflect the unique costs and

risks of transporting TIH commodities, and properly attribute those costs to the TIH commodities rather than spreading them to non-TIH traffic that does not generate those costs.[27]

b. The Board Should Apply the Trainload Adjustment Advocated in *AEPCO 2011* to Shipments Moving In Single Trainload Service Over the SBRR

In its opening narrative SunBelt disputes the merits of the Board's proposed *AEPCO 2011* MMM adjustment.[28] However in its workpapers SunBelt did apply the Board's proposed AEPCO unit train adjustment, but to a very limited amount of SBRR traffic. NS believes that if the Board applied MMM in this proceeding, it should apply a slightly modified version of the trainload adjustments included in SunBelt's workpapers and expand the application of the adjustment consistent with the service provided by the SBRR.

The modification involves correcting the application of the unit train cost adjustment to reflect the actual empty return ratio of the types of cars moving over the SBRR in place of the URCS assumed unit train empty return ratio of 2.0. This adjustment better aligns the MMM URCS costs with the loaded and empty car movements over the SBRR.

SunBelt limited the application of the trainload adjustment to shipments that are local to the residual NS (originated and terminated on the NS) and overhead to the SBRR (received and delivered by the SBRR). This limitation inappropriately excludes traffic moving on the SBRR in trainload shipments between New Orleans, Meridian and Birmingham. NS dropped SunBelt's arbitrary limitation that trainload shipments had to both originate and terminate on the residual

---

[27] If the Board does not adopt NS's proposed approach, whatever alternative approach it uses should ensure that TIH-specific variable costs are attributed solely to TIH movements and not to non-TIH movements. Moreover, NS continues to advocate the attribution of unique TIH costs to TIH traffic alone for all variable cost uses in SAC cases (including jurisdictional threshold, MMM, and rate prescription floor), including the present case.

[28] SunBelt Opening III-H-14 to III-H-19.

NS and thus expanded the application of the trainload adjustment to all SBRR traffic that traversed the SBRR on a single train. Details of NS's calculations are included in NS Reply Workpaper "MMM Overhead Trainload.xlsx.

c. If It Applied MMM, the Board Would Also Need to Correct SunBelt's Two Other Clear Implementation Errors.

As discussed, SunBelt's MMM analysis also suffers another implementation error, which the Board should correct whether or not it adopts NS's proposed two-step MMM approach for TIH traffic or the trainload adjustment to shipments moving over the SBRR in single trainload service.

SunBelt used the wrong index to adjust the MMM URCS costs for the years 2011 through 2021. Instead of using the RCAF-A as instructed by the Board in its 2009 decision in *AEP Texas*, STB Docket No. 41191 (Sub-No. 1) at 14, SunBelt relied on a strained construction of the Board's decision in *OG&E*[29] to rationalize the use of the Board's standard URCS indexing approach in the MMM analysis.[30] The *OG&E* decision is inapposite here, because it involved short term indexing of URCS costs to inflate them only for specific quarters within one year, and not across years. The SunBelt MMM model, on the other hand, is projecting URCS costs nine years into the future. Moreover, the Board has consistently used the RCAF-A approach in applying MMM in other cases, including *Western Fuels* and *AEPCO.* NS followed the Board's *AEP Texas, Western Fuels*, and *AEPCO precedents* and applied a forecast of the RCAF-A as the basis for forecasts of variable costs in the MMM model. *See* NS Reply WP "SBRR MMM Model Reply.xlsm."

---

[29] *Oklahoma Gas & Elec. Co. v. Union Pac. R.R.*, STB Docket No. 42111 (STB served July 24, 2009).

[30] SunBelt Opening at III-H-12.

Table of Contents

Page

IV. WITNESS QUALIFICATIONS AND VERIFICATION IV-1
James D. Bagley IV-1
Michael R. Baranowski IV-12
Willie Benton III IV-23
F. Douglas Bess IV-26
Paul E. Bobby IV-31
Richard Brown IV-43
Patrick J. Bryant IV-48
Kaustuv Chakrabarti IV-59
Xingang Clark Cheng IV-62
Benton V. Fisher IV-66
Rob Fisher IV-77
Randall G. Frederick IV-80
Roberto J. Guardia IV-85
Michael P. Hedden IV-94
David Hughes IV-102
Kenneth LeCroy IV-108
Ronnie D. Johnson IV-111
David A. Magistro IV-113
Michael Matelis IV-121
Mark D. Mathewson IV-124
Joseph C. Osborne, Jr. IV-128
Mark A. Peterson IV-133
Robert C. Phillips IV-145
A. Mitchell Polinsky IV-152
Michael K. Quinn IV-165
Richard Ray IV-167
Dale A. Schaub IV-171
Dewey D. Smith IV-173
Kathleen C. Smith IV-175
Richard L. Smith IV-177
Gerhard Thelen IV-181
David R. Wheeler IV-184
Michael K. Williams IV-188
George T. Zimmerman IV-191

IV. WITNESS QUALIFICATIONS AND VERIFICATION

JAMES D. BAGLEY

Mr. Bagley is an independent consultant with over 35 years of experience in the railroad industry, working for Norfolk Southern Railway Company ("NS") (and its predecessor Southern Railway Company) and for CSXT. His office is located at 1781 Harrington Park Drive, Jacksonville, Florida 32225. Between June 2004 and February 2008, Mr. Bagley served as Vice President Engineering and Chief Engineering Officer for CSXT. Mr. Bagley is sponsoring portions of Section III-D of NS's Reply Evidence that relate to maintenance-of-way costs and Section III-F that relate to road property investment for the SBRR. Mr. Bagley has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

As CSXT's Vice President Engineering and Chief Engineering Officer, Mr. Bagley was responsible for all engineering functions within the CSXT system - track, roadway, bridges and structures, buildings, facilities, and communications and signals. He supervised and managed a workforce of approximately 6,500 employees in over 22 States and two Canadian Provinces covering over 21,000 miles of main track and 9,000 miles of yard and siding tracks.

Before his tenure as CSXT's Chief Engineering Officer, Mr. Bagley had over 30 years of experience working for NS and its predecessor railroads. A sampling of the positions he held over the course of his career include Track Supervisor; Assistant Division Engineer-Piedmont Division; Division Engineer-Asheville Division; Division Engineer-Kentucky Division; Engineer Maintenance of Way-Southwest Region; Engineer Maintenance of Way-Eastern Region; Division Engineer-Virginia Division (following a departmental reorganization); Chief Engineer Line Maintenance-Western Region; Chief Engineer Line Maintenance-Eastern Region; Chief Engineer Line Maintenance-Staff; Chief Engineer Line Maintenance-Northern Region. In

these positions Mr. Bagley had increasing responsibility for the maintenance of and daily operations on track and bridges. He represented the Maintenance of Way and Structures Department on the transition team working on the integration of the Conrail territory. In his final position with NS, Mr. Bagley directed over 2,000 employees and had responsibility for over 7,000 miles of main track and 2,000 miles of yard and siding track. Mr. Bagley has also worked as a consultant on a number of projects concerning safety assessment and inspection of track infrastructures.

Mr. Bagley received a Bachelor of Science degree in civil engineering from Southern Polytechnic State University. He is a member of the American Railway Engineering and Maintenance-of-Way Association ("AREMA"), and was a member of its predecessor organizations. Since 2007 he has been a member of AREMA's Board of Governors.

Mr. Bagley's complete curriculum vitae is attached.

VERIFICATION

I, James D. Bagley, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

James D. Bagley

Executed on this 8TH day of December, 2012.

JAMES D. BAGLEY

♦♦♦

1781 Harrington Park Drive • Jacksonville, Florida 32225
Fax 904 220 0095 • Home 904 220 9287 • Cell 904 200 2859
Email: DonBagley@comcast.net

SUMMARY

35+ years experience with Norfolk Southern Railway Company (and predecessor company, Southern Railway Company), and CSX Transportation, in the Maintenance of Way & Structures and Engineering Departments. Began my career with Southern Railway in November 1968 as a Management Trainee progressing steadily through positions of increasing responsibility from Track Supervisor to Chief Engineer with Norfolk Southern, and then to Vice President and Chief Engineering Officer for CSX Transportation.

WORK HISTORY

INDEPENDENT CONSULTANT - March 1, 2008 to Present

December 2008 and January 2009

Special Consultant for Niemeyer & Associates, PC and
Teledyne Brown Engineering, Inc. on track and bridge upgrade work
on Russian Railways project near Bolshoi Kamen, Russia.

CSX TRANSPORTATION COMPANY

June 1, 2004 to February 29, 2008
Vice President Engineering and Chief Engineering Officer

Responsible for all engineering functions within the CSX system (track, roadway, bridges & structures, buildings, facilities, communications and signals, design, construction & capacity). Overall responsibility for supervising and managing a workforce of approximately 6500 employees over 22 States and two Canadian Provinces covering 21,000 + miles of main track, 9000+ miles of yard and siding tracks, with an annual expense and capital budget in excess of $1.4B.

2000-2004 **INDEPENDENT CONSULTANT**

August 28-September 1, 2000
September 18-23, 2000

Safety assessment and inspection of track infrastructure on the Alaska Railroad from Anchorage to Fairbanks, Alaska.

November 19-20, 2000

Safety assessment/track inspection of Canadian National Railway's Kitimat Subdivision to assess the feasibility of operating longer/heavier trains between Kitimat and Terrace, B.C., Canada.
January 11-17, 2001

Safety assessment and inspection of track infrastructure of Ferrominera Orinoco Railroad between Porte Ordaz and San Isidro ore mine (146km) in Venezuela, South America.

February 12-16, 2001

Member of a Value Engineering team reviewing Phase I of Metra's rail expansion project on Metra's West Line and Wisconsin Central's North Central Line in the Chicago, IL. area.

April 23-27, 2001

Conducted track maintenance/track inspection training class at Coronach, SK., Canada for Luscar, Ltd.'s track maintenance employees.

May 21-25, 2001

Member of a Value Engineering team reviewing proposed rail expansion project for Metra between Geneva and Elburn,IL.

June 4-8, 2001

Member of Value Engineering team reviewing phase II of proposed rail expansion project for Metra in the Chicago, IL. area on Metra's West Line and Wisconsin Central's North Central Line.

June 11-15, 2001

Member of a Value Engineering team reviewing rail expansion project on the Greenbush Line for the MBTA in Boston, MA.

August 1-3, 2001

Safety assessment and inspection of track infrastructure of the Indiana Railroad between Newton, IL. and Indianapolis, IN.

October 8-12, 2001

Conducted track maintenance/track inspection training classes for INTERCOR track maintenance employees in Columbia, South America.

January 7-10, 2002

Safety assessment and inspection of track infrastructure for Westinghouse Corp. at the Savannah River Nuclear Plant near Aiken, SC.

March 4 – September 30, 2002

Consultant for Norfolk Southern Railway in two coal rate cases before the Surface Transportation Board.

May 20-22, 2002 and July 28 –30, 2003

Safety assessment and inspection of track infrastructure of the Georgia Ports Authority tracks in the Savannah and Brunswick, Georgia areas.

November 18-21, 2002

Conducted training class covering FRA Track Safety Standards, Track Inspection, and Track Maintenance for employees of Westinghouse Corp. at the Savannah River Nuclear Plant near Aiken, SC.

September 9-12, 2003

Performed Inspection, evaluation and risk assessment of Luscar, Ltd.'s Poplar River Mine Rail Line near Coronach, SK., Canada including preparation of a written report.

September 22-25, 2003

Conducted training class covering FRA Track Safety Standards and Track Inspection for employees of Bechtel BWXT Idaho, LLC (BBWI) at the Idaho National Engineering & Environmental laboratory near Idaho Falls, Idaho.

1968-2000 NORFOLK SOUTHERN RAILWAY / SOUTHERN RAILWAY COMPANY

June 1, 1999- February 28, 2000
Chief Engineer Line Maintenance Northern Region (Conrail acquired territories)
Atlanta, Georgia

Overall responsibility for daily track and bridge operations on 7000+ miles of main track and approximately 2000+ miles of yard and siding track. Overall responsibility for directing a maintenance force of approximately 2000 employees with an annual expense and capital budget of approximately $200 million.

May 16, 1997-May 31, 1999
Chief Engineer Line Maintenance-Staff
Atlanta, Georgia

In this position I was the Maintenance of Way & Structures Department representative on a Transition Team involved in Norfolk Southern's acquisition of a very sizable portion of Consolidated Rail Corporation (Conrail). Responsibilities included familiarization of the Conrail territory to be acquired, interviewing Conrail supervisors and maintenance of way employees and extending job offers to existing Conrail employees for non-agreement Maintenance of Way & Structures supervisory positions with Norfolk Southern. Responsibilities also included determining division boundaries for the territories being acquired as well as staffing and manpower requirements for these territories. It was also my responsibility to develop five-year maintenance and capital programs for the physical plant being acquired.

July 1, 1995- May 15, 1997
Chief Engineer Line Maintenance-Eastern Region

Atlanta, Georgia

Overall responsibility for daily track and bridge operations on approximately 7000 miles of main track and 1700 miles of yard and siding track. Overall responsibility for directing a maintenance force of approximately 1700 employees with annual expense and capital budgets of approximately $200 million.

October 1, 1993- June 30, 1995
Chief Engineer Line Maintenance-Western Region
Atlanta, Georgia

Overall responsibility for daily track and bridge operations on approximately 7000 miles of main track and 1800 miles of yard and siding track. Overall responsibility for directing a maintenance force of approximately 1900 employees with annual expense and capital budgets of approximately $200 million.

February 1, 1989- September 30, 1993
Division Engineer- Virginia Division (Departmental Reorganization)
Roanoke, Virginia

Overall responsibility for daily track and bridge operations on heavy tonnage division (110 million gross tons annually on approximately one-third of division) consisting of approximately 1900 miles of main track and 800 miles of yard and siding track. Responsible for directing a maintenance track and bridge force of approximately 450 employees. Responsibilities included preparing annual maintenance and capital programs for both track and bridge projects with an annual budget of approximately $50-60 million.

August 16, 1986- January 31, 1989
Engineer Maintenance of Way- Eastern Region
Roanoke, Virginia

Overall responsibility for daily track operations and maintenance on the Eastern Region of the Norfolk and Western Railway Company (subsidiary of Norfolk Southern Railway Company). The Eastern Region was comprised of approximately 2000 miles of main track and 1000+ miles of yard and siding track. The vast majority of this region was mountainous terrain territory with heavy coal tonnage being the predominate commodity being transported. Directed a work force of approximately 750 employees responsible for the maintenance and safety of the track structure on this region. Responsibilities included preparing annual maintenance and capital

programs for track projects with an annual budget of approximately $100 million.

February 1, 1983- August 15, 1986
Engineer Maintenance of Way- Southwest Region
Atlanta, Georgia

Overall responsibility for daily track operations and maintenance on the Southwest Region of the Southern Railway System (subsidiary of Norfolk Southern Railway Company). The Southwest region was comprised of approximately 2500 miles of main track and 1000+ miles of yard and siding track. Approximately 50% of the main track was mountainous terrain with heavy coal tonnage. Directed a work force of approximately 500 employees responsible for the maintenance and safety of the track structure on this region. Responsibilities included preparing annual maintenance and capital programs for track projects with an annual budget of approximately $80-90 million.

July 1, 1976- January 31, 1983
Division Engineer- Kentucky Division
Somerset, Kentucky

Responsible for daily track operations and maintenance on heavy tonnage division between Cincinnati, Ohio and Chattanooga, Tennessee on the Southern Railway System. This division was comprised of 500 miles of heavy tonnage CTC main track (35MGT- 72MGT), 100 miles of secondary main track and approximately 200 miles of yard and siding track. Directed a work force of 130 employees responsible for maintenance and safety of the track structure. Responsible for preparing annual maintenance and capital programs for track projects with an annual budget of approximately $25 million.

March 16, 1974- June 30, 1976
Division Engineer- Asheville Division
Asheville, North Carolina

Responsible for daily track operations and maintenance on mountainous division consisting of approximately 200 miles of heavy tonnage main track,

200 miles of secondary main track, and 100 miles of yard and siding track. Directed a work force of approximately 65 employees responsible for maintenance and safety of the track structure on this division. Responsibilities included preparing annual maintenance and capital programs for track projects with an annual budget of approximately $10 million.

January 16, 1973- March 15, 1974
Assistant Division Engineer- Piedmont Division
Greenville, South Carolina

Assisted the Division Engineer on the Piedmont Division in managing daily track operations and maintenance on approximately 500 miles of CTC main track, 150 miles of secondary main track, and 200 miles of yard and siding track. Assisted the Division Engineer in planning future maintenance and capital programs for the division.

January 1, 1972- January 15, 1973
Track Supervisor-Piedmont Division
Greenville, South Carolina

Responsible for daily track maintenance on 100 miles of Centralized Traffic Control main track, 45 miles of secondary main track, and 15 miles of yard and siding track. Directed a daily work force of approximately 20 employees.

August 12, 1969-December 31, 1971
Track Supervisor- Piedmont Division
Union, South Carolina

Responsible for daily track maintenance on 100 miles of main track, 25 miles of secondary main track, and 5 miles of yard and siding track. Directed a work force of six employees.

November 18, 1968- August 11, 1969
Management Trainee
Columbus, Georgia

Participant in a structured Management Training program under the direction of the Division Engineer at Columbus, Georgia.

1964-1968 **DANIEL CONSTRUCTION COMPANY**
Florida Division
Jacksonville, Florida

Field Construction Engineer and Assistant Construction Superintendent on several heavy building construction projects in Jacksonville and Windermere, Florida and St. Mary's Georgia.

EDUCATION

1964 Graduated Southern Technical Institute (Southern Polytechnic State University) – Civil Engineering Degree

1995 Management Development Certificate from Duke University - The Fuqua School of Business

SAFETY TRAINING

1989 Completed the DuPont Safety Training Course developed for Norfolk Southern Railway. Conducted Safety Training/Safety Audit training classes for all M/W personnel on Norfolk Southern's Virginia Division.

PROFESSIONAL ORGANIZATIONS

1973 to Present Member of American Railway Engineering and Maintenance-Of-Way Association and predecessor organizations American Railway Engineering Association and Roadmasters and Maintenance-Of-Way Association.

2007 to Present Member of the Board of Governors of American Railway Engineering and Maintenance of Way Association (AREMA).

MICHAEL R. BARANOWSKI

Mr. Baranowski is a Senior Managing Director at FTI Consulting, Inc., an economic and consulting firm with offices located at 1101 K Street, NW, Washington, DC 20005. Since 1980, Mr. Baranowski has been involved in various aspects of transportation analysis including operations, engineering, facility requirements, valuations and costing. Mr. Baranowski is sponsoring portions of Sections III-F, III-G, and III-H of Norfolk Southern's ("NS's") Reply Evidence. Mr. Baranowski has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Baranowski holds a Bachelor of Science degree in accounting from Fairfield University in Fairfield, Connecticut. In 1980, he joined the consulting firm of Wyer, Dick and Company in Livingston, New Jersey as a consultant. He participated in a variety of studies for railroad, shipper and other clients including line abandonments, operations analysis, terminal switching studies, labor protection and rail facility and equipment valuation.

In late 1981, Mr. Baranowski became a consultant with Snavely, King and Associates with offices in Morristown, New Jersey and Washington, D.C. While at Snavely, King, he was involved in rail merger, traffic, switching, liquidation and valuation studies for a variety of rail and rail related clients. He was also responsible for engineering, operating and costing components in a number of Section 229 proceedings.

Mr. Baranowski joined Klick, Kent & Allen ("KK&A") in 1988 as a Senior Consultant. He became a principal of KK&A in 1989 and remained in that position until its acquisition by FTI in 1998. Mr. Baranowski has presented testimony before the Interstate Commerce Commission, Surface Transportation Board, Federal Communications Commission, Federal Regulatory Commission and a variety of state regulatory agencies.

Mr. Baranowski's complete curriculum vitae is attached.

VERIFICATION

I, Michael R. Baranowski, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Michael R. Baranowski

Executed on this 5 day of January, 2013.

Michael R. Baranowski

Senior Managing Director – Economic Consulting

mike.baranowski@fticonsulting.com

FTI Consulting
1101 K Street, NW
Suite B100
Washington, DC 20005
Tel: (202) 312-9100
Fax: (202) 312-9101

Education
B.S. in Accounting,
Fairfield University

Supplemental Finance
Studies, Kean College

Mike Baranowski provides financial and economic consulting services to the telecommunications and transportation industries. He has special expertise in analyzing and developing complex computer costing models, operations analysis, and transportation engineering. Much of his work involves providing oral and written expert testimony before courts and regulatory bodies.

Some of Mr. Baranowski's representative accomplishments include:

- Overseeing the development of computer cost modeling tools designed to simulate the cost of competitive entry into local telecommunications markets and directing the efforts of a nationwide team of testifying experts presenting the cost model results in multiple proceedings across the country.
- Directing the analysis, critique and restatement of a variety of complex cost models developed by major telecommunications companies designed to simulate the forward-looking cost of competitive entry into local telecommunications markets.
- Designing multiple PC-based spreadsheet models for use in calculating the stand-alone cost of competitive entry into the railroad and pipeline markets. These models have been used to assist clients in all three network industries in making internal pricing decisions that are in compliance with governing regulatory standards.
- Conducting detailed analyses of railroad operations and developing the associated capital requirements and operating expenses attributable to specific movements and the incremental capital and operating expense requirements attributable to major changes in anticipated traffic levels.
- Calculating marginal and incremental costs for a major petroleum products pipeline company, an approach that is now used regularly by the company in making internal day-to-day pricing decisions.

Mr. Baranowski holds a B.S. in Accounting from Fairfield University in Fairfield, Connecticut and has pursued supplemental finance studies at Kean College in Union, New Jersey.

TELECOMMUNICATIONS TESTIMONY

Federal Communications Commission

February 1998	File No. E-98-05. AT&T Corp. v. Bell Atlantic Corp. Affidavit of Michael R. Baranowski.
March 13, 1998	File No. E-98-05. AT&T Corp. v. Bell Atlantic Corp. Supplemental Affidavit of Michael R. Baranowski.
June 10, 1999	CC Docket No. 96-98. Implementation of the Local Competition Provisions of the Telecommunications Act of 1996. Reply Affidavit of Michael R. Baranowski, John C. Klick and Brian F. Pitkin.

July 25, 2001	CC Docket No. 00-251, 00-218. In the Matter of Petition of AT&T Communications of Virginia, Inc. and WorldCom, Inc., Pursuant to Section 252(e)(5) of the Communications Act, for Preemption of the Jurisdiction of the Virginia State Corporation Commission Regarding Interconnection Disputes with Verizon-Virginia, Inc. Panel
June 13, 2005	WC Docket No. 05-25;RM-10593. In the Matter of Special Access Rates for Price Cap Local Exchange Carriers; AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Joint Declaration on Behalf of SBC Communications, Inc.
July 29, 2005	WC Docket No. 05-25;RM-10593. In the Matter of Special Access Rates for Price Cap Local Exchange Carriers; AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Joint Reply Declaration on Behalf of SBC Communications, Inc.
Public Service Commission of Delaware	
February 4, 1997	PSC Docket No. 96-324. In the Matter of Bell Atlantic - Delaware Statement of Terms and Conditions Under Section 252(F) of the Telecommunications Act of 1996. Testimony of Michael R. Baranowski.
Public Service Commission of the District of Columbia	
March 24, 1997	Formal Case No. 962. In the Matter of the Implementation of the District of Columbia Telecommunications Competition Act of 1996. Testimony of Michael R. Baranowski.
May 2, 1997	Formal Case No. 962. In the Matter of the Implementation of the District of Columbia Telecommunications Competition Act of 1996. Rebuttal Testimony of Michael R. Baranowski.
Public Service Commission of the State of Maryland	
March 7, 1997	Docket No. 8731, Phase II. In the Matter of the Petitions for Approval of Agreements and Arbitration of Unresolved Issues Arising Under Section 252 of the Telecommunications Act of 1996. Direct Testimony of Michael R. Baranowski.
April 4, 1997	Docket No. 8731, Phase II. In the Matter of the Petitions for Approval of Agreements and Arbitration of Unresolved Issues Arising Under Section 252 of the Telecommunications Act of 1996. Rebuttal Testimony of Michael R. Baranowski.
May 25, 2001	Case No. 8879. In the Matter of the Investigation into Rates for Unbundled Network Elements Pursuant to the Telecommunications Act of 1996. Panel Testimony on Recurring Cost Issues

Public Service Commission of the State of Michigan

January 20, 2004	Case No. U-13531. In the Matter, on the Commission's Own Motion to Review the Costs of Telecommunication Service Provided By SBC Michigan. Initial Testimony of Michael R. Baranowski and Julie A. Murphy.
May 10, 2004	Case No. U-13531. In the Matter, on the Commission's Own Motion to Review the Costs of Telecommunication Service Provided By SBC Michigan. Final Reply Testimony of Michael R. Baranowski and Julie A. Murphy.

New Jersey Board of Public Utilities

December 20, 1996	Docket No. TX 95120631. Notice of Investigation Local Exchange Competition for Telecommunications Services. Rebuttal Testimony of John C. Klick and Michael R. Baranowski.

North Carolina Utilities Commission

March 9, 1998	Docket No. P-100, Sub 133d. In the Matter of Establishment of Universal Support Mechanisms Pursuant to Section 254 of the Telecommunications Act of 1996. Rebuttal Testimony of Michael R. Baranowski.

Pennsylvania Public Utility Commission

January 13, 1997	Docket Nos. A-310203F0002 et al. MFS-III. Application of MFS Intelenet of Pennsylvania, Inc. et. Al. (Phase III). Rebuttal Testimony of Michael R. Baranowski.
February 21, 1997	Docket Nos. A-310203F0002 et al. MFS-III. Application of MFS Intelenet of Pennsylvania, Inc. et. Al. (Phase III). Surrebuttal Testimony of Michael R. Baranowski.
April 22, 1999	Docket Nos. P-00991648, P-00991649. Petition of Senators and CLECs for Adoption of Partial Settlement and Joint Petition for Global Resolution of Telecommunications Proceedings. Direct Testimony of Michael R. Baranowski.
January 11, 2002	Docket No. R-00016683. Generic Investigation of Verizon Pennsylvania, Inc.'s Unbundled Network Element Rates. Panel Testimony on Recurring Cost Issues

State Corporation Commission Commonwealth of Virginia

April 7, 1997	Case No. PUC970005. Ex Parte to Determine Prices Bell Atlantic - Virginia, Inc. Is Authorized To Charge Competing Local Exchange Carriers In Accordance With The Telecommunications Act of 1996 And Applicable State Law. Affidavit of Michael R. Baranowski.
April 23, 1997	Case No. PUC970005. Ex Parte to Determine Prices Bell Atlantic - Virginia, Inc. Is Authorized To Charge Competing Local Exchange Carriers In Accordance With The Telecommunications Act of 1996 And Applicable State Law. Direct Testimony of Michael R. Baranowski.

June 10, 1997 — Case No. PUC970005. Ex Parte to Determine Prices Bell Atlantic - Virginia, Inc. Is Authorized To Charge Competing Local Exchange Carriers In Accordance With The Telecommunications Act of 1996 And Applicable State Law. Rebuttal Testimony of Michael R. Baranowski.

Washington State Utilities and Transportation Commission

December 22, 2003 — Docket No. UT-033044. In the Matter of the Petition of Qwest Corporation To Initiate a Mass-Market Switching and Dedicated Transport Case Pursuant to the Triennial Review Order. Direct Testimony of Michael R. Baranowski.

February 2, 2004 — Docket No. UT-033044. In the Matter of the Petition of Qwest Corporation To Initiate a Mass-Market Switching and Dedicated Transport Case Pursuant to the Triennial Review Order. Response Testimony of Michael R. Baranowski.

Public Service Commission of West Virginia

February 13, 1997 — Case Nos. 96-1516-T-PC, 96-1561-T-PC, 96-1009-T-PC, 96-1533-T-T. Petition to establish a proceeding to review the Statement of Generally Available Terms and Conditions offered by Bell Atlantic in accordance with Sections 251, 252, and 271 of the Telecommunications Act of 1996. Testimony of Michael R. Baranowski.

February 27, 1997 — Case Nos. 96-1516-T-PC, 96-1561-T-PC, 96-1009-T-PC, 96-1533-T-T. Petition to establish a proceeding to review the Statement of Generally Available Terms and Conditions offered by Bell Atlantic in accordance with Sections 251, 252, and 271 of the Telecommunications Act of 1996. Rebuttal Testimony of Michael R. Baranowski.

June 3, 2002 — Case No. 01-1696-T-PC, Verizon West Virginia, Inc. Petition For Declaratory Ruling That Pricing of Certain Additional Unbundled Network Elements (UNEs) Complies With Total Element Long-Run Incremental Cost (TELRIC) Principles. Direct Testimony of Michael R. Baranowski

July 1, 2002 — Case No. 01-1696-T-PC, Verizon West Virginia, Inc. Petition For Declaratory Ruling That Pricing of Certain Additional Unbundled Network Elements (UNEs) Complies With Total Element Long-Run Incremental Cost (TELRIC) Principles. Supplemental Direct Testimony of Michael R. Baranowski

RAILROAD TESTIMONY

Interstate Commerce Commission

March 9, 1995 — Finance Docket No. 32467. National Railroad Passenger Corporation and Consolidated Rail Corporation -- Application Under Section 402(a) of the Rail Passenger Service Act for an Order Fixing Just Compensation.

October 30, 1995 — Docket No. 41185. Arizona Public Service Company and Pacificorp v. The Atchison, Topeka and Santa Fe Railway Company.

Surface Transportation Board

July 11, 1997	Docket No. 41989. Potomac Electric Power Company v. CSX Transportation, Inc. Reply Statement and Evidence of Defendant CSX Transportation, Inc.
August 14, 2000	Docket No. 42051. Wisconsin Power and Light Company v. Union Pacific Railroad Company, Reply Verified Statement of Christopher D. Kent and Michael R. Baranowski.
September 20, 2002	STB Docket No. 42070. Duke Energy Corporation v. CSX Transportation, Inc., Reply Evidence and Argument of CSX Transportation, Inc.
September 30, 2002	STB Docket No. 42069. Duke Energy Corporation v. Norfolk Southern Railway Company, Reply Evidence and Argument of Norfolk Southern Railway Company.
October 11, 2002	STB Docket No. 42072. Carolina Power & Light v. Norfolk Southern Railway Company, Reply Evidence and Argument of Norfolk Southern Railway Company.
November 12, 2002	Docket No. 42070 Duke Energy Corporation v. CSX Transportation, Rebuttal Evidence and Argument of CSX Transportation
November 19, 2002	Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company, Rebuttal Evidence and Argument of Norfolk Southern Railway Company
November 27, 2002	Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Rebuttal Evidence and Argument of Norfolk Southern Railway Company
January 10, 2003	STB Docket No. 41185. Arizona Public Service Co. And Pacificorp v. The Atchison, Topeka and Santa Fe Railway Company, Petition of the Burlington Northern and Santa Fe Railway Company to Reopen and Vacate Rate Prescription.
February 19, 2003	STB Docket No. 42077, Arizona Public Service Co. And Pacificorp v. The Burlington Northern and Santa Fe Railway Company, and STB Docket No. 41185, Arizona Public Service Co. And Pacificorp v. The Burlington Northern and Santa Fe Railway Company, Reply of the Burlington Northern Santa Fe Railway Company in Opposition to Petition for Consolidation.
April 4, 2003	Docket No. 42057 Public Service Company of Colorado D/B/A Xcel Energy v. The Burlington Northern and Santa Fe Railway Company, Reply Evidence and Argument of The Burlington Northern and Santa Fe Railway Company
October 8, 2003	Docket No. 42071 Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
October 24, 2003	Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company, Supplemental Evidence of Norfolk Southern Railway Company

October 31, 2003	Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company, Reply of Norfolk Southern Railway Company to Duke Energy Company's Supplemental Evidence
November 24, 2003	Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Supplemental Evidence of Norfolk Southern Railway Company
December 2, 2003	Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Reply of Norfolk Southern Railway Company to Carolina Power & Light Company's Supplemental Evidence
December 12, 2003	Docket No. 42069 Reply of Norfolk Southern Railway Company to Duke Energy Corporation's Petition to Correct Technical Error and Affidavit of Michael R. Baranowski
January 5, 2004	Docket No. 42070 Duke Energy Corporation v. CSX Transportation, Inc., Supplemental Evidence of CSX Transportation, Inc.
January 26, 2004	Docket No. 42058 Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company, Joint Supplemental Reply Evidence and Argument of The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company
March 22, 2004	Docket No. 42071 Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Supplemental Reply Evidence of The Burlington Northern and Santa Fe Railway Company
April 9, 2004	Docket No. 41185 Arizona Public Service Company and Pacificorp v. The Burlington Northern and Santa Fe Railway Company, The Burlington Northern and Santa Fe Railway Company's Reply Evidence on Reopening
May 24, 2004	Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. The Burlington Northern and Santa Fe Railway Company, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
June 23, 2004	Docket No. 42057 Public Service Company of Colorado d/b/a Xcel Energy v. The Burlington Northern and Santa Fe Railway Company, Petition to Correct Technical and Computational Errors
March 1, 2005	Docket No. 42071 Otter Tail Power Company v BNSF Railway Company, Supplemental Evidence of BNSF Railway Company
April 4, 2005	Docket No. 42071 Otter Tail Power Company v BNSF Railway Company, Reply of BNSF Railway Company to Supplemental Evidence
July 20, 2005	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Reply Evidence of BNSF Railway Company
May 1, 2006	Docket No. Ex Parte 657 (Sub-No. 1) Major Issues in Rail Rate Cases, Verified Statement Supporting Comments of BNSF Railway Company

May 31, 2006	Ex Parte 657 (Sub-No. 1) Major Issues in Rail Rate Cases; Verified Statement Supporting Reply Comments of BNSF Railway Company
June 15, 2006	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Reply Supplemental Evidence of BNSF Railway Company
June 15, 2006	Docket No. 41191 (Sub 1) AEP Texas North Company v. BNSF Railway Company, Reply Supplemental Evidence of BNSF Railway Company
June 30, 2006	Docket No. Ex Parte 657 (Sub-No. 1) Major Issues in Rail Rate Cases; Verified Statement Supporting Rebuttal Comments of BNSF Railway Company
February 4, 2008	Docket No. 42099 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Opening Evidence of CSX Transportation, Inc.
February 4, 2008	Docket No. 42100 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Opening Evidence of CSX Transportation, Inc.
February 4, 2008	Docket No. 42101 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Opening Evidence of CSX Transportation, Inc.
May 1, 2008	Docket No. Ex Parte 679 Petition of the AAR to Institute a Rulemaking Proceeding to Adopt a Replacement Cost Methodology to Determine Railroad Revenue Adequacy, Verified Statement of Michael R. Baranowski
July 14, 2008	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Third Supplemental Reply Evidence of BNSF Railway Company
July 14, 2008	Docket No. AB-515 (Sub-No. 2) Central Oregon & Pacific Railroad, Inc. -- Abandonment and Discontinuance of Service -- in Coos, Douglas, and Lane Counties, Oregon (Coos Bay Rail Line)
August 8, 2008	Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. BNSF Railway Company, Fourth Supplemental Evidence of BNSF Railway Company
August 11, 2008	Docket No. 42014 Entergy Arkansas, Inc. and Entergy Services, Inc. v Union Pacific Railroad Company and Missouri & Northern Arkansas Railroad Company, Inc.; Finance Docket No. 32187 Missouri & Northern Arkansas Railroad Company, Inc. – Lease, Acquisition and Operations Exemption – Missouri Pacific Railroad Company and Burlington Northern Railroad Company, Reply Evidence and Argument of Union Pacific
September 5, 2008	Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. BNSF Railway Company, Fourth Supplemental Reply Evidence of BNSF Railway Company
September 12, 2008	Docket No. AB-515 (Sub-No. 2) Central Oregon & Pacific Railroad, Inc. -- Abandonment and Discontinuance of Service -- in Coos, Douglas, and Lane Counties, Oregon (Coos Bay Rail Line); Rebuttal to Protests
August 24, 2009	Docket No. 42114 US Magnesium, L.L.C. v. Union Pacific Railroad Company, Opening Evidence of Union Pacific Railroad Company
October 22, 2009	Docket No. 42114 US Magnesium, L.L.C. v. Union Pacific Railroad Company, Rebuttal Evidence of Union Pacific Railroad Company

January 19, 2010	Docket No. 42110 Seminole Electric Cooperative, Inc. v. CSX Transportation, Inc., Reply Evidence of CSX Transportation, Inc.
May 7, 2010	Docket No. 42113 Arizona Electric Power Cooperative, Inc. v. BNSF Railway Company and Union Pacific Railroad Company, Joint Reply Evidence of BNSF Railway Company and Union Pacific Railroad Company
November 22, 2010	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, BNSF Comments on Remand, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher
January 6, 2011	Docket No. 42056 Texas Municipal Power Agency v. BNSF Railway Company, BNSF Reply to TMPA Petition for Enforcement of Decision, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher
October 28, 2011	Docket No. FD 35506 Western Coal Traffic League - Petition for Declaratory Order, Opening Evidence of BNSF Railway Company, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher
November 10, 2011	Docket No. 42127 Intermountain Power Agency v. Union Pacific Railroad Company, Reply Evidence of Union Pacific Railroad Company\
November 28, 2011	Docket No. FD 35506 Western Coal Traffic League - Petition for Declaratory Order, Reply Evidence of BNSF Railway Company, Joint Reply Verified Statement of Michael R. Baranowski and Benton V. Fisher
May 10, 2012	Docket No. 42056 Texas Municipal Power Agency v. BNSF Railway Company, BNSF Reply to TMPA Petition to Reopen and Modify Rate Prescription, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher
US District Court for Northern District of Oklahoma	
January 2, 2007	Case No. 06-CV-33 TCK-SAJ, Grand River Dam Authority v. BNSF Railway Company; Report of Michael R. Baranowski
February 2, 2007	Case No. 06-CV-33 TCK-SAJ, Grand River Dam Authority v. BNSF Railway Company; Reply Report of Michael R. Baranowski
Circuit Court of Pulaski County, Arkansas	
August 17, 2007	Case No. CV 2006-2711, Union Pacific Railroad v. Entergy Arkansas, Inc. and Entergy Services, Inc., Expert Witness Report of Michael R. Baranowski
December 14, 2007	Case No. CV 2006-2711, Union Pacific Railroad v. Entergy Arkansas, Inc. and Entergy Services, Inc., Reply Expert Witness Report of Michael R. Baranowski
U.S. District Court for the Eastern District of Wisconsin	
February 15, 2008	Case No. 06-C-0515, Wisconsin Electric Power Company v. Union Pacific Railroad Company, Expert Reply Report of Michael R. Baranowski

Arbitrations and Mediations

March 7, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J.B. Hunt Transport, Inc., Expert Report on behalf of BNSF Railway Company
March 28, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J.B. Hunt Transport, Inc., Rebuttal Expert Report on behalf of BNSF Railway Company
April 12, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J.B. Hunt Transport, Inc., Supplemental Expert Report on behalf of BNSF Railway Company
April 19, 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J.B. Hunt Transport, Inc., Supplemental Rebuttal Expert Report on behalf of BNSF Railway Company
April/May 2005	Arbitration Case #181 Y 00490 04 BNSF Railway Company and J.B. Hunt Transport, Inc., Hearings before Arbitration Panel
February 20, 2007	In the Matter of the Arbitration between the Detroit Edison Company, et al, and BNSF Railway Company, Expert Report of Michael R. Baranowski
March 19, 2007	In the Matter of the Arbitration between the Detroit Edison Company, et al, and BNSF Railway Company, Supplemental Expert Report of Michael R. Baranowski
February 12, 2009	In the Matter of the Arbitration between Wisconsin Public Service Corporation and Union Pacific Railroad Company, Rebuttal Expert Report of Michael R. Baranowski
October 16, 2009	In the Matter of Arbitration Between Norfolk Southern Railway Company and Drummond Coal Sales, Inc., Expert Report of Michael R. Baranowski
July 25, 2011	American Arbitration Association Case No. 58 147 Y 0031809, BNSF Railway Company and Kansas City Southern Railway Company, Expert Report of Michael R. Baranowski

WILLIE BENTON III

Mr. Benton is a consultant for Scott Bridge Company and president of B-3 Engineering, located at 208 Nathan Thaxton Road, Jackson, Georgia 30233. Since 1974, Mr. Benton has been involved in various aspects of railroad engineering, including work on structures and bridges. Mr. Benton is sponsoring a portion of Section III-F of Norfolk Southern's ("NS's") Reply Evidence regarding bridges. Mr. Benton has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Benton holds a Bachelor of Science degree in civil engineering from the University of South Carolina. He is a licensed engineer in Georgia and a member of the American Railway Engineering and Maintenance-of-Way Association ("AREMA"). Mr. Benton chaired the Timber Structures Committee and Structure Inspection, Maintenance and Repair Committees.

In 1972, Mr. Benton joined NS's predecessor Southern Railway Company. Mr. Benton held positions as a Track Supervisor and Assistant Engineer. In 1978 he became a Bridge Engineer, a position he held for 12 years. In 1990, Mr. Benton became Engineer Structures, Western Region at NS until his retirement in 2009.

Mr. Benton's complete curriculum vitae is attached.

VERIFICATION

I, Willie Benton III, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.



Willie Benton III

Executed on this 10th day of December, 2012.

RESUME

October 10, 2012

Willie Benton, III, P.E.
208 Nathan Thaxton Road
Jackson, Georgia 30233

EMPLOYMENT HISTORY:

Scott Bridge Company – Engineer Railroad Structure - September, 2009 – (consultant services) present

B-3 Engineering – President - March, 2009 - present

Norfolk Southern Railway – Engineer Structures Western Region - January 1990 - March, 2009

Southern Railway/Norfolk Southern Railway – Bridge Engineer - April, 1978 – January, 1990

Southern Railway – Assistant Engineer - August, 1974 – April, 1978

Southern Railway – Track Supervisor - January, 1974 – August, 1974

Southern Railway – Management Trainee - August, 1972 – January, 1974

EDUCATION:

1972 Graduate of the University of South Carolina School of Engineering – BS in Civil Engineering

LICENSES AND ASSOCIATIONS:

Licensed Professional Engineer in the State of Georgia

Member of the American Railway Engineering and Maintenance of Way Association

Member of Committee 7, Timber Structures, AREMA, Past Chairman

Member of Committee 10, Structure Inspection, Maintenance and Repair, AREMA, Past Chairman

Member of the American Association of Railroads Bridge Research Steering Committee, 1980 - 1984

F. DOUGLAS BESS

Mr. Bess is an Engineering Specialist with STV Inc., a professional firm offering engineering, architectural, planning, environment and construction management services located at 1201 Peachtree Street NE, Suite 1001, Atlanta, Georgia 30361. Mr. Bess has over 30 years of experience in the railroad industry, working on projects for Norfolk Southern Railway Company ("NS"), CSXT, and Kansas City Southern. Mr. Bess is sponsoring portions of Section III-F of NS's Reply Evidence that relate to road property investment for the SBRR. Mr. Bess has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Bess has a Bachelor of Science degree of civil engineering from Marshall University. He joined NS's predecessor, Southern Railway Company, in 1973. Mr. Bess worked in several engineering positions for NS and its predecessor in the Bridges and Structures Department. After leaving the railroad and joining STV, Mr. Bess continued to do special projects for NS and other carriers. This work included assisting in developing a computerized system for bridge, culvert and tunnel inspections, and conducting such inspections. For the past five years, Mr. Bess has been qualified as a Level 1A inspector of Erosion and Sediment Control in Georgia and a qualified Erosion Prevention and Sediment Control Inspector in South Carolina.

Mr. Bess's complete curriculum vitae is attached

VERIFICATION

I, F. Douglas Bess, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

F. Douglas Bess

Executed on this 12 day of December, 2012.

F. Douglas Bess, Jr.

Engineering Specialist

Mr. Bess is a civil engineer with more than 30 years of experience in railroad line structures, most of which was gained as an engineer with the Norfolk Southern Corporation. His expertise includes structural inspections and the development of computerized systems to manage data on bridge characteristics and conditions.

Office Location
Atlanta, GA

Date joined firm
4/15/08 to present
7/30/04 - 2/29/08

Years with other firms
30

Education
Bachelor of Science, Civil Engineering; Marshall University (1973)

Certifications
Erosion Prevention and Sediment Control Certification; South Carolina Department of Health and Environmental Control (2007)

Computer Skills
BIMS Software, Statistical Analytical System (SAS) Software

Project Experience with STV/RWA

CSX Roadway Worker Training – Senior Engineer
Mr. Bess is qualified for 2009 as a facilitator for contractors working on or near CSX property. The facilitator is responsible to train contractors on Contractor Safety, Security Awareness, Roadway Worker Safety and On-Track Machinery. (02/09 - Present).

Erosion and Sediment Control - Senior Engineer
Mr. Bess qualified as a Level 1A certified inspector in the state of Georgia in 06/07. Mr. Bess was also qualified in the state of South Carolina as an Erosion Prevention and Sediment Control Inspector in 09/07.

The Athens Line Miscellaneous Engineering Services - Project Design Engineer
Responsible for performing visual inspections of the site prior to the jack and bore installation of a 42-inch-diameter steel casing pipe under the main Athens Line track, and the extension of two existing casing pipes under the track in Athens, GA. (4/07)

CSX Inspection Services - Project Design Engineer
Providing inspection services at several locations on the CSX right-of-way while outside contractors install casing pipe under CSX tracks by the jack and bore method. As a field inspector, Mr. Bess is responsible for protecting the right-of-way and making sure that the proper size pipe is used and that it is at the proper depth under the track as outlined in the plans. Mr. Bess is empowered to stop work if he feels the contractor is not performing the installation in a safe and proper manner. (9/06 - Present)

Norfolk Southern Bridge Information Management System (BIMS) - Project Design Engineer
Acting as a liaison with the Norfolk Southern Corporation Bridges and Structures Department in developing a computerized system for Norfolk Southern to use in bridge, culvert, and tunnel inspections. Mr. Bess is providing the bridge, culvert, and tunnel data to the subcontractor, WebTech, who designed the initial inspection program. He tests the programs developed by the subcontractor to ensure they work as requested, and works with the Norfolk Southern Bridge Department to make changes and

enhancements requested by them. Mr. Bess is also works with the Norfolk Southern Engineering Systems group as they implement these changes made by WebTech. (7/04 - Present)

Kansas City Southern Railway BIMS - Project Design Engineer
Helped to design a feature that is currently not a part of the Norfolk Southern Corporation BIMS package for Kansas City Southern Railway's Bridge Information Management System (BIMS) for their bridge inspection program. Mr. Bess has made Norfolk Southern aware of this feature, and they hope to incorporate it into their inspection procedure when the feature becomes available. He is now working to develop an additional inspection feature that Kansas City Southern Railway desired for the inspection of timber bridges. (2004; 12/06 - 2008)

SCDOT Assembly Street Railroad Consolidation and Grade Crossing Elimination Study - Project Design Engineer
Prepared a layout of the existing Norfolk Southern and CSX trackage for a study to determine the feasibility of eliminating at-grade crossings to improve traffic and pedestrian safety, and decrease traffic congestion on Assembly Street in Columbia, SC. The focus of the feasibility study is to grade separate Assembly Street and the Norfolk Southern and CSX's main lines, eliminate at-grade crossings, and relocate new rail alignments. (4/07 - 6/07)

Norfolk Southern Line Structure Inspection Database - Project Design Engineer
Assisted in the recording and filing of bridge, culvert, and tunnel inspection reports and maintained bridge, culvert, and tunnel databases. Mr. Bess organized these records for Norfolk Southern Corporation prior to the implementation of the Bridge Information Management System (BIMS) in 2006. (11/05 - 9/06)

Project Experience with Norfolk Southern

Southern Railway/Norfolk Southern Bridges and Structures Department - Assistant Engineer
Was involved with detailing bridge tie decks and bridge design. Designed bridges, mostly steel ballast trestles, to replace existing bridges that were primarily timber trestles. The new structures had to be built under traffic, so care had to be taken to locate the new structure. (1974-1982)

Mr. Bess was also responsible for maintaining the bridge, culvert, and tunnel inspection reports and databases and ensuring that all structures were inspected yearly. He was in constant communication with Bridge and Building field personnel by phone or e-mail to follow up on delinquent or missing inspection reports. He used SAS computer software to write programs to generate reports for this as well as other aspects of the database, such as length of bridges on the system. Prior to his retirement, Mr. Bess was working with the Norfolk Southern Corporation Bridges and Structures

Department Manager in developing a computerized system for bridge inspections. (1987 – 2003).

Norfolk Southern Underwater Bridge Inspection Program - Assistant Engineer
Contracted the yearly Underwater Bridge Inspection Program for those structures that could not be inspected by Norfolk Southern Corporation Bridge and Building field forces. This included developing the list of bridges to be inspected, preparing plans and specifications, coordinating with the Material Management Department for solicitation of bids and awarding of work, and monitoring work by the contractor until completion. (1999 - 2003)

Norfolk Southern Bridges and Structures Department - Assistant Clearance Engineer
Worked in the Clearance Section in the Bridges and Structures Department of the Norfolk Southern Corporation. This involved travel to measure various obstructions, returning to the office to plot the information from film, and digitizing the plotted information in the mainframe computer for use by the clearance section of the Transportation Department for clearing high and/or wide shipments. (1982 - 1987).

Southern Railway – Management Trainee

Began railroad career in the Management Training Program in September, 1973. Received class and field training covering aspects of track and bridge maintenance, which included roadway basics and operating rules. (1973-1974).

PAUL E. BOBBY

Mr. Bobby is a Project Manager with STV Inc., a professional firm offering engineering, architectural, planning, environment and construction management services located at 200 West Monroe Street, Suite 1650, Chicago, Illinois 60606. Mr. Bobby is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence related to earthwork. Mr. Bobby has signed a verification of the truth of the statements contained therein. A copy of the verification is attached hereto.

Mr. Bobby earned his Bachelor of Science degree in civil engineering from the University of Wisconsin/Platteville. He has experience in the design and construction of railroad improvements including rail clearance and grade separation programs. Mr. Bobby has participated in the design of roadway and track alignment, geometry, and right-of-way and utility conflict identification, working on feasibility studies, cost estimation and the development of staging plans for construction. Mr. Bobby's specific projects have included work on a railroad bridge for CSXT over the Hudson River, a railroad bridge for the Wisconsin Central Railroad over a roadway, and planning and design for the reconfiguration of a CSXT coal terminal in Baltimore, among several others.

Mr. Bobby is a member of the American Railway Engineering and Maintenance-of-Way Association ("AREMA"). He is also a member of the Maintenance-of-Way Club of Chicago.

Mr. Bobby's complete curriculum vitae is attached.

VERIFICATION

I, Paul E. Bobby, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Paul E. Bobby

Executed on this 12 day of December, 2012.

Paul E. Bobby, P.E.

Project Manager

Office Location
Chicago, IL

Date joined firm
8/23/04

Years with other firms
5

Education
Bachelor of Science, Civil Engineering; University of Wisconsin/Platteville (2000)

Professional Registrations
Professional Engineer: Georgia (2009/#PE034469/exp. 12/31/2012), Illinois (2005/Civil/Sanitary Engineering/#062-058268/exp. 11/30/13), Indiana (2007/#PE10708276/exp. 7/31/2012), and Wisconsin (2006/#38452-6/exp. 7/31/14)

Memberships
American Railway Engineering and Maintenance-of-Way Association (AREMA)

Maintenance-of-Way Club of Chicago

Mr. Bobby is a civil engineer and project manager with more than 10 years of experience in the design and construction of railroad and highway improvements, including FTA New Starts projects and rail clearance and grade separation programs. He is adept at the design of roadway and track alignment, geometry, and right-of-way (ROW) and utility conflict identification. Mr. Bobby has experience with feasibility studies, cost estimating, and the development of construction staging plans to maintain traffic and operations. He has also managed a variety of successful track capacity expansion and rail improvement project, for Metra, freight railroads, and as part of the Chicago Region Environmental and Transportation Efficiency Program (CREATE) program, which was established to identify key bottlenecks and conflicts within existing Chicagoland transportation infrastructure.

[cost estimating focus]
Mr. Bobby is a professional engineer with more than 10 years of experience providing capital cost estimating for transit and civil works projects, including FTA New Starts investments. He also brings experience in the design and construction of railroad and highway improvements, including rail clearance and grade separation programs. He served as the civil task manager for the Chicago Transit Authority (CTA) Circle Line Alternatives Analysis, and he led the Phase I engineering design for a commuter rail system for the Northern Indiana Commuter Transit District (NICTD). Mr. Bobby has experience with alignment development and analysis, right-of-way (ROW) and utility conflict identification, alternatives development and plan analyses, and feasibility studies. He also served as the project manager for a blanket contract with Metra to assist in standardizing capital cost methodology and estimates per FTA guidelines.

[track management focus]
Mr. Bobby is a project manager and track designer with more than 10 years of experience in the design and construction of rail improvements. He began his career as a track laborer for the Wisconsin Central Ltd. (now Canadian National Railway Company), and has since earned a solid reputation within the rail industry for his knowledge of light rail, passenger, and freight rail design programs. He served as lead rail engineer for the $120 million Chicago Transit Authority (CTA) Block 37 Station and Tunnel Connector, for which he provided design of a 2-track connection between the Blue and Red transit lines. He has also served as lead rail engineer for several capacity improvement projects, including work for CSX Corporation, Norfolk Southern Railway, and Kansas City Southern. In addition, Mr. Bobby has provided project management

for blanket civil/structural and project administration contracts with Metra, including more than 20 assigned tasks, all completed within budget and on schedule.

Project Experience

BRIDGES

IDOT IL 15 over ICG Railroad and IL 13 Reconstruction - Rail Coordinator
Providing railroad coordination services for the $14.4 million replacement of dual structures on IL 15 that span IL 13 and the Illinois Central Gulf (ICG) railroad ROW in St. Clair County, IL. An Illinois Department of Transportation (IDOT) inspection found the dual bridges to be in poor condition. The agency therefore recommended that both structures be replaced. STV provided Phase I and Phase II design engineering services for the structural replacements. Phase I services included the preparation of a crash analysis, geometric studies, environmental coordination, public involvement, and all other work necessary to prepare a Project Report for design approval. Phase II includes the complete design of the new structures. Mr. Bobby communicates closely with the various rail agencies to keep them informed of the project plans and mitigate potential impacts the project may have on their operations. (11/08 - Present)

CSX Bridge 45 - Rail Engineer
Responsible for the rail alignment design and construction staging plans for a new single-track railroad bridge over the Hudson River in Iona, NY. Mr. Bobby prepared staging plans to maintain rail operations during the bridge construction. The bridge was designed with environmental sensitivity to the Hudson River ecosystem. (3/07 - 9/07)

WisDOT Wisconsin Central Railroad Bridge over US 41 - Project Manager
Managed the replacement of the Wisconsin Central Bridge US 41 in Fond du Lac, WI. Mr. Bobby prepared the project work plan, budget, amendments, and schedule; made staff assignments; quality assurance; and managed all coordination with the client. The project encompassed five alternative studies for the new structure, which replaced the existing single-track bridge. The Wisconsin Department of Transportation (WisDOT) and STV determined that two new bridges would best replace the single-track bridge over US 41. The design provided a new industrial spur railroad track off of the main line to the Fond du Lac Southwest Industrial Park. The firm also assisted in executing public information meetings and utilities coordination. Mr. Bobby's responsibilities included coordinating the evaluation of alternatives with WisDOT. (2002 - 2004)

HIGHWAYS/ROADWAYS

IDOT Elgin O'Hare West Bypass - Railroad Coordinator
Responsible for rail coordination with the Union Pacific, Canadian Pacific, and the Canadian National freight railroads, as well as the project team, for the proposed extension of the Elgin O'Hare West Bypass in Cook County, IL. This $3.6 billion project began with an Environmental Impact Statement and

feasibility study analyzing alternatives to improve transportation and ease congestion within the study area. Proposed improvements include widening existing roadways and extending the Elgin O'Hare Expressway east into O'Hare International Airport to provide western airport access. The initial study was completed and presented to the Illinois Department of Transportation (IDOT), who is moving forward with the design of the recommended improvements that have the least impact on the surrounding neighborhoods. Mr. Bobby is overseeing the evaluation of the impacts of the proposed Elgin O'Hare West Bypass on the freight and passenger rail services located within the project area. The primary objectives of his coordination efforts are to keep the railroads informed of the progress of the study and to resolve any potential conflicts at an early stage. Mr. Bobby also has been working with the planning team during the alternative design process and advising them of potential rail impacts. (9/07 - Present)

ISTHA Open Road Tolling Plaza CM - Project Controls
Provided project controls for STV's Phase III engineering services for plaza/roadway improvements for the open road tolling conversions at four mainline plazas on the Tri-State Tollway for the Illinois State Toll Highway Authority (ISTHA). The conversions included the Tri-State Tollway; M.P. 19.5 (83rd Street- Plaza 39); M.P. 19.8 (82nd Street - Plaza 36); M.P. 30 (Cermak - Plaza 35); and M.P. 39 (Irving Park- Plaza 33) in DuPage and Lake Counties in Illinois. Mr. Bobby assisted in cost analysis, construction revisions, quantity changes, and change order requests. (2005 - 2006)

IDOT Dan Ryan Expressway Reconstruction - Project Engineer
Provided interdisciplinary coordination, road grading, and intersection grading design of the frontage road reconstruction from 63rd Street to 47th Street on the Dan Ryan Expressway in Chicago for the Illinois Department of Transportation (IDOT). Mr. Bobby's responsibilities included ramp relocations, writing special provisions, and horizontal and vertical design layout. He also designed 25 cast-in-place retaining walls, which line the frontage roads and ramps. (2/03 - 4/04)

Village of Elwood Drummond Road Relocation - Project Engineer
Completed horizontal and vertical design, earthwork, storm sewer layout, and erosion control for the roadway design for the relocation of Drummond Road in Elwood, IL. (11/02 - 4/03)

RAIL

CSX Curtis Bay Coal Terminal Reconfiguration - Project Manager
Managing the planning and design for the reconfiguration of CSX's Curtis Bay coal terminal in Baltimore. The project will consolidate yard tracks from the existing coal inbound yard and merchandise yard to provide three 130-foot inbound tracks to store unit coal trains. The project will also reconfigure the inbound lead tracks to the west yard in order to separate switching operations and implement new crossover arrangements at the existing three coal dumpers. The work is needed for CSX's planned expansion of ground storage at this facility. Mr. Bobby is overseeing the conceptual layouts and design for the yard reconfiguration. The most challenging aspect is staging the sequence of construction for the maintenance of operations to minimize impacts to CSX service during construction. He is also conducting onsite visits, communicating extensively with the client, and managing the project budget and schedule. (11/11 - Present)

UP CREATE B-2 Project - Project Manager
Oversaw design engineering services for the reconstruction of the Metra's Union Pacific West Line's passenger stations in Berkeley and Bellwood, IL, as part of the CREATE B2 Project. STV provided engineering and architectural design services to modify the stations to accommodate a third mainline track being constructed by Union Pacific Railroad (UP). The station upgrades consist of new center

platforms, warming shelters, and pedestrian underpasses with retaining walls. Mr. Bobby worked closely with the railroads to develop a phased implementation plan to coordinate with the third-track construction. STV completed the design in July 2011, and the project has now moved into the construction phase. Mr. Bobby is overseeing STV's construction phase services. (3/11 - Present)

CSX/Chicago/Gary Regional Airport Authority CSX Fort Wayne Line and NS Gary Branch Consolidation - Project Manager

Overseeing track and civil plans for the consolidation of CSX's Fort Wayne Line and the Norfolk Southern Railway (NS) Gary Branch in Gary, IN. The work is being performed to facilitate the Chicago/Gary Regional Airport Authority's airport runway extension and includes the addition of a new connection from CSX's Barr Subdivision to Canadian National (CN)'s reconfigured Elgin, Joliet & Eastern (EJ&E) Railway Line. A new industrial connection from the CSX Porter Subdivision to the Indiana Sugars manufacturing facility will also be required. In addition, the project includes reconfiguring the Clarke Junction Interlocking between the Barr Subdivision, adding a new connection to the NS Chicago Line, and removing the Pine Junction Interlocking on the Barr Subdivision to improve speeds from 40 mph to 60 mph. Mr. Bobby is coordinating closely with the client while developing the track design. STV is acting as the owner's representative for the project, and Mr. Bobby is reviewing documentation from the airport to the client to assess impacts to CSX. He is identifying potential hazards, such as drainage issues, to make sure the interests of CSX are maintained and their property is not affected during construction. Mr. Bobby is also managing the project budget, schedule, and staff. (2/11 - Present)

GEC Services for CSX CREATE Projects - Project Manager

Overseeing various projects under a general engineering consultant (GEC) contract with CSX. The aim of the Chicago Region Environmental and Transportation Efficiency (CREATE) program is to help CSX expedite freight rail transit through Chicago, the busiest rail freight gateway in the United States. The tasks under the contract involve interlocking, track, and signal modifications, which require civil and track engineering design and construction management services. (4/10 - Present)

CSX CREATE B-9 - Project Manager

Leading the design of a new double-track connection and crossover upgrades in Summit Argo, IL. The project will replace the connection between Canadian National and Baltimore & Ohio Chicago Terminal (B&OCT) tracks and increase the track capacity by extending the B&OCT siding track in Bridgeview, IL. Mr. Bobby is also overseeing improvements to Argo Yard, including realigning switch lead tracks, installing three new yard tracks, and constructing a new industry lead track to avoid switching within the control point. He is developing project reports and plans, specifications, and estimates packages for the client and contractor. Mr. Bobby is also communicating with the railroad to make sure the designs effectively meet their needs while avoiding service disruptions. (5/11 - Present)

CSX CREATE B-16 Thornton Junction Connection Design - Project Manager

Developing a project report and design approval documents for a new track and associated switches to connect the Canadian National Elsdon Sub and Union Pacific Villa Grove Sub in South Holland, IL, as part of a general engineering consultant contract for CSX. This will reestablish a former connection between the Beltway and Western Avenue corridors. (10/10 - Present)

CSX CREATE WA-2 Segment B - Project Manager

Oversaw the design of new crossovers between the Baltimore & Ohio Chicago Terminal (B&OCT) main tracks and modifications to the crossover between the B&OCT track and Norfolk Southern Railway tracks as part of a general engineering consultant contract with CSX for projects within the CREATE program. Mr. Bobby worked closely with the various railroads involved to design new alignments and profiles within the project area. He also developed a project report and plans, specifications, and estimates packages for the contractor and the railroad. (4/11 - 12/11)

CSX CREATE WA-2 Construction Management - Project Manager
Oversaw STV's construction management services during the 4-phase signal installation and construction of interlocking improvements at seven locations on the Western Avenue Corridor in Chicago, from Ogden Junction to 75th Street, where a new centralized traffic control (CTC) signaling system will be installed. The CTC signaling and interlocking improvements will increase train speeds and traffic capacity through better track utilization. The project was part of a general engineering consultant contract with CSX. (6/10 - 7/11)

CSX CREATE B12 Third Main Construction Oversight - Project Manager
Oversaw the construction of a third mainline along the Beltway Corridor from 123rd Street to CP San Francisco in Alsip and Blue Island, IL. This additional mainline will increase freight rail capacity and decrease travel times within the area. STV managed construction of new track, track upgrades, signal work, and a new rail bridge over 127th Street under a general engineering consultant contract with CSX. (4/10 - 8/11)

CHSRA Los Angeles-to-Anaheim Project EIR/EIS - QA/QC Review
Conducting a quality assurance/quality control (QA/QC) review, including track and alignments, of a 30-mile segment of high-speed rail line between Los Angeles and Anaheim, CA, for the California High-Speed Rail Authority (CHSRA). The proposed corridor runs adjacent to existing passenger and freight lines and will travel at speeds up to 220 miles per hour. The segment requires the development of solutions for overlaying a new set of track infrastructure into a physically constrained rail corridor, which includes local and regional passenger service as well as local and transcontinental rail freight operating on a limited ROW in a dense urban environment. Mr. Bobby is providing a QA/QC review of the plan and profile drawings, as well as the inclusion of alternatives for at-grade, tunnel, and aerial portions during the evaluation process. (12/09 - Present)

Sunoco Logistics Nederland Rail Facilities Upgrade - Rail Design Lead
Led the design of the rail component of the infrastructure upgrade at the large marine terminal in Nederland, TX, which provides oil loading and unloading facilities for extracting crude oil from rail cars. The site has two short existing tracks with a small number of equipment spots for loading and unloading oil. Mr. Bobby directed the design of the track extension to accommodate multiple 30-car loading and unloading spots. His team's rail plan included typical sections, alignment plan, profiles, cross sections, and track details. The track expansion was designed to be constructed under traffic to allow oil cars to still load and unload while the track extensions are constructed. (3/12 - 4/12)

NICTD Kensington Interlocking Improvements CM Services - Construction Manager
Directed construction management (CM) services for improvements at the Kensington Interlocking on Chicago's south side, including the addition of a second Northern Indiana Commuter Transportation District (NICTD) route across the Canadian National railroad to the Metra Electric Mains. STV provided a precondition survey to identify existing conditions of the rail and ROW within the project limits, including the existing signal system, structures, and track appurtenances, and oversaw all aspects of the contractor's construction methods. Mr. Bobby was responsible for field inspections, contract

administration, project controls, quality assurance, safety monitoring, and procurement assistance. (12/08 - 12/11)

CSX CREATE WA-10 - Project Manager
Managed the final design of a rail interlocking to allow the interchange between the Canadian National and CSX railroads in Blue Island, IL. Expanding this interlocking between these two main lines will increase rail traffic capacity and improve train movement through Chicago. Mr. Bobby coordinated work between the signal designers and each railroad and their respective labor forces. He also prepared plans, specifications, and estimate submittals to the Illinois Department of Transportation. (6/08 - 3/11)

Metra Civil/Structural Blanket Engineering Services - Project Manager
Oversaw rail engineering services for STV's civil/structural blanket project for Metra, for which the firm provided systemwide services on an as-needed basis. STV's project scope varied by task order, and services included field verification of conditions, design of buildings and trackwork, rehabilitation of buildings and retaining walls, construction inspection and plan preparation, environmental assessments, traffic studies, roadway geometry, and property surveys. Mr. Bobby oversaw all 12 tasks associated with this contract, one of which involved conducting a thorough condition inspection, preparing a condition report, and developing the necessary rehabilitation activities for repair of the Rock Island District Turntable in Blue Island, IL. (10/08 - 12/10)

NICTD West Lake Corridor New Starts Studies - Engineering Task Leader
Led Phase I engineering design of a commuter rail system for the Northern Indiana Commuter Transit District (NICTD) extending from Valparaiso to Lowell, IN, to Chicago. Mr. Bobby prepared travel-demand modeling, alternatives development, plan and profile development, and a public outreach campaign. (7/05 - 9/10)

St. Louis Metro East Riverfront Interlocking - Project Engineer
Oversaw the track design for a new diamond interlocking located between St. Louis Metro's existing East Riverfront light-rail station and the Eads Bridge spanning the Mississippi River. The Eads Bridge is a 2-level structure carrying two sets of tracks for the MetroRail transit system on its lower level and a 4-lane highway on the upper level. The new interlocking is located in an area east of the bridge known as the East Arcade. Mr. Bobby and his team designed the new interlocking on a tight schedule and within a restricted area, which made design work challenging. The project required the installation of an asymmetrical double crossover using a combination of No. 6 and No. 8 turnouts on concrete ties to allow single-track operation over the Eads Bridge with minimal disruption to the passenger rail service while the bridge is rehabilitated. This project had an aggressive completion schedule, which required STV to develop an independent material procurement package in advance of the construction contract. Mr. Bobby directed the track design for the new interlocking and reviewed the final plans, successfully meeting the aggressive schedule. (11/09 - 6/10)

Metra Computerized Maintenance Management System Program - Project Manager
Oversaw the selection and implementation of a computerized maintenance management system (CMMS) for Metra's fixed facilities, including passenger train stations, locomotive and car shops, maintenance-of-way facilities, train control centers, and offices throughout Chicago and its surrounding suburbs. Mr. Bobby and his team collaborated with the agency to develop and implement a 2-phase plan to standardize and automate preventive maintenance work orders for Metra's fixed assets. As part of the project, STV evaluated and customized an off-the-shelf Web-based CMMS application that would replace Metra's

paper-based legacy system. Mr. Bobby led site inventories to survey and document Metra's facilities equipment and assets, which were then loaded into the CMMS asset database. During the second phase of the plan, he successfully managed the staggered implementation of the CMMS. Under Mr. Bobby's direction, the CMMS was fully implemented and is utilized across all of Metra's districts. (11/07 - 11/09)

Metra Blanket Project Administration/Management Services - Project Manager
Oversaw the administration of projects for Metra to be designed by outside consultants. Mr. Bobby managed project controls and monitored compliance with approved budgets and schedules. Specific tasks under this blanket included administration and management of parking lot design, construction inspection services, and Standard Cost Category Analysis for New Starts projects. Mr. Bobby was also responsible for making sure Metra's standards and guidelines were adhered to by the project teams and documented according to Metra project management guidelines. (2005 - 6/09)

Metra Standard Cost Category Analysis for New Starts Projects - Project Manager
Managed this project to assist Metra in standardizing the capital cost methodology and estimates for four Chicagoland projects according to FTA guidelines on Standard Cost Categories. These guidelines were required as part of the application process to enter the New Starts program for federal funding. Projects included new service to the STAR Line and Southeast Line; the Union Pacific Railroad (UP) Northwest Line track and signal improvement, as well as extension of service; and the UP West Line track and signal improvements. (12/05 - 5/07)

NS Lakeside Dam Rehabilitation - Rail Engineer
Provided design services for rail alignment and related earthwork as part of the construction of a 1.5-mile realignment in Macon, GA, for the Norfolk Southern Railway (NS). The proposed alignment was partially over a 60-foot-high earthen dam. The project, which required coordination among many stakeholders, involved a complex intersection of the railroad, a major state route, and the dam. (8/08 - 12/08)

CTA Brown Line Tie Renewal - Project Rail/Civil Engineer
Provided engineering and track inspection services for this $18 million project, which included the renewal of dense, composite ties with Pandrol plates, as well as the replacement of timber guards, rail greasers, and contact rail chairs for the Chicago Transit Authority (CTA) Brown Line in Chicago. This project included the complete replacement of timber cross ties and outer guard with plastic composite cross ties and outer guards, all new tie plates, and other track materials. Live train testing was performed on the 50-foot-high elevated track, which spans 3 miles and encompasses eight stations. Mr. Bobby assisted with constructability reviews, project planning, inspection services, and emergency services. (4/08 - 9/08)

CSX Goldsboro Passing Siding - Lead Rail Engineer
Oversaw rail engineering for the design of a 2-mile passing siding on the W&W subdivision of the Atlantic Coast Line in Goldsboro, NC. Work for this project was performed on an accelerated schedule, allowing only four weeks from the start of engineering until the bid documents needed to be complete. Mr. Bobby prepared complete documents, including plans, special provisions, and cost estimates. The project was completed on time and within budget. (6/07)

KCS Meridian Rail Siding - Lead Rail Engineer
Led the design team for a proposed rail alignment and related earthwork as part of the construction of a 3-mile double-track extension on the Meridian Speedway in Meridian, MS. The project had an aggressive schedule, and the line remained operational with staged construction. The project was part of a master

agreement with Kansas City Southern (KCS) to provide professional services on an on-call basis for the main rail lines. (3/07 - 5/07)

KCS Meridian Connection - Lead Rail Engineer
Served as technical lead and managed the design team responsible for the design of the rail alignment and related earthwork as part of the construction of a 4-mile realignment and connection of the Norfolk Southern Railway (NS) and the Kansas City Southern (KCS) railway on the Meridian Speedway in Meridian, MS. The project required extensive coordination between the KCS and NS railroads, resulting in an operational staging plan suitable for both parties. The project was part of a master agreement with KCS to provide professional services on an on-call basis for the main rail lines. (3/07 - 5/07)

NS Heartland Clearance Improvements CM - Rail Engineer
Provided design services in support of construction management (CM) for modifications to the Norfolk Southern Railway (NS) alignment in order to meet clearance requirements and developed an undercutting plan to be executed by the railroad for clearance improvements to 29 tunnels in Virginia, West Virginia, Kentucky, and Ohio known as the "Heartland Corridor." Mr. Bobby contributed to the design of overhead bridge-jacking plans to obtain vertical clearances. He modified slide fences, provided utility coordination, and reviewed track design. Mr. Bobby also created railroad bridge-lowering plans and stormwater pollution prevention plans at tunnel portals for this $191 million project. (7/06 - 8/06)

Michigan State University Rail Feasibility Study - Rail Advisor
Provided technical advisement to Michigan State University (MSU) for a feasibility study to expand its existing coal storage yard to allow for bulk unit trains. The study investigated the possibility of increasing both operational flexibility and capacity to allow MSU to store unit trains and perform switching operations. Mr. Bobby utilized his extensive rail experience to advise the client on geometric and operational solutions, and performed quality assurance for the study. (11/05 - 2/06)

CTA Circle Line Alternatives Analysis - Task Manager
Served as civil task manager for the alternatives analysis of the new Chicago Transit Authority (CTA) Circle Line, which would connect the existing CTA transit lines and several Metra commuter lines by an outer loop track approximately two miles outside of downtown Chicago. Mr. Bobby performed project data collection, horizontal/vertical alignment development and analysis, and ROW and utility-conflict identification. The study focused on a series of elevated structures and underground tunnels required to make the connections. (4/04 - 8/04)

Metra Southwest Service Expansion - Project Engineer
Led the rail design for this $97 million mainline expansion of Metra's Southwest Service Line in Chicago, a Federal Transit Administration New Starts project to support Metra's growing ridership needs. The scope of work included upgrading 3.2 miles of an existing single-track to a double-track to increase the frequency of Metra's service to its existing areas and expand service to Manhattan, IL. The project also included four maintenance-of-way sidings, three interlockings, two new station layouts, and one new yard that included a maintenance facility. Mr. Bobby coordinated with the various project disciplines to develop the rail design according to the project plan. He also produced bid documents. (3/01 - 11/02)

City of Ottawa Illinois Valley Commuter Rail Feasibility Study - Project Engineer
Provided conceptual engineering for the analysis of the physical, operational, and financial feasibility of providing commuter rail service on an existing active railroad ROW and trackage between Joliet and LaSalle/Peru, IL. (4/02)

SITE DEVELOPMENT

Forest City Enterprises Illinois Science and Technology Park Redevelopment - Project Manager
Oversaw the development of the master utility and drainage plan and the Phase I construction documents for this $500 million, 23-acre redevelopment project in Skokie, IL. The scope of work included the demolition of multiple buildings, site utilities disconnection and demolition, partial utility tunnel demolition, site backfill, and temporary site and landscape improvements in preparation for new buildings, structures, and permanent landscape. Mr. Bobby managed the pre-design services, the development of site utility and drainage master plans, and limited interim site engineering for a master plan, all of which addressed current and future buildings, as well as phased development. He oversaw the integration of existing systems with new systems, and attended meetings with the client, utility companies, surveyors, public agencies, construction and demolition contractors, architects, and electrical/mechanical consultants. (2005 - 2007)

TRANSPORTATION FACILITIES

City of Joliet Regional Multimodal Transportation Center - Engineering Lead
Provided railroad coordination and oversaw required infrastructure improvements as part of the development of a multimodal transportation center in Joliet, IL. Several modes of transportation will be relocated into a central facility located within the Joliet Union Depot Interlocking, which includes Union Pacific Railroad, BNSF Railway, Amtrak, and the Metra Rock Island District and Heritage Corridor rail lines, and will connect to the historic Joliet Union Station. Mr. Bobby coordinated with the various rail agencies, keeping them informed of the project plans and mitigating potential impacts the project may have on the railroads. STV provided professional services for the planning and engineering of the center and developed an implementation plan identifying possible funding sources and phasing of project elements over a multi-year timeframe. In addition to rail coordination, Mr. Bobby developed infrastructure improvements related to track realignments, platform configurations, interlocking modifications, bridge rehabilitations, and construction staging for the estimated $42 million facility. (9/09 - 2/11)

Riverview Trenton Rail Road Intermodal Facility - Design Engineer
Prepared plans for conceptual grade crossings, new yard layout, container storage, and trackwork for this intermodal facility in Detroit. (6/01)

Amtrak Detroit Station - Design Engineer
Designed a parking lot, site drainage, and grading plans for the development of this rail station in Detroit. Mr. Bobby was also responsible for utility and rail coordination. (1/01 - 6/01)

City of Lisle Commuter Rail Station - Resident Engineer
Completed inspection, material testing, and construction documentation for a commuter rail station rehabilitation in Lisle, IL. The project included construction of new precast platforms on grade beams, handicap ramps, hand railings, drainage, retaining walls, and stairways. (6/01)

Jefferson Terminal Railroad Auto Mixing Facility - Design Engineer
Provided the conceptual design of an auto mixing facility in Detroit, MI, which incorporated over-the-road auto haulers with a rail yard and staging facility that included plans for conceptual grade crossings, new yard layout, container storage, and trackwork. (5/01)

CSX Piqua Yard - Design Engineer

Provided cost-estimating and design services for a new yard located in Fort Wayne, IN, to accommodate a new steel manufacturer in the area that needed rail service. (6/00 - 12/00)

Metra 47th Street Trainwasher - Project Engineer
Provided on-site project-engineering services during construction for the layout of the yard lead track and new approach to the trainwasher. (5/00 - 7/00)

MWRDGC Stickney Facility Centrifuge - Track Engineer
Designed the layout for additional yard track for the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) centrifuge in Stickney, IL. Mr. Bobby also incorporated a new car-mover with the existing facility. (5/98 - 8/98)

TUNNELS

CTA Block 37 Station and Tunnel Connector - Project Engineer/Lead Rail Engineer
Designed the rail alignment for a mined tunnel in water-bearing soft clay that connects the Chicago Transit Authority (CTA) Blue and Red transit lines in Chicago. Located at Block 37 between State and Dearborn streets, this tunnel links the two subways to a new underground station. Work for this project was performed on an extremely complex and tight schedule, and had to be completed with minimal disruptions to the subway service. Mr. Bobby prepared all special trackwork and details, and established the horizontal geometry for the trackwork and alignment for the entire project. (8/04 - 6/07)

WATER RESOURCES

MWRDGC MUPPS for the North Side Water Reclamation Plant - Project Engineer
Provided overall engineering services to prepare a Master Underground Process Piping Survey (MUPPS) — a comprehensive Geographical Interface System (GIS) database that identifies and locates all underground utilities, process piping, topographic features, and permanent structures — at the North Side Water Reclamation in Skokie, IL, for the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). The GIS system comprises AutoCAD Civil Map 3-D graphical objects with links to a customized Microsoft Access relational database, and facilitates an inventory and information retrieval on all site utilities. Mr. Bobby was responsible for the development and implementation of the GIS database system and researched and digitized existing district drawings and associated databases. (7/07 - 5/09)

Publications and Presentations

Published and presented "Metra - Southwest Service Expansion" at the American Railway Engineering and Maintenance-of-Way Association (AREMA) International Conference in Chicago. (2003)

RICHARD BROWN

Mr. Brown is a Director at FTI Consulting, Inc., an economic and consulting firm with offices located at 1101 K Street, NW, Washington, D.C. 20005. With 28 years of experience in the railroad industry, Mr. Brown specializes in providing financial, economic and analytical consulting services to North America's largest railroads. Mr. Brown is sponsoring portions of Section III-D of Norfolk Southern's ("NS's") Reply Evidence relating to operating and general and administrative expenses. Mr. Brown has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Brown received a Bachelor of Art degree in economics from Syracuse University in 1963 and a Master of Business Administration from Northwestern University in 1971. Prior to joining FTI, Mr. Brown spent 28 years with the Burlington Northern & Santa Fe Railway ("BNSF"), and its predecessor the Atchison, Topeka and Santa Fe Railway ("ATSF"). While at BNSF, Mr. Brown focused on strategic issues including the negotiation and implementation of the agreements between Union Pacific ("UP") and BNSF that were effected to facilitate the UP and Southern Pacific ("SP") merger. Additionally, he took a lead role in the analysis of the potential impact of regulatory changes on railroad marketing strategy.

Mr. Brown held numerous positions in Strategic Planning and Marketing at ATSF. He was involved in merger analysis and planning and played a key role in the attempted merger between ATSF and SP. Mr. Brown headed ATSF's Bulk Commodity Marketing which included Chemicals and Coal. In this role, he re-engineered a field sales organization with regional directors responsible for coaching and mentoring account managers. He also led ATSF's rail-truck retail efforts and negotiated several joint venture and business partnerships. While in this capacity, he developed a program for using rail truck transfer to increase car utilization. He implemented a joint venture with a major bulk truck line to bring intermodal rail service to dry

bulk shippers. Mr. Brown has provided expert testimony in merger proceedings before the Interstate Commerce Commission and the Surface Transportation Board.

Mr. Brown's complete curriculum vitae is attached.

VERIFICATION

I, Richard Brown, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Richard Brown

Executed on this 4 day of January, 2012.

Richard Brown

Director – Economic Consulting

rick.brown@fticonsulting.com

FTI Consulting
1101 K Street, NW
Suite 8100
Washington, DC 20005
Tel: (202) 312-9100
Fax: (202) 312-9101

Education
MBA from Northwestern University Graduate School of Management

BS in Economics from Syracuse University

Richard Brown is a Director in FTI's Economic Consulting practice. With 28 years of experience in the railroad industry, Mr. Brown specializes in providing financial, economic and analytical consulting services to North America's largest railroads. Mr. Brown has provided expert testimony in merger proceedings before the Interstate Commerce Commission and The Surface Transportation Board. Mr. Brown is assigned to the DC office, however works from his home office at 100 Windwood Circle; Breckenridge, Colorado 80424.

Mr. Brown joined FTI Consulting in 1999. Much of the NIS group's work focuses on the economic and financial analysis of network industries, in particular different aspects of transportation. While at FTI, he has been involved in the analysis of rates, costs, and service in the railroad industry. Mr. Brown has worked extensively to develop expert testimony before the Surface Transportation Board ("STB") examining the reasonableness of railroad rates, railroads' applications for mergers and acquisitions. He also supported railroad internal strategic planning needs with respect to mergers and acquisitions and the impact of potential regulatory changes.

Prior to joining FTI, Mr. Brown spent 28 years with The Burlington Northern & Santa Fe Railway (BNSF), and its predecessor The Atchison, Topeka and Santa Fe Railway (ATSF). While at BNSF, he focused on strategic issues including the negotiation and implementation of the agreements between UP and BNSF that were effected to facilitate the UP-SP merger. Additionally, he took a lead role in the analysis of the potential impact of regulatory changes on railroad marketing strategy.

Mr. Brown held numerous positions in Strategic Planning and Marketing at ATSF. He was involved in merger analysis and planning and played a key role in the attempted merger between ATSF and Southern Pacific. He headed ATSF's Bulk Commodity Marketing which included Chemicals and Coal. In this role, Mr. Brown re-engineered a field sales organization with regional directors responsible for coaching and mentoring account managers; started a subsidiary company to handle tank containers as a retail intermodal options; and expanded on that with a joint venture with Bulkmatic, a major dry bulk truck line, to initiate a retail intermodal option for bulk containers.

Mr. Brown holds a Bachelors Degree in Economics from Syracuse University and an MBA degree from Northwestern University Graduate School of Management.

TESTIMONY

Surface Transportation Board

September 20, 2002 Docket No. 42070. Duke Energy Corporation v. CSX Transportation, Inc., Written Reply Evidence and Argument of CSX Transportation, Inc.

September 30, 2002 Docket No. 42069. Duke Energy Corporation v. Norfolk Southern Railway Company, Written Reply Evidence and Argument of Norfolk Southern Railway Company.

October 11, 2002	Docket No. 42072. Carolina Power & Light v. Norfolk Southern Railway Company, Written Reply Evidence and Argument of Norfolk Southern Railway Company.
January 19, 2010	Docket No. 42110. Seminole Electric Cooperative, Inc. v. CSX Transportation, Inc., Written Reply Evidence of CSX Transportation, Inc.
February 5, 2010	CV No. 3:08-CV-415-BR. -BNSF Railway Company v. Albany and Eastern Railroad Company, et al.
May 7, 2010	Docket No. 42113 Arizona Electric Power Cooperative, Inc. v. BNSF Railway Company and Union Pacific Railroad Company, Joint Reply Evidence of BNSF Railway Company and Union Pacific Railroad Company
November 10, 2011	Docket No. 42127 Intermountain Power Agency v. Union Pacific Railroad Company, Reply Evidence of Union Pacific Railroad Company

PATRICK J. BRYANT

Mr. Bryant is a Civil Engineer with STV, a professional firm offering engineering, architectural, planning, environment and construction management services located at 200 West Monroe Street, Suite 1650, Chicago, Illinois 60606. Mr. Bryant is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to earthwork. Mr. Bryant has signed a verification of the truth of the statements contained therein. A copy of the verification is attached hereto.

Mr. Bryant has more than 15 years of experience in rail, roadway, highway and bridge design and construction. He worked as Project Engineer on a CSXT coal terminal reconfiguration and as a Design Engineer for CSXT's Blue Island interchange with CN. He has also worked as a Track Engineer for the Elgin O'Hare West Bypass in Illinois and the City of Joliet's Regional Multimodal Transportation Center. Mr. Bryant worked as a Rail Engineer on the KCS Meridian Connection, performing design for the rail alignment and related earthwork as part of a realignment and connection construction. For Norfolk Southern, Mr. Bryant worked as a Rail Engineer on the Lakeside Dam Rehabilitation, designing the rail alignment and related earthwork as part of a 1.5 mile realignment at the intersection of the railroad, a state road and a dam.

Mr. Bryant earned his Bachelor of Science in civil engineering from the University of Illinois. His complete curriculum vitae is attached.

VERIFICATION

I, Patrick J. Bryant, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Patrick J. Bryant

Executed on this 17 day of December, 2012.

Patrick J. Bryant, P.E.

Civil Engineer

Mr. Bryant is a civil engineer with more than 15 years of experience in rail, roadway, highway, and bridge design and construction, as well as site/civil and environmental engineering. He is experienced in designing rail alignments and track for light rail, commuter and freight railroads, and in coordinating among freight railroads, transit agencies and departments of transportation for track improvement projects. Mr. Bryant is currently serving as track engineer for the Illinois Department of Transportation (IDOT) Elgin O'Hare West Bypass, where he is providing conceptual track design for potential alignments and impacts to the Union Pacific Railroad, Canadian Pacific Railway, and Canadian National Railway. He has also performed track design for Kansas City Southern, the Northern Indiana Commuter Transportation District, and Norfolk Southern Railway.

Firm
STV

Education
Bachelor of Science; Civil Engineering; University of Illinois, Chicago

Professional Registrations
Professional Engineer: Illinois

Training
Amtrak Contractor Safety

Computer Skills
AutoCAD, Civil 3D, MicroStation, GeoPak, HydroFlow, TR20, Paydirt, Visual Basic, AutoLisp, Eaglepoint

Project Experience

RAIL

CSX Curtis Bay Coal Terminal Reconfiguration - Project Engineer
Planning and designing the reconfiguration of CSX's Curtis Bay coal terminal in Baltimore. The project will consolidate yard tracks from the existing coal inbound yard and merchandise yard to provide three 130-foot inbound tracks to store unit coal trains. The project will also reconfigure the inbound lead tracks to the west yard to separate switching operations and implement new crossover arrangements at the existing three coal dumpers. The work is needed for CSX's planned expansion of ground storage at this facility. Mr. Bryant is overseeing the conceptual layouts and design for the yard reconfiguration. The most challenging aspect is staging the sequence of construction for the maintenance of operations to minimize impacts to CSX service during construction. (11/11 - Present)

CSX/Chicago/Gary Regional Airport Authority CSX Fort Wayne Line and NS Gary Branch Relocation - Design Engineer
Preparing track and civil plans for the reconfiguration of CSX's Fort Wayne Line onto the Norfolk Southern Railway (NS) Gary Branch in Gary, IN. The work is being performed as a component of the Chicago/Gary Regional Airport Authority's airport runway extension project and includes the addition of a new connection from CSX's Barr Subdivision to Canadian National's reconfigured Elgin, Joliet & Eastern Railway Line. A new industrial connection from the CSX Porter Subdivision to the Indiana Sugars manufacturing facility will also be added. In addition, the scope of work includes reconfiguring the Clarke Junction Interlocking between the Barr Subdivision, adding a new connection to the NS Chicago Line, and removing the Pine Junction Interlocking on the Barr Subdivision and improving design speed from 40 mph to 60 mph. This work will increase rail traffic capacity

and improve train movement into and out of Chicago. Mr. Bryant is also coordinating the design plans with the various railroads and transportation agencies. (2/11 - Present)

CSX CREATE WA-10 - Design Engineer
Preparing track and civil plans for the final design of the rail interlocking to allow the interchange between the Canadian National (CN) and CSX railroads in Blue Island, IL. As a component of the Chicago Region Environmental and Transportation Efficiency (CREATE) program, the project involves reconfiguring the CSX Vermont Street interlocking to provide a universal connection to the CN main line. Expanding this interlocking between these two main lines will increase rail traffic capacity and improve train movement through Chicago. Mr. Bryant is also coordinating the design plans with the various railroads and transportation agencies. (2011 - Present)

IDOT Elgin O'Hare West Bypass - Track Engineer
Coordinating design plans with various railroads and transportation agencies and preparing staging plans as part of STV's freight rail coordination for the $3.9 billion Elgin O'Hare West Bypass in Cook County, IL. Mr. Bryant developed conceptual track engineering plans and cost estimates for potential track alignments and impacts to the railroads during Phase I of this project. He also developed staging plans, cross-sections, plan profiles, and drainage plans. The project has now moved into Phase II, and STV is coordinating the approved plans among the Union Pacific, Canadian Pacific, and Canadian National freight railroads and the project team. The primary objective of the coordination is to keep the railroads informed of project progress and to resolve any potential conflicts at an early stage. Mr. Bryant is coordinating work with the planning team during the alternative design process and is advising them of potential rail impacts. He is also coordinating plans with signals and highway improvement work being performed simultaneously. (10/08 - Present)

NICTD Kensington Interlocking Improvement CM Services - Track Engineer
Developed track engineering for construction management (CM) services for improvements at the Kensington Interlocking, including the addition of a second Northern Indiana Commuter Transportation District (NICTD) route across the connect to the Metra electric mains. Mr. Bryant made recommendations for alterations to the original track design that are being incorporated into the final design and construction. He also performed office engineering tasks as well as field inspections. STV oversaw all aspects of the contractor's construction methods, and provided a precondition survey to identify existing conditions of the rail and right-of-way in the area of the Kensington Interlocking limits, including the existing signal system, structures, and track appurtenances. (6/09 - 6/12)

UP vs. Intermountain Power Agency Rate Case Litigation Cost Assessments - Project Engineer
Assembled the planning, engineering, and construction costs to build a hypothetical contemporary operating railroad for the Union Pacific Railroad (UP). Services included a complete itemization, justification, and documentation of all transportation, material, and labor construction costs associated with a contemporary construction costing. All submittals were entered as evidence to the Surface Transportation Board to justify contested rates for this coal rate case. The cost assessments Mr. Bryant worked on included major earthwork and culvert construction. (8/11 - 12/11)

CSX CREATE CSX CREATE B-12 Third Main Construction Oversight - Field Inspector
Performed field inspections for the construction of a third mainline along the Beltway Corridor from 123rd Street to CP San Francisco in Alsip and Blue Island, IL, which includes new track and upgrades to existing track. Part of the Chicago Region Environmental and Transportation Efficiency (CREATE) program, this additional mainline will increase freight rail capacity and decrease travel times within the area. A new rail bridge over 127th Street was also constructed, including associated signal work. Mr. Bryant provided inspections to make sure the work was performed according to the project plans and specifications. (9/10 - 7/11)

TTC Transit City LRT Program Project Management Services - Track Design QC
Provided quality control for track and civil plans, as part of the proposed 13.6-km (8.5-mile) Toronto Transit Commission (TTC) underground light rail transit (LRT) line and new Sheppard's Street station in Toronto, Canada. Mr. Bryant verified that the project was designed according to the agency's design criteria and that it is constructible. He checked clearances, materials, profile grades, and drainage design. (4/10 - 2/11)

St. Louis Metro East Riverfront Interlocking - Track Engineer
Prepared track and civil plans for the design of a new interlocking between the East Riverfront MetroRail station and the historic Eads Bridge, which connects St. Louis with East St. Louis, IL, over the Mississippi River. The Eads Bridge is a 2-level structure carrying two sets of tracks for the MetroRail light-rail transit system on its lower level and a 4-lane highway on the upper level. STV designed a new asymmetrical diamond cross-over interlocking within the East Arcade located east of the bridge. To construct the new interlocking, approximately 206 feet of the roadway deck and superstructure was removed. The firm designed the new interlocking on a tight schedule and within a restricted area, making the design work challenging. The interlocking is 185 feet long and the cross-over is confined within an 18-foot-wide area. Mr. Bryant performed track calculations and geometry to develop multiple track alignment options. The plans were then presented to the client, which chose an option most suitable to its needs. Mr. Bryant prepared track and civil design plans using AutoCAD. He also coordinated with other project disciplines to develop conduit plans for multiple systems including electrical, communications, overhead catenary

systems, and signals, all of which are located within the restricted area. (11/09 - 6/10)

NS PennDOT SR 0028 Improvement - Track Engineer
Facilitated track design to address Norfolk Southern Railway (NS) capacity issues during the Pennsylvania Department of Transportation (PennDOT) improvement of SR 0028 in Pittsburgh. To allow for single-tracking during roadway improvements, NS Control Point (CP) Herr will be eliminated. For NS to have capacity for this interlocking removal and single-tracking, STV relocated two approaching interlockings: one at CP Etna, and one at CP Sharp. Mr. Bryant designed track geometry, plan and profile for relocation of the interlockings as well as extension of the westward main track No. 2 and controlled siding. The total project will increase block capacity by 2,700 feet. (8/08 - 5/09)

KCS Meridian Connection - Rail Engineer
Performed design for the rail alignment and related earthwork as part of the construction of a 4-mile realignment and connection of Norfolk Southern Railway (NS) and the Kansas City Southern (KCS) railway on the Meridian Speedway in Meridian, MS, as part of an on-call contract. The project required extensive coordination between the KCS and NS, resulting in an operational staging plan suitable for both parties. (10/08 - 7/09)

NS Lakeside Dam Rehabilitation - Rail Engineer
Responsible for the design of the rail alignment and related earthwork as part of the proposed construction of a 1.5-mile realignment of Norfolk Southern Railway (NS) in Macon, GA. The proposed alignment was partially over a 60-foot-high earthen dam. The project, which required coordination among many stakeholders, was a complex intersection of the railroad, a major state route, and the dam. (8/08 - 12/08)

BRIDGES

CSX Manville Bridge Reconstruction - Track Engineer
Prepared track designs to address construction staging for CSX's reconstruction of a railroad bridge over a waterway in Manville, NJ. The new structure increases CSX's capacity from one track to two tracks in the Reading subdivision. Mr. Bryant designed track geometry, plan and profiles, and temporary shoofly alignments for the staging plans and final rail alignment. (7/09 - 8/09)

CDOT Montrose Harbor Bridges and Underpasses - Project Engineer
Provided engineering services for the reconstruction of four concrete arch bridges originally built in the 1930s in Chicago's Montrose Harbor Park. STV evaluated rehabilitation and reconstruction alternatives for each of the structures. Because the bridges are located in a historic park setting, STV coordinated with the project architect to develop a structural system that maintained the existing architectural features while meeting current highway

bridge standards. Mr. Bryant designed maintenance of traffic plans, which included assessing current traffic volume and developing a plan would have minimal impact to commuters during construction. He also assisted with the drainage design plans for the Chicago Department of Transportation (CDOT) project. (4/08 - 1/09)

HIGHWAYS/ROADWAYS

Kane County DOT Fabyan Parkway at Van Nortwick Avenue Phase II Intersection Improvements - QA/QC
Performed QA/QC for STV's Phase II engineering services for the Fabyan Parkway and Van Nortwick Avenue intersection in Batavia, IL, for the Kane County Department of Transportation (DOT). The scope of work included road widening and the addition of a left-turn lane, as well as data collection, geotechnical services, and drainage design. The firm also extended lateral pipes in the widened area, replacing inlets along curb lines and a culvert to correct a drainage problem. STV prepared construction documents in accordance with the IDOT Bureau of Local Roads manual and Kane County design standards. Mr. Bryant performed QA/QC of the final Phase II engineering plans STV submitted. (6/09 - 2/10)

IDOT US 150 Phase I Study - Civil Engineer
Provided civil design for Phase I engineering for the preparation of a Categorical Exclusion Group II report for the widening of US 150 in Tazewell County, IL, to three lanes. Mr. Bryant was responsible for roadway design, including grading, geometric alignments, and easements. (7/08 - 8/08)

Kendall County Highway Department/Sharp Homes Hunter's Ridge Road Widening - Project Engineer
Designed roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems, for the widening of a 2-lane rural road to a 4-lane arterial with multiple intersections to support new residential developments in Joliet, IL. The project included widening a 1.5-mile stretch of roadway to accommodate the 130-acre Hunter's Ridge and 90-acre Jones Road subdivisions developed by Sharp Homes. Mr. Bryant was also responsible for developing site plans for the subdivision projects. (5/05 - 3/06)

Kendall County Highway Department/Lakewood Homes Ridge Road Widening - Project Engineer
Supervised the design of roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems, for 2 miles of a major 4-lane arterial in Joliet, IL. Mr. Bryant was also responsible for developing roadway improvements funded by Lakewood Homes. All plans were submitted to the Kendall County Highway Department for review. (10/04 - 3/05)

ISTHA I-294 Reconstruction - Project Engineer
Managed the design of roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems, for the reconstruction of 6 miles of I-294 in Illinois. Mr. Bryant was also responsible for developing special provisions and preparing project cost estimates for this Illinois State Toll Highway Authority (ISTHA) project. (6/03 - 4/05)

CDOT Racine Avenue Improvements - Project Engineer
Facilitated the design of roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems associated with the improvement of a 0.8-mile segment of Racine Avenue in Chicago. Mr. Bryant was also responsible for developing special provisions and preparing project cost estimates for this Chicago Department of Transportation (CDOT) project. (7/03 - 1/04)

CDOT 37th Street Improvements - Project Engineer
Developed roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems for improvements, to a 0.5-mile stretch of 37th Street in Chicago. Mr. Bryant also developed special provisions and prepared project cost estimates for the Chicago Department of Transportation (CDOT) project. (7/03 - 1/04)

IDOT Higgins Road Rehabilitation - Project Engineer
Responsible for the design of roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems, for the rehabilitation of 4 miles of Higgins Road in Schaumburg, IL. Mr. Bryant was also responsible for developing special provisions and preparing project cost estimates. (12/00 - 1/03)

IDOT Golf Road Rehabilitation - Project Engineer
Designed roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems, for the rehabilitation of 4 miles of Golf Road in Schaumburg, IL. Mr. Bryant also developed special provisions and prepared project cost estimates. (10/00 - 1/03)

DuPage County Highway Department Road Improvement Projects - Construction Engineer
Inspected the resurfacing and repair of numerous county roads in DuPage County, IL, including Bloomingdale Road, Gary Avenue, Glen Ellyn Road, Naperville Road, 75th Street, and 63rd Street. Mr. Bryant also provided QA/QC of contractors' work on these road construction projects. (4/95 - 9/99)

ISTHA I-90 Improvements - Project Engineer
Responsible for the design of roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems, for improvements to I-90 in Illinois. Mr. Bryant was also responsible for developing special provisions

and preparing project cost estimates for this Illinois State Toll Highway Authority (ISTHA) project. (11/97 - 4/98)

Cook County Highway Department Ashland Avenue - Construction Engineer
Inspected the construction of 1.5 miles of Ashland Avenue in Chicago. Mr. Bryant also provided QA/QC of contractors' work on the highway and bridge construction. (4/97 - 11/97)

ISTHA Randall Road/I-90 Interchange - Project Engineer
Designed roadway plans, including profiles, horizontal alignments, cross-sections, and drainage systems, for the Randall Road/I-90 interchange in Elgin, IL. Mr. Bryant was also responsible for developing special provisions and preparing cost estimates for the Illinois State Toll Highway Authority (ISTHA). (10/96 - 4/97)

Cook County Highway Department Lehigh Avenue - Construction Engineer
Responsible for the construction of 1.5 miles of Lehigh Avenue in Morton Grove, IL. Mr. Bryant provided QA/QC of the contractors' work. (3/96 - 12/96)

IDOT Route 59 - Project Engineer
Prepared roadway plans, including profiles, horizontal alignments, cross sections, and drainage systems, as part of the design of 5 miles of Route 59 in Naperville, IL. Mr. Bryant was also responsible for developing special provisions and preparing cost estimates. (9/94 - 4/95)

ISTHA I-294 Improvements - Construction Engineer
Responsible for construction inspection during the repair and resurfacing of 6 miles of I-294 in Rosemont, IL. Mr. Bryant provided QA/QC of contractors' work on this Illinois State Toll Highway Authority (ISTHA) project. (4/94 - 9/94)

SITE PLANNING

Sharp Homes Commercial Development Projects - Project Engineer
Developed site plans for various commercial development projects in Joliet, IL. Mr. Bryant oversaw spur track design, road design, grading design, geometric alignments, storm water management design, easement coordination, and utility design and coordination for the new Sharp Industrial Park, three commercial lots, and a railroad distribution center at the Mound Road Commercial Park. (5/05 - 5/08)

O&S Holdings Bridge Street Mall - Project Engineer
Responsible for site plans for a 320-acre mall development project in Joliet, IL. The proposed mall would contain numerous stores, restaurants, and medical and professional offices. Mr. Bryant was responsible for parking lot,

road, and grading design; geometric alignments; easement coordination; storm water management system design; and utility design and coordination. (10/07 - 4/08)

Taking Care of Business Inc. Crete Marketplace - Project Engineer
Developed site plans for a 100-acre commercial development project in Crete, IL. This commercial development contains two major department stores, a fast-food restaurant, two gas stations, and 12 other useable lots. Mr. Bryant was responsible for parking lot, road, and grading designs; geometric alignments; easement coordination; storm water management design; and utility design and coordination. (3/07 - 4/08)

IDI Rock Run Industrial Park - Project Engineer
Provided road and grading designs, geometric alignments, easement coordination, and utility design and coordination for this 60-acre development in Joliet, IL. (4/07 - 9/07)

Chovan Commercial Subdivision - Project Engineer
Developed site plans for a 20-acre commercial development project in Joliet, IL, consisting of medical and professional offices. Mr. Bryant was responsible for parking lot, road, and grading design; geometric alignments; easement coordination; storm water management design; and utility design and coordination. (2/06 - 9/07)

KB Homes Streams of Plainfield Residential Subdivision - Project Engineer
Provided road design, grading design, geometric alignments, easement coordination, and utility design and coordination for this 80-acre residential subdivision in Plainfield, IL. (6/06 - 4/07)

Gallagher and Henry Parker Road Residential Subdivision - Project Engineer
Responsible for road and grading designs, geometric alignments, easement coordination, and utility design and coordination for this 120-acre residential subdivision in Homer Glen, IL. (2/06 - 1/07)

Sharp Homes Horton Farms Residential Subdivision - Project Engineer
Provided road and grading design, geometric alignments, easement coordination, storm water management, and utility design and coordination for this 80-acre residential subdivision in Joliet, IL. (1/06 - 8/06)

TRANSPORTATION FACILITIES

UP CREATE B-2 Project - Project Engineer
Delivering site design engineering services for the reconstruction of the Metra's Union Pacific West Line's passenger stations in Berkeley and Bellwood, IL, as part of the Chicago Region Environmental and Transportation Efficiency (CREATE) program. STV is providing

engineering and architectural design services to modify the stations to accommodate a third mainline track being constructed by Union Pacific Railroad (UP). The station upgrades consist of new center platforms, warming shelters, and pedestrian underpasses with retaining walls. Mr. Bryant is providing site design, including grading, drainage, signage, and construction staging. The project is currently in the construction phase, and Mr. Bryant is providing construction support services. (3/11 - Present)

City of Joliet Regional Multimodal Transportation Center - Track Engineer

Provided railroad coordination and designs for infrastructure improvements as part of the development of a multimodal transportation center in Joliet, IL. Several modes of transportation were relocated into a central facility that connects to the historic Joliet Union Station. This venture could eventually be a stop on the future high-speed passenger rail line, linking Chicago with St. Louis. The transportation center is located within the Joliet UD Interlocking, which includes Union Pacific, Burlington Northern Santa Fe, Amtrak, and the Metra Rock Island District and Heritage Corridor rail lines. Mr. Bryant developed designs for the infrastructure improvements related to track realignments, platform configurations, interlocking modifications, bridge rehabilitations, and construction staging. (9/09 - 6/11)

KAUSTUV CHAKRABARTI

Mr. Chakrabarti is a Senior Director of Economic Consulting in the Network Industries Strategies ("NIS") Group of FTI Consulting, Inc., an economic and consulting firm with offices located at 1101 K Street, NW, Washington, DC 20005. Mr. Chakrabarti is sponsoring portions of Section III-D of NS's Reply Evidence. Mr. Chakrabarti has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Chakrabarti holds a Bachelor of Science degree in chemistry and economics from the College of William and Mary. He also has a Master of Arts in applied economics from Johns Hopkins University.

Mr. Chakrabarti has provided economic and financial analysis to the transportation, telecommunications, and energy industries. He has worked on transportation industry analysis to estimate and forecast operating expenses, investment costs, and variable costs. He has applied the Board's URCS regulatory costing model in SAC, Simplified SAC and Three-Benchmark rate cases.

Mr. Chakrabarti's curriculum vitae is attached.

VERIFICATION

I, Kaustuv Chakrabarti, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.



Kaustuv Chakrabarti

Executed on this 1 day of January, 2013.

Kaustuv Chakrabarti

Senior Director – Economic Consulting

Kaustuv.Chakrabarti@fticonsulting.com

FTI Consulting
1101 K Street, NW
Suite B100
Washington, DC 20005
Tel: (202) 312-9100
Fax: (202) 312-9101

Education

Master of Arts in Applied Economics from the Johns Hopkins University

Bachelor of Science in Chemistry and Economics from the College of William and Mary

Kaustuv Chakrabarti is a Senior Director at FTI Consulting in the Network Industries Strategies group within the Economic Consulting practice in the Washington, DC office. Mr. Chakrabarti conducts economic and financial analysis for primarily the transportation, telecommunications, and energy industries. He holds an M.A. in Applied Economics from the Johns Hopkins University and a Bachelor of Science, majoring in Chemistry and Economics, from the College of William and Mary, and is a CFA (Chartered Financial Analyst) charterholder.

Background

Mr. Chakrabarti has developed analyses in the transportation industry to estimate and forecast operating expenses, investment costs, variable costs, and other income-related elements. He has constructed and utilized databases to analyze operational data and in support of strategic decision-making. He has applied the STB's URCS regulatory costing model and the above analyses in rate cases brought before the STB under the Full SAC, Simplified SAC, and Three-Benchmark standards. He has also conducted valuations of firms or business segments outside of the transportation industry. For these valuations, he analyzed financial statements and other income data to develop various discount cash flow models.

Mr. Chakrabarti has conducted numerous business case analyses for the federal government in voice telephony, information technology, and building construction. In these efforts, he worked with clients to design potential investment solutions; compare the costs, benefits, and risks of each; and identify the optimal solution.

XINGANG CLARK CHENG

Mr. Cheng is the Director of Operations Research at Norfolk Southern Corporation, the parent of Norfolk Southern Railway Company ("NS"), located at 1200 Peachtree Street, Northeast, Atlanta, Georgia 30309. Mr. Cheng has been with NS for seventeen years. He is sponsoring portions of Section III-C of NS's Reply Evidence. Mr. Cheng has signed a verification of the truth of the statements contained therein. A copy of the verification is attached hereto.

Mr. Cheng joined NS in 1995. He became an Industrial Engineer in 1999, Manager of Operations Research in 2001 and Director of Operations Research in 2010. As Director, Mr. Cheng leads the Operations Research group in developing planning tools for locomotive fleet sizing, railcar routing and scheduling, network optimization, railcar fleet planning, yard simulation, crew planning, train scheduling, car distribution and demand forecasting.

Mr. Cheng is a member of the Institute for Operations Research and Management Sciences ("INFORMS"), where he has chaired the Rail Applications Section. He earned a Ph.D. of electrical engineering from the Chinese Academy of Sciences in Beijing and a Ph.D. of industrial engineering from Clemson University in South Carolina.

Mr. Cheng's complete curriculum vitae is attached.

VERIFICATION

I, Xingang Clark Cheng, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Xingang Clark Cheng

Executed on this 10 day of December, 2012.

XINGANG (CLARK) CHENG, PH.D.

5550 Tenbury Way
Johns Creek, GA 30022

Phone: (404) 897-3022
Email: clark.cheng@nscorp.com

Summary

- Managing a group of 40+ highly skilled professionals in operations research (OR) and information technology (IT), including 16 Ph.D.s
- Developed a suite of planning tools for network optimization, train service design, locomotive and railcar fleet planning, crew planning, terminal capacity planning, and demand forecasting
- Providing consulting services and technical support to various departments in dozens of studies and projects
- Built arguably the most innovative and productive OR group in the industry. Most of the tools we developed are far ahead of other railroads
- Strong background in optimization models, computer algorithms, simulation, statistical analysis, programming, and software development
- Proven track record in building full life cycle software products starting from requirements, design, construction to implementation, maintenance and user support
- Published a dozen of academic research papers on peer-reviewed journals and conference proceedings. Presented dozens of times at academic and professional conferences
- Hold two Ph.D. degrees in engineering. Went to college at the age of 15

Professional Experience

1995 - Date, Norfolk Southern Corporation, Atlanta, Georgia

Position History: Director Operations Research, 2010-date; Senior Manager Operations Research, 2004 – 2010; Manager Operations Research, 2001 – 2004; Senior OR Specialist, 1999 – 2001; Industrial Engineer, 1999; Associate Designer, 1996 – 1999; Contract Programmer, 1995

Major Accomplishments at Norfolk Southern

- Leading the OR group in the development of a suite of planning tools for locomotive fleet sizing, railcar routing & scheduling, network optimization, car fleet planning, yard simulation, crew planning, train scheduling, car distribution, and demand forecasting. These tools include:
    - Locomotive Assignment and Routing System (LARS), a locomotive fleet sizing model. It estimates the right fleet sizes in order to meet the forecasted demands. It has been used to support locomotive acquisition decisions.
    - ABC Next Generation: a new railcar routing & scheduling algorithm. It finds the best routes to minimize travel distance, transit time, and intermediate handling.
    - Optimal Blocking Model (OBM): a tool for generating an optimal blocking plan. It can also be used in network optimization to identify the most efficient rail network.
    - Optimal Train Model (OTM), a tool for designing train service plan. It generates an optimal train plan to minimize terminal dwell times and train starts.
    - Strategic Fleet Planning Model (SFPM), a tool for railcar fleet planning. The tool recommends the optimal car supply plan and supports railcar acquisition decisions.
    - Crew Planning Model, a tool for planning crew requirements. It evaluates the impact on crew cost and train delay of the changes in crew call rule and train service plan.
    - Terminal Simulator, a 3-D railroad hump yard simulator and animator. It identifies bottlenecks in a hump yard and evaluates various options to improve yard operations.
    - Empty Car Distribution (CDM), a tool for empty car distribution. It recommends the best strategies for empty car distribution in order to improve equipment utilization.
    - Corporate Traffic Forecast (Delphi), a centralized demand forecast system. The built-in statistical models provide Marketing with the initial volume growth projections.

Major Accomplishments at Norfolk Southern (cont.)

- Created Operating Plan Developer (OPD), an operational planning and network optimization system used to generate new operating plans based on traffic demand and rail network. It has the what-if capability which allows a planner to compare potential plans with prior plans, generate alternative operating scenarios, and quantify the impact of operating plan changes on customer service and operating costs prior to implementation. Originally, when NS rolled out its Thoroughbred Operating Plan (TOP) in 2001, it took almost 19,000 man hours to work through various operating scenarios prior to installation. Today, it takes less than 80 man hours to accomplish these tasks. OPD has enabled NS to analyze and respond quickly to ever changing business conditions and provides NS the competitive advantage over other Class I railroads.
- Developed a detailed discrete-event simulation model with 3-D animation for the automotive mixing center in Chicago where finished vehicles were unloaded, re-shuffled and reloaded for destination. The model had been used to determine the proper yard layout, operating strategies, yard throughput, track capacity, resource utilization, and train schedules.
- Built the NS/Conrail combined rail network prior to the Conrail acquisition in 1999, together with the assistance from the ALK Associates. The combined rail network included the NS network at the time and the NS-portion of Conrail and laid the foundation for developing the blocking plan and train service plan to operate the merged NS/Conrail railroad.

1993 - 1995, Clemson University, Clemson, South Carolina.
Research Assistant, Teaching Assistant, and Lab Assistant, Department of Industrial Engineering

- Developed new stochastic dynamic programming algorithms with applications in project scheduling and production planning for flexible manufacturing systems (FMS)
- Assisted professors in teaching statistics and quality improvement methods, and prepared lab instructions on computer numerical control (CNC), robotics, and computer-aid manufacturing

Education

- Ph.D. in Industrial Engineering, Clemson University, Clemson, South Carolina, 1999
- Ph.D. in Electrical Engineering (Automation), Chinese Academy of Sciences, Beijing, 1989

Computer Skills

- Programming Languages: C/C++, Visual Basic, Perl, SQL, HTML/XML, Java, FORTRAN
- Operating Systems: UNIX, Linux, MS Windows, VMS
- Optimization and Simulation: CPLEX, OPL Studio, ARENA, Automod
- DBMS and Other Software: DB2, Sybase, MS Access, Minitab, SAS, MS Office

Achievements

- 1989 Chinese Academy of Sciences President Award, Chinese Science News, October 31, 1989
- Norfolk Southern Quality Award in 2005 for the successful development of OPD
- Published a dozen of research papers on peer-reviewed journals and conference proceedings; and made dozens of presentations in academic and industry conferences

Professional Activities

- Member of Alpha Pi Mu (Industrial Engineering Honor Society)
- Member of Institute of Industrial Engineers (IIE)
- Member of Institute for Operations Research and the Management Sciences (INFORMS)
- Past Chair, Treasurer and Secretary of the Rail Applications Section of INFORMS
- Track Chairs, Winter Simulation Conference (WSC 2011), Joint Rail Conference (JRC 2012)

BENTON V. FISHER

Mr. Fisher is Senior Managing Director in the Network Industries Strategies ("NIS") Group of FTI Consulting, specializing in the economic analysis of network industries, including railroad transportation. His business address is 1101 K Street, Suite B100, Washington, DC 20005. Mr. Fisher is sponsoring portions of Sections II-A, III-C, and III-D of Norfolk Southern's ("NS's") Reply Evidence. Mr. Fisher has signed a verification of the truth of the statements contained therein. A copy of the verification is attached hereto.

Mr. Fisher is a graduate of Princeton University where he obtained a Bachelor of Science degree of Engineering from the Civil Engineering and Operations Research department. He graduated with a concentration in Information and Decision Sciences, and also received a certificate for completing the requirements for the Engineering and Management Systems program. After graduating, Mr. Fisher served as the Deputy Controller for the U.S. Senate re-election campaign for Bill Bradley, and since April 1991 has been employed by FTI Consulting and Klick, Kent & Allen, an economic consulting firm that FTI Consulting acquired in 1998.

Much of the NIS group's work focuses on the economic and financial analysis of network industries, in particular different aspects of transportation. Mr. Fisher has spent more than 19 years involved in the analysis of rates, costs, and service, and the factors that affect them. In the rail industry, he has worked extensively to develop expert testimony before the Surface Transportation Board examining the reasonableness of railroad rates, railroads' applications for mergers and acquisitions, and rulemakings regarding the establishment, evaluation, revision, and implementation of rules and regulations. He has managed the development of expert testimony covering a variety of topics in numerous contract disputes in Federal court or Arbitration, requiring the analysis of economic and operating issues and response to service performance or other claims.

Much of Mr. Fisher's work for the railroad industry has required a detailed understanding of the regulations under which railroads operate, the rules by which rates are evaluated, and the costing approaches and models that are used. He has testified numerous times regarding stand-alone costs and URCS costs (Uniform Railroad Costing System, the STB's general purpose costing system) for individual movements, traffic groups, and entire networks. He has extensive experience with these costing approaches, including the detailed inputs and their sources, and the costing methodologies and formulae.

In addition to the rail industry, Mr. Fisher has been engaged with similar issues and disputes regarding the economic and financial analysis of telecommunications, postal, and energy matters. In those matters, as with rail, he has worked closely with detailed price, cost, and operational data and reviewed cost models and analyzed the sensitivity of multiple economic components, in evaluating rates, costs, and service in a variety of different contexts.

Mr. Fisher's complete curriculum vitae is attached.

VERIFICATION

I, Benton V. Fisher, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Benton V. Fisher

Executed on this 4 day of January, 2013.

Benton V. Fisher

Senior Managing Director – Economic Consulting

benton.fisher@fticonsulting.com

FTI Consulting
1101 K Street, NW
Suite 8100
Washington, DC 20005
Tel: (202) 312-9100
Fax: (202) 312-9101

Education
B.S. in Engineering and Management Systems, Princeton University

Benton V. Fisher is a Senior Managing Director of FTI's Economic Consulting group, located in Washington, D.C. Mr. Fisher has more than 20 years of experience in providing financial, economic and analytical consulting services to corporate clients dealing with transportation, telecommunications, and postal subjects.

North America's largest railroads have retained FTI both to assist them in making strategic and tactical decisions and to provide expert testimony in litigation. FTI's ability to present a thorough understanding of myriad competitive and regulatory factors has given its clients the necessary tools to implement and advance their business. Mr. Fisher has worked extensively to develop these clients' applications for mergers and acquisitions and expert testimony justifying the reasonableness of their rates before the Surface Transportation Board. In addition to analyzing extensive financial and operating data, Mr. Fisher has worked closely with people within many departments at the railroad as well as outside counsel to ensure that the railroads' presentations are accurate and defensible. Additionally, Mr. Fisher reviews the expert testimony of the railroads' opponents in these proceedings, and advises counsel on the necessary course of action to respond.

AT&T and MCI retained FTI to advance its efforts to implement the Telecommunications Act of 1996 in local exchange markets. Mr. Fisher was primarily responsible for reviewing the incumbent local exchange carriers' (ILEC) cost studies, which significantly impacted the ability of FTI's clients to access local markets. Mr. Fisher analyzed the sensitivity of multiple economic components and incorporated this information into various models being relied upon by the parties and regulators to determine the pricing of services. Mr. Fisher was also responsible for preparing testimony that critiqued alternative presentations.

Mr. Fisher assisted in reviewing the U.S. Postal Service's evidence and preparing expert testimony on behalf of interveners in Postal Rate and Fee Changes cases. He has also been retained by a large international consulting firm to provide statistical and econometric support in their preparation of a long-range implementation plan for improving telecommunications infrastructure in a European country.

Mr. Fisher has sponsored expert testimony in rate reasonableness proceedings before the Surface Transportation Board and in contract disputes in Federal Court and arbitration proceedings.

Mr. Fisher holds a B.S. in Engineering and Management Systems from Princeton University.

TESTIMONY

Surface Transportation Board

January 15, 1999	Docket No. 42022 FMC Corporation and FMC Wyoming Corporation v. Union Pacific Railroad Company, Opening Verified Statement of Christopher D. Kent and Benton V. Fisher
March 31, 1999	Docket No. 42022 FMC Corporation and FMC Wyoming Corporation v. Union Pacific Railroad Company, Reply Verified Statement of Christopher D. Kent and Benton V. Fisher
April 30, 1999	Docket No. 42022 FMC Corporation and FMC Wyoming Corporation v. Union Pacific Railroad Company, Rebuttal Verified Statement of Christopher D. Kent and Benton V. Fisher
July 15, 1999	Docket No. 42038 Minnesota Power, Inc. v. Duluth, Missabe and Iron Range Railway Company, Opening Verified Statement of Christopher D. Kent and Benton V. Fisher
August 30, 1999	Docket No. 42038 Minnesota Power, Inc. v. Duluth, Missabe and Iron Range Railway Company, Reply Verified Statement of Christopher D. Kent and Benton V. Fisher
September 28, 1999	Docket No. 42038 Minnesota Power, Inc. v. Duluth, Missabe and Iron Range Railway Company, Rebuttal Verified Statement of Christopher D. Kent and Benton V. Fisher
June 15, 2000	Docket No. 42051 Wisconsin Power and Light Company v. Union Pacific Railroad Company, Opening Verified Statement of Christopher D. Kent and Benton V. Fisher
August 14, 2000	Docket No. 42051 Wisconsin Power and Light Company v. Union Pacific Railroad Company, Reply Verified Statement of Christopher D. Kent and Benton V. Fisher
September 28, 2000	Docket No. 42051 Wisconsin Power and Light Company v. Union Pacific Railroad Company, Rebuttal Verified Statement of Christopher D. Kent and Benton V. Fisher
December 14, 2000	Docket No. 42054 PPL Montana, LLC v. The Burlington Northern Santa Fe Railway Company, Opening Verified Statement of Christopher D. Kent and Benton V. Fisher
March 13, 2001	Docket No. 42054 PPL Montana, LLC v. The Burlington Northern Santa Fe Railway Company, Reply Verified Statement of Christopher D. Kent and Benton V. Fisher
May 7, 2001	Docket No. 42054 PPL Montana, LLC v. The Burlington Northern Santa Fe Railway Company, Rebuttal Verified Statement of Christopher D. Kent and Benton V. Fisher

October 15, 2001	Docket No. 42056 Texas Municipal Power Agency v. The Burlington Northern Santa Fe Railway Company, Opening Verified Statement of Benton V. Fisher
January 15, 2002	Docket No. 42056 Texas Municipal Power Agency v. The Burlington Northern Santa Fe Railway Company, Reply Verified Statement of Benton V. Fisher
February 25, 2002	Docket No. 42056 Texas Municipal Power Agency v. The Burlington Northern Santa Fe Railway Company, Rebuttal Verified Statement of Benton V. Fisher
May 24, 2002	Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company, Opening Evidence and Argument of Norfolk Southern Railway Company
June 10, 2002	Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Opening Evidence and Argument of Norfolk Southern Railway Company
July 19, 2002	Northern States Power Company Minnesota v. Union Pacific Railroad Company, Union Pacific's Opening Evidence
September 30, 2002	Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company, Reply Evidence and Argument of Norfolk Southern Railway Company
October 4, 2002	Northern States Power Company Minnesota v. Union Pacific Railroad Company, Union Pacific's Reply Evidence
October 11, 2002	Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Reply Evidence and Argument of Norfolk Southern Railway Company
November 1, 2002	Northern States Power Company Minnesota v. Union Pacific Railroad Company, Union Pacific's Rebuttal Evidence
November 19, 2002	Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company, Rebuttal Evidence and Argument of Norfolk Southern Railway Company
November 27, 2002	Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Rebuttal Evidence and Argument of Norfolk Southern Railway Company
January 10, 2003	Docket No. 42057 Public Service Company of Colorado D/B/A Xcel Energy v. The Burlington Northern and Santa Fe Railway Company, Opening Evidence and Argument of The Burlington Northern and Santa Fe Railway Company
February 7, 2003	Docket No. 42058 Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad, Opening Evidence of The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad

April 4, 2003	Docket No. 42057 Public Service Company of Colorado D/B/A Xcel Energy v. The Burlington Northern and Santa Fe Railway Company, Reply Evidence and Argument of The Burlington Northern and Santa Fe Railway Company
May 19, 2003	Docket No. 42057 Public Service Company of Colorado D/B/A Xcel Energy v. The Burlington Northern and Santa Fe Railway Company, Rebuttal Evidence and Argument of The Burlington Northern and Santa Fe Railway Company
May 27, 2003	Docket No. 42058 Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad, Joint Variable Cost Reply Evidence of The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad
May 27, 2003	Docket No. 42058 Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
June 13, 2003	Docket No. 42071 Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Opening Evidence of The Burlington Northern and Santa Fe Railway Company
July 3, 2003	Docket No. 42058 Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad, Joint Variable Cost Rebuttal Evidence of The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad
October 8, 2003	Docket No. 42071 Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
October 24, 2003	Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company Supplemental Evidence of Norfolk Southern Railway Company
October 31, 2003	STB Docket No. 42069 Duke Energy Corporation v. Norfolk Southern Railway Company, Reply of Norfolk Southern Railway Company to Duke Energy Company's Supplemental Evidence
November 24, 2003	STB Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Supplemental Evidence of Norfolk Southern Railway Company
December 2, 2003	STB Docket No. 42072 Carolina Power & Light Company v. Norfolk Southern Railway Company, Reply of Norfolk Southern Railway Company to Carolina Power & Light Company's Supplemental Evidence
January 26, 2004	STB Docket No. 42058 Arizona Electric Power Cooperative, Inc. v. The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company, Joint Supplemental Reply Evidence and Argument of The Burlington Northern and Santa Fe Railway Company and Union Pacific Railroad Company

March 1, 2004	STB Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. The Burlington Northern and Santa Fe Railway Company, Opening Evidence and Argument of The Burlington Northern and Santa Fe Railway Company
March 22, 2004	STB Docket No. 42071 Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Supplemental Reply Evidence of The Burlington Northern and Santa Fe Railway Company
April 29, 2004	STB Docket No. 42071 Otter Tail Power Company v. The Burlington Northern and Santa Fe Railway Company, Rebuttal Evidence of The Burlington Northern and Santa Fe Railway Company
May 24, 2004	STB Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. The Burlington Northern and Santa Fe Railway Company, Reply Evidence of The Burlington Northern and Santa Fe Railway Company
March 1, 2005	Docket No. 42071 Otter Tail Power Company v. BNSF Railway Company, Supplemental Evidence of BNSF Railway Company
April 4, 2005	Docket No. 42071 Otter Tail Power Company v BNSF Railway Company, Reply of BNSF Railway Company to Supplemental Evidence
April 19, 2005	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Opening Evidence of BNSF Railway Company
July 20, 2005	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Reply Evidence of BNSF Railway Company
July 27, 2004	STB Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. The Burlington Northern and Santa Fe Railway Company, Rebuttal Evidence of The Burlington Northern and Santa Fe Railway Company
September 30, 2005	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Rebuttal Evidence of BNSF Railway Company
October 20, 2005	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Surrebuttal Evidence of BNSF Railway Company
June 15, 2006	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Reply Supplemental Evidence of BNSF Railway Company
June 15, 2006	Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. BNSF Railway Company, Reply Supplemental Evidence of BNSF Railway Company
March 19, 2007	Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. BNSF Railway Company, Reply Third Supplemental Evidence of BNSF Railway Company

March 26, 2007	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Reply Second Supplemental Evidence of BNSF Railway Company
July 30, 2007	Docket No. 42095 Kansas City Power & Light v. Union Pacific Railroad Company, Union Pacific's Opening Evidence
August 20, 2007	Docket No. 42095 Kansas City Power & Light v. Union Pacific Railroad Company, Union Pacific's Reply Evidence
February 4, 2008	Docket No. 42099 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Opening Evidence of CSXT
February 4, 2008	Docket No. 42100 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Opening Evidence of CSXT
February 4, 2008	Docket No. 42101 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Opening Evidence of CSXT
March 5, 2008	Docket No. 42099 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Reply Evidence of CSXT
March 5, 2008	Docket No. 42100 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Reply Evidence of CSXT
March 5, 2008	Docket No. 42101 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Reply Evidence of CSXT
April 4, 2008	Docket No. 42099 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Rebuttal Evidence of CSXT
April 4, 2008	Docket No. 42100 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Rebuttal Evidence of CSXT
April 4, 2008	Docket No. 42101 E.I. DuPont De Nemours and Company v. CSX Transportation, Inc., Rebuttal Evidence of CSXT
July 14, 2008	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Third Supplemental Reply Evidence of BNSF Railway Company
August 8, 2008	Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. BNSF Railway Company, Fourth Supplemental Evidence of BNSF Railway Company
September 5, 2008	Docket No. 41191 (Sub-No. 1) AEP Texas North Company v. BNSF Railway Company, Fourth Supplemental Reply Evidence of BNSF Railway Company
October 17, 2008	Docket No. 42110 Seminole Electric Cooperative, Inc. v. CSX Transportation, Inc., CSX Transportation, Inc.'s Reply to Petition for Injunctive Relief, Verified Statement of Benton V. Fisher
August 24, 2009	Docket No. 42114 US Magnesium, L.L.C. v. Union Pacific Railroad Company, Opening Evidence of Union Pacific Railroad Company

September 22, 2009	Docket No. 42114 US Magnesium, L.L.C. v. Union Pacific Railroad Company, Reply Evidence of Union Pacific Railroad Company
October 22, 2009	Docket No. 42114 US Magnesium, L.L.C. v. Union Pacific Railroad Company, Rebuttal Evidence of Union Pacific Railroad Company
January 19, 2010	Docket No. 42110 Seminole Electric Cooperative, Inc. v. CSX Transportation, Inc., Reply Evidence of CSX Transportation, Inc.
May 7, 2010	Docket No. 42113 Arizona Electric Power Cooperative, Inc. v. BNSF Railway Company and Union Pacific Railroad Company, Joint Reply Evidence of BNSF Railway Company and Union Pacific Railroad Company
October 1, 2010	Docket No. 42121 Total Petrochemicals USA, Inc. v. CSX Transportation, Inc., Motion for Expedited Determination of Jurisdiction Over Challenged Rates, Verified Statement of Benton V. Fisher
November 22, 2010	Docket No. 42088 Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. v. BNSF Railway Company, Comments of BNSF Railway Company on Remand, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher
January 6, 2011	Docket No. 42056 Texas Municipal Power Agency v. BNSF Railway Company, BNSF Reply to TMPA Petition for Enforcement of Decision, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher
July 5, 2011	Docket No. 42123 M&G Polymers USA, LLC v. CSX Transportation, Inc., Reply Market Dominance Evidence of CSX Transportation, Inc.
August 1, 2011	Docket No. 42125 E.I. DuPont De Nemours and Company v. Norfolk Southern Railway Company, Norfolk Southern Railway's Reply to Second Motion to Compel, Joint Verified Statement of Benton V. Fisher and Michael Matelis
August 5, 2011	Docket No. 42121 Total Petrochemicals USA, Inc. v. CSX Transportation, Inc. , Reply Market Dominance Evidence of CSX Transportation, Inc.
August 15, 2011	Docket No. 42124 State of Montana v. BNSF Railway Company, BNSF Railway Company's Reply Evidence and Argument, Verified Statement of Benton V. Fisher
October 24, 2011	Docket No. 42120 Cargill, Inc. v. BNSF Railway Company, BNSF Railway Company's Reply Evidence and Argument, Verified Statement of Benton V. Fisher
October 28, 2011	Docket No. FD 35506 Western Coal Traffic League - Petition for Declaratory Order, Opening Evidence of BNSF Railway Company, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher
November 10, 2011	Docket No. 42127 Intermountain Power Agency v. Union Pacific Railroad Company, Reply Evidence of Union Pacific Railroad Company
November 28, 2011	Docket No. FD 35506 Western Coal Traffic League - Petition for Declaratory Order, Reply Evidence of BNSF Railway Company, Joint Reply Verified Statement of Michael R. Baranowski and Benton V. Fisher

December 14, 2011	Docket No. 42132 Canexus Chemicals Canada L.P. v. BNSF Railway Company, BNSF Motion to Permit Consideration of 2011 TIH Movements from BNSF Traffic Data in Selecting Comparison Group, Verified Statement of Benton V. Fisher
February 13, 2012	Docket No. 42132 Canexus Chemicals Canada L.P. v. BNSF Railway Company, Opening Evidence of BNSF Railway Company, Verified Statement of Benton V. Fisher
March 13, 2012	Docket No. 42132 Canexus Chemicals Canada L.P. v. BNSF Railway Company, Reply Evidence of BNSF Railway Company
April 12, 2012	Docket No. 42132 Canexus Chemicals Canada L.P. v. BNSF Railway Company, Rebuttal Evidence of BNSF Railway Company
May 10, 2012	Docket No. 42056 Texas Municipal Power Agency v. BNSF Railway Company, BNSF Reply to TMPA Petition to Reopen and Modify Rate Prescription, Joint Verified Statement of Michael R. Baranowski and Benton V. Fisher

U.S. District Court for the Eastern District of North Carolina

March 17, 2006	Civil Action No. 4:05-CV-55-D, PCS Phosphate Company v. Norfolk Southern Corporation and Norfolk Southern Railway Company, Report by Benton V. Fisher

U.S. District Court for the Eastern District of California

January 18, 2010	E.D. Cal. Case No. 08-CV-1086-AWI, BNSF Railway Company v. San Joaquin Valley Railroad Co., et al.

Arbitrations and Mediations

July 10, 2009	JAMS Ref. # 1220039135; In the Matter of the Arbitration Between Pacer International, Inc., d/b/a/ Pacer Stacktrain (f/k/a/ APL Land Transport Services, Inc.), American President Lines, Ltd. And APL Co. Pte. Ltd. And Union Pacific Railroad Company; Rebuttal Expert Report of Benton V. Fisher

ROB FISHER

Mr. Fisher is a Senior Director – Economic Consulting in the Network Industries Strategies ("NIS") Group of FTI Consulting, Inc., specializing in the economic analysis of network industries, including railroad transportation. His business address is 1101 K Street, Suite B100, Washington, DC 20005. Mr. Fisher is sponsoring portions of Sections III-A, III-G and III-H of Norfolk Southern's ("NS's") Reply Evidence. Mr. Fisher has signed a verification of the truth of the statements contained therein. A copy of the verification is attached hereto.

Mr. Fisher earned his Bachelor of Science from Georgetown University and his Master of Business Administration from the University of Michigan. Mr. Fisher spent ten years as a strategy consultant, working for dozens of telecommunications firms on financial analysis, marketing strategy and operational improvement.

At FTI, Mr. Fisher has provided financial and economic consulting services to the transportation, energy and telecommunications industries. Mr. Fisher has participated in multiple Stand-Alone Cost rate cases before the Surface Transportation Board, including providing testimony.

Mr. Fisher's curriculum vitae is attached.

VERIFICATION

I, Rob Fisher, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Rob Fisher

Executed on this 4 day of January, 2013.

Rob Fisher

Senior Director – Economic Consulting

Robert.Fisher@fticonsulting.com

FTI Consulting
1101 K Street, NW
Suite B100
Washington, DC 20005
Tel: (202) 312-9100
Fax: (202) 312-9101

Education
MBA (with distinction) from University of Michigan

BS from School of Foreign Service at Georgetown University

Rob Fisher is a senior director in the Network Industries Strategies group of the FTI Economic Consulting practice and is based in Washington, D.C. Mr. Fisher provides financial and economic consulting services to the transportation, energy and telecommunications industries.

Mr. Fisher has developed expert testimony for railroad clients in litigation disputes involving the delivery of large coal shipments to energy customers. He also has directed financial analysis to demonstrate the reasonableness of railroad rates before the Surface Transportation Board, including leading the analysis for the first small-shipper case before the Board.

In addition, Mr. Fisher has supported a consortium of manufacturers to gain anti-leakage provisions in the pending greenhouse gas legislation. His report, which measured the energy and trade intensity and the emissions of each industry, has been entered into Congressional testimony.

Prior to joining FTI, Mr. Fisher worked for two technology companies, most recently as Vice President of Strategic Marketing, where he held P&L responsibility for the company's largest product. Before that, he spent 10 years as a strategy consultant, working with dozens of telecom clients on financial analysis, marketing strategy and operational improvement.

Mr. Fisher holds an M.B.A. (with distinction) from the University of Michigan and a B.S. from the School of Foreign Service at Georgetown University.

TESTIMONY

Surface Transportation Board

May 7, 2010	Docket No. 42113 Arizona Electric Power Cooperative, Inc. v. BNSF Railway Company and Union Pacific Railroad Company, Joint Reply Evidence of BNSF Railway Company and Union Pacific Railroad Company
November 10, 2011	Docket No. 42127 Intermountain Power Agency v. Union Pacific Railroad Company, Reply Evidence of Union Pacific Railroad Company
September 24, 2012	Docket No. 42130 SunBelt Chlor Alkali Partnership v. Norfolk Southern Railway Company, Norfolk Southern Railway Company's Motion to Hold Case in Abeyance Pending Completion of Rulemaking, Verified Statement of Robert O. Fisher

RANDALL G. FREDERICK

Mr. Frederick is a Project Manager/Senior Engineer/Associate with STV Inc., a professional firm offering engineering, architectural, planning, environmental and construction management services with offices at 5200 Belfort Road, Suite 400, Jacksonville, Florida 32256. Mr. Frederick has more than 30 years of experience as a project manager and senior engineer managing underground wireline and pipeline utility installations and construction engineering and inspection ("CE&I") services for highway and railway bridges and tunnels. Mr. Frederick is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to earthwork. Mr. Frederick has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

As a former CSX Principal Engineer, Mr. Frederick functioned as the primary representative in the mediation of legal proceedings, public safety issues, and other politically sensitive railroad-related matters. He managed the system and network of the company's Computer Aided Dispatching System ("CADS"), Rail-Highway Grade Crossing Warning Systems, and Incremental Train Control Signaling ("ITCS"). Mr. Frederick holds a Bachelor of Arts degree in business administration from Cedarville University.

Mr. Frederick's complete curriculum vitae is attached.

VERIFICATION

I, Randall G. Frederick, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Randall G. Frederick

Executed on this 12 day of December, 2012.

Randall G. Frederick

Project Manager/Senior Engineer
Associate

Mr. Frederick, the office manager for STV's office in Jacksonville, FL, has more than 35 years of experience as a project manager providing construction engineering and inspection (CE&I) services for highway and railway bridges and tunnels. As a former CSX Principal Engineer, he was responsible for management and administration of publicly funded projects in Ohio, Pennsylvania, West Virginia, Virginia, Maryland, and Washington, D.C. Mr. Frederick functioned as the primary representative in the mediation of legal proceedings, public safety issues, and other politically-sensitive railroad-related matters. He managed the system and network of the company's Computer Aided Dispatching System (CADS), and provided guidance for Rail-Highway Grade Crossing Warning System designs and other publicly funded projects.

Office Location
Jacksonville, FL

Date joined firm
9/12/05

Years with other firms
30

Education
Bachelor of Arts, Business Administration; Cedarville University (1987)

Training
FRA Roadway Worker

Environmental and Industrial Safety Course

AREMA Highway Crossing Interconnection

Memberships
NCUTCD Railroad & Light Rail Transit Highway Grade Crossings Technical Committee

Computer Skills
MS PowerPoint, MS Project, MS Access

Project Experience

RAIL

CSX I-370 Bridge Widenings - Construction Manager
Managing CE&I services for the widening of dual highway bridges on I-370 over the CSX right-of-way in Derwood, MD. Mr. Frederick is preparing estimates, coordinating with CSX personnel, and managing the budget. (2006 - Present)

CSX Public Projects GEC Management – Project Manager
Supervising the engineering review, administrative and contract handling, and estimate preparation for third-party overhead bridge and at-grade crossing projects. Mr. Frederick is responsible for ensuring strict compliance with CSX criteria, specifications, and standards. His responsibilities include reviewing CSX operating requirements, railroad force account development, contract management, construction management, and project budget oversight. (2005 – Present)

CSX Wireline and Pipeline Installations - Construction Manager
Managing multiple underground wireline and pipeline utility installations across CSX property in 23 states, some of which go under and others parallel to the CSX right-of-way. Mr. Frederick is preparing estimates, coordinating with CSX personnel, and managing the project budgets. (2005 - Present)

CSX Railroad Bridge over Asbury Road Rehabilitation - Project Manager
Managing preliminary engineering reviews and development of railroad force account estimates and contract management for the rehabilitation of a

single-span railroad bridge over Asbury Road at Erie International Airport in Erie, PA. Mr. Frederick coordinated with CSX personnel and managed the budget until the project was cancelled. (2006 - 2012)

CSX Montgomery Sanitary Sewer Installation - Project Manager
Managed CE&I services for the micro-tunneling and installation of a 96-foot sanitary sewer beneath the CSX main line tracks in Montgomery, AL. Mr. Frederick prepared estimates, coordinated with CSX personnel, and managed the budget. (2007 – 2008)

Republic of China Ministry of Rail ITCS Signal System - Designer
Served as a member of the design management team for a state-of-the-art, GPS-based, ITCS system on 1,400 km of rail line between Beijing and Tibet for the Republic of China's Ministry of Rail. Mr. Frederick led a team of engineers and CAD designers in the application engineering department of GE Transportation Systems in Jacksonville, FL, to ensure on-time project completion within pre-established budgetary constraints. (2004 - 2005)
Performed while employed by GE Transportation Systems.

GE Transportation Systems - Signal Engineer
Directed oversight and management of the grade crossing warning system and as-in-service train control projects. This position required solid knowledge and experience in railroad signal design; inspection and installation; Federal Railroad Administration, Federal Highway Administration, and Manual on Uniform Traffic Control Devices standards; as well as a thorough understanding of the federal (ISTEA/TEA-21/SAFETEA-LU) funding programs. (2000 - 2005)

CSX Public Projects - Former Principal Engineer, Public Projects
Oversaw project management and administration of publicly funded projects, within a 11-state area including Ohio, Michigan, Indiana, Illinois, Pennsylvania, Kentucky, Tennessee, West Virginia, Virginia, Maryland, Washington, D.C., and Ontario, Canada. Mr. Frederick monitored, scheduled, and coordinated key project milestones necessary for successful implementation. His responsibilities necessitated close interaction, communication, and negotiation with state and local government authorities for review and execution of contractual agreements. The position required detailed knowledge and application of state and federal laws and regulations, as they relate to railroad operations, permitting, and associated issues. He periodically appeared as the railroad's expert witness for grade crossing accident and Public Utility Commission hearings and litigation. Mr. Frederick also functioned as the railroad's primary representative in the mediation of legal proceedings, public safety issues, and other politically-sensitive railroad-related matters. (1994 - 2000)

CSX Technology - Former Software Engineer
Managed the system and network of the company's CADS in Jacksonville, FL. His duties included system monitoring, performance tuning, supervision, implementation and management of software/hardware upgrades, and

disaster recovery planning within a high-volume, mission-critical operation. (1992 - 1994)

CSX Technology - Former Electronic Signal Technician
Coordinated and implemented new software to update CADS in Jacksonville, FL. His duties included managing and directing field personnel in the identification, analysis, and resolution of signal code system problems. (1988 - 1992)

CSX Technology - Former Division Signal Maintainer
Performed signal design, installation, maintenance, and electronic trouble shooting of automatic signal and grade crossing warning systems in Newark, OH. (1974 - 1988)

ROBERTO J. GUARDIA

Mr. Guardia is a Vice President with Shannon & Wilson, Inc., a consulting firm dedicated to providing a full range of geotechnical and environmental engineering services located at 13400 Sutton Park Drive South, Suite 1401, Jacksonville, Florida 32224. Mr. Guardia is a geotechnical engineer with 25 years of experience including the last 18 years in tunneling, microtunneling and horizontal directional drilling projects. Mr. Guardia is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to tunnels. Mr. Guardia has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Guardia has been involved in the construction and rehabilitation of over 150 tunnels in the U.S. and overseas. Other areas of expertise include tunnel support, grouting, and shotcrete. He has been Resident Engineer for the enlargement of approximately 25 railroad tunnels. Mr. Guardia has served as Project Manager for the design and plans and specifications for construction, enlargement and rehabilitation of railroad, highway and conveyance tunnels. Mr. Guardia has both a Bachelor of Science degree in civil engineering and a Master of Science degree in (geotechnical) civil engineering from the University of Illinois.

Mr. Guardia's complete curriculum vitae is attached.

VERIFICATION

I, Roberto J. Guardia, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Roberto J. Guardia

Executed on this 7th day of December, 2012.

Roberto J. Guardia, PE | Vice President

GEOTECHNICAL ENGINEER

EDUCATION

MS, (Geotechnical) Civil Engineering, University of Illinois, 1978
BS, Civil Engineering, University of Illinois, 1976

REGISTRATION

Professional Engineer, Washington, 26086, 1989
Professional Engineer, Oregon, 66833PE, 2001
Professional Engineer, California, C63333, 2002
Professional Engineer, Florida, 63761, 2006
Professional Engineer, Georgia, PE032289, 2007
Professional Engineer, Alabama, 30515
Professional Engineer, South Carolina, 27552
Professional Engineer, Panama, 81-006-053, 1981
Approved Examiner and Trainer for American Concrete Institute Shotcrete Nozzlemen Certification

ADDITIONAL TRAINING

Health and Safety Training for Hazardous Waste Operations (40-Hour 29 CFR, 1910.120)
Short Course - Applied Rock Mechanics, ASCE, 1998
Short Course – Deep Foundations, Deep Foundation Institute, 1993
Short Course – Mechanical Excavation and Ground Support, Colorado School of Mines, 1994
Short Course- Project Delivery System, Transpeed, 2001
Various Short Courses organized by the Seattle Section of ASCE

Roberto Guardia is a geotechnical engineer with 25 years of experience including the last 18 years in tunneling, microtunneling and horizontal directional drilling projects. Roberto has been involved in the construction and rehabilitation of over 150 tunnels in the US and overseas. Other areas of expertise include tunnel support, grouting, and shotcrete. He has been Resident Engineer for the enlargement of approximately 25 railroad tunnels. Mr. Guardia has served as Project Manager for the design and plans and specifications for construction, enlargement and rehabilitation of railroad, highway and conveyance tunnels including the Elk Creek, Cape Creek and Edwards Tunnels for ODOT.

Microtunneling

Health Ministry/ Nippon Koei, Panama, Sewer Collection Tunnel, Panama City, Panama. As Project Geotechnical Manager, Roberto provided Geotechnical services for the 8-kilometer 3.0-meter diameter sewer collector tunnel. The first phase of exploration included 22 deep borings up to 40 meters deep in soil and rock and a preliminary engineering report of conditions encountered and recommendations for design and tunneling machine selection. The rock samples were characterized by performing unconfined compressive strength tests, tri-axial tests, point load tests and slake durability tests. In-place permeability tests were performed at the bottom of the boreholes utilizing packer tests. The second phase included 42 deep borings to further explore difficult areas and included the preparation of tunneling specifications and a Geotechnical

Baseline Report for the Design-Build project. Tunneling machine is an earth pressure balance tunneling machine and support provided with a segmental concrete lining.

King County, Henderson Combined Sewer Overflow (CSO), Seattle, Washington. A 1,000-foot segment of the project consisted of a 72-inch-diameter concrete pipe that was installed by microtunneling under an eight-lane section of Interstate-5 and the BNSF and Union Pacific Railroad corridor into Seattle. Three-dimensional tomography methods were utilized to identify potential obstructions. Horizontal directional drilling was used to install three 4 ½-inch high-density polyethylene (HDPE) pipes around the future tunnel to run the tomography probes. Roberto managed the exploration program, prepared a geotechnical baseline report, and plans and specifications related to the 72-inch crossing. Obstructions found during tunneling confirmed the anticipated obstructions identified by the three-dimensional tomography.

King County, Henderson Combined Sewer Overflow (CSO), Seattle, Washington. Roberto was Project Manager assisting Construction Management Team in reviewing geotechnical related submittals, weekly progress meetings, assessing construction methods, special inspections for shotcrete supported circular shafts and monitoring and analyzing ground behavior while tunneling under two important water mains. The 3,500-foot-long, 15-foot diameter storage tunnel was excavated with an earth pressure balance machine and supported with gasketed segmental liner. Compaction grouting was utilized for an area of excessive ground settlement and as a precautionary measure under the main waterlines. Five microtunnels ranging from 48- to 78-inch-diameter and up to 750 feet long were part of the project connecting between shafts.

Bonneville Power Administration, Pipe Jacking, Vancouver, Washington. As Project Engineer, Roberto provided design and plans and specifications for the construction of a 48-inch pipe jack to replace an existing distressed concrete pipe at the Cold Creek diversion pipeline of the Bonneville Power Administration in Vancouver. The design-construct contract was structured to allow concrete, fiberglass, and steel pipe as alternates. A Data Report and a Baseline Report were provided as part of the project documents. Lateral loads were provided for the design of three shafts up to 80 feet deep connecting the three segments of the 2,250 feet long pipeline. Provided Engineer's cost estimate, submittal review, and overseeing construction activities with participation in progress meetings as required. A slurry excavation microtunneling machine and a closed shield machine were used simultaneously in different segments.

Burns & McDonnell, Lake Ft. Smith Water Supply Intake Works, Fort Smith, Arkansas. The water supply intake structures consisted of an intake tower built in a shaft on the shore of Lake Ft. Smith, a 1,300 feet long multi-use tunnel and outlet portal structure. The shaft and tunnel were excavated by drill and blast methods and supported by steel fiber reinforced shotcrete and rock dowels. The tunnel was lined with cast-in-place concrete and will be used for flood control discharge. There are two water supply pipes below the invert of the tunnel. Two lake taps of 72-inch-diameter and 300 feet aggregate length were excavated from the intake shaft below lake level utilizing microtunneling methods. Roberto served as Project Manager/Designer for this project preparing plans and specifications.

Cascade Water Alliance, Waterline Central Segment, Seattle, Washington The Cascade Water Alliance, composed by several utilities and cities of eastern Seattle are building a new 42-inch diameter waterline to meet the needs of the growing east side communities. The 10-mile long Central segment has four undercrossings that will be excavated by microtunneling methods installing 48 to 56-inch diameter casings. Obstacles include a BNSF railroad line/ Jenkins Creek, four-lane with median SR-18, Little Soos Creek and a major avenue Kent-Kangley Road. Roberto was Project Manager for the exploration consisting of eight borings and Geotechnical

recommendations for the new crossings with lengths between 135 to 355 feet utilizing microtunneling methods. Slug tests in cased boreholes were conducted to estimate the groundwater inflow during dewatering of the alluvial deposits at Jenkins Creek. Both slurry pressure balanced and auger microtunneling methods were recommended. Recommendations were provided for shafts, thrust blocks and construction dewatering.

City of Seattle Duwamish River Crossing, Seattle, Washington. As Project Engineer, Roberto provided submittal reviews for two 80-foot-deep frozen ground shafts and 10-foot-diameter concrete pipes installed by pipe-jacking with a slurry-circulation microtunneling machine. The 540-foot-long crossing traversed saturated silts and fine sands. Participated in construction monitoring during the difficult shaft construction due to freeze-pipe complications and evaluated instrumentation including inclinometer/magnetic switch extensometers, piezometers, and thermistor strings.

City of Everett, I-5 Crossing, Everett, Washington. Roberto was Project Engineer for a 60-inch steel pipe jacked under I-5 near Everett. Provided construction monitoring during chemical grouting of the heading material consisting of soft organic soils and hydraulically placed fill. Performed cube compression test on grouted sand samples. The pipe was jacked with an open face shield and spoils removed with an auger.

City of Kennewick, Kennewick Treatment Plant, Kennewick, Washington. Roberto was Project Engineer for the design, plans, and specifications for 10-foot-diameter jacked steel pipe crossing a BNSF mainline embankment. Also provided the engineer's cost estimate and lateral pressures for the design of the reaction shoring. The 160 feet long pipe jack will be used to convey a 2-foot-diameter treated sewer line and pedestrian traffic.

BNSF, Pipe Jacking, Tacoma, Washington. As Project Engineer, Roberto reviewed submittals and provided partial construction monitoring for a 540-foot-long, 68-inch-diameter steel pipe jacked under a BNSF railyard in Tacoma. The tunnel was driven with a slurry microtunneling machine excavating through consolidated silts, sands, and clays with the ground water located 3 feet below the ground surface. Logs were encountered in the course of the excavation, which were crushed by the slurry machine. The project was completed without significantly disturbing the railyard tracks as verified by survey settlement points.

Tunnels

CSX Transportation, National Gateway Initiative Project, Pennsylvania, West Virginia and Maryland. Roberto served as Project Manager for the National Gateway Project that included double-stack container clearance improvements for seven tunnels in Phase 1 of the project. Roberto coordinated the work of three full time Tunnel Resident Engineers and other rotating staff providing Construction Management services. Clearance improvement work included notching of concrete and brick liners and removal and replacement of existing brick liners with shotcrete and rock dowels or steel sets.

Oregon Department of Transportation, In-Depth Tunnel Inspections, Oregon. As Project Manager, Roberto performed in-depth tunnel inspections of nine highway tunnels in Oregon and provided tunnel inspection training to their engineering and maintenance personnel. The inspection reports had detailed information regarding tunnel design and detailed tunnel maps. Tunnel portals, adjacent slopes, and tunnel drainage systems were also evaluated during the tunnel inspections. Recommendations were provided for immediate, short-term and long-term maintenance and the scope and budget of the anticipated repairs. A tunnel inspection training

manual was prepared with basic tunnel design concepts, descriptions of tunnel liners, and specific tunnel inspection procedures adapted to each kind of tunnel liner. One-day and half-day long training seminars were developed for engineering and maintenance personnel respectively. The seminars included examples of liner distress for various kinds of liners, as identified during the tunnel inspections, and discussion of tunnel maintenance and rehabilitation recommendations for each tunnel.

Washington State Department of Transportation, Interstate 90 Tunnel Feasibility, Hyak, Washington. Roberto was Project Manager for the feasibility study and preliminary cost estimate for the 3,000-feet long, 36-foot wide roadway twin tunnels through volcanic and sedimentary rocks. Geologic reconnaissance of the portals and terrain over the tunnel alignment provided basic geologic information that was used in the preliminary rock support design. The preliminary design of the 190 foot high west portal rock cut was developed based on existing topography and existing highway constraints. An engineer's cost estimate was developed for construction of the tunnel and portals based on unit costs and estimated quantities. A geotechnical exploration program for final design including core drilling along the alignment and portals and the use of the boring optical televiewer and a pilot bore along the tunnel alignment was developed.

Oregon Department of Transportation, Cape Creek Tunnel Rehabilitation, Florence, Oregon. Roberto was Project Manager for the geotechnical investigation, testing, design, plans, specifications, and construction observation for Cape Creek Tunnel Rehabilitation. The 714-foot-long tunnel built in 1933 has approximately 450 feet of timber lining that was later covered with a reinforced concrete lining. The rest of the tunnel was left unlined. Geotechnical investigations included drill probes through the concrete lining and six coreholes drilled through the arch form within the tunnel to a depth of 25 feet. The concrete linings were also tested with ground penetration radar and sonic testing to determine the strength and thickness of the lining, and to get an indication of loose rock and voids above the lining. The investigation found that a segment of the concrete lining had areas of thinner concrete and signs of distress and corrosion with high rock loading. The lining near the south portal was designed for replacement with lattice girders and shotcrete and cement grouting in the tunnel arch. The rest of the concrete linings will be backfilled with lightweight grout to fill the existing voids. The unlined areas will be supported with rock bolts and shotcrete.

Union Pacific, Clearance Improvements for Double-Stack Cars of Coos Bay Tunnels, Oregon. Roberto is Project Manager for the ongoing evaluation of 9 tunnels in the Coos Bay area to determine preliminary feasibility and construction costs for providing double-stack container car clearance. The condition of the tunnels was assessed and surveyed cross-sections were evaluated to determine the depth of tunnel clearance required by location. Concrete notching, complete timber set removal with new tunnel support and track lowering are under consideration to obtain the clearance improvements.

RailAmerica, Tunnel 13, Siskiyou, Oregon. Tunnel 13 had extensive damage due to a fire and after rehabilitation there were two segments of the tunnel that did not meet State requirements for vertical and side clearance. Roberto was Project Manager for determining the impediments by laser survey and developing the design and specifications for the tunnel clearance improvements. Existing steel sets had to be removed and replaced with new steel sets located in a new centerline. The work involved the use of steel fiber reinforced shotcrete, steel dowels and new steel sets. We also participated during construction with submittal review and construction observation on a full-time basis.

Union Pacific Railroad, Tunnel No. 2, Keddie, California. Roberto served as resident engineer for the mining of a collapsed tunnel in foliated schist providing additional support with spilling, grouting and shotcrete as required for the Union Pacific Railroad. A top heading excavation method was utilized in a portion of the tunnel that collapsed up to the ground surface. Liner consisted of steel sets and channel lagging backfilled with concrete.

Union Pacific Tunnel Clearance Improvements, Feather River and Fremont, California. Roberto served as resident engineer for notching railroad tunnels to improve clearance. Notching was performed with a roadheader mounted on a rail car. Resin encapsulated rock bolts were installed through the existing concrete liners to provide additional liner support or to replace existing rock bolts located in the notched area. Responsible for measuring air flows and toxic gases during the operation. Notching was performed in 10 tunnels located in the Feather River Canyon and one tunnel in Fremont.

Southern Pacific, Tehachapi Tunnel Clearance Improvement Project, Caliente and Tehachapi, California. Roberto served as resident engineer for this project. Twelve tunnels between Caliente and Tehachapi were enlarged to accommodate double-stack container trains. The work consisted of installing crown rock bolts and sidewall tiebacks, pumping cement grout behind the concrete liner to fill voids, and notching with a roadheader.

Conrail, Tunnel Enlargement, Gallitzin, Pennsylvania. The brick liner of the 3,600-foot-long tunnel was removed and the tunnel enlarged from a single-track to a double-track configuration. Coal mines were present over the tunnel and caused several collapses. Support consisted of rock dowels and pre-stressed rock bolts with steel-fiber-reinforced wet mix shotcrete. Provided construction management services and supervised six engineers and technicians on three shifts per day. Roberto served as Resident Engineer.

ICF-Kaiser, Berry Street Tunnel Rehabilitation and Enlargement Project, Pittsburgh, Pennsylvania. The project involved enlargement of a 100-year-old brick railroad tunnel and conversion to a bus tunnel, excavation of shale and sandstone, lattice girder, shotcrete and rock dowel support, and new drainage systems. Roberto collaborated in the design approach, plans and specifications, engineer's cost estimate, and Geotechnical Design Summary Report. He also reviewed contractor's value engineering proposal.

La Nacional, Loma Larga Tunnels, Monterrey, Mexico. Project Manager for alternate design and blasting recommendations for the construction of the tunnels. The 2,350 feet long twin highway tunnels have a semi-circular shape with a horizontal diameter of 58 feet making it a large underground cavern. Reviewed available borings and site geology and provided design for various support categories based on the RMR and Q methods. Proposed liner was of fiber-reinforced shotcrete and rock bolts in lieu of the original design of wire mesh and plain shotcrete. Further analysis of the benefits of utilizing rock bolt was conducted by numerical methods (FLAC). Provided tunnel blasting recommendations for optimizing drillhole diameter, spacing and blast sequence of the benched heading. The perimeter of the tunnel was blasted by innovative smooth blasting methods.

Wheeling & Lake Erie, Robertsville Tunnel Rehabilitation, Robertsville, Ohio. The 550-foot-long railroad tunnel supported by timber sets has erodible shales, which weaken the sidewalls and requires continuous ditch maintenance. Roberto served as Project Manager and provided field investigation and alternative recommendations with cost estimates followed by plans and specifications for shotcreting the sidewalls and providing shotcrete and rock bolt support to one portal and a new portal excavation.

Oregon Department of Transportation (DOT), Elk Creek Highway Tunnel, Elkton, Oregon. Roberto was Project Manager for the rehabilitation of the 1,150 feet long Elk Creek highway tunnel. Performed tunnel exploration by probes through wood liner and ground penetration radar methods. Accomplished geological mapping and rock mass classification of the tunnel including Schmidt rebound hammer and point load testing of the rock. Developed design of tunnel ground support for the new clearance envelope, consisting of fiber-reinforced shotcrete, rock bolts, lattice girders, and steel sets. Prepared plans and specifications for Oregon DOT for the ground support and portal structures. Included engineer's cost estimate, which was within 10 percent of successful bidder's proposal.

BNSF, Tunnel Enlargement, Martinez, California. As Project Manager, Roberto provided preliminary design and cost estimate for the enlargement of three tunnels in Martinez. The concrete-lined tunnels were enlarged in 1989 for double stack clearance by performing notches that exceeded 2 feet and undercutting. The proposed notching is to achieve Chrysler car clearance. The work will involve notching with a road header and installing new resin-grouted rock bolts above and below the new notch.

Union Pacific, Clearance Improvement Program of the Donner Pass Tunnels, Sacramento, California to Reno, Nevada. As Project Manager, Roberto prepared plans and specifications for enlarging 25 tunnels for double stack and Chrysler car clearance. Several of the tunnels will require remining or undercutting. Prior to notching with a road header the tunnels will be grouted and reinforced with rock bolts. Construction costs were estimated in the order of $12 million.

BNSF, Ostrander Tunnel Rehabilitation, Kelso, Washington. The timber set and lagging supported tunnel was burned to ashes after a forest fire. The 430-foot-long tunnel built in vesicular basalt was literally cooked by the fire and had to be scaled by mechanical methods. Final support was achieved with the installation of resin-grouted rock bolts and steel fiber-reinforced shotcrete. Bidding documents were prepared in an accelerated schedule and the work was completed in 28 working days. Roberto was Project Manager.

Puget Sound Energy, Lower Baker Tunnel In-Depth Inspection, Concrete, Washington. The Lower Baker Tunnel has had a long history of water flows on the downstream abutment partially originating from the concrete lined tunnel. When the 22-foot-diameter tunnel is dewatered inflows are in the order of 800 gallons per minute originating in cracks and previously installed grout pipes. The tunnel was mapped indicating existing cracks, construction joints, and areas of seepage and leaks. Nondestructive testing consisting of ground penetration radar and sonic/ultrasonic methods were utilized to determine the extent of poor concrete and the location of voids in the concrete and between the concrete and rock. Probe holes drilled through the concrete liner verified and calibrated the ground penetration radar and sonic measurements. Roberto served as Project Manager for this project.

Puget Sound Energy, Lower Baker Tunnel Rehabilitation, Concrete, Washington. Roberto served as Project Manager for this project. Based on the results of the Lower Baker Tunnel In-Depth Inspection, a rehabilitation program was implemented consisting of cement and chemical grouting of voids behind the concrete liner and within the concrete liner. A valve attached to a steel plate anchored to the concrete was used to seal one grout pipe that was leaking approximately 300 gallons per minute. Once the flow was stopped, polyurethane grout was injected into the grout pipe successfully stopping the flow. Significant cracks were grouted through holes drilled into the liner. Other work consisted of surface repairs of cavitation areas and sealing cracks on the surface.

PUBLICATIONS

Lake Ft. Smith Microtunneling Lake Tap, Guardia, R., Winkler, K., Rasmussen, P., and Lewtas, T. Proceedings Rapid Excavation and Tunneling Conference, Seattle, June 2005.

Rehabilitation of the Cape Creek Highway Tunnel Under Traffic, Robinson, R. A., Shell, T., Guardia, R., Rodolf, S., Proceedings Rapid Excavation and Tunneling Conference, Seattle, June 2005.

Predicted versus Actual Obstructions for Two Pipe-jacked Tunnels of The Henderson CSO, Seattle, Washington, Cowles, B., Guardia, R., Robinson, R., Andrews, R., Molvik, D., Proceedings Rapid Excavation and Tunneling Conference, Seattle, June 2005.

"Conceptual Design for a Deep Underground Science and Engineering Laboratory," by H.C. Haxton, J.F. Wilkerson, R. Robinson, and R. J. Guardia, Proceedings of the Rapid Excavation and Tunneling Conference, June 2005.

Godlewski, P.M., and Guardia, R.J., 2003, Transportation Tunnel Rehabilitation *in* Rapid Excavation and Tunneling Conference, New Orleans, La., June 2003, Proceedings, New Orleans, La..

Neil, D.M., and Guardia, R.J., 2002, Tomographic Ground Imaging for the Henderson CSO Treated Tunnel Alignment, King County, Washington, Proceedings North American Tunneling, Seattle, May.

Guardia, R.J., Robinson, R.A., Godlewski, P.M., and Hultman, W.A., 2002, Reconditioning of Transportation Tunnels in the Pacific Northwest, Proceedings North American Tunneling, Seattle, May.

Parker, H.W., Godlewski, P.M., and Guardia, R.J., 2002, The Art of Tunnel Rehabilitation with Shotcrete, Shotcrete Magazine, American Shotcrete Association, Fall.

Fisk, P.S., Guardia, R.J., and Porter, W.D., 2002, Lower Baker Tunnel Investigation and Repairs, Proceedings North American Tunneling, Seattle, May.

Robertson, C.A., Guardia, R.J., Robinson, R.A., and Rustvold, J.W., 2001, Bonneville Power Administration Cold Creek Pipeline Replacement, Proceedings Rapid Excavation and Tunneling Conference, San Diego, June.

Parker, H.W., Robinson, R.A., Godlewski, P.M., Hultman, W.A., and Guardia, R.J., 2001, Tunnel Rehabilitation in North America, Proceedings International Tunneling Association World Tunnel Congress, Milan, June.

Guardia, R.J., Robertson, R.A., and Laird, J.R., 2000, Tunnel Inspection Manual, prepared for Oregon Department of Transportation, June, 96 p.

PROFESSIONAL ASSOCIATIONS

American Society of Civil Engineers
American Shotcrete Association; Individual Member
American Railway Engineering and Maintenance of Way Association; Associate Member

MICHAEL P. HEDDEN

Mr. Hedden is Managing Director in the Real Estate Solutions Group of FTI Consulting, specializing in providing valuation and appraisal of industrial, commercial, residential, real, and special purpose property. His business address is 750 Third Avenue, 27th Floor, New York, New York 10017. Mr. Hedden is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence related to real estate. Mr. Hedden has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

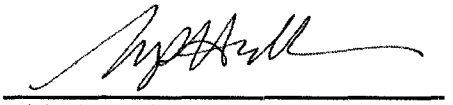
Mr. Hedden has over 30 years of experience in all aspects of real estate market analysis and valuation. He has appraised properties across the United States for purposes of property tax, financial reporting, financing, purchase or sale, insurance, fair rental, tax reporting condemnation and donation. He is certified as a real estate appraiser in 13 states.

Mr. Hedden is a member of the Appraisal Institute, Counselors of Real Estate and Royal Institute of Chartered Surveyors. He previously served as Managing Director of the American Appraisal Associates. He earned his Bachelor of Science of Marketing from the University of Bridgeport and a Master of City and Regional Planning at Rutgers University.

Mr. Hedden's complete curriculum vitae is attached.

VERIFICATION

I, Michael P. Hedden, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.



Michael P. Hedden

Executed on this _2_ day of January, 2013.



Michael P. Hedden, MAI, CRE, FRICS

Managing Director - Real Estate Solutions

michael.hedden@fticonsulting.com

FTI Consulting
750 Third Avenue
27th Floor
New York, NY 10017
Tel: (646) 731-1503
Fax: (646) 731-1599

Education
B.S. in Marketing, University of Bridgeport

M.C.R.P., Rutgers University

Industries
Banking/Financial Services, Construction, Healthcare, Hospital, Industrial Manufacturing, Legal Services, Leisure and Hospitality, Real Estate, Restaurant, Retail

Certifications
MAI, Appraisal Institute

Counselor of Real Estate (CRE)

Fellow Royal Institution of Chartered Surveyors (FRICS)

General Certified Real Estate Appraiser: New York, New Jersey, Connecticut, Massachusetts, Pennsylvania, Delaware, Maryland, Virginia, Georgia, Illinois, Florida, California, Washington

Professional Affiliations
Appraisal Institute
Past President
Metro NJ Chapter

Counselors of Real Estate
Past Chair,
NJ Chapter

Urban Land Institute

Michael P. Hedden is a managing director in the FTI Real Estate Solutions practice and is based in New York. Mr. Hedden specializes in providing valuation, litigation support and expert testimony services for clients. He is a knowledgeable real estate expert with over 30 years of experience in all aspects of the market analysis and valuation of real property. Mr. Hedden has experience in the appraisal of industrial, commercial, residential and special purpose property including hospitality, hospital and healthcare facilities. He has developed broad experience in the valuation of properties with detrimental conditions and is a recognized expert in the valuation of property suffering from environmental contamination.

Mr. Hedden has experience in the valuation of investment and user-based specialized real estate and real estate-related enterprises. He has appraised properties in many U.S. states. Purposes have included property tax, financial reporting, financing, purchase or sale, insurance, fair rental, tax reporting, condemnation, and donation. Advisory services performed by Mr. Hedden have included appraisal review, market research, appraisal management, and offer/option analysis

Mr. Hedden has significant expert testimony experience and has appeared before the U.S. District Court, Superior Court of New Jersey, U.S. Bankruptcy Court, New Jersey State Tax Court, New Jersey Legislature Committee, and various condemnation and zoning boards.

Prior to joining FTI Consulting, Mr. Hedden was a managing director with American Appraisal Associates where he provided expert testimony and litigation support for clients as well as prepared valuations used for financial reporting. Prior to that, he was a director for CBIZ Valuation Group, LLC. Before joining CBIZ, Mr. Hedden was president of Realty Economics Group, a real estate consulting and appraisal firm working for various government, public, and private entities throughout the New York metropolitan area.

A member of the Appraisal Institute (MAI) and the Counselors of Real Estate (CRE) and a distinguished Fellow of the Royal Institute of Chartered Surveyors (FRICS), Mr. Hedden earned a Master of City and Regional Planning (M.C.R.P.) degree from The Edward J. Bloustein School of Planning and Public Policy at Rutgers University and a Bachelor of Science degree in marketing from the University of Bridgeport. He has been a licensed real estate broker in New Jersey since 1978. In addition, Mr. Hedden holds general certified real estate appraiser licenses in New York, New Jersey, Connecticut, Massachusetts, Pennsylvania, Delaware, Maryland, Virginia, Georgia, Florida, California and Washington.

Expert Testimony/Depositions

Tropicana v. City of Atlantic City,New Jersey, Docket Nos.: 7568-2008; 4012-2009; 3178-2010 and 8024-2011

Trump Taj Mahal Associates, LLC vs. City of Atlantic City, New Jersey, Docket Nos.: 7574-2008,; 10192-2009; 584-2010

Trump Marina Associates, LLC vs. City of Atlantic City, New Jersey. Docket Nos.: 7488-2008; 10454-2009; 6062-2010

Trump Plaza Associates, LLC vs. City of Atlantic City, New Jersey, Docket Nos.: 7488-2008; 10454-2009; 6064-2010

New Jersey Turnpike Authority v. PRI Washington Township, New Jersey et al, Superior Court of New Jersey; Docket No. MER-L-1890-10

Borough of Carteret, etc. v. CDI Industries, Inc., et al., Docket No. MID-L-4534-05, Superior Court of New Jersey, Middlesex County

New Brunswick Housing Authority v. New Brunswick Industries, Superior Court of New Jersey, Middlesex County

Action Manufacturing Company v. Simon Wrecking Company, Civil Action No. 02-8964, U.S. District Court, Eastern District of Pennsylvania

United States of America and The Chemclene Site Defense Group v. Chemclene Corporation, W. Lloyd Balderston, Estate of Ruth Balderston and Springridge Management Corporation, Inc.

Omega Healthcare Investors, Inc. v. Res-Care Health Services, Inc., et al., Case No. 1:99-cv-862, U.S. District Court, Southern District of Indiana

Metuchen I, LLC v. Borough of Metuchen, Docket No. 00878 2000, Tax Court of New Jersey, March 29, 2004

Reliance Trust Company v. Greater Exodus Missionary Baptist Church, Docket No. F-12330-02, Superior Court of New Jersey, Atlantic County, New Jersey

New Jersey Turnpike Authority v. Michael Feldman Associates, et al., Docket No. BURL-L-2519-97, Superior Court of New Jersey, Burlington County, New Jersey

Hans and Helena Tielmann v. Camp Dresser & McKee, Inc., et al., Docket No. L-1559-00, Superior Court of New Jersey, Law Division, Morris County, New Jersey

Custom Distribution Services, Inc. v. City of Perth Amboy, Nos. 95-37206, 95-3218, U.S. Bankruptcy Court D. New Jersey, December 17, 1997

Shakelly v. DeFilippo et. als. Docket Number MID-L-5201-06 Superior Court of New Jersey, Middlesex County

Pansini Custom Design Associates, LLC and Roger Parkin Joint Venture v. City of Ocean City and Patrick Newton, Construction Code Official of the City of Ocean City, Docket No. A-2003-0 17 T1, Superior Court of New Jersey, Atlantic County

New Jersey Department of Transportation v. Bellemead Development Corp., Commissioners Hearing, Somerset County New Jersey

Borough Of Paulsboro vs. Essex Chemical Corporation, Superior Court of New Jersey Law Division - Gloucester County Docket No. Glo-L-699-06

MT Ventures vs. Mount Freedom Golf Partners, Chancery Division, Morris County, New Jersey - Docket No. MRS-C-65-09

The People of the State of New York v. First American Corporation and First American eAppraiseIT (Supreme Court, N.Y. Co., Index No. 07-406796)

Textron Financial-New Jersey, Inc v.Herring Land Group, LLC, Case No. 3:06-cv-02585-MLC_DEA, U.S. District Court, District of New Jersey, Trenton Division,

Bayonne Medical Center v. Bayonne/Omni Development, L.L.C., Case No. 07-15195 (MS), United States Bankruptcy Court, District of New Jersey, In re Bayonne Medical Center

Reported Decisions

Metuchen I, LLC v. Borough of Metuchen, Docket No. 00878 2000, Tax Court of New Jersey, March 29, 2004

Custom Distribution Services, Inc. v. City of Perth Amboy, Nos. 95-37206, 95-3218, U.S. Bankruptcy Court D. New Jersey, December 17, 1997

Pansini Custom Design Associates, LLC and Roger Parkin Joint Venture v. City of Ocean City and Patrick Newton, Construction Code Official of the City of Ocean City, Docket No. A-2003-0 17 T1, Superior Court of New Jersey, Appellate Division

Publications

Examining the Role of Risk and the Appraiser in Property Valuatio; New York Law Journal; June 18, 2012

The Appraiser's Approach: Commercial Investment Real Estate; May/June 2012 (co-authored with Marc Shapiro)

Bid vs. Ask - Motivated investors are closing the pricing gap on institutional assets. Commercial Investment Real Estate; May/June 2011

2003 Lender Survey: Preferences in Financing Senior Housing and Long Term Care Projects, Maryland: National Investment Center for Senior Housing & Care Industries and CBIZ Valuation Group, Inc., 2003 (coauthored with David A. Arnoldi)

Residential Redevelopment of Brownfields: What Are the Valuation Issues?, New Jersey: National Center for Neighborhood and Brownfields Redevelopment, Edward J. Bloustein School of Planning and Public Policy, Rutgers University, 1999 (coauthored with Jan Wells PhD)

Presentations

"Real Estate Accountancy/Compliance Breakfast", RICS Americas Tri-State Chapter, June 5, 2012

"Easement Valuations: Common Pitfalls and Principles" Lorman Education Services, Webinar, June 26, 2012

"The Use of Rent Coverage Ratios in the Valuation of Healthcare Properties," The 24th Pan Pacific Congress of Real Estate Appraisers, Valuers and Counselors, Seoul, Korea, September 2008

"Fair Value and Highest and Best Use - The Real Estate Perspective," AICPA National Real Estate Conference, Las Vegas, Nevada, November 2007

"Mock Trial" and "Takings of Unique or Special Properties," Eminent Domain Conference, CLE International, Princeton, New Jersey, October 2007

"Condemnation Valuation - Its Impact on Your Property and Your Projects," Eminent Domain Conference, CLE International, Princeton, New Jersey, October 2006

"Valuation of Contaminated Property," New Jersey County Tax Board Administrators, March 2002

"Appraisal Process Considering Environmental Impairments," Realtors' Tri-State Convention and Trade Show, Atlantic City, New Jersey, December 2000 (panelist)

"Residual Redevelopment of Brownfields: What are the Valuation Issues?," The Bloustein School of Planning and Public Policy at Rutgers University, November 1999 (leader of symposium)

"How to Buy and Sell Contaminated Property - Appraising Contaminated Properties," Institute of Continuing Legal Education in New Jersey (presenter)

"Litigation Issues Relating to MTBE Drinking Water Contamination," Institute of Continuing Legal Education in New Jersey (presenter)

"Transactional and Litigation Pitfalls in the Sale of Residential and Commercial Real Estate," New Jersey Institute for Continuing Legal Education, New Brunswick, New Jersey, January 14, 2010.

"Real Estate and Land Valuation in Depressed Markets," Lorman Education Services, Webinar, October 5, 2010.

"Commercial Property Assessing in Distressed Markets," Society of Professional Assessors - Annual New Jersey Seminar, East Rutherford, New Jersey, April 9, 2010

"Easement Valuations: Common Pitfalls and Principles," Lorman Education Services, Webinar, December 3, 2009.

"International Financial Reporting Standards (IFRS) - Introduction to Valuation for Financial Reporting and Case Studies," IAAO/RICS 2010 Commercial Real Estate Symposium, Baltimore, Washington, March 18, 2010.

"How to Understand Expert Valuations," New Jersey Institute for Continuing Legal Education, 12th Annual Honorable William H. Gindin Bankruptcy Bench-Bar Conference, New Brunswick, New Jersey, April 16, 2010.

"Case Studies in Valuation for Financial Reporting," Appraisal Institute-Appraisal Institute of Canada, Summer Conference, Toronto, Canada, June 27, 2004

Instruction

"Highest & Best Use and Market Analysis," Appraisal Institute Course

"Real Estate Finance, Statistics, and Valuation Modeling," Appraisal Institute Course

"Valuation for Financial Reporting," Appraisal Institute Course

"How to Buy and Sell Contaminated Property," New Jersey Institute for Continuing Legal Education Seminar

"Litigating Regulatory Takings Cases," New Jersey Institute for Continuing Legal Education Seminar

Various seminars for the Municipal Tax Assessors Association in New Jersey, New Jersey Association of Realtors, and the National Association of Industrial and Office Parks.

Valuation and Special Courses

"Analyzing Distressed Real Estate," Appraisal Institute

"Environmental & Property Damages: Standards, Due Diligence, Valuation & Strategy,"

Appraisal Institute

"Environmental Risk and the Real Estate Process," Appraisal Institute

"Measuring the Effects of Property Contamination from Hazardous Materials on Real Estate Prices: Techniques and Applications," Appraisal Institute

"Valuation of Detrimental Conditions in Real Estate," Appraisal Institute

State Certifications

State of California, Certified General Real Estate Appraiser, #AGO36595

State of Connecticut, Certified General Real Estate Appraiser, #RCG0001042

State of Delaware, Certified General Real Property Appraiser, #X1-0000397

State of Florida, Certified General Appraiser, #RZ3081

State of Georgia, Certified General Real Property Appraiser, #280761

State of Illinois, Certified General Real Property Appraiser, #553.002184

State of Maryland, State Certified General Appraiser, #11924

Commonwealth of Massachusetts, State Certified General Appraiser, #100962

State of New Jersey, Certified General Appraiser, #RG00206

State of New Jersey, Real Estate Broker, #RB7814861

State of New York, Real Estate General Appraiser, #46000041828

Commonwealth of Pennsylvania, Certified General Appraiser, #GA001660R

Commonwealth of Virginia, Certified General Real Estate Appraiser, #4001009126

State of Washington, Certified General Real Estate Appraiser, #1101650

Professional Affiliations

Appraisal Institute, MAI Designated Member #7357

Counselors of Real Estate, CRE Member # 2158

Royal Institute of Chartered Surveyors, FRICS Member # 1227210

Employment History

American Appraisal Associates, New York, *Managing Director* 2007 – 2010

Mr. Hedden served as a Managing Director and the Northeast Practice Leader for the U.S. Real Estate and related assets practice of American Appraisal.

CBIZ Valuation Group, New Jersey, *Director of Real Estate* 2003 - 2007

Mr. Hedden served as the Director of Real Estate for CBIZ Valuation group. In this capacity he ran the real estate valuation, consulting and litigation practice on a national level.

Michael P. Hedden, MAI Inc., d/b/a Realty Economics Group, *President*	1990 – 2002
Mr. Hedden served as the President and leader of this Real Estate Consulting and Appraisal firm for various government, public and private entities throughout New Jersey.	
Martin, Benner, Pintinalli, Hedden, Inc., *Vice President*	1988 – 1990
Mr. Hedden served as a Real Estate Consultant for various government, public and private entities.	
Hedden – Izenberg Appraisal Associates, *President*	1987 – 1988
Mr. Hedden ran this Real Estate appraisal and consulting firm which provided a full spectrum of narrative appraisals and documents.	
Landauer Associates, Inc., *Vice President*	1985 – 1987
Mr. Hedden was part of the valuation and technical services division which was responsible for national real estate counseling.	
Glander Bates Associates, *Appraiser/Consultant*	1983 – 1985
Barkan Associates, *Staff Appraiser*	1982 – 1983
Patrick L. Hedden Realty Company, Vice President	1976 – 1981
Mr. Hedden was actively involved with this full service brokerage company servicing central New Jersey.	

DAVID HUGHES

Mr. Hughes has over 30 years of experience as a professional engineer in railroad engineering and railroad operations and maintenance supervision. Mr. Hughes's business address is 1401 S. Ocean #601, Hollywood, Florida 33019. Mr. Hughes is sponsoring Section III-D-4 of Norfolk Southern's ("NS's") Reply Evidence relating to maintenance-of-way costs. Mr. Hughes has signed a verification of the truth of the statements contained therein. A copy of the verification is attached hereto.

From 1967 to 1975, Mr. Hughes had numerous responsibilities at Southern Pacific Railroad, including first line supervision of track maintenance and bridge and building maintenance. Mr. Hughes served as Vice President of Engineering for the Boston and Maine Railroad from 1975 to 1980, where he had responsibility for track structures, signal systems maintenance, and reconfiguring and reconstructing 155 route miles of mainline. Mr. Hughes next served as President of Pandrol, Inc. and Speno Rail Services, where he assisted railroads in developing high-performance track components and mechanized rail and ballast maintenance practices. In 1985, Mr. Hughes became President of the Bangor & Aroostook Railroad, a regional railroad in the northeastern United States. He later served as Chief Engineer for the National Railway Passenger Corp ("Amtrak") and as its Acting President and Chief Executive Officer.

Mr. Hughes has previously served as Chairman of the Regional Railroads of America. He was a director of the American Railway Engineering Association ("AREA"). He has served on the Association of American Railroads Board of Directors.

Mr. Hughes' curriculum vitae is attached.

VERIFICATION

I, David Hughes, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

David Hughes

Executed on this 7th day of December, 2012.

David Hughes

David Hughes is an independent railroad consultant with broad consulting and executive experience in railroad infrastructure and railroad operations. He specializes in identifying strategies through which railroads can manage their infrastructure, operations, and investments to realize strategic objectives, optimize asset reliability and maximize the long term cash flow. Recent or on-going consulting assignments include:

- Currently providing technical and economic advice to Norfolk Southern Corporation regarding the design, construction and maintenance of a 7000 mile stand-alone railroad in the US as part of a proceeding before the US Surface Transportation Board

- Recently advised a major owner and operator of regional railroads in the US on track, bridge and signaling issues related to their planned acquisition of RailAmerica, the largest operator of regional railroads in the world.

- Worked with the Peruvian Ministry of Transportation to develop a methodology for evaluating the economic feasibility of building new rail lines in the Peruvian Andes, including investment requirements and operating costs and applying the methodology to evaluate several proposed projects.

- Advised a major iron ore hauling railroad in Canada on infrastructure capacity expansion requirements necessary to increase annual iron ore throughput by 250%.

- Recently advised a major African heavy haul railroad regarding infrastructure investment requirements as part of a long term integrated corridor commercial strategy. The project included estimating infrastructure capacity expansion costs, operating costs and financial feasibility of the required investments.

- Recently advised the Dedicated Freight Corridor Corporation of India on design and contracting standards for construction of a new national heavy haul rail network, as a member of a panel of international experts.

- Assisted a major private equity firm in performing infrastructure due diligence on $2 billion acquisition of a US railroad company. Later, provided estimates of capital investment requirements to support refinancing of the acquisition.

- In a dispute involving economic damages due to rail service irregularities on a U.S. heavy haul railroad, Mr. Hughes provided an expert verified testimony regarding the adequacy of coal line maintenance practices and expenditures and an assessment of the reasons for infrastructure failure.

- For a standalone rate case in the western U.S., provided an expert verified statement determining the maintenance and operating costs a new heavy haul rail line for a standalone railroad in a standalone rate case before the Surface Transportation Board

- In a proceeding before the Surface Transportation Board, provided an expert verified statement regarding the adequacy of a light density railroad to transport heavy haul coal unit trains and the scope of work and cost to upgrade the infrastructure of the line

- Evaluated the capital investment and ongoing infrastructure maintenance necessary to introduce 18,000 ton coal trains on a light density branch line for a major US railroad.

- Prepared an infrastructure maintenance and investment plan for 2,000 miles of high density coal railroad in conjunction with litigation about coal transportation rate reasonableness for two major western railroads.

- Assessed the long term infrastructure investment requirements as part of a due diligence for a major railroad financial transaction.

In addition to the recent assignments above, Mr. Hughes has been engaged in dozens of assignments in over 27 countries, including Chile, Peru, Bolivia, Uruguay, Argentina, Brazil Kazakhstan, Poland, Czechoslovakia, Hungary, Africa, Asia and North America.

Mr. Hughes also has extensive executive experience in the railroad industry. Most recently he served as Acting President and CEO of Amtrak 2005-2006. He served four years as chief engineering officer of Amtrak before becoming Acting CEO. He also served as President of the Bangor and Aroostook Railroad, President of Pandrol Incorporated, a manufacturer of track fastening products for the railroad industry and President of Speno Rail Services, a railroad track maintenance contractor. Earlier in his career he was vice president engineering and Acting President of the Boston & Maine railroad and held numerous engineering and management positions with Southern Pacific railroad, including bridge and building supervisor and general track foreman.

His industry and community activities have included:

- Director, The Association of American Railroads
- Director, American Railway Engineering and Maintenance Association
- Member, AAR Track Research Committee
- Member, various engineering and operating committees of AAR
- President and cofounder, Regional Railroads of America
- President, New England Transportation Research Form
- Director, Transporting the Elderly and Handicapped in New England
- President, Maine Chamber of Commerce

Mr. Hughes has testified before the United States Congress on numerous occasions regarding railroad passenger and freight financing and infrastructure issues. He has testified in Federal District court and before the Interstate Commerce Commission (now STB) on legal and commercial matters.

Mr. Hughes holds a B.S. degree in civil engineering from the University of Texas and a Masters Degree in business administration from the Harvard Business School and has over 30 years of experience as a registered professional civil engineer. He is fluent in English and has a working knowledge of Spanish and Brazilian Portuguese.

Contact information:
David Hughes
4622 Fisher Island Drive
Miami Beach, FL 33109, USA
+1 (954) 616-9742 (cell)
david.hughes@foxglove.us.com

Mr. Hughes' professional experience uniquely qualifies him to accurately assess the MOW work load and resource requirements of the SBRR.

He has hands on field experience as a General Track Foreman in Utah and a Bridge and Building Supervisor in Texas. As general track foreman, he actually inspected track for defects and either personally made repairs or scheduled the repairs by a maintenance gang. He also supervised the work of section gangs, smoothing gangs and welders.

As bridge and building supervisor on the UP (former SP) in Houston, he was personally responsible for performing annual bridge inspections and prioritizing bridge maintenance. He also was responsible for maintenance of equipment maintenance facilities and other railroad facilities in the Houston Terminal.

In addition to his first line experience, Mr. Hughes has served as chief engineer of the Boston and Maine (B&M) Railroad and, more recently, chief engineer of Amtrak. As the B& M was in bankruptcy reorganization when Mr. Hughes was chief engineer, he gained valuable experience in effectively maintaining track and structures at the lowest possible cost.

Mr. Hughes has also benefited from his experience in the railroad track supply and track maintenance industry. As president of Pandrol, Inc. (a manufacturer of track fastening systems) and as president of Speno Rail Services (a railroad track maintenance contractor) he spent extensive time in the field on every class I railroad in north America, observing first hand maintenance problems and devising solutions that could be applied.

Mr. Hughes' experience goes far beyond the class I railroads of North America. He has extensive experience with regional and short line railroads and railroads internationally.

As co-founder and first chairman of Regional Railroads of America, he has testified before Congress on several occasions about the capital and maintenance requirements of small railroads. He had personal relationships with the leaders of the small railroad industry and had frequent discussions with them about their techniques for profitably operating railroads that class Is had sold to them.

Mr. Hughes had another window into the MOW practices of small railroads. In a consulting capacity, he has performed due diligence reviews of dozens of MOW plans on behalf of lenders or buyers of lines being spun off by class Is or of existing lines being bought or sold by private parties. These due diligence studies generally involved hi-rail inspection trips over the lines and interviews of MOW officials regarding their organizations and plans for maintaining the lines. The reports that resulted included an assessment of the adequacy of the MOW plan and suggestions of ways it could be strengthened.

In addition to his work with class I and small railroads in North America, he has many years of experience working with MOW organizations in over 25 railroads in Mexico, South America, South Africa, Europe and countries from the former Soviet Union.

Furthermore, Mr. Hughes has a long history of participation in professional engineering organizations and keeps those contacts current. He has been a director of the Engineering Division of the AAR, a director and member of the Board of Governors of the American Railway Engineering and Maintenance Association, president of the Transportation Research Forum of New England. He has served on the AAR committee prioritizing new research investments and has attended several annual meetings of the International Heavy Haul Association. He has been a frequent visitor to the Facility for Accelerated Service Testing (FAST) in Pueblo, Colorado where he followed the performance of various track components under heavy haul conditions. He has over 30 years' experience in the railroad industry as a professional engineer.

KENNETH LECROY

Mr. LeCroy is an Industrial Engineer at Norfolk Southern Corporation, the parent of Norfolk Southern Railway Company ("NS"), located at 1200 Peachtree Street, Northeast, Atlanta, Georgia 30309. He is sponsoring portions of Section III-C of NS's Reply Evidence that relate to the analysis of the SunBelt Railroad's yard requirements. Mr. LeCroy has signed a verification of the truth of the statements contained therein. A copy of the verification is attached hereto.

Mr. LeCroy has worked as a professional engineer since 1994. He began his career as a consultant at Adapta Solutions, Inc. where he developed and implemented mathematical algorithms for production scheduling. From 1995 to 2003, he was employed at Agere Systems, Inc., where he performed industrial engineering functions related to cost control, safety, and detailed capacity analysis. Mr. LeCroy spent three years at Dynamics Research Corporation, building and maintaining simulation models for Department of Defense training systems. He has developed simulation models for the analysis of ground operations at the Kennedy Space Center. At NS, Mr. LeCroy conducts RTC Simulation projects to improve NS operations.

Mr. LeCroy earned his Bachelor of Science degree in industrial engineering from Auburn University and his Master of Science degrees in industrial engineering from the University of Central Florida. He is a member of the Institute of Industrial Engineers, the Project Management Institute, and the American Society of Quality. He has been published in Interfaces, a Journal on the Practice of Operations Research.

Mr. LeCroy's complete curriculum vitae is attached.

VERIFICATION

I, Kenneth Lecroy, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company. that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Kenneth Lecroy

Executed on this 7th day of December, 2012.

Ken LeCroy, M.S.I.E., PMP, SSBB

WORK EXPERIENCE

January 2006 - Present: Industrial Engineer, Norfolk Southern Corp.

- Conducting RTC Simulation projects and process improvement field studies

September 2008 - January 2012: Senior Discrete-Event Simulation Engineer

- Developed and exercised simulation models for analysis of ground operations at Kennedy Space Center

September 2006 - September 2008: Process Improvement Engineer, Kaman Precision Products

- Developed and implemented innovative means of process improvement for the manufacturing of Fuses for defense industry

May 2003 to September 2006: Discrete-Event Simulation Analyst, Dynamics Research Corporation

- Built, maintained, and exercised DES simulation models for Department of Defense training systems

November 1995 - July 2003: Industrial Engineer / Manufacturing Supervisor, Agere Systems, Inc.,

- Performed various IE functions related to cost control, safety, automation of reporting metrics, and detailed capacity analysis. Managed group of 20-25 manufacturing technicians.

August 1994 – November 1995: Consultant, Adapta Solutions, Inc.

- Developed and implemented mathematical algorithms for bulk process scheduling.

EDUCATION

BS/MS in Industrial Engineering – Auburn University (1992) / University of Central Florida (1994)

PROFESSIONAL QUALIFICATIONS

Project Management Professional Certification (PMP), Six Sigma Black belt (ASQ)

PUBLICATIONS

"Application of Neural Networks and Simulation Modeling in Manufacturing System Design" – 1994, Interfaces (Informs Journal on the Practice of Operations Research)

PROFESSIONAL MEMBERSHIPS

Institute of Industrial Engineers(IIE), Project Management Institute(PMI), American Society of Quality(ASQ)

RONNIE D. JOHNSON

Mr. Johnson is the founder of R & D Johnson Enterprises LLC, a consulting firm with offices located at 1324 Gulfprot Run, Grayson, Georgia 30017. Prior to founding R & D Johnson Enterprises, Mr. Johnson was employed at Norfolk Southern Railway Company ("NS"), where he developed extensive experience in railroad operations. Mr. Johnson is sponsoring portions of Section III-C of NS's Reply Evidence relating to train schedules, yard structure, and car blocking plans. Mr. Johnson has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Johnson's railroad operations experience stems from over 40 years in varied and increasingly responsible operations positions with the Illinois Terminal Railroad, Norfolk and Western Railroad, and Norfolk Southern Railway. Mr. Johnson held various positions at these railroads throughout his career including Terminal Supervisor, Trainmaster, Terminal Superintendant, Senior Director of Automotive Service and Distribution. Mr. Johnson also has experience in railroad logistics and support for Premium Operations as well as service design. Mr. Johnson studied Economics and Business at Southern Illinois University. Mr. Johnson holds certificates from the University of Tennessee College of Business' Supply Chain Management Program and the University of Virginia's Darden Executive Development Program.

VERIFICATION

I, Ronnie D. Johnson, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Ronnie D. Johnson

Executed on this 17th day of December, 2012.

DAVID A. MAGISTRO

Mr. Magistro is a Senior Engineer/Project Manager with STV, a professional firm offering engineering, architectural, planning, environmental and construction management services with offices located at 6405 Metcalf Avenue, Suite 516, Overland Park, Kansas 66202. Mr. Magistro has more than 14 years of experience with structural design, almost all of which have been focused on movable bridges and railroad structures. Mr. Magistro is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to bridges. Mr. Magistro has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Magistro's experience includes structural steel design, steel bridge rehabilitation, fixed bridge and moveable bridge inspection, fixed bridge and movable bridge design including structural and mechanical aspects, plan production, and project management for numerous railroad and transportation agency clients. Mr. Magistro holds a Bachelor of Science, Civil Engineering from Kansas State University and is a member of the American Railway Engineering and Maintenance-of-Way Association (AREMA).

Mr. Magistro's resume with additional project experience is attached hereto.

VERIFICATION

I, David A. Magistro, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof. and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

David A. Magistro

Executed on this 12th day of December, 2012.

David A. Magistro, P.E.

Senior Engineer/Project Manager

Mr. Magistro has more than 14 years of experience with structural design, almost all of which has been focused on railroad structures. His is well versed in structural steel design, steel bridge rehabilitation, fixed bridge and movable bridge inspection and design, including structural and mechanical aspects, plan production, and project management for numerous railroad and transportation agency clients.

Project Experience

BNSF Bridge 6.3 Rail Joint Replacement – Project Manager
Design project to replace the rail joints and steel ties on this double-track bascule span. The project includes structure modification for the new steel ties and rail joints, and providing a construction sequence to complete the work. (6/12 – Present)

BNSF Bridge 6.3 Operating Strut Reinforcement – Project Manager
Providing fabrication and installation recommendations for the replacement of the bearings the support the main pinions inside the operating struts on this double-track bascule span. The project includes review of fabrication shop drawings and construction sequence to complete the work. (8/12 – Present)

NS Vs. DuPont Rate Case – Project Engineer
Project Engineer responsible for the bridge evidence in this chemical rate case, officiated by the Surface Transportation Board (STB). Responsible for evaluating Opening Evidence generated by DuPont, and compiling Reply Evidence on behalf of NS to establish the construction cost of a Stand Alone Railroad system, upon which NS's shipping rates are based. (5/12 – Present)

BNSF Bridge 231.4 Inspection – Project Manager
Inspection of structural repairs that were made in 2008 to verify that the as-repaired condition merits the as-repaired structural rating. (10/11 – 1/12)

IPA Vs. BNSF/UPRR Rate Case – Project Engineer
Project Engineer responsible for the bridge evidence in this coal rate case, officiated by the Surface Transportation Board (STB). Responsible for evaluating Opening Evidence generated by IPA, and compiling Reply Evidence on behalf of BNSF and UPRR to establish the construction cost of a Stand Alone Railroad system, upon which BNSF's and UPRR's shipping rates are based. (9/11 – 11/11)

BNSF/UPRR Precast Specification Update – Project Manager
Evaluation of the shared standard specification for the manufacture of precast and prestressed concrete components for BNSF and UPRR. The project included bringing the standard specification into accordance with current fabrication practice. (3/11 – 1/12)

Employee No.
04910

Department No.
53

Office Location
Overland Park, KS

Date joined firm
3/30/09

Years with other firms
11

Education
Bachelor of Science, Civil Engineering, Kansas State University (1998)

Professional Registrations
Professional Engineer: Missouri (2003/#2003001064/exp. 12/31/13), Kansas (2009/#20754/exp. 4/30/13), Oklahoma (2009/#24155/exp. 8/31/14)

Memberships
American Railway Engineering and Maintenance-of-Way Association (AREMA) (2005 - Present)

AREMA Committee 15, Subcommittee 6 Chairman (2012-Present)

Heavy Movable Structures (HMS) Registrar (2001 - 2010), Treasurer (2010-Present)

BNSF Kansas City Movable Bridge Inspection – Project Manager
Provided walk-through maintenance inspection of the two movable bridges owned by BNSF in the Kansas City area, ASB and Hannibal. The walk-through maintenance inspections included observing all mechanical and electrical equipment in-use, noting deficiencies and areas that will require maintenance or repair. The project ended with a report containing recommendations for all maintenance and repair work. (4/11 – 7/11)

KCPL LaCygne Station Siding Addition – Project Manager
Provided survey of existing track and topography upon which to base the design of the new siding addition. Provided track design for the new siding. Provided roadway design for a roadway overpass alignment that utilized a steel plate arch structure to remove the at-grade crossing. Provided shop drawing review of the fabrication drawings for the steel plate arch structure. (9/10 – 11/11)

AEPCO Vs. UPRR Rate Case – Project Engineer
Project Engineer responsible for the bridge evidence in this coal rate case, officiated by the Surface Transportation Board (STB). Responsible for evaluating Opening Evidence generated by AEPCO, and compiling Reply Evidence on behalf of UPRR to establish the construction cost of a Stand Alone Railroad system, upon which UPRR's shipping rates are based. (2/10 – 5/10)

AEPCO Vs. BNSF Rate Case – Project Engineer
Project Engineer responsible for the bridge evidence in this coal rate case, officiated by the Surface Transportation Board (STB). Responsible for evaluating Opening Evidence generated by AEPCO, and compiling Reply Evidence on behalf of BNSF to establish the construction cost of a Stand Alone Railroad system, upon which BNSF's shipping rates are based. (2/10 – 5/10)

Seminole Electric Vs. CSX Transportation Rate Case – Project Engineer
Project Engineer responsible for the bridge evidence in this coal rate case, officiated by the Surface Transportation Board (STB). Responsible for evaluating Opening Evidence generated by Seminole Electric, and compiling Reply Evidence on behalf of CSX Transportation to establish the construction cost of a Stand Alone Railroad system, upon which CSXT's shipping rates are based. (7/09 – 5/10)

ODOT Robinson Street Grade Crossing - Project Manager
Managing the construction of a detour for rail and vehicular traffic that will be used during construction of a permanent Burlington Northern Santa Fe (BNSF) Railroad grade separation at Robinson Street in Norman, OK. This railroad corridor receives heavy freight traffic and is also an Amtrak corridor. STV's shoofly design will permit rail and roadway traffic to continue during construction. In addition, the firm is assisting the contractor with the design of shoring for the permanent bridge structure. (3/10 - Present)

UPRR Oklahoma City I-40 - Project Engineer
Reviewed project plans for the realignment of train tracks along this highway corridor in Oklahoma City. Mr. Magistro reviewed the overhead structures and foundation configuration at each grade separation to determine if the arrangements, clearances, and structural designs met American Railway Engineering and Maintenance-of-Way Association (AREMA) and Union Pacific Railroad (UPRR) requirements. He provided reviews through the duration of the project and interacted with UPRR, the Oklahoma Department of Transportation, utility owners, and construction contractors. (6/09 - 9/10)

New England Central Railroad Bridge 15.21 Modification - Project Engineer
Provided mechanical and structural design services for the conversion of a swing-span bridge from manual to mechanical operation in Swanton, VT. The bridge, which had been operated manually using a capstan, is protected as a state historic resource. The project team successfully incorporated the electric-powered system without altering the appearance or function of the bridge. (5/09 - 10/10)

VDOT Coleman Bridge Cable Replacement - Project Engineer
Designed emergency repairs to the structural and mechanical systems on this 3,750-foot, double swing-span bridge that crosses the York River between Yorktown and Gloucester Point, VA. A tug boat struck the bridge and damaged several cables. Mr. Magistro's work enabled VDOT to restore service to this important toll crossing, which carries the 4-lane U.S. 117 and connects the Peninsula and Middle Peninsula areas of Virginia's Tidewater region. (10/09 - 6/10)

South Central Florida Express Moore Haven Bridge Rehabilitation - Project Engineer
Prepared design plans for new mechanical equipment on this swing-span railroad bridge in Moore Haven, FL, which remained in operation during construction. Engineers completed the transition between the old and new system in a week without causing interruptions to train service. (5/10 - 9/10)

BNSF Bridge 231.4 Structural Inspection, Load Rating, and Structural Repairs - Project Manager/Field Inspector/Design Engineer
Responsible for the comprehensive structural inspection and load rating of the floor system for the roadway portions of this double-deck structure over the Mississippi River in Fort Madison, IA, for the Burlington Northern Santa Fe (BNSF) Railroad. The inspection and load rating was followed by a phase of structural repairs. Mr. Magistro was responsible for the design and construction sequencing of the structural steel repairs for an approach span through plate girders and floor system components, including stringers and floorbeams. (6/08 - 3/09)

Norfolk Southern Bridge 6.66 Rehabilitation - Design Engineer
Managed the structural design for the replacement of curved segments on the rolling girders of this double-track rolling bascule span over the South Branch Elizabeth River in Gilmerton, VA. The project included structural

design and detailing, plan production, construction specifications, construction sequencing and contractor coordination. (5/07 - 1/09)

BNSF Bridges 5.8, 6.2, and 6.7 Structural Inspection, Load Rating and Structural Repairs - Project Manager/Field Inspector
Directed the comprehensive inspection and load rating analysis of these three structures over north Willamette Boulevard, north Lombard Street, and north Fessenden Street in Portland, OR. All three structures consist of a combination of deck plate girder spans and deck truss spans resting on either structural steel towers or concrete piers. Mr. Magistro also managed the follow-up project to design structural retrofits to increase the load capacity of these structures. (1/08 - 12/08)

BNSF Bridge 117.35 Electrical/Mechanical Rehabilitation - Project Manager
Responsible for the replacement of the drive system on this span drive vertical lift bridge over the Illinois River in Beardstown, IL. The project included replacing the existing central reducer, drive motors, auxiliary drive system, shafts, bearings, and couplings. (9/07 - 11/08)

Canadian Pacific Rail Bridge 283.27 Bearing Repair and Truss Jacking - Project Manager/Design Engineer
Responsible for design and detailing of jacking frames used to longitudinally jack two approach spans through trusses adjacent to this 360-foot swing span over the Mississippi River in La Crosse, WI. The project included construction sequencing and field assistance during construction. (5/07 - 12/07)

VDOT I-264 Berkley Bridge Rehabilitation - Design Engineer
Participated in the rehabilitation of a 4-leaf bascule bridge over the New Elizabeth River in Norfolk, VA, for VDOT. The project consisted of design and integration of a new drive system and machinery on top of an existing system of equipment and machinery. The design includes two complete designs to accommodate the original 2-leaf bascule built in 1950 and the second bascule pair built in 1992. Mr. Magistro's responsibilities included design of the new mechanical equipment, as well as structural retrofits required for installation of the new equipment. (6/06 - 9/07)

BNSF Abo Canyon Double Track Capacity Design Project - Lead Bridge Engineer
Responsible for bridge layouts, design, quantity calculations and cost estimates for nine bridge structures along a 5-mile stretch of second mainline track for the Burlington Northern Santa Fe (BNSF) Railroad through Abo Canyon, NM. (10/04 - 3/06)

BNSF Bridge 0.80 Emergency Stringer Replacement - Project Manager/Design Engineer
Supervised the emergency replacement of eight stringers in the movable span floor system of this 450-foot swing span over the Missouri River in Kansas

City, MO. The scope of the project also included shop inspection during fabrication of the fracture critical stringers. (8/04 - 10/04)

Canadian Pacific Rail Bridge 283.27 Span Alignment Lock Design - Project Manager
Led the design and detailing of a new span alignment and span locking device for this 360-foot swing span over the Mississippi River in La Crosse, WI. The project included structural modifications to the approach span where the new device was located. (12/03 - 10/04)

BNSF Bridge 37.0 Fender Replacement - Project Manager/Design Engineer
Oversaw design and detailing of a new fender system for the 260-foot swing span over the Snohomish River in Everett, WA. (5/03 - 4/04)

BNSF Bridge 14.2 Pier Rehabilitation - Project Engineer
Assisted in development and design of rehabilitation details for the rest pier, bridge bearings, lift tower structural support steel, and end floorbeam top flange replacement for this bridge located near Steilacoom, WA. The rest pier was rehabilitated and the live load bearing was replaced while maintaining both rail and navigation traffic. (3/02 - 11/03)

BNSF Richmond Turntable Rehabilitation - Project Engineer
Responsible for design of the new mechanical components in the rehabilitation of this 110-foot turntable structure in Richmond, CA. The project included design and details for new end trucks, new enclosed gear reducer to replace open gear set, new shafts and bearings, and new structural supports. (8/02 - 5/03)

EJE Railway Bridge 728 Rehabilitation - Design Engineer
Responsible for the mechanical rehabilitation of this Scherzer single-leaf rolling bascule span over the East Chicago Canal in Gary, IN, for Elgin, Joliet and Eastern (EJE) Railway. The project included replacement of the drive motor and central reducer, and all associated shafts, bearings, and couplings; installation of a new auxiliary motor and clutch; and upgrade of the control system. Mr. Magistro was also responsible for the design of the structural support system rehabilitation for new mechanical components, and construction sequencing and field assistance during construction. (4/01 - 5/03)

CSX Transportation Bridge L653.4 Span Replacement - Project Engineer
Participated in the inspection to evaluate the existing condition of the movable span for purposes of the United States Coast Guard Cost Apportionment. Mr. Magistro was responsible for the new bridge deck details, including timber ties, steel ties, and rail joints for this on-line swing span replacement with a new 360-foot vertical lift span over the Mobile River near Hurricane, AL. (5/00 - 2/03)

Elgin, Joliet and Eastern Railway Bridge 198 Inspection and Rehabilitation - Design Engineer
Led the mechanical rehabilitation of this skewed 306-foot-long tower drive vertical lift bridge over the Des Plaines River in Joliet, IL. This Elgin, Joliet and Eastern (EJE) Railway project included the replacement of an open gear set with an enclosed gear reducer, as well as the replacement of all impacted shafts, pinions, bearings, and couplings. Mr. Magistro was also responsible for the design of new mechanical system components, construction sequence, and field assistance during construction. (5/01 - 11/02)

BNSF Bridge 1136.3 Rail Joint Replacement - Design Engineer
Responsible for the replacement of the rail joints on this Abbott Style single-leaf bascule bridge over the Old River in Orwood, CA. The project also involved installation of steel ties under the new joints, replacement of one approach span, and rehabilitation of the span lock. Mr. Magistro's responsibilities also included engineering design, plan production, and field assistance during construction. (5/00 - 4/01)

MICHAEL MATELIS

Mr. Matelis is a Senior Director in the Network Industries Strategies ("NIS") Group of FTI Consulting, Inc., an economic and consulting firm with offices located at 1101 K Street, NW, Washington, DC 20005. Mr. Matelis is sponsoring portions of Sections III-C and III-A of Norfolk Southern ("NS's") Reply Evidence, including NS Reply Exhibit III-C-7 related to data sufficiency. Mr. Matelis has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Matelis holds a Bachelor of Arts degree in economics from the University of North Carolina at Chapel Hill. He provides financial and economic consulting services to the transportation, energy, and telecommunications industries. Mr. Matelis has led efforts assessing data quality and performed complex economic and financial analysis.

Mr. Matelis previously worked as a management consultant for a number of government and private organizations, providing quantitative analysis.

Mr. Matelis's curriculum vitae is attached.

VERIFICATION

I, Michael Matelis, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Michael Matelis

Executed on this 4 day of January, 2013.

Michael Matelis

Senior Director – Economic Consulting

michael.matelis@fticonsulting.com

FTI Consulting
1101 K Street, NW
Suite B100
Washington, DC 20005
Tel: (202) 312-9100
Fax: (202) 312-9101

Education
BA in Economics from University of North Carolina at Chapel Hill

Michael Matelis is a Senior Director in the Network Industries Strategies group of the FTI Economic Consulting group, located in Washington, D.C. Mr. Matelis provides financial and economic consulting services to the transportation, energy and telecommunications industries.

Mr. Matelis has developed and managed complex database systems incorporating data from various sources to generate enterprise-level information for analysis. He has worked with clients to define data requirements and identify appropriate data sources for various projects. He has led efforts assessing data quality – ensuring proper configurations, linkages, and values contained within data sets. He has performed economic and financial analysis and developed methodologies to model operations, examine costs, establish pricing rates, and ensure compliance with regulations.

Prior to joining FTI Consulting, Mr. Matelis worked as a management consultant leading projects specializing in analytical and data-driven efforts for various government and private organizations. These efforts included: creating data collection and analysis tools, developing and analyzing performance measures, designing and implementing national surveys, and developing information systems. His core skills include quantitative analysis, data management, and information system development.

TESTIMONY

Surface Transportation Board

August 1, 2011	Docket No. 42125, E.I. DuPont De Nemours and Company v. Norfolk Southern Railway Company, Norfolk Southern Railway Company's Reply to Second Motion to Compel, Joint Verified Statement of Benton V. Fisher and Michael Matelis

MARK D. MATHEWSON

Mr. Mathewson is the Founder and President of Mathewson Right of Way Company, a land acquisition services company, with offices located at 30 North LaSalle Street, Suite 1726, Chicago, Illinois 60602. Mr. Mathewson is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to real estate acquisition costs. Mr. Mathewson has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

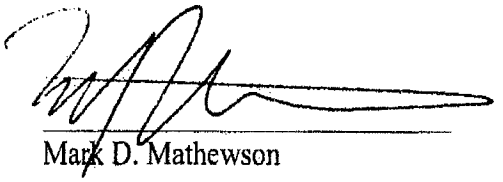
Mr. Mathewson received his Bachelor of Science degree in political science from Loyola University of Chicago and his Juris Doctor from Loyola University of Chicago School of Law. He has approximately 25 years of experience in the land acquisition field.

For six years, Mr. Mathewson has headed Mathewson Right of Way Company, which concentrates on right of way consulting and project management, negotiations, and relocation assistance. Mr. Mathewson has provided negotiation services for numerous state agencies, municipalities, and County Agencies, including for several transportation projects. Mr. Mathewson is on the state of Illinois' Department of Transportation list of Approved Negotiators.

Mr. Mathewson's complete curriculum vitae is attached.

VERIFICATION

I, Mark D. Mathewson, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.



Mark D. Mathewson

Executed on this 10th day of December, 2012.

MROWCO
MATHEWSON RIGHT OF WAY

Mark D. Mathewson

President

Mark D. Mathewson founded Mathewson Right of Way Company in 2006 with a mission of providing the highest quality land acquisition services in the State of Illinois.

Mr. Mathewson is a licensed attorney and has worked in the land acquisition field since 1987. During his career he has acquired thousands of parcels of property across much of the State of Illinois. Mr. Mathewson remains one the most highly qualified and experienced negotiators in Illinois. Further, Mr. Mathewson provides project management capabilities that result in projects being completed in a timely and budget conscious manner.

Mr. Mathewson has been on the list of Approved Negotiators published by the Illinois Department of Transportation since it was first prepared in 1989.

Education

Juris Doctor, 1985
Loyola University of Chicago, School of Law

B.S. Political Science, 1982
Loyola University of Chicago

Professional Registrations

Attorney at Law; Admitted to the State of Illinois Bar, November 7, 1985
IDOT Approved Fee Negotiator

Areas of Concentration

Right of Way Consulting & Project Management
Negotiations
Relocation Assistance

Representative Projects

Provided land acquisition negotiation services for the following projects

- *Algonquin Road, 78 parcels;* McHenry County Division of Transportation
- *Irene Road and I-90 Interchange, 3 parcels acquired by negotiation;* Boone County
- *I-294 South Tri-State Widening, 170 parcels;* Illinois State Toll Highway Authority
- *Wacker Drive Reconstruction, 2 parcels acquired by negotiation ($2 million);* Chicago Department of Transportation
- *Hillside Strangler (I-290), 99 parcels;* Illinois Department of Transportation – District 1
- *Naperville Road at East-West Tollway, 1 parcel acquired by negotiation ($3.75 million);* DuPage County Division of Transportation
- *IL Route 32/33 Effingham, 46 parcels acquired by negotiation (no condemnation);* Illinois Department of Transportation – District 7
- *FAP 310 (IL 255) Turn-Key Project, 75 parcels;* Illinois Department of Transportation – District 8

Provided land acquisition negotiation services for the following State Agencies

- Illinois Department of Transportation, District 1
- Illinois Department of Transportation, District 4
- Illinois Department of Transportation, District 7
- Illinois Department of Transportation, District 8
- Illinois Tollway

MROWCO
MATHEWSON RIGHT OF WAY

Mark D. Mathewson
President

Representative Projects (Continued)

Provided land acquisition negotiation services for the following County Agencies

- Boone County
- Cook County
- DuPage County (Appointed Special Assistant State's Attorney, 1998)
- Kane County
- McHenry County
- Will County

Provided land acquisition negotiation services for the following Local Agencies

- Village of Addison
- Village of Arlington Heights
- City of Batavia
- Village of Beecher
- Village of Bensenville
- Village of Berkeley
- Village of Buffalo Grove
- Village of Bull Valley
- Village of Cary
- City of Chicago (Special Assistant Corporation Counsel)
- Town of Cicero
- City of Country Club Hills
- Village of Crete
- City of Crystal Lake
- Village of Deerfield
- Village of Elk Grove Village
- Village of Evergreen Park
- Village of Fox Lake
- Village of Franklin Park
- Village of Glen Ellyn
- Village of Gurnee
- Village of Homewood
- Village of Itasca
- Village of Johnsburg
- City of Lockport
- Lockport Township
- Village of Matteson
- Village of Monee
- Village of Morton Grove
- Village of Northbrook
- Village of Oak Brook
- City of Oak Forest
- Village of Orland Park
- Village of Palatine
- Village of Plainfield
- Village of Robbins
- Village of Romeoville
- Village of Schaumburg
- Village of Sugar Grove
- Village of Vernon Hills
- City of West Chicago
- Village of Westmont
- City of Wheaton
- Village of Winfield
- Village of Woodridge
- City of Woodstock

JOSEPH C. OSBORNE, JR.

Mr. Osborne is a consultant with RELX LLC with extensive expertise in railroad operations following a career at Norfolk Southern. Mr. Osborne is sponsoring portions of Section III-D of Norfolk Southern's ("NS's") Reply Evidence relating to police and environmental staffing. Mr. Osborne has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Osborne's railroad experience includes over 30 years in the railroad industry, first as an employee of Penn Central, then Conrail, and later at NS. Mr. Osborne was an integral part of the NS Management Team that oversaw the Conrail acquisition and integration. Mr. Osborne most recently served as Vice President – Coal Transportation and Planning and prior to that as Group Vice President – Chemicals for NS. Mr. Osborne's experience includes years with various marketing and business development units within both NS and Conrail. Mr. Osborne holds both Masters and Bachelor of Arts degrees in History from the University of Delaware.

Mr. Osborne's resume with additional project experience is attached hereto.

VERIFICATION

I, Joseph C. Osborne, Jr., declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Joseph C. Osborne, Jr.

Executed on this 2nd day of January, 2013.

Joseph C. Osborne, Jr.
1550 Strawberry Mountain Drive, Roanoke, VA 24018
(540) 725-1118

Profile - Retired June 1, 2011 from Norfolk Southern. Currently consulting under RELX LLC.

Member of the Norfolk Southern Management Team that successfully integrated the Conrail acquisition. Held various senior level positions in marketing, coal operations and equipment management. Successfully increased profitability across various business segments while minimizing regulatory impact. Implemented a series of commercial agreements to better manage the risks of handling hazardous materials by rail.

Member of the Conrail Management Team that delivered one of the most notable corporate turnarounds in history at that time. Held various senior level positions in marketing, operations, and equipment management, areas key to achieving a yield of 27% ROE. Demonstrated success by focusing cross-functional teams on clear measures and delivery of results. Achieved significant improvements in asset return while maintaining high levels of employee satisfaction and motivation.

Experience - **Norfolk Southern** (NS), Roanoke, VA **1998 - 2011**
A railroad generating $9.5 billion in annual revenue and providing freight transportation to the eastern half of the U.S.

Coal Business Group
GVP – Coal Transportation & Planning **2009 - 2011**

Business Manager for all aspects of Transportation and railcar fleet supply in support of NS' coal business.

- In the face of an unprecedented increase in 2010 demand, tailored available transportation capacity such that no coal customer experienced a critical, NS caused shutdown
- Increased transparency of coal transportation performance for producers and receivers
- Provided key input as NS' spokesperson to the STB's RETAC Committee and Coal Industry groups on service performance and capacity expansion plans

Industrial Products Group
GVP - Chemicals **2000 - 2009**

Business Unit Manager responsible for $1.1 billion in annual revenue for over 600 chemical commodities

- Increased profitability by over 145% on a declining (-10%) carload base through a complete rate restructuring while minimizing NS' rate regulatory risk
- Successfully marketed NS' superior service and safety record in the handling of hazardous materials while contractually achieving risk management goals
- Achieved the Thoroughbred Award as Leader of the SMART Pricing Team, which restructured pricing across the entire Industrial Products Group
- Lead the TVA Coal Ash clean-up project which was delivered on time, without any regulatory incidents, and with 100% profitability above standard for this business segment; this Team won the 2010 Chairman's Award

Merchandise Marketing Group
Director Construction Marketing **1998 - 2000**

Business Unit Manager responsible for $260 million in annual revenue for highway and building construction related products.

- Successfully increased profitability across the business unit portfolio while reducing rail fleet asset base.

Consolidated Rail Corporation (Conrail), Philadelphia, PA **1974 - 1998**
A railroad generating $3.86 billion in annual revenue and providing freight transportation to the Northeast and Midwest, U.S.

CORE SERVICE GROUP
AVP - Service, Equipment and Shortline Network **1995 - 1998**

Service and Equipment Management responsibility for distributing 58,000 freight cars per day and managing a $500 million annual equipment budget.

- Lead a cross-functional team to reduce equipment rents as a percent of Conrail revenue from 11% to 9% by instituting common and clear measures focusing on performance
- Reduced Equipment Management costs by 60% by standardizing car ordering and empty waybilling procedures
- Established new car allocation process which increased utilization by 7%
- Increased order fill rate from 65 to 85% by developing new freight car ordering technology
- Directed a staff of 53 employees, covering the functional areas of Equipment Management and Planning, Service Design, Car Accounting and Deprescription, and Conrail's Shortline Network

CORE SERVICE GROUP
AVP - Metals **1994 - 1995**
Director - Metals Marketing **1993 - 1994**

Business Unit manager responsible for $350 million in annual revenue. Conrail was the largest transporter of steel in North America

- Increased market share and revenue by $70 million by locating seven new steel mills on Conrail through a combination of competitive service/rate packages, leveraging Conrail's scrap steel franchise, and coordination of both electric power suppliers and state and local government agencies
- Improved margins on steel business by 19% over two years through improved freight car supply and quality, applying yield management techniques to the car allocation process, and selling the value of Conrail's steel franchise to all suppliers of the steel production process
- Saved $182 million in equipment acquisition costs by coordinating a 30% utilization improvement on 10,000 gondolas and coil cars
- Directed a staff of 72 employees, covering the functional areas of marketing, sales, equipment planning and pricing specialists

AUTOMOTIVE BUSINESS GROUP
Director - Auto Parts Marketing **1990 - 1993**

Line of Business manager in charge of $230 million in annual revenue for the largest transporter of auto parts in North America

- Successfully launched a $57 million annual revenue project for GM's Tarrytown Assembly plant. Team leader of key Conrail, General Motors, Metro North Rail, and New York State personnel. Completed entire commercial plan, service design for both inbound auto parts and outbound finished vehicles. Coordinated the engineering efforts for the Hudson Line Clearance Project and the Tarrytown Auto Loading facility
- Lead a cross-functional team that designed and implemented a guaranteed service product which stabilized Conrail's auto parts market share
- Recognized as Chairperson of the Conrail Marketing Department Quality Council

AUTOMOTIVE BUSINESS GROUP
Various Marketing, Business Development, Service Planning and Equipment Management positions **1986 - 1990**

TRANSPORTATION and OPERATIONS
Division Road Foreman - New Jersey Division **1984 - 1986**

- Managed five Road Foreman and 350 Locomotive Engineers for service and safety performance over almost 1,000 miles of railroad. Responsible for Locomotive Utilization and Road Train operations

Road Foreman - Harrisburg Division **1981 - 1984**
Trainmaster, Road Foreman - Philadelphia Division **1980 - 1981**
Locomotive Engineer **1974 - 1980**

Education - University of Delaware - Masters in History **1979**
- B.A. *in History* **1973**

Training Programs (62 Programs completed) **1983 - 2011**

Computer Skills - Familiar with Mainframe Applications for Railroad Operations; Outlook, Word, Excel, Power Point

MARK A. PETERSON

Mr. Peterson is a Vice President and Architect with STV, a professional firm offering engineering, architectural, planning, environmental and construction management services with offices located at 1055 West Seventh Street, Suite 3150, Los Angeles, California 90017. Mr. Peterson has more than 25 years of experience in the design and oversight of new and renovated transportation, healthcare, and laboratory facilities. Mr. Peterson is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to facilities. Mr. Peterson has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Peterson's transportation work has included master planning, programming, and design for vehicle maintenance, service and inspection, parking, operations and administrative, and communications facilities for state and regional transit agencies as well as for railroads. Mr. Peterson holds a Bachelor of Arts, Architecture from Washington University and is a member of the American Institute of Architects.

Mr. Peterson's resume with additional project experience is attached hereto.

VERIFICATION

I, Mark A. Peterson, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Mark A. Peterson

Executed on this 12 day of December, 2012.

Mark A. Peterson, AIA

Architect
Vice President

Mr. Peterson is an architect and project manager with more than 25 years of experience in the design and oversight of new and renovated transportation, healthcare, and laboratory facilities. His transportation work has included master planning, programming, and design for vehicle maintenance, service and inspection, parking, operations and administrative, and communications facilities for state and regional transit agencies and railroads. Mr. Peterson also has particular expertise providing design for healthcare facilities, as well as for life safety systems and ADA compliance upgrades. He brings a high degree of knowledge and experience in the resolution of challenging construction projects within operating facilities.

Office Location
Los Angeles, CA

Date joined firm
12/3/07

Years with other firms
23

Education
Bachelor of Arts, Architecture; Washington University (1984)

Professional Registrations
Architect: California (1994/#C25229/exp. 5/31/13)

Memberships
American Institute of Architects (AIA), Los Angeles Chapter

Project Experience

HEALTH & SCIENCE

LACDPW Olive View – UCLA Medical Center - Architect-of-Record
Provided architectural oversight for the design of a new cleanroom and anteroom at the Olive View – University of California, Los Angeles (UCLA) Medical Center in Sylmar, CA. Under an architectural and engineering design services task-order contract with the Los Angeles County Department of Public Works (LACDPW), STV designed a renovation of an existing pharmacy area at this 377-bed hospital to accommodate an International Organization for Standardization (ISO) Class 5 intermediate cleanroom for intravenous compounding and chemotherapy, an ISO Class 7 anteroom, and a Talyst machine. Mr. Peterson oversaw design plans, which encompassed architectural, mechanical, and structural disciplines. As part of this complex renovation, the firm designed a standalone HVAC system with separate exhaust; electrical, plumbing, and fire protection system improvements; a horizontal and vertical flow hood; and upgrades to the pharmacy restroom, in accordance with ADA requirements. STV also designed the anchorage for three carousel prescription dispensers planned for installation and verified that the pharmacy's floor could support their load, strengthening the floor beams, as required. The California Office of Statewide Health Planning and Development approved STV's plans for the project. (7/08 - 7/10)

VA Building 99 Seismic Upgrade and HVAC Systems Replacement - Architect
Led initial building evaluation and formulation of the design approach, phasing, and costing for the seismic retrofit of a single-story, long-term U.S. Department of Veterans Affairs (VA) care facility in Sepulveda, CA. The project scope for this occupied 50,000-sf facility included full replacement of

the HVAC system, slab-on-grade and foundation wall moisture sealing, and replacement of all interior finishes. (1996)

VA Long Beach Campus ADA and Life Safety Systems Upgrades - Project Architect
Provided design for the upgrade of numerous structures for compliance with ADA guidelines and life safety codes on the U.S. Department of Veterans Affairs (VA) campus in Long Beach, CA, as part of an open-ended contract. The project included initial evaluation of deficiencies within fire-rated existing systems, reporting, and the development of construction documents detailing corrective measures. (1995)

U.S. FamilyCare Medical Center Expansion - Project Manager/ Architect
Provided design for the seismic upgrade and expansion of a 101-bed acute care facility in Montclair, CA. The project goals included a seismic upgrade and market-driven expansion of the hospital from 72,000 to 100,000 sf while avoiding impact to the census or services at any time. Mr. Peterson's design included phased upgrades to all departments and complete redesign of the site. All mechanical and electrical systems were replaced to comply with current standards, including life safety and critical branch power requirements. (1993)

LABORATORY & HIGH-TECH

NASA Jet Propulsion Laboratory Improvements - Contract Manager/Project Architect
Responsible for the administration and direction of projects under an open-ended contract with the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory in Pasadena, CA. Projects typically ranged from $700,000 to $1.5 million and included optical, flight hardware development, and super-computing laboratories; administrative and records archiving units; and cafeterias. Other projects included clean rooms, specialized utility delivery requirements, and addressing security issues. (1995 - 2007)

MULTIMODAL

BNSF Railway Intermodal and Automotive Facility Expansions - Project Manager/Project Architect
Led design for numerous rail and building projects in Los Angeles associated with a $150 million expansion of the world's largest intermodal facility. One project was the complete redesign of secure parking facilities, which included security systems; gate reconfiguration; and supporting administrative, repair, and mechanical structures. Mr. Peterson helped develop a complete master plan corresponding to the rolling 5-year goals of the BNSF Railway. He was responsible for the programming and design of a

new 30,000-sf operations and administrative command center serving the nearly 500 employees and contractors at the Los Angeles facility, as well as a new, secure communications hub built to emergency services standards in Stockton, CA, to provide connectivity between operations centers in Los Angeles; Fort Worth, TX; and Northern California. Mr. Peterson assumed a similar design role for the BNSF Memphis Intermodal Yard Expansion, which was one of the first in the nation to employ European wide-span crane technology. (1995 - 2007)

POLA/BNSF Railway Southern California International Gateway - Task Manager/Project Architect
Worked with the Port of Los Angeles (POLA) and BNSF Railway to plan a new intermodal facility, the Southern California International Gateway (SCIG), on a sustainable design basis in Los Angeles. The SCIG will provide much-needed near-dock capacity with direct access to the Alameda Corridor, a 20-mile-long, grade-separated rail line between the ports and downtown Los Angeles. The design, which progressed to the Environmental Impact Report process and is presently awaiting approval, is based on minimizing the environmental footprint and employs highly efficient wide-span cranes capable of serving up to eight intermodal tracks. The cranes are electric and use cogeneration of power in their operation. All hostling equipment will utilize either compressed natural gas or liquefied natural gas to reduce emissions. Yard lighting is designed to virtually eliminate light trespass and utilizes highly efficient lamps. Yard operations are designed to provide the utmost in efficiency and further reduce hostling operations and third-party truck dwell time. This efficiency also reduces the overall area of impact for stormwater management. (2005)

TRANSPORTATION FACILITIES

WRTA Bus Maintenance, Operations, and Storage Facility - Lead Designer
Overseeing architectural design for the construction of a new vehicle maintenance, operations, and storage facility in Worcester, MA, for the Worcester Regional Transit Authority (WRTA). The 2-story, 150,000-sf facility will have a capacity for 125 vehicles and space for 155 employees. It will include bus lifts, wash and fueling bays, a body shop and paint booth, fluid dispensing systems, general parts and tire storage operations and retrieval, operations and maintenance personnel welfare areas, bus and van dispatch space, and office and administration spaces. (7/11 - Present)

City of Los Angeles LADOT CNG Fueling and Bus Maintenance Facility Feasibility Study - Project Manager
Leading a feasibility study of three locations for a proposed new Los Angeles Department of Transportation (LADOT) fueling and maintenance facility for its 60-vehicle compressed natural gas (CNG) Downtown Area Short Hop bus fleet, with layover area for up to 64 Commuter Express buses. The facility will include vehicle storage, CNG fueling stations, maintenance bays, office

space, parking for employees and non-revenue vehicles, welfare facilities, and a dispatch center. In addition to determining minimum site size and configuration, the conceptual feasibility evaluation will include environmental and accessibility requirements, capacity for future expansion, general floor plans, rendered elevations, and cost estimates. Issues Mr. Peterson is addressing include the maneuvering and parking needs of the 30-foot-long and 40-foot-long vehicles, traffic patterns and impacts in and around the sites, and the availability of adequate quality natural gas, as well as integration with and support for planned future high-speed rail service in the region. (8/11 - Present)

Omnitrans East Valley Vehicle Maintenance Facility Modifications - Project Manager
Leading architectural and engineering services for project development — including preliminary engineering and final design; engineering support services during construction; and development of plans and procedures for start-up, commissioning, operations, and maintenance — of the Omnitrans East Valley Vehicle Maintenance Facility in San Bernardino, CA. The facility needs to be modified to accommodate the introduction of up to 23 sixty-foot-long articulated buses associated with the sbX bus rapid transit project. All maintenance services must remain operational throughout the construction period. (1/11 - Present)

CHSRA Los Angeles-to-Anaheim Project EIR/EIS - Facilities Programming and Design Manager
Leading the team for preliminary design of three stations and a rolling stock vehicle maintenance facility for a 30-mile high-speed train corridor between Los Angeles and Anaheim, CA, for the California High Speed Rail Authority (CHSRA). The maintenance facility will provide Class 1-3 vehicle maintenance services for 28 trainsets daily. The contextual nature of the proposed facilities is seen as critical in terms of aesthetic, scale, massing, and traffic impact. Early on, Mr. Peterson led the team's effort to generate projections for vehicle design, operations, ridership numbers, and demographics: parameters that CHSRA had not yet defined. These projections distilled down into sensible design solutions. Despite significant changes to the project due to immense political pressures, Mr. Peterson's leadership enabled the team to complete deliverables on time. Currently, design is progressing toward a 30% design deliverable in support of the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the design-build procurement package. Mr. Peterson is meeting and coordinating with numerous agencies and cities along the corridor. He is also addressing the complex integration with the proposed Anaheim Regional Transit Intermodal Center. (6/09 - Present)

SCRRA On-Call Professional Engineering Design Services - Project Manager
Directed design to 30% and preparation of design-build bridging documents for the consolidation of several Southern California Regional Rail Authority (SCRRA) properties into a single campus in Pomona, CA. The campus

consists of a 64,000-sf maintenance support facility and a 28,000-sf train control center (TCC), which houses a modified Metrolink operations center that will remain online during the project as a back-up to the new facility. Upon approval at a public hearing, the project was praised by the City of Pomona Planning Commission as a "very attractive" building that will be an asset to the community. The TCC was designed according to the strict standards of California's essential services building regulations and includes a dispatch center and a significant data center. It will provide several modes of wireless communications including a microwave array and two cellular towers. The design team secured environmental clearances for the NEPA and the California Environmental Quality Act. The project also includes positive train control systems, which are mandated to be installed on all railroads in California by 2015. (2/09 - Present)

POLA Pacific Harbor Line Maintenance Facility - Project Manager
Managing the design of an 8,200-sf maintenance facility and a 5,000-sf prefabricated office building at the Port of Los Angeles (POLA) in Wilmington, CA, to accommodate the Pacific Harbor Line. The maintenance facility will provide two covered inspection pits, a fueling track, sanding facility, and an oil/water separator. In addition to the service areas, the building will house a storage area, machine shop, tool corral, break room, office area, locker room, and restrooms. The office building will house administrative offices, a dispatching center, support spaces, a conference room, and employee welfare spaces. The design for the $90 million project features a broad range of sustainable strategies and project-specific innovations to comply with the California Green Building Code. Due to uncertainty in the economy, the project has been put on-hold several times, after which Mr. Peterson has successfully regrouped the project team and gotten them back up to speed. As a result, STV's team has met all submittal deadlines in a timely and material fashion. (7/08 - Present)

OCTA Metrolink Capital Improvement Program Study - Project Manager
Oversaw a comprehensive assessment for the Orange County Transportation Authority (OCTA) of its 12 Metrolink commuter rail stations to evaluate current conditions and prioritize potential enhancements. STV's study provided a comprehensive inventory of station facilities and amenities, and highlighted issues associated with public safety; station accessibility; and ease of transfer between rail, bus, and other modes of surface transportation. Mr. Peterson and his team ranked the recommended improvements to the Metrolink stations based on priority and implementation timeframe. (11/11 - 1/12)

[consolidated description]
OCTA On-Call Design and Construction Support Services - Project Manager
Directed personnel, development of proposals, and fees and budgets for an on-call contract with the Orange County Transportation Authority (OCTA) for improvements to its Southern California bus maintenance facilities.

Projects included modifications to steam cleaning facilities to replace siding panels and lighting fixtures damaged by the corrosive environment; replacement of piping and structural elements in bus wash areas, and the design of a roof access ladder; the addition of an uninterruptible power system at a fuel building; upgrades to restroom and employee break rooms; and the addition of a mezzanine for parts storage. (12/07 - 11/09) [Client Contact: Sara Strader, Contract Administrator, (714) 560-5633]

[individual description]
OCTA Worker Fall Protection at Three Sites - Project Manager/Project Architect
Managed and led the design of new fall protection systems at the Orange County Transportation Authority (OCTA) Santa Ana, Garden Grove, and Anaheim, CA, bus maintenance facilities to allow OCTA personnel to safely access the bus roofs. The design met the needs for servicing several bus designs, which range in length from 40 feet to 60 feet. The primary challenge was retrofitting fall protection systems into the repair bays to allow for effective bus maintenance while limiting the impact on existing overhead utility systems. In addition, Mr. Peterson's team of designers had to keep the number of support system types to a minimum to reduce the cost of the installations. (12/07 - 6/08)

Metro Union/Patsaouras Plaza Busway Station - Architect
Coordinated with project design architects and the engineering group to define the aesthetics for and functionality of a new bus station at Patsaouras Plaza adjacent to Union Station and US 101 in Los Angeles for the Los Angeles County Metropolitan Transportation Authority (Metro). Mr. Peterson participated in a number of design charrettes and worked with Metro to develop the signage and wayfinding design package. He also participated on the art component selection committee, which entertained proposals from 120 internationally recognized artists. (10/09 - 7/10)

[consolidated description]
NCTD On-Call Projects - Project Manager
Oversaw design for a number of on-call engineering, planning, and design projects for the North County Transit District (NCTD) in San Diego County. Projects included development and site adaptation of a bus shelter prototype design, modifications to the Oceanside Transit Center site, expansion of the East Division Maintenance Facility, a replacement study for the Fallbrook Junction Maintenance-of-Way Facility, the Vista Del Ray Transit Center, the remodel of the 810 Mission Street office's board rooms, and security office renovations and roof replacement at the Oceanside Transit Center. (2000 - 2009)

[individual description]
NCTD Bus Shelter Prototype - Project Manager
Worked with a prefabricated bus shelter manufacturer to develop a prototypical design for bus shelters to be deployed at several transit centers for the North County Transit District (NCTD) in San Diego County. These large shelters are designed to provide shade and cover from the weather for

up to 30 passengers. The design provides the basic canopy elements and is then clad to work with the established aesthetic and context of the transit centers. Mr. Peterson's responsibilities include assisting the NCTD with site layout of the canopies for each location. (2007 - 2009)

[individual description]
NCTD Oceanside Transit Center Modifications - Project Manager
Managed the completion of several North County Transit District (NCTD) projects to update this intermodal facility in Oceanside, CA. Tasks included new wayfinding and signage installation to assist the public in locating transit center services and to access the various rail and bus lines that serve the facility. Additional services included new landscape and hardscape design, new site lighting, the addition of emergency power, structural evaluation of canopies and other structures, and a complete renovation of the transit center's security center. Mr. Peterson also oversaw the renovation of the center's canopies, including nearly 1 acre of polycarbonate panels. (2007 - 2009)

[individual description]
NCTD East Division Bus Maintenance Facility Expansion - Project Manager/Project Architect
Provided project design and management for the expansion of this North County Transit District (NCTD) facility in Escondido, CA, to accommodate compressed natural gas-fueled buses. The project involved the addition of eight new bays and the renovation of the existing maintenance building to provide support services and storage for maintenance operations. Challenges included maintaining maintenance operations through construction via phasing, and developing a site layout that could accommodate the increased bus count and provide safe and adequate circulation to service facilities without an increase in available property. (2004 - 2007, 1/08 - 5/09)

[individual description]
NCTD Sprinter DMU Maintenance Facility - Construction Manager
Provided personnel management and technical review associated with the construction of the $25 million North County Transit District (NCTD) Sprinter Maintenance Facility in Escondido, CA. The facility was built to house operations and maintenance functions for 12 diesel multi-unit (DMU) commuter vehicles serving communities from Oceanside to Escondido. (2006)

[individual description]
NCTD 810 Mission Avenue Board Room Remodeling - Project Manager
Managed this project to remodel the public board room at the North County Transit District (NCTD) offices in Oceanside, CA. The design also included a private, break-out meeting room adjacent to the main conference area. Mr. Peterson led the design for revised casework for board members, upgrades to IT and communications systems, HVAC system and lighting modifications, and furnishing specifications. (2004)

[individual description]

NCTD West Division Fuel System Replacement - Project Manager
Oversaw design for the removal of underground diesel and gasoline storage tanks for North County Transit District (NCTD) buses and other non-revenue vehicles at the West Division Bus Maintenance Facility in Oceanside, CA. The final design included several aboveground diesel fuel and one gasoline tank as well as new fuel distribution and management systems. (2004)

[individual description]
NCTD San Luis Rey Transit Center - Project Manager
Worked with the North County Transit District (NCTD) and a transit-oriented development (TOD) developer to integrate bus services into a new mixed-use development in Oceanside, CA, that includes multifamily residences, offices, and other business functions. The design includes pedestrian and vehicular circulation to serve 12 bus bays, a ticket office with restrooms, and 4 covered shelters with seating and restroom facilities. Particular effort was dedicated to the interface with the TOD and its aesthetic and to the site's vertical challenges for accessibility. (2003)

SJRRC Altamont Commuter Express Authority Equipment Storage and Maintenance Facility - Project Manager
Oversaw the design of a new service and inspection facility in Stockton, CA, for the San Joaquin Regional Rail Commission (SJRRC) Altamont Commuter Express rail service. Mr. Peterson managed a team of approximately 100 people, including various subconsultants. The site is bordered to the north by a residential community, and Mr. Peterson worked throughout the development of the project to mitigate the massiveness of the facility through design, coordinating closely with the City of Stockton and the neighboring community. The project is also the first vehicle maintenance shop of its type pursuing LEED® certification and includes a 110,000-sf shop with areas for maintenance, wheel truing, fueling, service, and inspection; 12,000-sf of office and welfare areas; and a 1,840-sf trainwasher. The industrial nature of the facility, which services diesel locomotives, made it an unusual LEED candidate, and many of the sustainable design techniques considered conflicted with building codes. Despite these challenges, Mr. Peterson proposed several sustainable techniques including water reclamation from industrial processes for reuse in pressure washers and as grey water in toilets, and strategies that use automatic processes to minimize energy consumption. One such process uses air quality monitors to control exhaust fans to run as-needed. Other sustainable strategies include photovoltaic panels, rainwater harvesting for irrigation, and drought tolerant plants. Mr. Peterson suggested significant design changes to the client that would have netted cost savings, had they been adopted. This LEED-registered project is pursuing Silver certification. (12/07 - 6/09)

Amtrak Seattle Interim Improvement - Project Manager
Managed the proposed modification of track configurations in a Seattle rail maintenance facility in response to a mainline shift by BNSF Railway and to improve storage. This shift also required modifications to the existing drop table and drop table building. Mr. Peterson developed a plan to separate the

stormwater and sewage, which commingled in an outdated drainage system. This involved massive underground water storage tanks. He also customized the preliminary design so that all modifications satisfied the initial project requirements as well as the needs of anticipated build outs in the future. Using a highly successful design-build team approach, Mr. Peterson delivered plans that met all project goals. However, the project was never constructed due to budget constraints. (12/07 - 3/09)

Amtrak Southampton Drop Table Study - Project Manager
Oversaw the design of several studies to add a new drop table and progressive maintenance track to a maintenance facility serving the northern terminus of Amtrak's Acela service in Boston. The project posed several challenges, including a severely constrained site, a high water table, and differential settlement issues. Mr. Peterson helped develop innovative foundation concepts to minimize construction impacts to yard operations and capacity. To address the storage shortage on the site, the team developed a design scheme for storing full locomotive truck sets on a mezzanine level created in the drop pit. The project also required a comprehensive fire response and suppression system plan with the Boston Fire Department. There was no existing fire plan prior to the study and the department initially wanted a fire access road constructed adjacent to the facility. Through Mr. Peterson's coordination efforts and the assistance of a property risk management consultant, the fire department agreed to a standpipe system. The standpipe was a much safer solution, considering the extensive catenary system, and created minimal impact to yard operations compared to the fire access road originally requested. (5/08 - 1/09)

Arlington County Department of Environmental Services Division of Transportation ART House Master Plan - Project Director
Performed a concept study under an on-call contract for a temporary and subsequent permanent bus maintenance facility in Crystal City, VA, to house the Arlington Transit (ART) bus fleet, as a task under an on-call contract for the Arlington County Department of Environmental Services Division of Transportation. The project, which included planning, civil, architectural, and engineering services, was accomplished in four phases. Mr. Peterson assisted in site assessment, site and facility design, and vehicle circulation analysis. Subsequent to the original study, the master plan was updated to accommodate an additional land purchase and a larger fleet. (2006 - 2009)

UPRR Intermodal and Welfare Facility Projects - Principal-in-Charge/Project Architect
Responsible for overseeing design and providing overall direction for numerous improvements projects at Union Pacific Railroad (UPRR) facilities. Mr. Peterson led the design efforts to improve the UPRR intermodal yard in Salt Lake City. Improvements included new automated gate system inbound and outbound gates with canopies, an office and gate control building, welfare facilities, and hostler facilities. He also served as the principal-in-charge of architectural and engineering services for two new welfare and office buildings at UPRR intermodal yards in Southern

California and a new maintenance-of-way crew building in Oxnard, CA. Other projects included replacement of HVAC systems at the UPRR Los Angeles Police Department building; a new yard crew facility in Martinez, CA; and a warehouse expansion in Roseville, CA. (2004 - 2007)

Amtrak Passenger Platform Expansion - Project Manager
Worked with Amtrak, BNSF Railway, and the City of Hanford to develop an 800-foot second passenger platform to support a second mainline in Hanford, CA. Platform and shelter designs reflected the historic context of the Hanford Depot and interfaced with the city's adjacent intermodal transit facilities. The 7th Street at-grade crossing and pedestrian safety were major considerations in the design solution. (6/04 - 6/05)

NCTD Fallbrook Junction MOW Facility Replacement - Project Manager
Oversaw preliminary design and pricing for the replacement of the North County Transit District (NCTD) maintenance-of-way (MOW) building and yard north of Oceanside, CA. The study looked at several sites to satisfy environmental impact requirements and ultimately was developed to conform to a specific site. The facility included four vehicle bays, welfare facilities for business operations and employees, a partially covered spur track, and parking and material laydown areas. (2004)

Caltrans/Amtrak National City Car Service Facility and Passenger Platform - Project Manager
Led the design of a service and inspection facility for Amtrak trains at a layover storage yard in National City, CA. The facility includes a 2-track inspection service and fueling facility designed for joint use with BNSF Railway. On-site improvements for this joint California Department of Transportation (Caltrans)/Amtrak project also included storage for six trainsets and a train wash, administrative shop, and storage building. The project also entailed the design of a new passenger platform and trans-load dock, as well as 6 miles of track improvements through downtown San Diego. Complexities of this project included the number of rail lines servicing the area as well as working with the city to get the facility to conform with its vision of growth for the community. (1999)

ROBERT C. PHILLIPS

Mr. Phillips is Vice President of the Rail Division of STV, a professional firm offering engineering, architectural, planning, environmental and construction management services. Mr. Phillips has more than 35 years of experience with track design and maintenance, grade crossings, bridge construction, construction management of rail projects, maintenance and protection of traffic, and the installation of fiber-optic cable within railroad rights-of-way. Mr. Phillips is sponsoring portions of Section III-F of NS's Reply Evidence. Mr. Phillips has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Phillips is responsible for overseeing and directing STV's commuter and freight rail planning and engineering projects. Mr. Phillips joined STV in 1994. Prior to his employment with STV, Mr. Phillips worked for Norfolk Southern in various capacities for 12 years, where he gained operating experience in engineering, track maintenance, and train operations. His responsibilities included managing track maintenance, supervising and training train crews, ensuring operating rules compliance, and investigating accidents and injuries. Mr. Phillips holds a Bachelor of Science, Civil Engineering from Virginia Polytechnic Institute and a Master of Business Administration from Averett College.

Mr. Phillips' resume with additional project experience is attached hereto.

VERIFICATION

I, Robert C. Phillips, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Robert C. Phillips

Executed on this 12th day of December, 2012.

Robert C. Phillips, P.E.

Vice President/Project Manager

Mr. Phillips, Vice President of the Rail Division, is responsible for overseeing and directing STV's freight rail planning and engineering projects. He has more than 35 years of experience with track design and maintenance, grade crossings, bridge construction, construction management of rail projects, maintenance and protection of traffic, and the installation of fiber-optic cable within railroad rights-of-way. Mr. Phillips worked for Norfolk Southern Railway (NS) in various capacities for 12 years, during which he gained operating experience in engineering, track maintenance, and train operations. His responsibilities included managing track maintenance, supervising and training train crews, ensuring operating rules compliance, and investigating accidents and injuries.

Office Location
Charlotte, NC

Date joined firm
6/2/94

Years with other firms
19

Education
Master of Business Administration; Averett College (1992)

Bachelor of Science, Civil Engineering; Virginia Polytechnic Institute (1975)

Professional Registration
Professional Engineer: Pennsylvania (2000/#PE056524-E/exp. 9/30/13) and Virginia (1997/#030702/exp. 2/28/13)

Project Experience

BRIDGES

NCDOT NS over U.S. 220 Bridge Replacement - Field Engineer
Provided construction field coordination between NS and the North Carolina Department of Transportation (NCDOT) for the replacement of a Norfolk Southern single-track, single-span railroad bridge with a double-track, 4-span railway bridge over U.S. 220 in Price, NC. (1996 - 1997)

NCDOT NS over U.S. 401 Bridge Replacement - Field Engineer
Handled the construction field coordination between NS and the North Carolina Department of Transportation (NCDOT) for replacement of the Norfolk Southern Bridge over U.S. 401 in Fuquay-Varina, NC. (1995 - 1996)

City of Greensboro Merritt Drive Improvements - Field Engineer
Performed construction observation for a detour bridge and replacement of the Norfolk Southern railroad bridge on Merritt Drive in Greensboro, NC. (1995 - 1996)

VDOT Norfolk Southern over U.S. 250 Bridge Replacement - Project Manager
Provided construction field coordination between NS and the Virginia Department of Transportation (VDOT) for the construction of a temporary detour bridge and a new through-plate girder replacement railroad bridge in Waynesboro, VA. (1994 - 1995)

RAIL

NS Construction Management for Rickenbacker, Birmingham, and Charlotte Airport Intermodal Yards - Senior Project Manager
Assembling and administering construction management (CM) teams for three new NS regional intermodal facilities to handle increases in rail container traffic and to accommodate the classification of double-stack container trains. Each team is managing the construction of $100 million projects at new site locations. Construction includes grading and drainage, classification tracks, storage tracks, new sidings, concrete loading and unloading pads, acres of roller compact concrete for storage, truck gates, yard offices, and crew facilities. CM services include plan review, progress reports, inspection reports, maintenance of contractor's schedule, monthly pay estimates, and project closeout verifications and documentation. (5/09 - Present)

Union Pacific Railroad Miscellaneous Engineering Services – Principal-in-Charge
Managing on-call contract services for an ongoing list of 40 current structural projects from Utah to Chicago for Union Pacific Railroad. Mr. Phillips is overseeing several types of engineering projects, including bridge deck replacements and repair, new track construction, construction and design reviews, and construction oversight. The projects include work on approximately 25 rail bridges. (2006 – Present)

NS On-Call Services Contract - Principal-in-Charge
Responsible for plan review and construction engineering on an on-call, as-needed basis for more than 50 projects involving proposed roadway, bridge, and retaining wall construction affecting railway facilities. Projects to date have included overseeing construction of overhead bridges, underpasses, floodwalls, utility crossings, parallel construction of utilities, roadways, bikeways, and grade crossings. (2/04 - Present)

CSX Transportation General Engineering Consultant Services Contract - Principal-in-Charge
Serving as the point of contact for administration of contract services and appointment of project managers. Mr. Phillips is overseeing track and bridge design and construction, plan review, construction management, and inspection services on an on-call basis for several projects involving proposed roadway, bridge, and retaining wall construction affecting railway facilities throughout the 23-state CSXT system. His contributions so far include the design and construction of bridges, tracks, yards, and capacity-related projects. Public projects includes bridge, track, floodwalls, utility crossings, parallel construction of utilities, roadways, bikeways, and grade crossings. (2/04 - Present)

STB Railroad Coal Rate Case Litigation Cost Assessments - Project Manager
Leading a team assembling the planning, engineering, and construction costs to build a hypothetical contemporary operating railroad. Services include a complete itemization, justification, and documentation of all transportation,

material, and labor construction costs associated with a contemporary construction costing. All submittals were entered as evidence to the Surface Transportation Board (STB) to justify contested rates for several coal rate cases. Cost assessments included major earthwork, bridge and culvert construction, track, communications and signalization, engineering design, construction management, facilities, material costs and logistics, mobilization, and contingencies. Cases included Norfolk Southern (NS) vs. Duke Energy, NS vs. CP&L, CSXT vs. Duke Energy, AEPCO vs. Burlington Northern Santa Fe (BNSF) and Union Pacific, Otter Tail vs. BNSF, AEP Texas North vs. BNSF, Seminole vs. CSXT, IPA vs. UP, DuPont vs. NS, TPI vs. CSXT, M&G vs. CSXT . (2002 – Present)

NS Heartland Corridor Clearance Improvements CM - Senior Project Manager

Oversaw this $191 million project to provide clearance improvements to 28 railroad tunnels and seven bridges on the 530-mile-long Heartland Corridor, which extends from Norfolk, VA, to Columbus, OH. Mr. Phillips' services included creating overhead bridge jacking plans to obtain vertical clearances, modifying slide fences, providing utility coordination, creating Stormwater Pollution Prevention Plans for tunnel portals, creating railroad-bridge lowering plans, and reviewing track designs. His construction management (CM) responsibilities also included conducting preconstruction meetings with contractors as well as weekly progress meetings, reviewing construction schedules, monitoring and documenting contractor work, reviewing monthly contractor pay estimates, and coordinating between the contractor and railroad forces. The project constituted an innovative public-private partnership venture between NS, various participating states, and the Federal Highway Administration. (4/07 - 12/10)

CSX Post-Hurricane Katrina/Rita Emergency Rail Reconstruction Project - Principal-in-Charge

Oversaw design and construction inspection for this $100 million emergency rail reconstruction project. Mr. Phillips was in charge of assessing damage to six major rail bridges ranging to more than 10,000 feet in length, developing repair or replacement plans, providing project management and construction management, and providing on-site inspection during the reconstruction period. In total, more than 75 miles of track was severely damaged and in need of emergency repair. (8/05 - 9/07)

NS Fiber-Optic Cable Installation - Project Manager

Responsible for the construction management of the installation of the fiber backbone along NS right-of-way along several routes: Cleveland, OH, to Boyce, VA, via Pittsburgh and Harrisburg, PA; Kalamazoo to Dearborn, MI; Dearborn, MI, to Toledo, OH; Toledo to Cleveland, OH; Cleveland, OH, to Buffalo, NY; and Cleveland, OH, to Pittsburgh, PA. Mr. Phillips oversaw staffing, permitting, inspection, safety operations, and final route approval. More than 100 managers and inspectors were involved in this major trunk line installation. Mr. Phillips also provided safety training, led NS operations meetings, attended weekly scheduling meetings, coordinated work trains and

flagmen, and provided engineering reviews, change orders, and construction administration. (1999 - 2002)

NS Fiber-Optic Cable Installation in North and South Carolina - Project Manager
Coordinated with NS personnel and monitored the installation of fiber-optic cables belonging to Qwest Communications along several hundred miles of NS right-of-way in North Carolina and South Carolina. All phases of installation were involved, including plow train operations, long directional bores, and bridge attachments. Mr. Phillips provided periodic progress reports to NS and authorized minor changes from the approved construction plans to meet local conditions. He was also responsible for monitoring the railroad safety aspects of the installations. (1998 - 1999)

CSX System-Wide Grade Crossing Sign Project - Team Leader
Led one of seven teams for this project which required the installation of standard identification signs at every roadway grade crossing on the CSX Transportation system. During this process, STV completely updated the CSX grade crossing inventory list. (1997 - 1998)

CSX Systemwide Grade Crossing Inventory - Project Manager
Managed multiple teams to perform a grade crossing inventory encompassing more than 35,000 grade crossings on the CSX Transportation system in 21 states to meet a Federal Railroad Administration deadline. The project included deployment of multiple teams to inventory crossings, installing standard identification signs at every crossing to enhance safety and reporting, and updating CSX's inventory, including digital imagery of each crossing. All work was performed under a tight deadline of 180 days and completed a month ahead of schedule. (10/97 - 6/98)

NS Automobile Mixing Facility - Field Engineer
Oversaw shop inspection of structural steel at the fabrication plant in Colfax, NC, to be utilized in construction of this new automobile mixing facility in Shelbyville, KY. Mr. Phillips managed preliminary and final hydraulic/hydrologic design as well as railway, roadway, highway bridge, and railway bridge design. (1996)

Norfolk Southern - Trainmaster
Supervised train crews and yard personnel, ensured operating rules compliance, investigated all accidents and injuries, scheduled local train and yard engine operations, and trained employees on Federal Railroad Administration and NS operating rules through annual operating rule classes for track and transportation employees in Manassas and Danville, VA. (1981 - 1987)

Norfolk Southern - Track Supervisor
Supervised track maintenance crews and production gangs, responsible for track inspection program, and ensured Federal Railroad Administration (FRA) Track Safety Standards for Class of track were in compliance. Mr. Phillips maintained the NS Safety Program over assigned territory and

investigated all accidents and injuries, scheduled track maintenance operations, and trained employees on FRA Track Safety Standards and NS track maintenance policy. (1975 - 1980)

A. MITCHELL POLINSKY

Dr. Polinsky, an economist, is the Josephine Scott Crocker Professor of Law and Economics at the School of Law, Stanford University, located at 559 Nathan Abbott Way, Stanford, California 94305. Dr. Polinsky is sponsoring the portion of Section III-D of Norfolk Southern's ("NS's") Reply Evidence related to excess risk. Dr. Polinsky has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

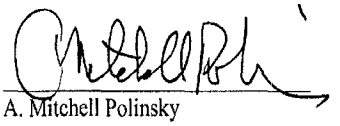
Dr. Polinsky has been a Stanford professor for more than thirty years. Prior to his work at Stanford, Dr. Polinsky was on the faculties of the Department of Economics and School of Law at Harvard University. Dr. Polinsky's research has been published extensively in economics and law journals including the *Quarterly Journal of Economics*, *American Economic Review*, *Harvard Law Review*, *Review of Economics and Statistics*, *Journal of Public Economics*, and the *Stanford Law Review*. He is an Advisory Editor of the *Journal of Risk and Uncertainty* and a Member of the Editorial Board of the *Journal of Public Economics*, the *International Review of Law and Economics*, and several other publications. He is a Research Associate of the Law and Economics Program of the National Bureau of Economic Research, as well as a founder and past president of the American Law and Economics Association.

Dr. Polinsky earned an A.B. in economics from Harvard University, a Ph.D. in economics from the Massachusetts Institute of Technology, and a M.S.L. from Yale Law School.

Dr. Polinsky's curriculum vitae is attached.

VERIFICATION

I, A. Mitchell Polinsky, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.



A. Mitchell Polinsky

Executed on this 29th day of December, 2012.

Curriculum Vitae

A. Mitchell Polinsky

Home: 900 Cottrell Way Stanford, CA 94305	Office: Stanford Law School Stanford, CA 94305	Born: February 6, 1948 Married: Joan Roberts, June 29, 1975; two children
(650) 856-6019 voice (650) 855-9966 fax	(650) 723-0886 voice (650) 723-3557 fax	polinsky@stanford.edu

I. EDUCATION

1966-1970 A.B. (Economics), Harvard University

— *magna cum laude* with Highest Honors in Economics

— *Phi Beta Kappa*

— Allyn A. Young Prize in Economics

1970-1973 Ph.D. (Economics), Massachusetts Institute of Technology

— Woodrow Wilson Foundation Honorary Fellow

— National Science Foundation Graduate Fellow

— Honorable Mention, National Tax Association-Tax Institute of America Outstanding Doctoral Dissertation Awards Program

1975-1976 M.S.L. (Master of Studies in Law), Yale Law School

II. EMPLOYMENT

1984- Josephine Scott Crocker Professor of Law and Economics (Law School) and Professor of Economics, by courtesy (Economics Department), Stanford University

1979- Director, John M. Olin Program in Law and Economics, Stanford Law School

1997-1998	Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, California
1992-1993	Visiting Professor of Law and Economics (Law School), Harvard University
1985-1986	National Fellow, Domestic Studies Program, The Hoover Institution, Stanford University
1979-1984	Professor of Law (Law School) and Associate Professor of Economics (Economics Department), Stanford University
1977-1979	Assistant Professor of Economics (Economics Department) and of Economics and Law (Law School), Harvard University
1975-1977	Russell Sage Foundation Resident in Law and Social Science, Yale Law School (1975-76) and Harvard Law School (1976-77)
1973-1975	Assistant Professor of Economics (Economics Department), Harvard University (on leave 1975-77)

III. ADDITIONAL PROFESSIONAL ACTIVITIES (selected)

2001-	Member, Editorial Board, *B.E. Journals of Economic Analysis & Policy*
1999-2006	Member, Editorial Board, *Journal of Public Economics*
1995-	Co-Editor, *Law and Economics Abstracts*, Social Science Research Network
1987-	Member, Editorial Board, *International Review of Law and Economics*
1987-	Advisory Editor, *Journal of Risk and Uncertainty*
1983-	Member, Editorial Board, *Journal of Law, Economics, & Organization*
1978-	Research Associate, Law and Economics Program, National Bureau of Economic Research
1993-1994	Fellow, John Simon Guggenheim Memorial Foundation
1991-1994	Member, Board of Directors (1991-93), Secretary-Treasurer (1991-92), Vice President (1992-93), and President (1993-94), American Law and

Economics Association

1985-1986 Principal Investigator, Grant No. SES-8510638 ("The Economic Theory of Punitive Damages"), National Science Foundation

1981-1985 Member, Editorial Advisory Board, *Supreme Court Economic Review*

1980-1982 Member, Law and Social Sciences Advisory Subcommittee, National Science Foundation

1978-1981 Principal Investigator, Grant No. SOC-78-20159 ("Legal Approaches to the Control of Externalities"), National Science Foundation

IV. PUBLICATIONS AND WORKING PAPERS

"Revenue Sharing — A Critical View" (with Richard A. Musgrave), in *Financing State and Local Governments* (Boston: The Federal Reserve Bank, 1970), pp. 17-51 (also published as "Revenue Sharing: A Critical View," *Harvard Journal on Legislation*, Vol. 8 (1971), pp. 197-219).

"Shortsightedness and Nonmarginal Pareto Optimal Redistribution," *American Economic Review*, Vol. 61, No. 5 (December 1971), pp. 972-979.

"Probabilistic Compensation Criteria," *Quarterly Journal of Economics*, Vol. 86, No. 3 (August 1971), pp. 407-425.

"A Note on the Measurement of Incidence," *Public Finance Quarterly*, Vol. 1, No. 2 (April 1973), pp. 219-230.

"Collective Consumption Goods and Local Public Finance Theory: A Suggested Analytic Framework," in International Institute of Public Finance, *Issues in Urban Public Finance* (Saarbrucken, West Germany: I.I.P.F., 1973), pp. 166-181.

"Economic Analysis as a Potentially Defective Product: A Buyer's Guide to Posner's *Economic Analysis of Law*," *Harvard Law Review*, Vol. 87, No. 8 (June 1974), pp. 1655-1681.

"Imperfect Capital Markets, Intertemporal Redistribution, and Progressive Taxation," in Harold M. Hochman and George E. Peterson (Eds.), *Redistribution Through Public Choice* (New York: Columbia University Press, 1974) pp. 229-258.

"Essays in Public Sector Economics: Central and Local," in National Tax Association--Tax Institute of America, *Proceedings of the Sixty-Sixth Annual Conference on Taxation* (Columbus, Ohio: N.T.A.-T.I.A., 1974), pp. 507-522.

"The Air Pollution and Property Value Debate" (with Steven Shavell), *Review of Economics and Statistics*, Vol. 57, No. 1 (February 1975), pp. 100-104.

"Amenities and Property Values in a Model of an Urban Area" (with Steven Shavell), *Journal of Public Economics*, Vol. 5, No. 1-2 (January-February 1976), pp. 119-129.

"The Demand for Housing: A Study in Specification and Grouping," *Econometrica*, Vol. 45, No. 2 (March 1977), pp. 447-461.

"Property Values and the Benefits of Environmental Improvements: Theory and Measurement" (with Daniel L. Rubinfeld), in Lowdon Wingo and Alan Evans (Eds.), *Public Economics and the Quality of Life* (Baltimore: The Johns Hopkins University Press, 1977), pp. 154-180.

"Amenities and Property Values in a Model of an Urban Area: A Reply" (with Steven Shavell), *Journal of Public Economics*, Vol. 9, No. 1 (February 1978), pp. 111-112.

"The Long-Run Effects of a Residential Property Tax and Local Public Services" (with Daniel L. Rubinfeld), *Journal of Urban Economics*, Vol. 5, No. 2 (April 1978), pp. 241-262.

"[Economics and Law:] Discussion," *American Economic Review: Papers and Proceedings*, Vol. 68, No. 2 (May 1978), pp. 435-436.

"Controlling Externalities and Protecting Entitlements: Property Right, Liability Rule, and Tax-Subsidy Approaches," *Journal of Legal Studies*, Vol. 8, No. 1 (January 1979), pp. 1-48.

"Notes on the Symmetry of Taxes and Subsidies in Pollution Control," *Canadian Journal of Economics*, Vol. 12, No. 1 (February 1979), pp. 75-83.

"The Demand for Housing: An Empirical Postscript," *Econometrica*, Vol. 47, No. 2 (March 1979), pp. 521-523.

"An Empirical Reconciliation of Micro and Grouped Estimates of the Demand for Housing" (with David T. Ellwood), *Review of Economics and Statistics*, Vol. 61, No. 2 (May 1979), pp. 199-205.

"The Optimal Tradeoff Between the Probability and Magnitude of Fines" (with Steven Shavell), *American Economic Review*, Vol. 69, No. 5 (December 1979), pp. 880-891.

"Private Versus Public Enforcement of Fines," *Journal of Legal Studies*, Vol. 9, No. 1 (January 1980), pp. 105-127.

"On the Choice Between Property Rules and Liability Rules," *Economic Inquiry*, Vol. 18, No. 2 (April 1980), pp. 233-246.

"Strict Liability vs. Negligence in a Market Setting," *American Economic Review: Papers and Proceedings*, Vol. 70, No. 2 (May 1980), pp. 363-367.

"The Efficiency of Paying Compensation in the Pigovian Solution to Externality Problems," *Journal of Environmental Economics and Management*, Vol. 7, No. 2 (June 1980), pp. 142-148.

"Resolving Nuisance Disputes: The Simple Economics of Injunctive and Damage Remedies," *Stanford Law Review*, Vol. 32, No. 6 (July 1980), pp. 1075-1112.

"Contribution and Claim Reduction Among Antitrust Defendants: An Economic Analysis" (with Steven Shavell), *Stanford Law Review*, Vol. 33, No. 3 (February 1981), pp. 447-471.

"Pigovian Taxation with Administrative Costs" (with Steven Shavell), *Journal of Public Economics*, Vol. 19, No. 3 (December 1982), pp. 385-394.

An Introduction to Law and Economics (Boston: Little, Brown and Company, 1983). 138 pp.

"Risk Sharing through Breach of Contract Remedies," *Journal of Legal Studies*, Vol. 12, No. 2 (June 1983), pp. 427-444.

"Products Liability, Consumer Misperceptions, and Market Power" (with William P. Rogerson), *Bell Journal of Economics*, Vol. 14, No. 2 (Autumn 1983), pp. 581-589.

"The Optimal Use of Fines and Imprisonment" (with Steven Shavell), *Journal of Public Economics*, Vol. 24, No. 1 (June 1984), pp. 89-99.

"Detrebling versus Decoupling Antitrust Damages: Lessons from the Theory of Enforcement," *Georgetown Law Journal*, Vol. 74, No. 4 (April 1986), pp. 1231-1236.

"Fixed Price versus Spot Price Contracts: A Study in Risk Allocation," *Journal of Law, Economics, & Organization*, Vol. 3, No. 1 (Spring 1987), pp. 27-46.

"Optimal Liability When the Injurer's Information about the Victim's Loss is Imperfect," *International Review of Law and Economics*, Vol. 7, No. 2 (December 1987), pp. 139-147.

"The Welfare Implications of Costly Litigation for the Level of Liability" (with Daniel L. Rubinfeld), *Journal of Legal Studies*, Vol. 17, No. 1 (January 1988), pp. 151-164.

"The Deterrent Effects of Settlements and Trials" (with Daniel L. Rubinfeld), *International Review of Law and Economics*, Vol. 8, No. 1 (June 1988), pp. 109-116.

"Legal Error, Litigation, and the Incentive to Obey the Law" (with Steven Shavell), *Journal of Law, Economics, & Organization*, Vol. 5, No. 1 (Spring 1989), pp. 99-108.

An Introduction to Law and Economics (Boston: Little, Brown and Company, Second Edition, 1989). 153 pp.

"A Note on Optimal Public Enforcement with Settlements and Litigation Costs" (with Daniel L. Rubinfeld), *Research in Law and Economics*, Vol. 12 (1989), pp. 1-8.

"A Note on Optimal Fines When Wealth Varies Among Individuals" (with Steven Shavell), *American Economic Review*, Vol. 81, No. 3 (June 1991), pp. 618-621.

"A Model of Optimal Fines for Repeat Offenders" (with Daniel L. Rubinfeld), *Journal of Public Economics*, Vol. 46, No. 3 (December 1991), pp. 291-306.

"Decoupling Liability: Optimal Incentives for Care and Litigation" (with Yeon-Koo Che), *RAND Journal of Economics*, Vol. 22, No. 4 (Winter 1991), pp. 562-570.

"Enforcement Costs and the Optimal Magnitude and Probability of Fines" (with Steven Shavell), *Journal of Law and Economics*, Vol. 35, No. 1 (April 1992), pp. 133-148.

"Should Employees Be Subject to Fines and Imprisonment Given the Existence of Corporate Liability?" (with Steven Shavell), *International Review of Law and Economics*, Vol. 13, No. 3 (September 1993), pp. 239-257.

"Sanctioning Frivolous Suits: An Economic Analysis" (with Daniel L. Rubinfeld), *Georgetown Law Journal*, Vol. 82, No. 2 (December 1993), pp. 397-435.

"A Note on Optimal Cleanup and Liability After Environmentally Harmful Discharges" (with Steven Shavell), *Research in Law and Economics*, Vol. 16 (1994), pp. 17-24.

"Should Liability be Based on the Harm to the Victim or the Gain to the Injurer?" (with Steven Shavell), *Journal of Law, Economics, & Organization*, Vol. 10, No. 2 (October 1994), pp. 427-437.

"Punitive Damages from the Economist's Perspective," in Roman L. Weil, Michael J. Wagner, and Peter B. Frank (Eds.), *Litigation Services Handbook: The Role of the Accountant as Expert* (New York: John Wiley & Sons, Inc., Second Edition, 1996 Supplement), Chapter 36A, pp. 1-9.

"Optimal Awards and Penalties When the Probability of Prevailing Varies Among Plaintiffs" (with Daniel L. Rubinfeld), *RAND Journal of Economics*, Vol. 27, No. 2 (Summer 1996), pp. 269-280.

"Are Punitive Damages Really Insignificant, Predictable, and Rational? A Comment on Eisenberg et al.," *Journal of Legal Studies*, Vol. 26, No. 2 (June 1997), pp. 663-677.

"Punitive Damages: An Economic Analysis" (with Steven Shavell), *Harvard Law Review*, Vol. 111, No. 4 (February 1998), pp. 869-962.

"Does the English Rule Discourage Low-Probability-of-Prevailing Plaintiffs?" (with Daniel L. Rubinfeld), *Journal of Legal Studies*, Vol. 27, No. 2 (Part 1) (June 1998), pp. 519-535.

"Public Enforcement of Law" (with Steven Shavell), in Peter Newman (Ed.), *The New Palgrave Dictionary of Economics and The Law*, Vol. 3 (London: Macmillan Reference Limited, 1998), pp. 178-188.

"Punitive Damages" (with Steven Shavell), in Peter Newman (Ed.), *The New Palgrave Dictionary of Economics and The Law*, Vol. 3 (London: Macmillan Reference Limited, 1998), pp. 192-198.

"On Offense History and the Theory of Deterrence" (with Steven Shavell), *International Review of Law and Economics*, Vol. 18, No. 3 (September 1998), pp. 305-324.

"On the Disutility and Discounting of Imprisonment and the Theory of Deterrence" (with Steven Shavell), *Journal of Legal Studies*, Vol. 28, No. 1 (January 1999), pp. 1-16.

"The Economic Theory of Public Enforcement of Law" (with Steven Shavell), *Journal of Economic Literature*, Vol. 38, No. 1 (March 2000), pp. 45-76.

"Punitive Damages" (with Steven Shavell), in Boudewijn Bouckaert & Gerrit De Geest (Eds.), *Encyclopedia of Law and Economics* (Cheltenham, UK: Edward Elgar, 2000), Volume II, pp. 764-781.

"Public Enforcement of Law" (with Steven Shavell), in Boudewijn Bouckaert & Gerrit De Geest (Eds.), *Encyclopedia of Law and Economics* (Cheltenham, UK: Edward Elgar, 2000), Volume V, pp. 307-344.

"The Fairness of Sanctions: Some Implications for Optimal Enforcement Policy" (with Steven Shavell), *American Law and Economics Review*, Vol. 2, No. 2 (Fall 2000), pp. 223-237.

"Corruption and Optimal Law Enforcement" (with Steven Shavell), *Journal of Public Economics*, Vol. 81, No. 1 (July 2001), pp. 1-24.

"Law: Economics of its Public Enforcement" (with Steven Shavell), in Neil J. Smelser and Paul B. Baltes (Eds.), *International Encyclopedia of the Social & Behavioral Sciences* (New York: Elsevier, 2001), Vol. 12, pp. 8510-8517.

"A Note on Settlements under the Contingent Fee Method of Compensating Lawyers" (with Daniel L. Rubinfeld), *International Review of Law and Economics*, Vol. 22, No. 2 (August 2002), pp. 217-225.

"Aligning the Interests of Lawyers and Clients" (with Daniel L. Rubinfeld), *American Law and Economics Review*, Vol. 5, No. 1 (Spring 2003), pp. 165-188.

An Introduction to Law and Economics (Aspen Publishers, Third Edition, 2003).

"The Optimal Use of Fines and Imprisonment When Wealth is Unobservable," *Journal of Public Economics*, Vol. 90, Nos. 4-5 (May 2006), pp. 823-835.

"Optimal Fines and Auditing When Wealth is Costly to Observe," *International Review of Law and Economics*, Vol. 26, No. 3 (September 2006), pp. 323-335.

"A Damage-Revelation Rationale for Coupon Remedies" (with Daniel L. Rubinfeld), *Journal of Law, Economics, & Organization*, Vol. 23, No. 3 (October 2007), pp. 653-661.

Co-editor (with Steven Shavell), *Handbook of Law and Economics* (Elsevier, 2007), two volumes, 1,738 pages.

"The Theory of Public Enforcement of Law" (with Steven Shavell), in A. Mitchell Polinsky and Steven Shavell (Eds.), *Handbook of Law and Economics*, Volume 1 (Elsevier Science, 2007), pp. 403-454.

"The Deadweight Loss of Coupon Remedies for Price Overcharges" (with Daniel L. Rubinfeld), *Journal of Industrial Economics*, Vol. 56, No. 2 (June 2008), pp. 402-417.

"law, public enforcement of" (with Steven Shavell), in Steven N. Durlauf and Lawrence E. Blume (Eds.), *The New Palgrave Dictionary of Economics* (London: Macmillan Publishers, Second Edition, 2008), pp. 1-15. <http://www.dictionaryofeconomics.com/article?id=pde2008_P000316>

"law, economic analyis of" (with Steven Shavell), in Steven N. Durlauf and Lawrence E. Blume (Eds.), *The New Palgrave Dictionary of Economics* (London: Macmillan Publishers, Second Edition, 2008), pp. 1-22. <http://www.dictionaryofeconomics.com/article?id=pde2008_L000038>

"Punitive Damages" (with Steven Shavell), in Michael G. Faure (Ed.), *Tort Law and Economics* (Edward Elgar, 2009), pp. 228-246.

"Public Enforcement of Law" (with Steven Shavell), in Nuno Garoupa (Ed.), *Criminal Law and Economics* (Edward Elgar, 2009).

"The Uneasy Case for Product Liability" (with Steven Shavell), *Harvard Law Review*, Vol. 123, No. 6 (April 2010), pp. 1437-1492.

"A Skeptical Attitude About Product Liability *Is* Justified: A Reply to Professors Goldberg and Zipursky" (with Steven Shavell), *Harvard Law Review*, Vol. 123, No. 8 (June 2010), pp. 1949-68.

An Introduction to Law and Economics (Wolters Kluwer, Fourth Edition, 2011).

"Mandatory Versus Voluntary Disclosure of Product Risks" (with Steven Shavell), *Journal of Law, Economics, & Organization*, Vol. 28, No. 2 (June 2012), pp. 360-379.

"Costly Litigation and Optimal Damages" (with Steven Shavell), Working Paper No. 436, John M. Olin Program in Law and Economics, Stanford Law School, Stanford, California, November 2012 (available at <http://papers.ssrn.com/abstract_id=2173597>.

"Deterrence and the Optimality of Rewarding Prisoners for Good Behavior," preliminary draft, November 2012.

"Litigation Costs and the Superiority of Market-Determined Liability to Product Liability" (with Steven Shavell), in progress.

December 2012

MICHAEL K. QUINN

Mr. Quinn is Director of State Taxes for Norfolk Southern Corporation, the parent of Norfolk Southern Railway Company ("NS"), located at 1200 Peachtree Street, Northeast, Atlanta, Georgia 30309. Mr. Quinn joined NS in 1986. He is sponsoring portions of Section III-D of NS's Reply Evidence regarding ad valorem taxes. Mr. Quinn has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Quinn holds a Bachelor of Science degree in business administration from the University of Dayton. He earned his Juris Doctor degree from the University of Notre Dame Law School. From 1975 to 1986, Mr. Quinn was in private practice in Roanoke, Virginia, specializing in tax, corporate, domestic relations, and commercial matters. He has been a Certified Public Accountant since 1995.

Mr. Quinn joined NS in 1986. He began in the Taxation Department as Assistant Tax Counsel. He then served as Director of Property Taxation. He was elevated to Director of State Taxes in 2000.

VERIFICATION

I, Michael K. Quinn, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Michael K. Quinn

Executed on this 11th day of December, 2012.

RICHARD RAY

Mr. Ray is the founder of RR Rail Hwy Crossing Consultants, Inc., a corporation that provides consulting services to States and Railroads concerning Rail/Highway crossings with offices located at 506 Fontaine Road, Mableton, Georgia 30126. Mr. Ray is a rail crossings and signals expert with over 40 years of experience. Mr. Ray is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to signals. Mr. Ray has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

In addition to operating RR Rail Hwy Crossing Consultants, Inc., Mr. Ray is a contract consultant with STV, a professional firm offering engineering, architectural, planning, environmental and construction management services. Mr. Ray provides consulting services to the rail industry, rail customers, and state and local road authorities for rail/highway crossing projects, signal systems and crossing signal requirements for rail construction projects. Prior to founding RR Rail Hwy Crossing Consultants, Inc., Mr. Ray spent 39 years at Norfolk Southern. Beginning in 1995, Mr. Ray spent 16 years as the Administrator – Highway Grade Crossing at NS, responsible for administering NS's portion of the federal highway grade crossing safety program. Mr. Ray holds a Computer Science degree from Southern Technical Institute and a Masters of Business Administration from West Georgia College.

Mr. Ray's resume with additional project experience is attached hereto.

VERIFICATION

I, Richard Ray, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Richard Ray

Executed on this 10th day of December, 2012.

Richard H. Ray
506 Fontaine Road
Mableton, GA 30126
Residence Phone 678-945-5442
Business Phone 404-529-1234

EDUCATION

1965-1969 Graduated Pebblebrook High School
1978-1980 West Georgia, College - Business Administration Curriculum
1985 Southern Technical Institute – Computer Science Curriculum

MILITARY SERVICE

1969-1971 United States Naval Air
Primary training in aviation electronics and operation of electronic countermeasures
Honorable Discharge, Combat Veteran

EMPLOYMENT

1972 Assistant Signal Maintainer, Central of Georgia Railroad
Assisted Signal Maintainer in maintenance and troubleshooting of signal systems and highway grade crossing warning devices.

1972 Signal Maintainer, Southern Railway
Provided maintenance and troubleshooting of signal systems and highway grade crossing warning devices. Responsibilities included testing and reports pursuant to FRA regulations.

1974-1978 C&S Supervisor, Southern Railway
Supervision of five mainline signal maintainers, one communications maintainer, one electrician and one floating signalman. Responsibilities included troubleshooting, ordering equipment, scheduling of jobs and maintenance of two hot box detectors. Ensure compliance with FRA regulations and railroad operating procedures.

1978-1988 Applications Engineer, Norfolk Southern Railway
Design of signal systems, area of concentration centered on design of highway grade crossing warning devices. Including ordering of materials and estimates for grade crossing signal projects. Instrumental in transition to computer aided drafting design and computerizing grade crossing signal program. Required interaction with state DOT officials within fourteen state territory. Served on Committee D of the AAR.

1988-1993 Signal Engineer, Norfolk Southern Railway
Primarily involved in design of train signal systems and job estimation for installation and removal of track structures. Required interaction with various railway departments.

EMPLOYMENT - CONTINUED

1993-1995 Senior Systems Engineer, Norfolk Southern Railway
Primary responsibilities included review and coordination with other departments of capital improvement projects providing estimates and extent of C&S involvement. Also involved with state and private industry projects.

1995 - 2011 Administrator Highway Grade Crossing, Norfolk Southern Railway
Administer the railroad's portion of the federal highway grade crossing safety program and other grade crossing safety requests. This is accomplished by directing control systems activities and coordinating activities between the railroad, state and other departments concerning projects for installation, up-grade or modification of grade crossing warning devices. Maintain close working relationship and contacts with necessary local, state and federal agencies and authorities to ensure success of programs and projects. Work closely with company claims and legal personnel including giving deposition testimony and testimony at hearings concerning all aspects of the grade crossing program.

2011 - Retired from Norfolk Southern after 39 years.

2011 - Incorporated RR Rail Hwy Crossing Consultants, Inc., a Georgia Corporation to provide consulting services to States and Railroads concerning Rail/Highway crossings.

2011 - Joined STV as a contract consultant to provide consulting services to the Rail Industry, Rail Customers and State and Local Road Authorities. Responsibilities include site and plan review and estimate for proposed rail/highway grade crossing projects to ensure compliance with Federal, State and Rail Industry standards, regulations and guidelines, provide detailed estimate to assist in determining cost benefit analysis of proposed rail/highway crossing projects and project review and estimate for signal systems and crossing signal requirements for rail construction projects involving private or public entities. Also, provide management or assistance with installation of rail/highway grade projects, which includes meeting with necessary road authorities and/or railroad personnel, project engineering, acquisition of material and scheduling of construction forces.

DALE A. SCHAUB

Mr. Schaub is an independent consultant with expertise in railroad operations. Mr. Schaub's experience stems from a career in the railroad industry, which included railroad operations. Mr. Schaub is sponsoring portions of Parts III-C and III-D of Norfolk Southern's ("NS's") Reply Evidence relating to yard structure and non-train operating personnel. Mr. Schaub has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Schaub has 37 years of railroad experience from the Penn Central, Conrail, and currently with NS. Mr. Schaub's operations experience stems from years in positions including Assistant Vice-President of Train Operations and Transportation Planning at Conrail, as well as General Manager for Intermodal Service. Mr. Schaub's experience at NS has included positions such as Assistant General Manager of the Eastern Region responsible for coordinating interline services at interchanges with other railroads, overseeing railroad operations in large terminals, and monitoring NS's main frame systems. In addition, as Senior Director for Customer Service Operations, Mr. Schaub's responsibilities included overseeing the Merchandise and Automotive National Customer Service Centers, Unit Trains Operations Group, and the Automotive Terminal Group. Mr. Schaub was responsible for directing the development of NS's first Thoroughbred Operating Plan.

Mr. Schaub holds a Bachelor of Arts degree in Criminology from Indian University of Pennsylvania and a Masters of Business Administration from Drexel University. Mr. Schaub also holds certificates from the Transportation Management Program at Penn State University; the Advanced Management Program from the Fuqua School of Business at Duke University; and in Financial Management from the Wharton School, University of Pennsylvania.

VERIFICATION

I, Dale A. Schaub, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Dale A. Schaub

Executed on this 12 day of December, 2012.

DEWEY D. SMITH

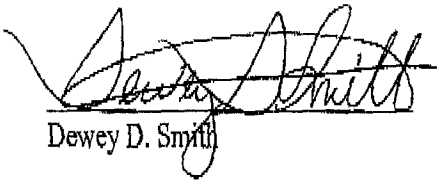
Mr. Smith is the Director of Service Design and Interline Management, Transportation Network Services for NS, at its Atlanta, GA offices located at 1200 Peachtree Street Northeast, Atlanta, Georgia 30309. Mr. Smith is sponsoring portions of Section III-C of NS's Reply Evidence relating to NS's MultiRail analysis and has also assisted Mr. Johnson in developing other aspects of the NS train service plan. Mr. Smith has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

As the Director of Service Design and Interline Management at NS, Mr. Smith is responsible for developing and maintaining train plans, developing shipment trip plans, contingency planning in the event of emergencies, such as developing routing contingencies, and disaster recovery management. Mr. Smith also is charged with developing and maintaining Interline Service Agreements that define the operating details for interchange locations. Mr. Smith previously served as the Director of the Automotive Mixing Center Network & Logistics, Assistant Director Mixing Center, Manager Agency Operation Center, and Trainmaster since joining NS in 1978.

Prior to joining NS, Mr. Smith completed five years in the U.S. Air Force. He holds a Bachelor of Science from Georgia State University.

VERIFICATION

I, Dewey D. Smith, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.



Dewey D. Smith

Executed on this 14 day of December, 2012.

KATHLEEN C. SMITH

Ms. Smith is the Director of Market Research and Economics in the Marketing Division of Norfolk Southern Corporation, the parent of Norfolk Southern Railway Company ("NS"), located at 1200 Peachtree Street, Northeast, Atlanta, Georgia 30309. Ms. Smith is sponsoring portions of Section III-A of NS's Reply Evidence. Ms. Smith has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Ms. Smith began her career with NS in 1995 as a management trainee in the Marketing Department. She has held the positions of Economic Analyst, Senior Economic Analyst, Account Manager, Product Manager, Business Development Manager, Manager Yield Analysis, and Director of Market Planning and Analysis in the Industrial Products Group during the course of her career. In 2011, she was elevated to her current role.

As NS's Director of Market Research and Economics, Ms. Smith's responsibilities include overseeing the preparation and analysis of marketing updates for quarterly earnings report; overseeing the analysis and summarization of revenue and volume quarterly forecasts with five year time horizons; managing NS's enterprise forecast and demand planning data system; oversees market research studies and initiatives in support of business development; evaluating and purchasing macro-economic and market research data from external providers on behalf of the NS business groups; and analyzing and summarizing corporate price and yield results and projections including same store sales price impacts, revenue variance drivers, and revenue goal tracking.

VERIFICATION

I, Kathleen C. Smith, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Kathleen C. Smith

Executed on this 14 day of December, 2012.

RICHARD L. SMITH

Mr. Smith is a consultant with XORail with expertise in the area of railroad signal engineering and offices located at 5011 Gate Parkway #100-400, Jacksonville, Florida 32256. Mr. Smith is sponsoring portions of Section III-F of NS's Reply Evidence relating to signals. Mr. Smith has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Smith has over 35 years of experience in railroad operations following a career at NS. Mr. Smith has extensive experience in the area of signals and communications, having served as an engineer in Signals and Communications groups at NS for years, and subsequently being promoted to General Supervisor for Signals and Communications on the Illinois Division. In 2001, Mr. Smith became Chief Engineer, Communications and Signals for the Northern Region, having responsibility for ensuring signal system was rule compliant, safe and efficient. Mr. Smith also has experience developing guidelines used today in hump yard design. With XORail, Mr. Smith has experience developing various Safety Plans for NS to ensure compliance with FRA regulations and has drafted a training manual for basic signal training currently used by NS.

Mr. Smith's resume with additional project experience is attached hereto.

VERIFICATION

I, Richard L. Smith, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Richard L. Smith

Executed on this 10 day of December, 2012.

Richard (Dick) L. Smith - Resume
RLS Consulting, LLC.
238 Paradise Point
Talladega, Al. 35160
Email: DSmith@coosahs.net

Education:

Graduate of Liberty High School, Liberty Illinois, May 1968

Attended the NS program at Darden Business School, 2005

Experience:

August of 1968 = started work for Norfolk and Western Rwy. As a welder helper and was laid off a short time later.

November of 1969 = Joined the United States Naval Reserves.

March of 1970 = returned to work for Norfolk and Western Rwy. as a signal helper on the Decatur Division.

In February 1971 I left for 22 months of active duty in the USN (reserves) being released from active duty in December 1972. I was honorably discharged in 1975.

Upon return to work from active duty I worked various contract positions including: assistant signal maintainer, signal maintainer, signal gang signalman and signal test foreman.

November of 1976 = I was promoted to a position of Supervisor S&C (signal and communications) in Decatur Illinois with responsibilities of supervising employees charged with signal maintenance, testing and inspections responsibilities as well as communication lineman charged with telephone wire, cable, radio and pole line maintenance.

June of 1980 = I was promoted to an Assistant Engineer, Signal Construction headquartered in St. Louis Missouri. Duties of this position included supervising various signal construction installations, cost control and meeting required on time deadlines. This position covered work in several states but primarily in Indiana. The number of employees supervised varied from project to project.

January of 1984 = I was promoted to Engineer Signal Construction with addition construction responsibilities on the Western Region of Norfolk Southern Rwy.

In 1985 my duties as an Engineer Signal Construction included replacing old antiquated dispatching centers with modern computer based systems in FT. Wayne Indiana and Decatur Illinois in 1987. The Ft. Wayne project involved combining two division offices, Ft. Wayne and Muncie Indiana into a single dispatching center in Ft. Wayne and the Decatur project involved

combining Decatur and Moberly Missouri. Extensive field work was also involved in both projects to ensure accuracy and efficiency.

September of 1987 = I was promoted to General Supervisor Signals in Decatur Illinois. In that position I managed the operations of the Illinois Division which included signal employee safety, operating budget, signal performance to minimize train delays and enhancements to the signal system necessary to improve operations.

December of 1995 = I was promoted to General Supervisor C&S (Communications and Signals) headquartered in Decatur Illinois with additional responsibilities added for communication based equipment located on the Illinois Division.

February of 2001 = I was promoted to Chief Engineer C&S Northern Region with duties of overseeing the communications and signal responsibilities of the former Conrail properties that made up the Northern Region of Norfolk Southern Railroad. This position was responsible for approximately 350 employees in 9 states. This position oversees budget requirements, division capital projects, works with the three division level department heads on manpower needs and develops subsystem test and maintenance procedures as well as safety and rules compliance. This position also works with the other Chief Engineers in C&S in management hiring and overall departmental guidelines necessary to meet corporate goals. I retired from this position on NS March 1, 2006.

My entire active career was spent with one company. I have spent extensive hours working with FRA to ensure rule compliance. Many hours were spent ensuring signal testing and application complied with FRA and NS guidelines. I have been heavily involved in ensuring signal systems on NS are rule compliant, safe and efficient. I was very involved in developing the guidelines used today in hump yard design on NS. My 36+ years of field experience qualifies me to critique, and evaluate a signal system for accuracy and rules compliance as well as operating efficiency and cost control.

Since retirement I have worked for Southwest Signal Engineers now known as XORail. Projects I have worked on since retirement are: Co-coordinating with the FRA and developing for NS the Railway Safety Product Plan (RSPP) and the Software Management Control Plan (SMCP) and the NS Product Safety Plan (PSP) for compliance with FRA regulations. I have also written a training manual for basic signal training used on NS on the former Norfolk and Western property. I have used this manual for signal training for field employees for the last three years in various locations in Indiana, Illinois, Michigan, Ohio, Virginia and West Virginia.

GERHARD THELEN

Mr. Thelen is Vice President – Operations Planning & Support for Norfolk Southern Corporation, the parent of Norfolk Southern Railway Company ("NS"), located at 1200 Peachtree Street, Northeast, Atlanta, Georgia 30309. Mr. Thelen is sponsoring portions of Section III-F of NS's Reply Evidence related to Positive Train Control. Mr. Thelen has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Thelen earned a Master of Engineering degree from Pennsylvania State University and has attended the Tuck School Executive Program at Dartmouth College. He joined NS's predecessor in 1977, starting as a Manager of Quality Control Materials. He spent ten years as Director – Mechanical Engineering. For four years, Mr. Thelen was the Assistant Vice President – Quality Assurance followed by seven years as Assistant Vice President – Engineering. Since 2006, he has held his current position.

Mr. Thelen has chaired a number of Association of American Railroads committees in the Research and Mechanical Divisions. He is a member of both the American Society of Mechanical Engineers and the American Railway Engineering Association. He holds three patents.

Mr. Thelen's complete curriculum vitae is attached.

VERIFICATION

I, Gerhard Thelen, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Gerhard Thelen

Executed on this 14th day of December, 2012.

NORFOLK SOUTHERN

Date: November 28, 2012

Name:	**Gerhard A. Thelen**
Title:	**Vice President – Operations Planning & Support**
Date and Place of Birth:	October 18, 1949 – Weiler, Germany
Education:	Master of Engineering, Pennsylvania State University Ing (Grad), Fachhochschule, Munich, Germany Tuck School Executive Program, Dartmouth College

Career Summary:

1977 - 1979	Manager Quality Control Materials
1979 - 1987	Director – Mechanical Engineering
1987 - 1991	Assistant Vice President – Quality Assurance
1991 – July 1998	Assistant Vice President – Engineering
July 1998 – December 1998	Assistant Vice President – Research & Tests
1998 - 2004	Assistant Vice President – Mechanical
2004 - 2006	Vice President – Mechanical
2006 – present	Vice President – Operations Planning & Support

Other Activities & Affiliations:	Chaired several committees of the Association of American Ra the Research and Mechanical Divisions Member – American Railway Engineering Association Member – American Society of Mechanical Engineers
Special Recognition:	Three US patents

DAVID R. WHEELER

Mr. Wheeler is the founder of Rail Network Analytics, with offices located at 9222 Nottingham Way, Mason, Ohio 45040. Mr. Wheeler has extensive experience developing railroad operation simulations, including the use of the Rail Traffic Controller ("RTC") program. Mr. Wheeler is sponsoring portions of Section III-B and Section III-C relating to the RTC simulation. Mr. Wheeler has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto

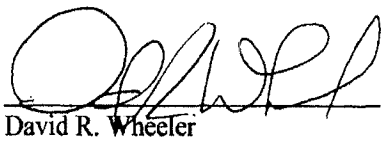
Throughout his career, Mr. Wheeler has focused on advanced analytical techniques for operational improvements and strategic planning. Prior to founding Rail Network Analysis, Mr. Wheeler was employed at Union Pacific Railroad and held various positions, including General Director of Capacity and Operations Analysis. Mr. Wheeler has more than fifteen years experience in areas including rail operations analysis, capacity analysis, simulation, stand-alone rate cases litigation, structured problem solving using the Six Sigma methodology, supply chain efficiency and mergers & acquisitions. Mr. Wheeler's simulation experience includes not only railroads, but also other high technology industries including cockpit simulation work on the F-16 and F-22 fighter aircraft.

Mr. Wheeler holds a Bachelor of Science degree in engineering and computer science from Merrimack College as well as a Masters of Business Administration degree in finance and operations management from Miami University. Mr. Wheeler has training in the Six Sigma methodology and holds a Six Sigma Blackbelt certification.

Mr. Wheeler's resume with additional project experience is attached hereto.

VERIFICATION

I, David R. Wheeler, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.



David R. Wheeler

Executed on this 7 day of December, 2012.

DAVID R. WHEELER

Work products include:

1. Corridor analysis for high density, complex Class 1 rail networks using multiple tools including the Rail Traffic Controller (RTC) model to determine the optimal operating plan.

2. Evaluation of five rail industry critical resources; line, terminal, crews, locomotives and technology

3. Passenger Operations on Freight Railroads

4. Stand-Alone Rate Cases analysis

- CSXT Southeast Corridor simulation, Chicago – Jacksonville, and 5 year capacity growth plan
- Incremental Passenger Service simulation and operating analysis between Las Vegas and Los Angeles
- CSXT Montgomery, AL to Jacksonville simulation as alternate to KCS Meridian speedway
- BNSF Coal Network Analysis; long term coal train capacity development at 5, 10, 15 and 20% volume increase levels - Powder River Basin – Denver – Kansas City – Creston
- Surface Transportation Board Rate Case: FMC v. Union Pacific Railroad
- Surface Transportation Board Rate Case: Wisconsin Power & Light v. Union Pacific Railroad
- Surface Transportation Board Rate Case: Duke Energy v. CSXT Railroad
- Surface Transportation Board Rate Case: Xcel Energy v. BNSF Railroad
- Surface Transportation Board Rate Case: Otter Tail Power v. BNSF Railroad
- Surface Transportation Board Rate Case: Western Fuels v. BNSF Railroad
- Surface Transportation Board Rate Case: Arizona Electric Power v. BNSF Railroad
- Surface Transportation Board Rate Case: Arizona Electric Power v. Union Pacific Railroad
- Surface Transportation Board Rate Case: Arizona Electric Power v. Union Pacific Railroad and BNSF Railroad
- BNSF Alliance Terminal process improvement project
- Discounted Cash Flow and Valuation Analysis: Business model and network model development for the acquisition of the Mexican Railroad concessions
- Union Pacific Railroad - team member - capacity development plan to recover the Houston Gulf Coast infrastructure during the operating crisis of 1998
- Union Pacific Railroad Feather River versus Donner Pass route analysis
- Surface Transportation Board – team member on the Union Pacific / Southern Pacific Mitigation plan including the Reno and Wichita oppositions to the merger
- Surface Transportation Board - Environmental Analysis for the Union Pacific Railroad purchase of the Northeast Kansas & Missouri Railroad (NEKM)
- UP/SP Merger Capacity Plan development and implementation
- Surface Transportation Board for Entergy v. Union Pacific Railroad

- Surface Transportation Board Rate Case for Seminole Energy v. CSXT Railroad
- Surface Transportation Board Rate Case for DuPont v. NS Railroad
- Surface Transportation Board Rate Case for Drummond Coal Sales, Inc v. NS Railroad
- Union Pacific Railroad – Amtrak 7-day service Sunset Limited capacity impact study
- Surface Transportation Board Rate Case for Intermountain Power v. Union Pacific Railroad
- Union Pacific Railroad – San Antonio Commuter Rail Operations simulation study

MICHAEL K. WILLIAMS

Mr. Williams is the Manager of Industrial Engineering for NS at its Atlanta, GA offices, located at 1200 Peachtree Street Northeast, Atlanta, Georgia 30309. Mr. Williams has over 10 years of experience as an industrial engineer with NS. Mr. Williams is sponsoring portions of Section III-C of NS's Reply Evidence relating to NS's RTC model and capacity analysis. Mr. Williams has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

As the Manager of Industrial Engineering at NS, Mr. Williams is responsible for managing and developing NS's capacity planning and RTC simulation team, as well as handling individual RTC projects. Mr. Williams has over 10 years experience working with RTC simulations. Prior to his appointment as an industrial engineer, Mr. Williams spent 15 years as an Engineer for Public Improvements with NS.

Mr. Williams holds a Bachelor of Sciences in Civil Engineering from Clemson University and a Masters of Business Administration from Kennesaw State University. Mr. Williams is a registered professional engineer in the state of Georgia and is qualified as a Six Sigma Greenbelt.

Mr. Williams's curriculum vitae identifying additional relevant experience is attached hereto.

VERIFICATION

I, Michael K. Williams, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Michael K. Williams

Executed on this 10th day of December, 2012.

Michael K. Williams, P.E.

WORK EXPERIENCE

August 2006 – Present: Manager Industrial Engineering, Norfolk Southern Corp.

- Responsible for managing and developing NS' capacity planning and RTC simulation team as well as handling individual RTC projects

November 2004 – July 2006: Senior Industrial Engineer, Norfolk Southern Corp.

- Responsible for building RTC simulations of across the NS system and developing infrastructure recommendations for NS senior management

June 2002 – October 2004: Industrial Engineer, Norfolk Southern Corp.

- Responsible for various process improvement initiatives and RTC capacity simulations

October 1987 – May 2002: Engineer Public Improvements, Norfolk Southern Corp.

- NS' engineering liaison for state DOT's and public agencies wanting to build public improvements on railway right-of-way

July 1985 – September 1987: Trainee / Asst. Engineer Bridges, Norfolk Southern Corp.

EDUCATION

BS in Civil Engineering - Clemson University (1985)

MBA - Kennesaw State University (2005)

PROFESSIONAL QUALIFICATIONS

Registered Professional Engineer in State of Georgia

Six Sigma Greenbelt

PUBLICATIONS

"Using Simulation to Understand Bottlenecks, Delay Accumulation, and Rail Network Flow" – Presented at the 2011 AREMA Annual Conference

PROFESSIONAL MEMBERSHIPS

Current Chairman - AREMA Committee 16 (Economics of Railway Engineering and Operations)

Member - Institute of Industrial Engineers

GEORGE T. ZIMMERMAN

Mr. Zimmerman is a Project Manager/Senior Engineer with STV, a professional firm offering engineering, architectural, planning, environmental and construction management services with offices located at 3505 Koger Boulevard, Suite 205, Duluth, Georgia 30096. Mr. Zimmerman is a railway engineer and project manager with more than 30 years of experience on roadway and bridge projects and has particular expertise in freight planning, design, and construction management. Mr. Zimmerman is sponsoring portions of Section III-F of Norfolk Southern's ("NS's") Reply Evidence relating to track construction and the construction schedule. Mr. Zimmerman has signed a verification of the truth of the statements contained therein. A copy of that verification is attached hereto.

Mr. Zimmerman's resident engineering and inspection experience includes grade crossings and roadway, railway, and highway bridges. Mr. Zimmerman manages STV's relationship with Norfolk Southern, working with the railroad on a daily basis and assisting in the preparation of proposals and contracts. In addition, Mr. Zimmerman provides structural design and plan reviews for railway and bridge projects. Mr. Zimmerman holds a Bachelor of Science, Civil Engineering from West Virginia University and is a member of the Roadway and Ballast Committee of the American Railway Engineering and Maintenance of Way Association (AREMA).

Mr. Zimmerman's resume with additional project experience is attached hereto.

VERIFICATION

I, George T. Zimmerman, declare under penalty of perjury that I have read the portions of the Reply Evidence of Norfolk Southern Railway Company that I have sponsored (as described in the foregoing Statement of Qualifications), that I know the contents thereof, and that the evidence I have sponsored is true and correct. Further, I certify that I am qualified and authorized to file this statement.

George T. Zimmerman

Executed on this 12th day of December, 2012.

George T. Zimmerman, P.E.

Project Manager/Senior Engineer

Mr. Zimmerman is a railway engineer and project manager with more than 30 years of experience on roadway and bridge projects and particular expertise in freight planning, design, and construction management. His resident engineering and inspection experience includes grade crossings and roadway, railway, and highway bridges. Mr. Zimmerman manages STV's relationship with Norfolk Southern, working with the railroad on a regular basis and assisting in the preparation of proposals and contracts. In addition, he provides structural designs and plan reviews for railway and bridge projects.

Office Location
Duluth, GA

Date joined firm
5/16/79

Years with other firms
0

Education
Bachelor of Science, Civil Engineering; West Virginia University (1979)

Professional Registrations
Professional Engineer: Georgia (1992/#019811/exp. 12/31/14), Kansas (2002/#17069/exp. 4/30/13), Missouri (2003/#2003000042/exp. 12/31/13), Ohio (2001/#65833/exp. 12/31/13), South Carolina (1989/#12625/exp. 6/30/14)

Memberships
Roadway and Ballast Committee Member, American Railway Engineering and Maintenance of Way Association (AREMA)

American Society of Civil Engineers (ASCE)

Project Experience

BRIDGES

Norfolk Southern Jeffersonville Road Widening - Project Manager
Managed the preliminary layout and design of a 4-span, 93.5-meter-long steel deck plate girder railroad bridge in Macon, GA. The single-track bridge will carry Norfolk Southern over Jeffersonville Road, which was widened from two to five lanes. The project included track realignment to allow off-line construction. (2002 - 2007)

GDOT Railroad Bridges over Butler Street and Piedmont Avenue - Senior Engineer
Provided bridge design for the widening of two CSX Railroad bridges over Butler Street and Piedmont Avenue in Fulton County, GA, and two retaining walls for the Georgia Department of Transportation (GDOT). (2002 - 2006)

GDOT S.R. 3 Connector - Senior Engineer
Designed a replacement bridge and adjoining roadway over I-75 on the S.R. 3 connector in Whitfield County, GA. The 8-lane bridge replaced a 2-lane structure of insufficient capacity. Work included horizontal and vertical design, construction plans, right-of-way plans, and construction staging plans, as well as pavement marking and signing plans. All design work for this Georgia Department of Transportation (GDOT) project was done in metric. (1995)

CSX Railroad over Monroe Road - Resident Engineer
Provided construction management and coordination with the railroad for this through-girder, single-track railroad structure in Charlotte, NC. The project included a temporary detour trestle, track realignment, staged construction, and coordination with the highway portion of the project. The underpass is located in what was one of the emerging growth corridors of the Charlotte area. (6/87 - 12/88)

COMMERCIAL

Private Developer Silas Creek Crossing Shopping Center - Resident Inspector
Provided construction observation for a 200,000-sf retail shopping center, highway bridge, and concrete box culvert in Winston Salem, NC. (7/88 - 3/89)

HIGHWAYS/ROADWAYS

Piper Glen Development Corporation Rea Road Extension - Engineer
Provided construction coordination and management for 1.65-mile roadway extension to serve as the main thoroughfare for Piper Glen Development in Mecklenburg County, NC. The $2.5 million roadway and highway bridge project were built to be taken into the North Carolina Department of Transportation system and connected to the Charlotte Outer Beltway. (6/87 - 6/89)

INDUSTRIAL

IBM Research and Manufacturing Facility University Research Park - Engineer
Provided staging and design, earthwork, and site plan staging for balancing of cuts and fills for recreational facilities during construction of the building site and railway in Charlotte, NC. (5/79 - 11/79)

RAIL: COMMUTER RAIL

Central Midlands Council of Governments Camden to Columbia Corridor Alternatives Analysis – Senior Rail Engineer
Contributed to the alternatives analysis for potential mass transit technologies and corridors between Camden, SC, and Columbia, SC. Mr. Zimmerman assisted the planning team by providing rail information, traffic potential, and operational layouts in Columbia where rail lines intersect. He also identified areas of structural conflict requiring further study and analysis. (6/09 - 6/11)

FTA PMO Denver RTD/CDOT Capital Program - Senior Engineer
Identified locations along proposed alignments where changes would be made to the Burlington Northern Santa Fe and Union Pacific Railroad tracks as part of project management oversight (PMO) services to the Federal Transit Administration (FTA) for the Denver Regional Transportation District (RTD)/Colorado Department of Transportation (CDOT) commuter rail system in Denver. Mr. Zimmerman also determined if the work could be considered a required railroad change or betterment for the railroad involved. To determine this, the trackwork and civil improvements to the rail system and track roadbed were evaluated as individual projects, but with a larger area view if there were track changes or replacements involved. (8/10 - 1/11)

CSX Ronald Reagan Parkway - Project Manager/Resident Engineer
Managed the construction engineering inspection of the CSX Railroad bridge over Ronald Reagan Parkway near Lawrenceville in Gwinnett County, GA. (2/92 - 12/93)

Norfolk Southern I-64 over Norfolk Southern - Resident Engineer
Observed construction field activities and represented the Norfolk Southern Railroad for two bridges over the railway, one at milepost 4.43 VB, and one at milepost 5.04 NS in Norfolk, VA. (1/90 - 2/92)

City of Virginia Beach Pungo Ferry Bridge - Resident Engineer
Provided construction management and inspection services and represented the City of Virginia Beach for the construction of the replacement of this obsolete swing span with a 3,400-foot-long highway bridge over the Intracoastal Waterway in Virginia Beach, VA. The project included roadway approaches and the placement of a geosynthetic stabilized embankment over adjacent wetlands. (1989 - 1992)

Norfolk Southern over Harris Boulevard - Resident Engineer
Provided construction management for a double-track Norfolk Southern underpass built using a temporary detour alignment in Newell, NC. (7/88 - 6/89)

City of Charlotte Tyvola Road Extension - Resident Structural Inspector
Inspected this 3.6-mile, 5-lane roadway extension in Charlotte, NC, including a new interchange with a 7-lane bridge over Billy Graham Parkway, eight reinforced concrete box culverts, and a 6-lane bridge over Sugar Creek. (6/87 - 6/89)

RAIL: FREIGHT RAIL

Sandersville Railroad Alternate Route Study - Senior Engineer
Providing location, evaluation, and cost estimates for a 12-mile industrial lead in Washington County, GA (10/11 - Present)

Cambridge Systematics CSXT Intermodal Location Feasibility Assistance - Lead Railroad Engineer
Collaborating with the Maryland Department of Transportation (MDOT) in the review and evaluation of preliminary plans for alternate sites for CSXT intermodal transfer facilities in the Baltimore, MD, area. Mr. Zimmerman is assisting MDOT in interpreting CSXT plans and figures, explaining CSXT requirements, and verifiying that provided information is consistent with current CSXT and railroad industry standards of practice. (8/11 - Present)

R. J. Corman Railroad On-Call Services Contract - Project Manager
Managing plan review and construction engineering and inspection services on an on-call, as-needed basis for proposed roadway, bridge, and miscellaneous projects affecting railway facilities throughout various R. J. Corman Railroad lines in the eastern United States. Mr. Zimmerman has overseen construction of overhead bridges, underpasses, utility crossings,

parallel construction of utilities, roadways, and grade crossings since 2007. (2007 - Present)

Norfolk Southern On-Call Services Contract - Project Manager
Managing plan review and construction engineering and inspection services on an on-call, as-needed basis for more than 1000 proposed roadway, bridge, and retaining wall construction projects affecting railway facilities throughout the 22-state Norfolk Southern system. Mr. Zimmerman has overseen construction of overhead bridges, underpasses, floodwalls, and utility crossings, and parallel construction of utilities, roadways, bikeways, and grade crossings since 1992. (1992 - Present)

Norfolk Southern Heartland Corridor Clearance Improvements CM - Project Manager
Coordinated various teams providing construction management (CM) services for portions of the Heartland Corridor Clearance Project, an award-winning, $191 million initiative to improve 28 tunnels and seven through-truss bridges and remove 24 overhead obstacles to provide a direct double-stacked container train route from the ports of Virginia through West Virginia and eastern Kentucky into central Ohio. Mr. Zimmerman oversaw the raising of a bridge at Harding Street in Bluefield, WV; stormwater and erosion control plans at various tunnel sites; and numerous bridge lowering and slide fence clearance tasks. (1/07 - 8/10)

LAMTPO Rail Relocation and Intermodal Facility Feasibility Study - Senior Engineer
Provided design engineering services for the proposed relocation of the Norfolk Southern Railroad mainline through Morristown, White Pine, and Jefferson City, TN, as part of a study for the Lakeway Area Metropolitan Transportation Planning Organization (LAMTPO) to determine the feasibility of relocating the Norfolk Southern A Line and installing an intermodal facility in Morristown. Mr. Zimmerman assisted in gathering information and determining railroad design and operation requirements. The A Line, which runs through downtown Morristown, will be eliminated and either a new line will be built or an existing line will be improved in the county. The intermodal facility will facilitate connections between freight lines along Interstate 81 and the Norfolk Southern Crescent. (3/08 - 4/09)

Rochester & Southern Railroad Silver Springs Connection Track - Project Manager
Reviewed rail design for a Rochester & Southern Railroad connection track in Silver Springs, NY. The connecting track will allow unit coal train movement from Norfolk Southern Railroad to the Rochester & Southern Railroad. Mr. Zimmerman's responsibilities included coordination with Norfolk Southern. (2007 - 2009)

Vulcan Materials Company Skippers Quarry Loop Track - Project Manager
Provided project administration and coordinated staff in multiple offices for the preliminary and final design of a 0.75-mile loop track, including a 100-

foot-long open deck railroad trestle, for Vulcan Materials Company at Skippers Quarry in Skippers, VA. The track is used for loading unit rail trains with railroad ballast and other crushed aggregate materials. (1/07 - 1/09)

STB Railroad Coal Rate Case Litigation Cost Assessments - Project Manager
Determined values for track work items and construction staging of the work plan for this Surface Transportation Board (STB) project, which included assembling the planning, engineering, and construction costs to build a hypothetical contemporary operating railroad in North Carolina, as part of a cost assessment for a several coal rate cases. Cost assessments included major earthwork, bridge and culvert construction, track, communications and signalization, engineering design, construction management, material costs and logistics, mobilization, and contingencies. Cases included Norfolk Southern versus Duke Energy, Norfolk Southern versus Carolina Power & Light, CSX versus Duke Energy, Burlington Northern Santa Fe (BNSF) and Union Pacific versus AEC, BNSF versus Otter Tail, and AEP Texas North versus BNSF. (2000)

Norfolk Southern Automobile Mixing Facility - Project Manager
Provided preliminary and final hydraulic/hydrologic, railway, roadway, highway, and railway bridge design for this Ford automobile mixing facility in Shelbyville, KY. The project included 2.5 million cubic yards of earthwork, 18 miles of track installation, a 45-acre paved vehicle storage yard, 3 bridges, and 2 access roads. (8/96 - 12/97)

CSX Double-Track Program - Project Manager
Designed 7 miles of track parallel to the CSX Railroad main line in Marietta, GA. The project included a study of several grade-crossing eliminations and retaining wall structures. (1995)

Norfolk Southern Third Mainline Track - Project Manager
Managed engineering services for the design and construction of a 2.9-mile third main track from adjacent to CSX's Queensgate Yard to Mitchell Avenue in Cincinnati. Mr. Zimmerman provided project management as well as the design of all earthwork, track work, and retaining structures. (6/94 - 7/95)

USACE Omaha District Wharf Track Military Ocean Terminal - Senior Engineer
Provided engineering services for track material research for the rehabilitation of 3.5 miles of railroad track on concrete wharfs in Sunny Point, NC, for the U.S. Army Corps of Engineers (USACE). (1994)

CSX Railroad Relocation, Consolidation, and Grade Crossing Elimination - Contract A Resident Engineer, Contract B Assistant Resident Engineer

Supervised the $16.7 million construction of a railway roadbed, including 7,600 linear feet of grading, in Columbia, SC. The project included drainage, dewatering, utilities, and retaining walls. (4/83 - 4/87)

Graham County Development Corporation Graham County Railroad - Resident Engineer
Provided construction management and testing services for the $1.65 million rehabilitation of 12.65 miles of track and 13 small railroad bridges, including drainage improvements and 1.25 miles of track relayed with heavier rails on a steep mountainous grade, for this railroad between the re-established connection to the Southern Railway at Totpon, NC, to the Bemis Lumber Company yard in Robbinsville, NC. (1/81 - 4/83)

RAIL: LIGHT RAIL

CATS LYNX Blue Line Extension Light Rail Project - Senior Engineer
Responsible for the coordination and resolution of issues generated by the preliminary design in areas along the corridor that involve Norfolk Southern, North Carolina and the Aberdeen, Carolina, and Western Railroads as part of the a new 9.3-mile light rail transit line extension in Charlotte, NC. Mr. Zimmerman is working with the Charlotte Area Transit System (CATS) to successfully integrate transit and land use, and to solve challenges associated with crossing and running along existing freight railroad right-of-way. The plans must satisfy the requirements of four different railroads so the city can secure necessary agreements. (2008 - Present)

SITE DEVELOPMENT

Statesville Redevelopment Authority Newtonville Subdivision - Resident Engineer
Provided construction management, inspection, and field testing services for the redevelopment of the $500,000 Newtonville Subdivision for the City of Statesville, NC. This project included the total removal of all existing facilities and the construction of all new infrastructure including excavation, drainage, utility installation, and street construction. (11/79 - 7/80)