

211669

BEFORE THE
SURFACE TRANSPORTATION BOARD



AEP TEXAS NORTH COMPANY

Complainant,

v.

THE BURLINGTON NORTHERN AND
SANTA FE RAILWAY COMPANY

Defendant.

Docket No. 41191 (Sub-No. 1)

REBUTTAL EVIDENCE OF
COMPLAINANT AEP TEXAS NORTH COMPANY

ENTERED
Office of Proceedings

EXHIBITS

JUL 25 2004

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Dated: July 27, 2004

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Powder/Green River

Year	All Grades*	All Grades*	Low Sulfur (Sub-Bituminous) Only	Low Sulfur (Sub-Bituminous) Only
	Million Short Tons	Growth Rate	Million Short Tons	Growth Rate
2001	407.5		375.1	
2002	410.2	0.7%	372.1	-0.8%
2003	432.1	5.3%	399.5	7.4%
2004	440.2	1.9%	401.9	0.6%
2005	459.2	4.3%	418.9	4.2%
2006	474.6	3.4%	431.0	2.9%
2007	484.4	2.1%	438.6	1.8%
2008	478.2	-1.3%	433.7	-1.1%
2009	505.5	5.7%	457.8	5.6%
2010	511.1	1.1%	463.4	1.2%
2011	518.6	1.5%	471.1	1.7%
2012	539.7	4.1%	492.2	4.5%
2013	555.0	2.8%	510.3	3.7%
2014	563.3	1.5%	523.9	2.7%
2015	573.1	1.7%	547.1	4.4%
2016	598.4	4.4%	553.1	1.1%
2017	605.1	1.1%	562.5	1.7%
2018	603.0	-0.4%	560.4	-0.4%
2019	620.9	3.0%	575.4	2.7%
2020	637.0	2.6%	590.9	2.7%
CAGR % 2008-2020	2.4%		2.6%	

* All grades include Low Sulfur (Bituminous), Low Sulfur (Sub-bituminous), and Medium Sulfur (Sub-bituminous).

Source: AEO 2004, Table 111. Coal Production by Region and Type

Exhibit III-A-18 Tonnage 85% Capacity Factor Cap Calculation Illustration - James River Plant

Formula Overview

$$\text{Tonnage Cap} = \text{PRB Tons} \times \text{BNSF Percentage}$$

where:

$$\text{PRB Tons} = \text{Total MMBtus} / (\text{Heat Content} \times 2 / 1000)$$

and

$$\text{Total MMBtus} = [\text{Capacity (MW)} \times 8760 \text{ (hours)} \times .85 \times \text{heat rate (Btu/Kwh)}] / 1000$$

Input Data

COALdat Data based on FERC Form 423

Year (1)	Mine Supply Region (2)	Originating Transp Parent (3)	Total Tons (000s) (4)	Btu/Lb (5)	Total MMBtu Delivered (4) * (5) * 2
2000	Mid-Continent:Illinois Basin	BNSF	155	12,118	3,756,580
2000	Western:Southern PRB	BNSF	620	8,958	11,107,920
2001	Mid-Continent:Illinois Basin	BNSF	120	12,037	2,888,880
2001	Western:Central Rockies	UNION PACIFIC	46	11,864	1,091,442
2001	Western:Southern PRB	BNSF	773	8,974	13,873,804
2002	Mid-Continent:Illinois Basin	BNSF	102	12,089	2,466,054
2002	Western:Central Rockies	UNION PACIFIC	35	11,939	835,695
2002	Western:Southern PRB	BNSF	897	8,948	16,052,712

Calculations

a. PRB Tons

a. 1. 85% Capacity Factor Cap in MMBtus (Total MMBtus)

Capacity (MW)	239.0	(i)
Average Heat Rate (Btu/kWh)	11,253	(ii)
Hours in a Standard Year (365 days * 24 hours)	8,760	(iii)
Capacity Factor	85%	(iv)

$$\text{Fuel Requirements @ 85\% Capacity Factor (MMBtu)} = 20,025,771 \quad [(i) * (ii) * (iii) * (iv)] / 1000$$

a. 2. PRB Tons Heat Content

Year	Average PRB Coal Heat Content (Btu/lb.)
2000	8,958
2001	8,974
2002	8,948
Three - Year Average PRB Coal Heat Content	8,960

Exhibit III-A-18 Tonnage 85% Capacity Factor Cap Calculation Illustration - Continued**a. 3. PRB Tons**

Fuel Requirements @ 85% Capacity Factor (MMBtu)	20,025,771	(a. 1.)
Three - Year Average PRB Coal Heat Content (Btu/lb)	8,960	(a. 2.)
PRB Tons = Fuel Requirements @ 85% Capacity Factor (Tons	1,117,510	(a. 1.) / [(a. 2.)*2/1000]

b. BNSF Percentage

Year	PRB MMBtus	Total MMBtu - All Sources	Annual BNSF PRB Percentage
2000	11,107,920	14,864,500	75%
2001	13,873,804	17,854,126	78%
2002	16,052,712	19,354,461	83%
Three - Year Average Percentage PRB Coal on BNSF			78%

c. Tonnage Cap

PRB Tons = Fuel Requirements @ 85% Capacity Factor (Tons)	1,117,510	(a. 3.)
Three - Year Average Percentage PRB Coal on BNSF	78%	(b.)
Maximum PRB Tonnage on BNSF @ 85% Capacity Factor	876,779	

Exhibit III-A-23 Comparison of EIA AEO 2004 National Transportation Rate Multiplier and Region Specific Coal Transportation Rate Growth Rates from Powder/Green River Basins for the Electricity Sector

DEMAND REGION	DEMAND STATES	2009	2010	2011	2012	2013	2014	2015
AM	AL,MS	2.1%	3.6%	3.4%	1.8%	3.2%	2.3%	2.8%
CU	CO,UT,NV	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
CW	MN,IA,ND,SD,NE,MO,KS	1.3%	2.9%	2.1%	0.7%	2.3%	2.1%	2.1%
EN	IN,IL,MI,WI	1.6%	3.2%	2.5%	1.1%	3.0%	2.8%	3.5%
GF	GA,FL	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
KT	KY,TN	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
MT	MT,WY,ID	22.8%	17.4%	5.7%	9.2%	2.0%	8.3%	9.7%
OH	OH	1.3%	2.9%	2.1%	0.7%	3.9%	2.7%	2.3%
PC	AK,HI,WA,OR,CA	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
SA	WV,MD,DC,DE,VA,NC,SC	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
WS	TX,LA,OK,AR	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
YP	NY,PA,NJ	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
ZN	AZ,NM	1.3%	2.9%	2.1%	0.7%	2.2%	2.1%	2.0%
National Transportation Rate Multiplier		2.2%	2.3%	1.7%	1.7%	1.8%	2.0%	2.1%

Note: Powder/Green River Supply Region includes Wyoming and Montana. EIA projects that transportation rates to regions with faster than average demand growth will increase faster than the National Transportation Rate Multiplier.

DEMAND REGION	DEMAND STATES	2016	2017	2018	2019	2020	CAGR 2008 - 2020
AM	AL,MS	2.7%	2.4%	3.0%	2.1%	2.7%	2.7%
CU	CO,UT,NV	2.0%	1.8%	3.2%	1.6%	1.8%	2.0%
CW	MN,IA,ND,SD,NE,MO,KS	2.0%	2.0%	3.8%	2.1%	2.1%	2.1%
EN	IN,IL,MI,WI	2.2%	1.9%	3.3%	-0.2%	1.6%	2.2%
GF	GA,FL	2.0%	1.8%	3.2%	1.6%	1.8%	2.0%
KT	KY,TN	2.0%	1.8%	3.2%	1.6%	1.8%	2.0%
MT	MT,WY,ID	11.7%	10.4%	3.1%	5.3%	3.2%	8.9%
OH	OH	5.7%	0.9%	2.5%	2.8%	2.3%	2.5%
PC	AK,HI,WA,OR,CA	2.0%	1.8%	3.2%	1.6%	8.8%	2.5%
SA	WV,MD,DC,DE,VA,NC,SC	2.0%	1.8%	3.2%	1.6%	1.8%	2.0%
WS	TX,LA,OK,AR	2.0%	1.8%	3.2%	1.6%	1.8%	2.0%
YP	NY,PA,NJ	2.0%	1.8%	3.2%	1.6%	1.8%	2.0%
ZN	AZ,NM	2.0%	1.8%	3.2%	1.6%	1.8%	2.0%
National Transportation Rate Multiplier		1.8%	2.0%	2.1%	2.3%	2.3%	2.0%

Note: Powder/Green River Supply Region includes Wyoming and Montana. EIA projects that transportation rates to regions with faster than average demand growth will increase faster than the National Transportation Rate Multiplier.

Sources: Annual Energy Outlook 2004 (aeo2004/d101703e) in an email from Kearney, Diane at EIA dated 6/29/2004.
Email address: Diane.Kearney@eia.doe.gov. AEO 2004 Assumptions Table 68

Exhibit III-A-24 EIA AEO 2003 and 2004 GDP-IPD Forecast Comparisons

Year	AEO 2004	AEO 2003
	Base Year 2002 = 1.000	Base Year 2002 = 1.000
2001	0.99	0.99
2002	1.00	1.00
2003	1.02	1.03
2004	1.03	1.05
2005	1.05	1.08
2006	1.07	1.10
2007	1.09	1.12
2008	1.12	1.14
2009	1.15	1.16
2010	1.18	1.18
2011	1.21	1.21
2012	1.24	1.24
2013	1.28	1.27
2014	1.32	1.30
2015	1.36	1.34
2016	1.40	1.38
2017	1.45	1.42
2018	1.50	1.46
2019	1.55	1.50
2020	1.60	1.54
CAGR % 2008-2020	3.04%	2.54%

Source: AEO 2004, Table 20. Macroeconomic Indicators & AEO 2003 Table 20. Macroeconomic Indicators.

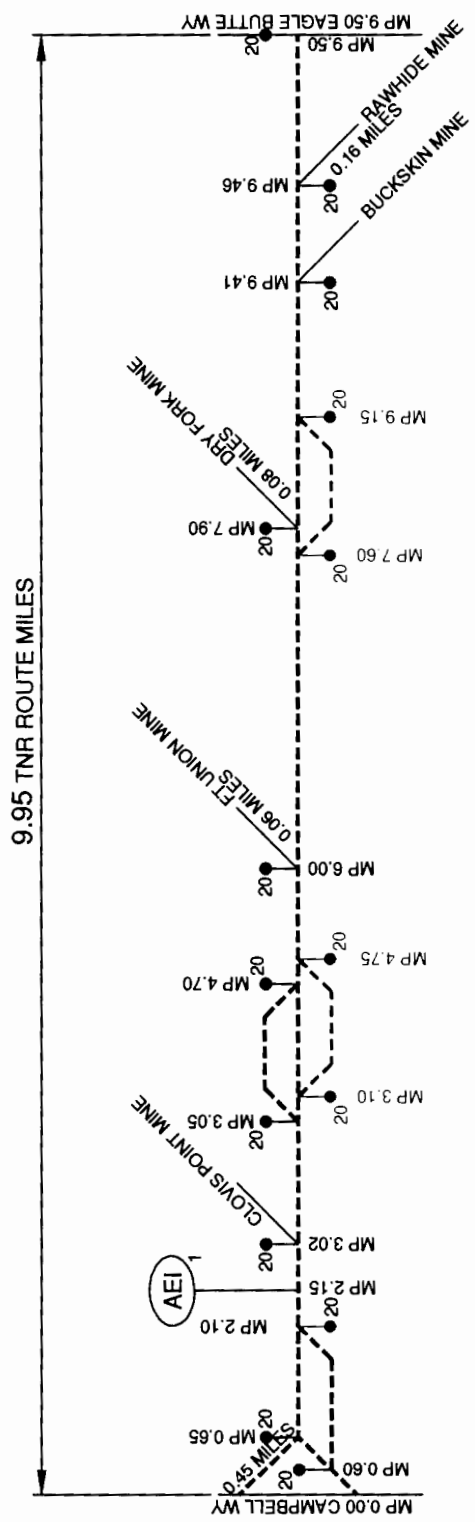
III-B Stand-Alone Railroad System



**SUMMARY OF AREAS WHERE AEP TEXAS AND BNSF
AGREE ON SARR SYSTEM/OPERATING PLAN/OPERATING EXPENSES**

<u>Item</u>	<u>Ref. in BNSF Reply Narrative</u>
1. Route and general configuration	III.B-3
2. Route miles (difference = 0.16 mile)	III.B-3
3. Location/functions of the principal TNR Yard	III.B-32
4. Use of the RTC model to assess TNR feasibility	I-14, 20; III.B-4
5.* Use of simulation period that includes the TNR's peak traffic week in 2020 for loaded trains plus warm-up and cool-down periods	III.B-3 to 5
6.* Train speed limits and restrictions	III.C-14 and Exhibit III.C-1
7.* Train sizes and types	III.C-2-3
8.* Locomotive types and consists (including DP)	III.C-3
9.* Helper districts; time to add/detach helpers	III.C-16
10.* Loading times Orin Sub/Reno Branch mines	III.C-11 and Exhibit III.C-1
11.* Start interchange cycle with arr. of empty train	III.B-14
12.* Crew districts and crew-change time	III.C-1, 13; III.D-21
13.* Interchange locations and time	Exhibit III.C-1
14.* No program MOW during peak traffic period	III.B-6
15.* Track inspections worked around peak period without interfering with train operations	III.B-6
16. The TNR requires only two yards; no need for staging yards near PRB mines	III.B-32
17. CTC traffic control system	III.B-39
18. Microwave communications system	III.B-39-40
19. Number of helper locomotives	III.C-III.C-7
20. Number of switch locomotives	III.C-8
21. Type and weight of rail in various track categories	III.B-29 to 31
22. Car inspection intervals and procedures	III.C-19
23. Dispatching districts and procedures	III.C-19
24. Car leasing and maintenance cost	III.D-17
25. Treatment of foreign cars/priv. car allowances	III.D-18
26. Gen. staffing levels for non-T&E op. positions	III.D-20
27. Method of determining peak-year road crew requirements including 270 shifts per year	III.D-21-22
28. Helper and switch crew sizes	III.D-23
29. Taxi and overnight costs per trip and per night	III.D-25
30. Mechanical staffing	III.D-33
31. Materials, supplies & Equipment unit costs	III.D-120
32. MOW op. expense contract work	III.D-206
33. Annual costs for derailment/casualty repairs and yard cleaning	III.D-219, 220
34. Cost of leased facilities/trackage rights	III.D-231-232
35. Loss & Damage expenses	III.D-231

* Note: Items 5 through 15 involve RTC Model operating inputs/assumptions.



SEGMENT 1
PAGE 1 OF 20

EXHIBIT:
III-B-6

LEGEND:

- TURNOUT TYPES
 - 24 - #24 ELECTRIC
 - 20 - #20 ELECTRIC
 - 14 - #14 ELECTRIC
 - 14H - #14 HAND-THROWN
 - 10S - #10 SPRING
 - 10 - #10 HAND-THROWN
 - 10E - #10 ELECTRIC
- 136# PREMIUM CWR
- - - 136# STANDARD CWR
- - - 115# CWR CLASS 1 RELAY
- (FED) 1 FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
- (HB) 1 HOT BEARING DETECTOR
- (DE OR DED) 1 DRAGGING EQUIPMENT DETECTOR
- (HW) 1 HOT WHEEL DETECTOR
- (AEI) 1 AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED

DIVISION: **POWDER RIVER**
SUBDIVISION: **CAMPBELL**

DATE: **7/16/04**

MP: **0.00**

MP: **9.50**

FROM: **CAMPBELL**

TO: **EAGLE BUTTE**

NOT TO SCALE

SEGMENT 3
PAGE 2 OF 20

LEGEND:

—	- 136# PREMIUM CWR
----	- 136# STANDARD CWR
----	- 115# CWR CLASS 1 RELAY

• TURNOUT TYPES

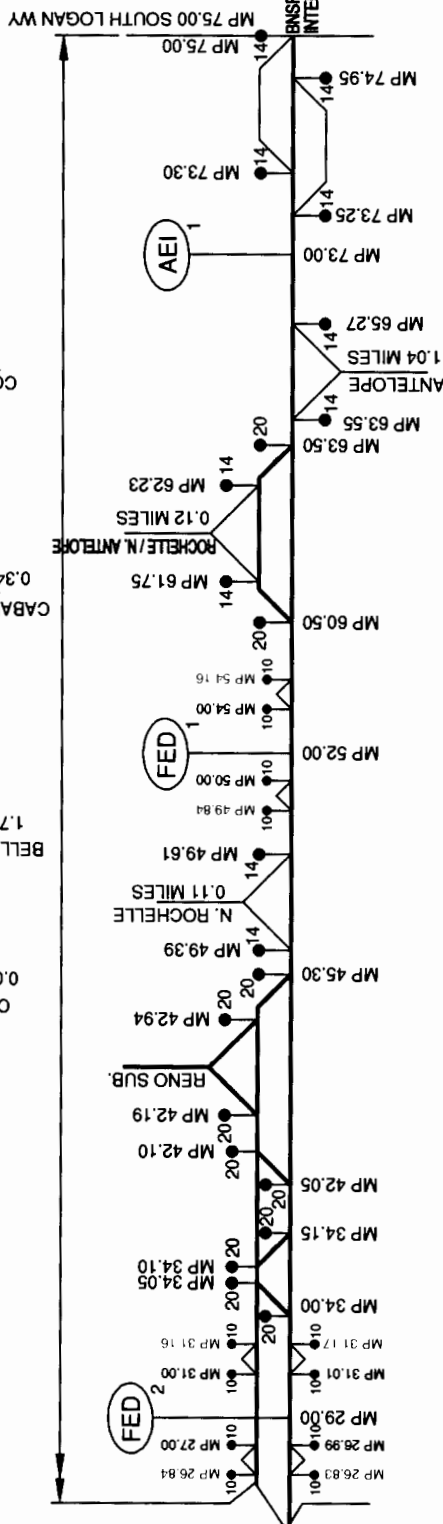
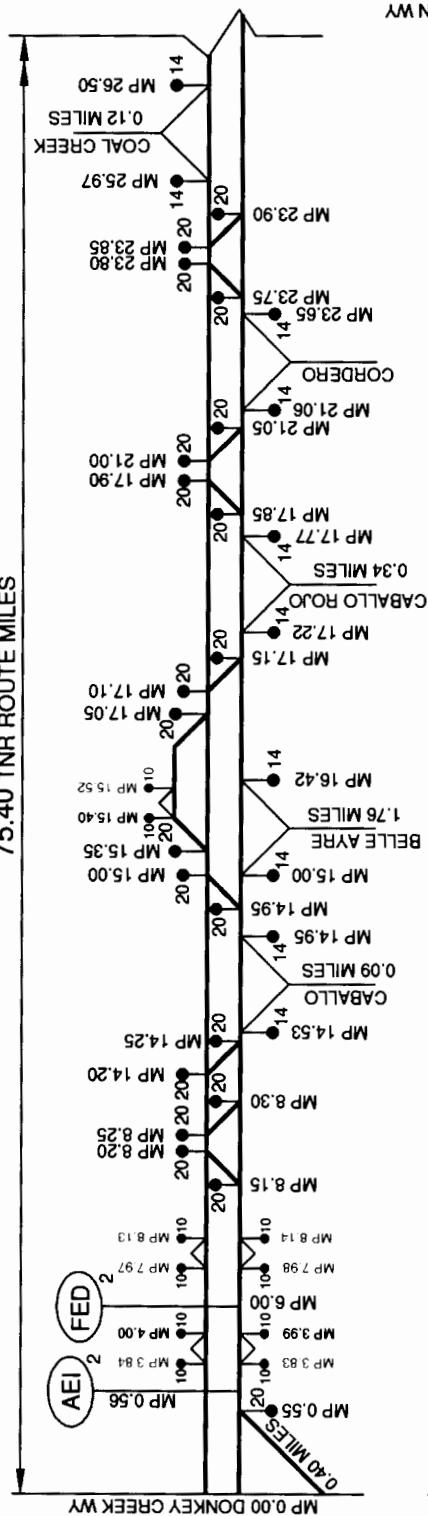
24 - #24 ELECTRIC	14H- #14 HAND-THROWN
20 - #20 ELECTRIC	10S- #10 SPRING
14- #14 ELECTRIC	10- #10 HAND-THROWN
	10E- #10 ELECTRIC

• 20 = TURNOUT TYPE

(FED) 1	FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
	HB = HOT BEARING DETECTOR DE OR DR= DRAGGING EQUIPMENT DETECTOR HW= HOT WHEEL DETECTOR
(AEI) 1	AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED

DIVISION: **POWDER RIVER**
SUBDIVISION: **BLACK HILLS**
FROM: **WEST CAMPBELL** MP: **589.95**
TO: **EDGEMONT** MP: **476.10**
DATE: **7/16/04**
NOT TO SCALE

75.40 TNR ROUTE MILES



SEGMENT 2
 PAGE 3 OF 20

DIVISION: **POWDER RIVER**
 SUBDIVISION: **ORIN**

FROM: **DONKEY CREEK** MP: **0.00**
 TO: **SOUTH LOGAN** MP: **75.0**

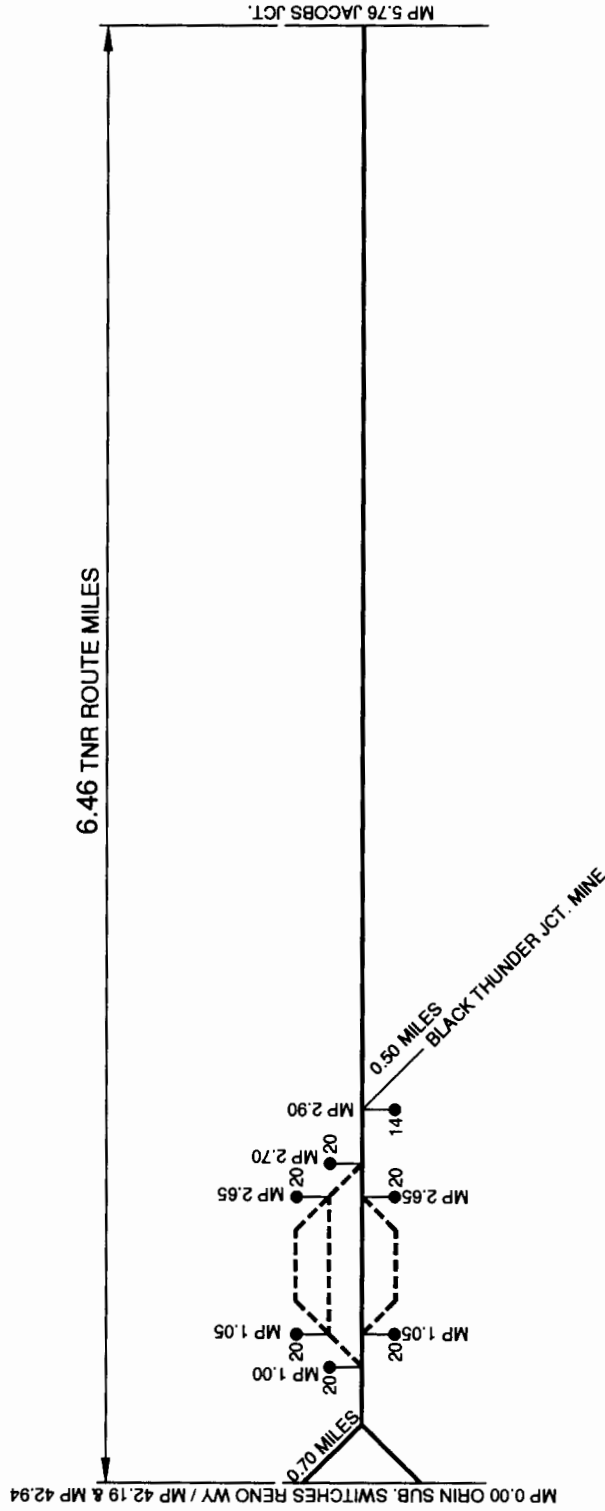
DATE: 7/16/04

NOT TO SCALE

LEGEND:

- TURNOUT TYPES
 - 24 - #24 ELECTRIC
 - 20 - #20 ELECTRIC
 - 14 - #14 ELECTRIC
 - 14H - #14 HAND-THROWN
 - 10S - #10 SPRING
 - 10 - #10 HAND-THROWN
 - 10E - #10 ELECTRIC
- 136# PREMIUM CWR
- 136# STANDARD CWR
- 115# CWR CLASS 1 RELAY
- (FED) 1 FAILED EQUIPMENT DETECTOR WITH
 NUMBER OF TRACKS COVERED
 HS = HOT BEARING DETECTOR
 DS OR DED = DRAGGING EQUIPMENT DETECTOR
 HW = HOT WHEEL DETECTOR
 AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
 NUMBER OF TRACKS COVERED
- (AEI) 1 AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
 NUMBER OF TRACKS COVERED
- 20 = TURNOUT TYPE

EXHIBIT:
III-B-6



SEGMENT 2A
PAGE 4 OF 20

EXHIBIT:
III-B-6

LEGEND:

136# PREMIUM CWR 136# STANDARD CWR 115# CWR CLASS 1 RELAY	20 = TURNOUT TYPE* 24- #24 ELECTRIC 20- #20 ELECTRIC 14- #14 ELECTRIC 14H- #14 HAND-THROWN 10S- #10 SPRING 10- #10 HAND-THROWN 10E- #10 ELECTRIC
- FAILED EQUIPMENT DETECTOR WITH - NUMBER OF TRACKS COVERED - HB = HOT BEARING DETECTOR - DE OR DEED = DRAGGING EQUIPMENT DETECTOR - HW = HOT WHEEL DETECTOR - AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH - NUMBER OF TRACKS COVERED	(FED) 1 (AEI) 1

DIVISION: POWDER RIVER

SUBDIVISION: RENO

DATE: 7/16/04

FROM: ORIN SUB. SWITCHES MP: 0.0

TO: JACOBS JCT. MP: 5.76

NOT TO SCALE

The drawing illustrates the proposed road alignment for Segment 3, showing the relationship between the road's plan view and its profile view. The plan view (top) shows the road's path with stationing from MP 419.85 to MP 476.10. The profile view (bottom) shows the road's elevation with stationing from MP 363.25 to MP 419.85. Key features include the 'ALLIANCE' and 'CRAWFORD' areas, the 'BNSF INTERCHANGE', and the 'ANGORA SUB. VORAWAY' area. The drawing includes various labels for 'FED' (Federal) and 'AE' (Alliance East End) sections, and a scale bar indicating 1.15 TNR ROUTE MILES.

EXHIBIT:
III-B-6

- 136# PREMIUM CWR
 - 136# STANDARD CWR
 - 115# CWR CLASS 1 RELAY

* TURNOUT TYPES
 24 - #24 ELECTRIC
 20 - #20 ELECTRIC
 14 - #14 ELECTRIC
 14H- #14 HAND-THROWN
 10S- #10 SPRING
 10 - #10 HAND-THROWN
 10E- #10 ELECTRIC

FAILED EQUIPMENT DETECTOR WITH
 NUMBER OF TRACKS COVERED

HB = HOT BEARING DETECTOR
 DE OR DE-D = DRAGGING EQUIPMENT DETECTOR
 HWS = HOT WHEEL DETECTOR

(FED) 1

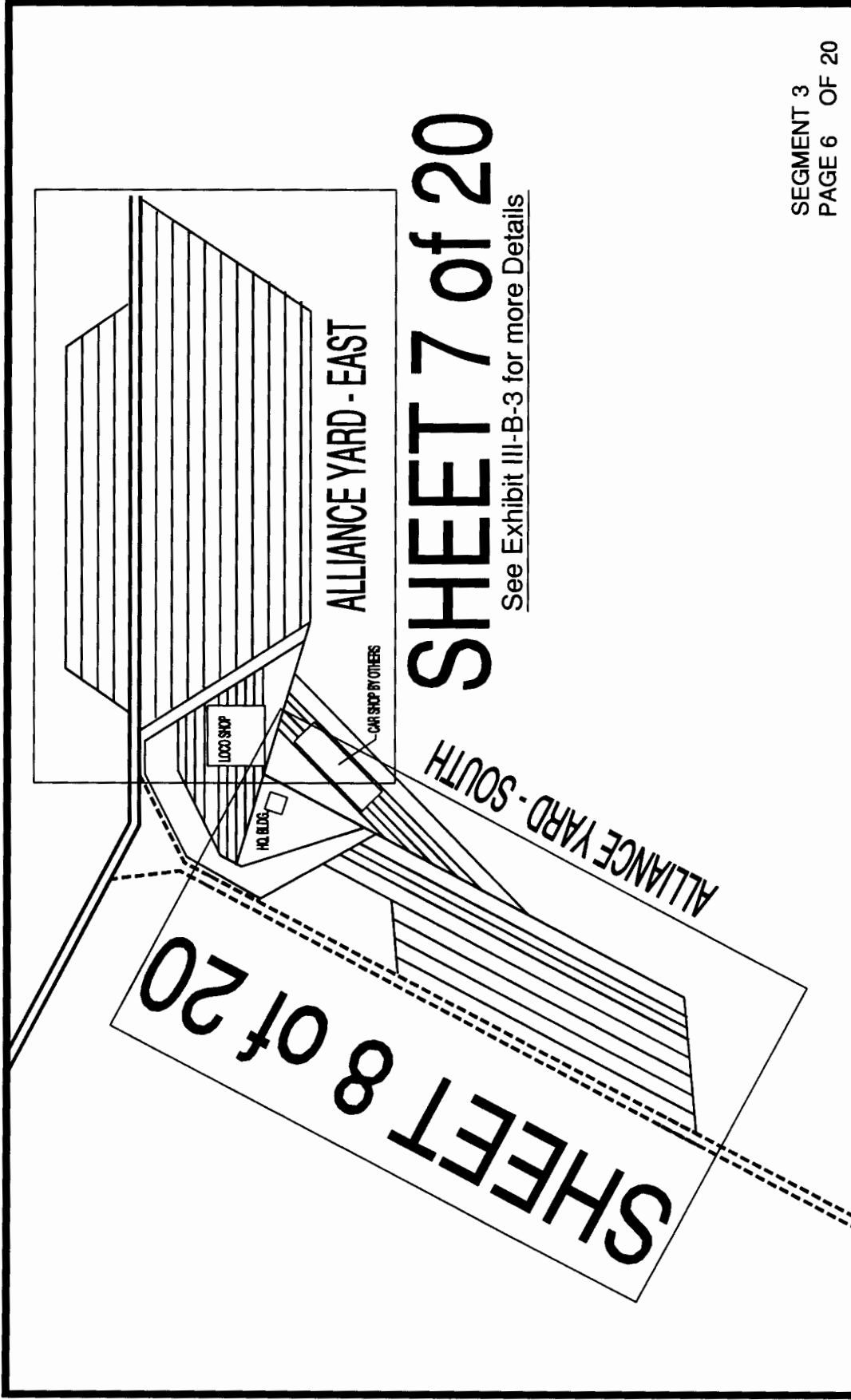
AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
 NUMBER OF TRACKS COVERED

(AEI) 1

FROM: EDGEMONT MP: 476.1

TO: EAST ALLIANCE MP: 364.40

NOT TO SCALE



SEGMENT 3
PAGE 6 OF 20

DIVISION: POWDER RIVER

SUBDIVISION: BUTTE / ANGORA

FROM: ALLIANCE YARD OVERVIEW MP:

TO:

DATE: 7/16/04

NOT TO SCALE

LEGEND:

--- - 136# PREMIUM CWR

--- - 136# STANDARD CWR

--- - 115# CWR CLASS 1 RELAY

--- FAILED EQUIPMENT DETECTOR WITH

--- NUMBER OF TRACKS COVERED

HB - HOT BEARING DETECTOR

DE OR DEB - DRAGGING EQUIPMENT DETECTOR

HW - HOT WHEEL DETECTOR

(FED) 1

(AEI) 1

EXHIBIT:

III-B-6

* TURNOUT TYPES

24 - #24 ELECTRIC

20 - #20 ELECTRIC

14 - #14 ELECTRIC

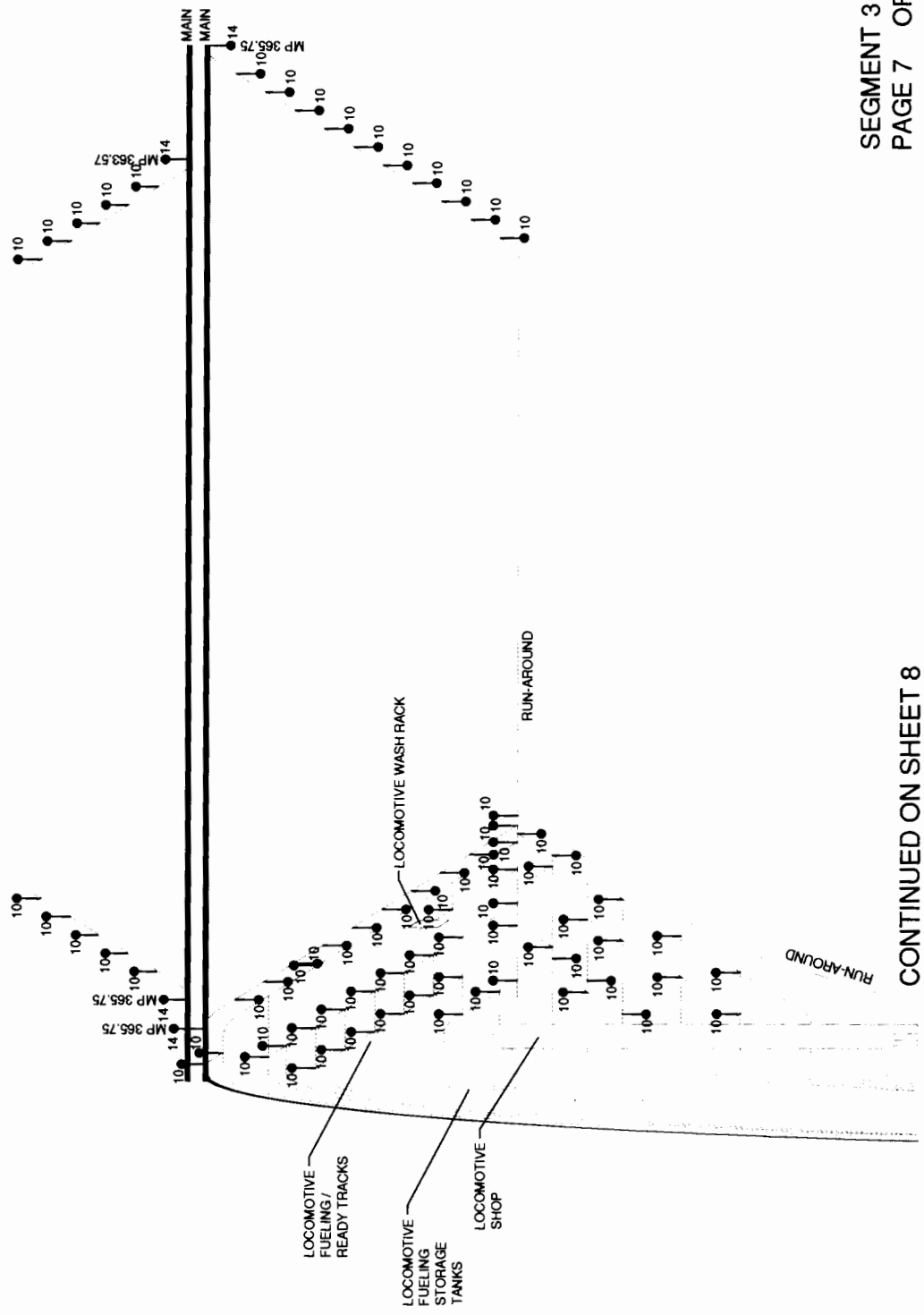
14H - #14 HAND-THROWN

10S - #10 SPRING

10 - #10 HAND-THROWN

10E - #10 ELECTRIC

* 20 - TURNOUT TYPE*



SEGMENT 3
PAGE 7 OF 20

EXHIBIT:
III-B-6

LEGEND:

- 136# PREMIUM CWR
- - - 136# STANDARD CWR
- - - 115# CWR CLASS 1 RELAY
- FED 1
- AEI 1
- 20 - TURNOUT TYPE*
- * TURNOUT TYPES
 - 24 - #24 ELECTRIC
 - 20 - #20 ELECTRIC
 - 14 - #14 ELECTRIC
 - 14H - #14 HAND-THROWN
 - 10S - #10 SPRING
 - 10 - #10 HAND-THROWN
 - 10E - #10 ELECTRIC
- FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
- HB - HOT BEARING DETECTOR
- DE OR DED - DRAGGING EQUIPMENT DETECTOR
- HW - HOT WHEEL DETECTOR
- AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED

CONTINUED ON SHEET 8

DIVISION: **POWDER RIVER**

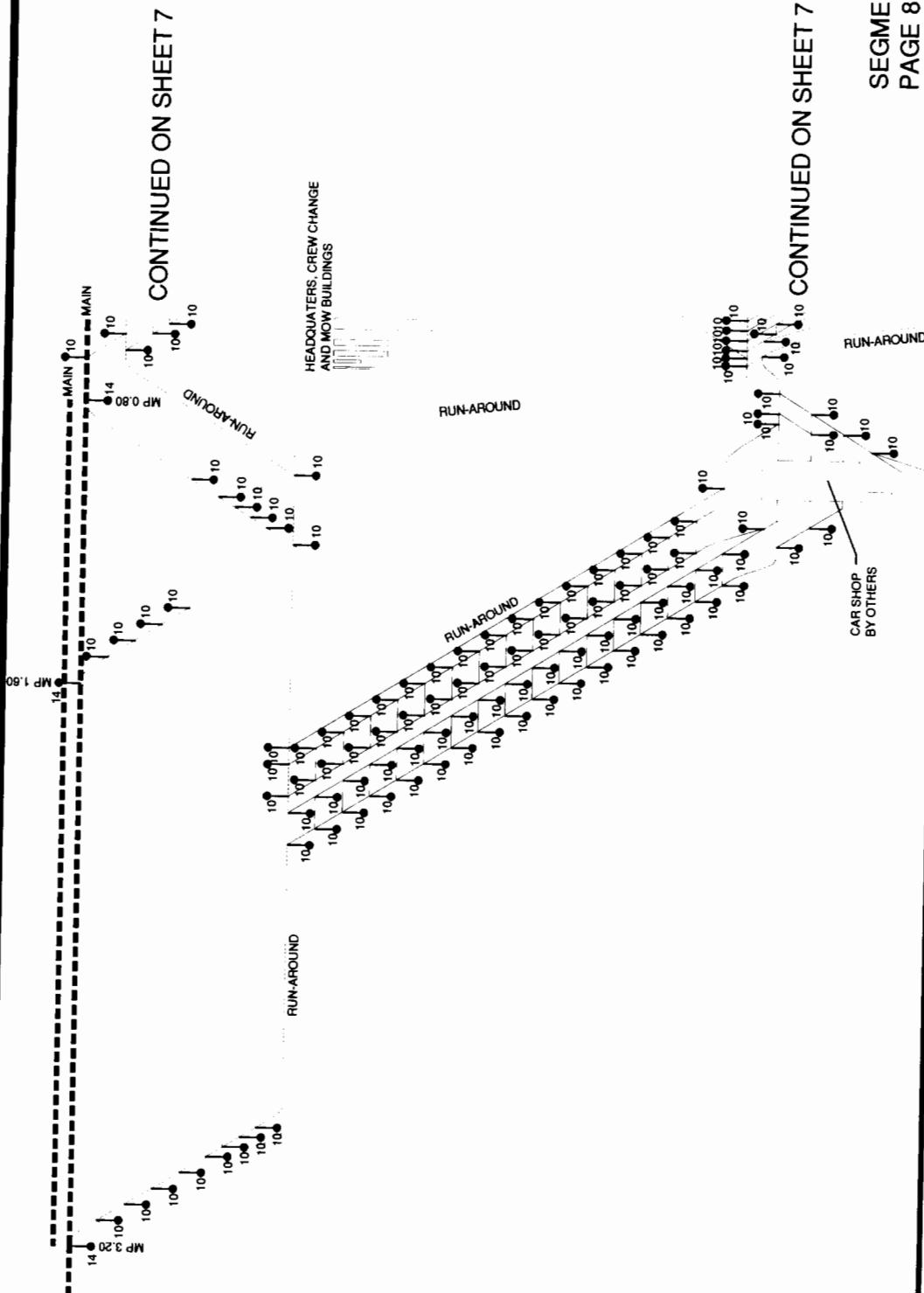
SUBDIVISION: **BUTTE**

DATE: **7/16/04**

FROM: **ALLIANCE YARD - EAST** MP: **365.80**

TO: MP: **363.25**

NOT TO SCALE



SEGMENT 3
PAGE 8 OF 20

EXHIBIT:
III-B-6

LEGEND:

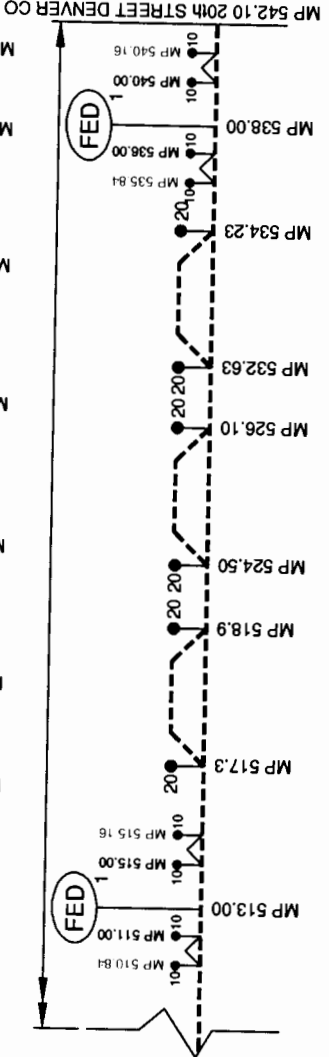
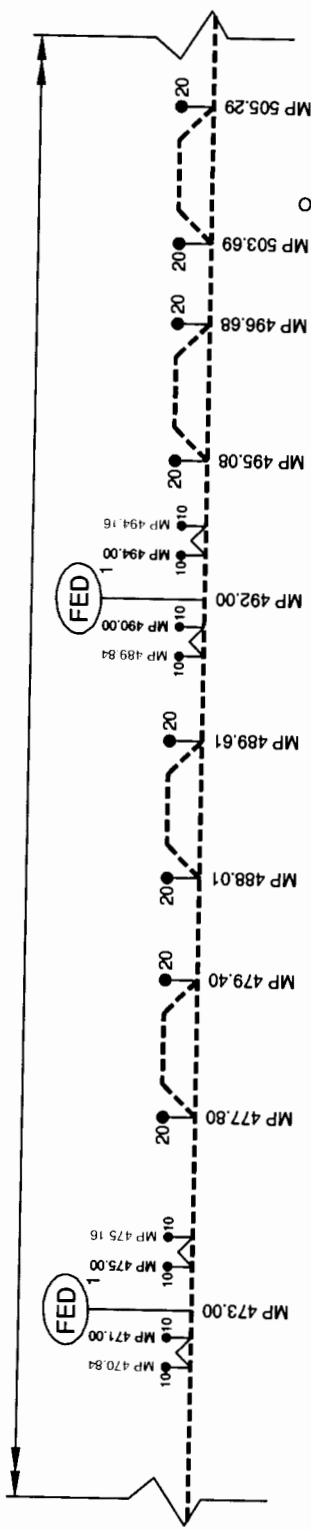
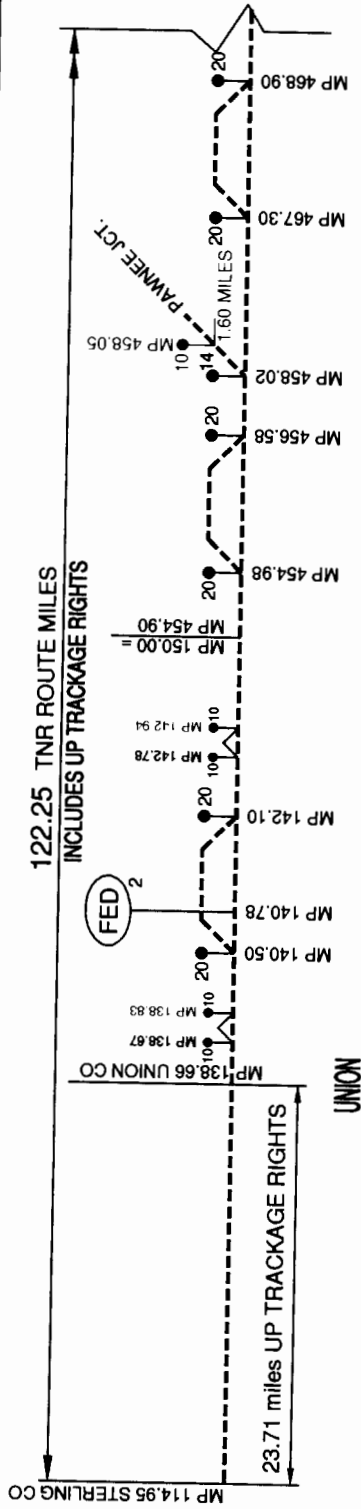
— 136# PREMIUM CWR - - - 136# STANDARD CWR - - - 115# CWR CLASS 1 RELAY	* TURNOUT TYPES 24 - #24 ELECTRIC 20 - #20 ELECTRIC 14 - #14 ELECTRIC 14H - #14 HAND-THROWN 10S - #10 SPRING 10 - #10 HAND-THROWN 10E - #10 ELECTRIC
(FED) 1 FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED HB - HOT BEARING DETECTOR DE OR DES - DRAGGING EQUIPMENT DETECTOR HW - HOT WHEEL DETECTOR	(AEI) 1 AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED

DIVISION: POWDER RIVER
SUBDIVISION: ANGORA

DATE: 7/16/04

FROM: ALLIANCE YARD - SOUTH MP: 0.80
TO: MP: 3.20

NOT TO SCALE



SEGMENT 4
PAGE 10 OF 20

DIVISION: **POWDER RIVER**
SUBDIVISION: **BRUSH**

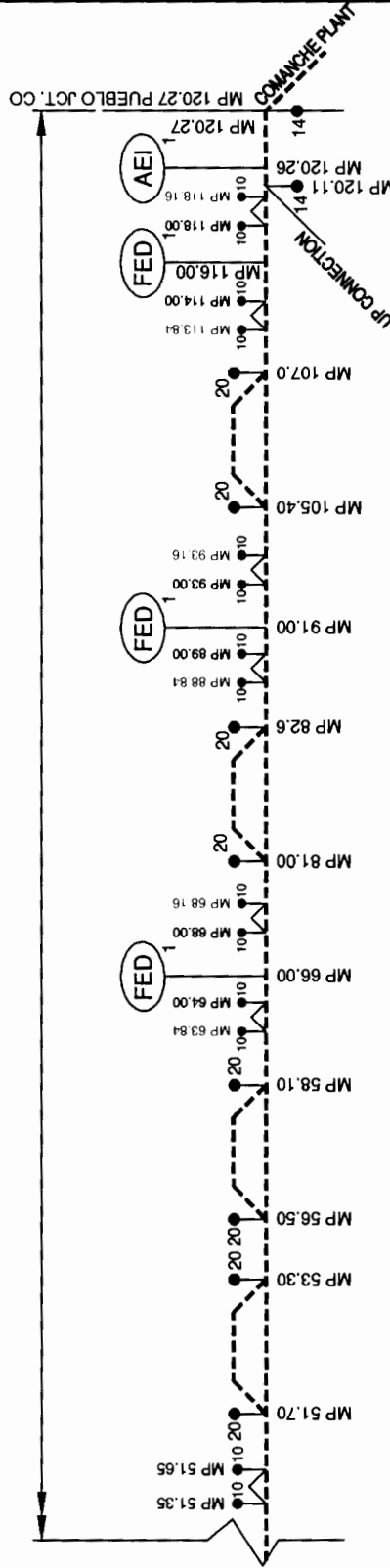
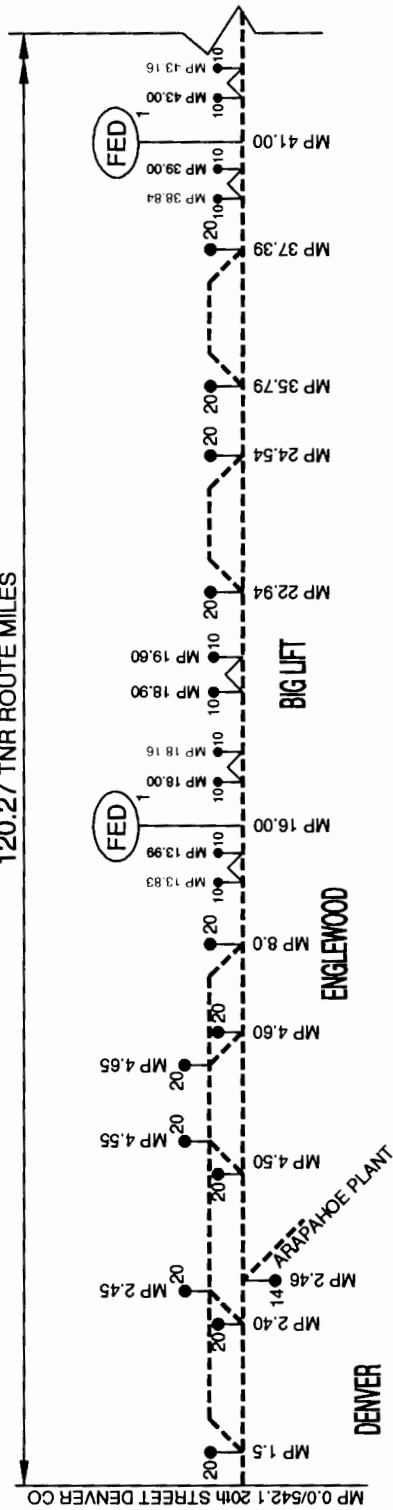
DATE: 7/16/04
FROM: **STERLING** MP: 114.95
TO: **20th STREET DENVER** MP: 542.10
NOT TO SCALE

EXHIBIT: **III-B-6**

LEGEND:

- 136# PREMIUM CWR
- 136# STANDARD CWR
- 115# CWR CLASS 1 RELAY
- FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
- HB = HOT BEARING DETECTOR
- DE OR DED = DRAGGING EQUIPMENT DETECTOR
- HW = HOT WHEEL DETECTOR
- AEI = AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED
- 20 = TURNOUT TYPE
- 24 = #24 ELECTRIC
- 20 = #20 ELECTRIC
- 14 = #14 ELECTRIC
- 14H = #14 HAND-THROWN
- 10S = #10 SPRING
- 10 = #10 HAND-THROWN
- 10E = #10 ELECTRIC

120.27 TNR ROUTE MILES



SEGMENT 5
PAGE 11 OF 20

DIVISION: POWDER RIVER

SUBDIVISION: PIKES PEAK

FROM: 20th STREET DENVER **MP: 0.0**

TO: PUEBLO JCT. **MP: 120.27**

DATE: 7/16/04

NOT TO SCALE

EXHIBIT: III-B-6

LEGEND:

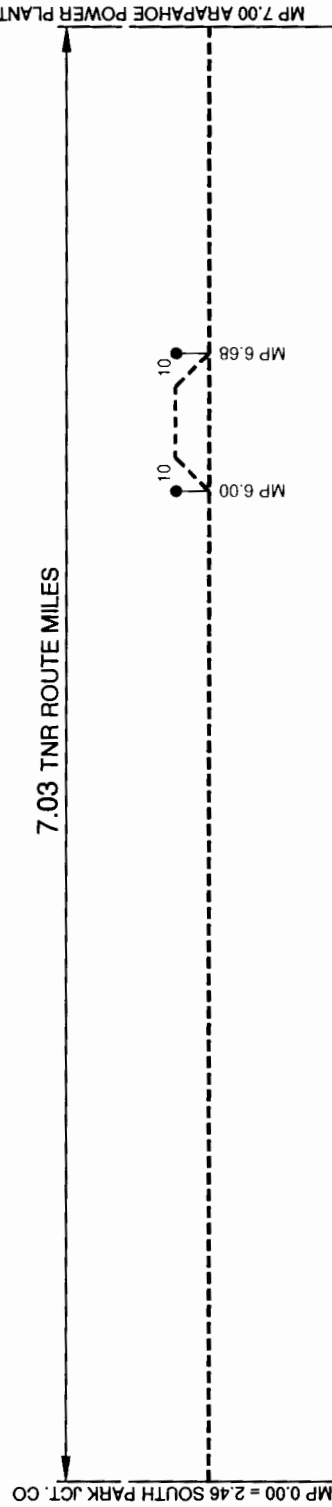
- 136# PREMIUM CWR
- 136# STANDARD CWR
- 115# CWR CLASS 1 RELAY

FED 1
 FAILED EQUIPMENT DETECTOR WITH
 NUMBER OF TRACKS COVERED
 HB = HOT BEARING DETECTOR
 DE OR DEAD DRAGGING EQUIPMENT DETECTOR
 HW = HOT WHEEL DETECTOR

* TURNOUT TYPES
 24 - #24 ELECTRIC
 20 - #20 ELECTRIC
 14 - #14 ELECTRIC
 14H - #14 HAND-THROWN
 10S - #10 SPRING
 10 - #10 HAND-THROWN
 10E - #10 ELECTRIC

20 = TURNOUT TYPE
 14 =

AEI 1
 AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
 NUMBER OF TRACKS COVERED



SEGMENT 5A
PAGE 12 OF 20

EXHIBIT:
III-B-6

LEGEND:

- TURNOUT TYPES
 - 24 - #24 ELECTRIC
 - 20 - #20 ELECTRIC
 - 14 - #14 ELECTRIC
 - 14H - #14 HAND-THROWN
 - 10S - #10 SPRING
 - 10 - #10 HAND-THROWN
 - 10E - #10 ELECTRIC
- 136# PREMIUM CWR
- 136# STANDARD CWR
- 115# CWR CLASS 1 RELAY
- FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
- HB = HOT BEARING DETECTOR
- DE OR DED = DRAGGING EQUIPMENT DETECTOR
- HW = HOT WHEEL DETECTOR
- AEI = AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED

DIVISION: **POWDER RIVER**

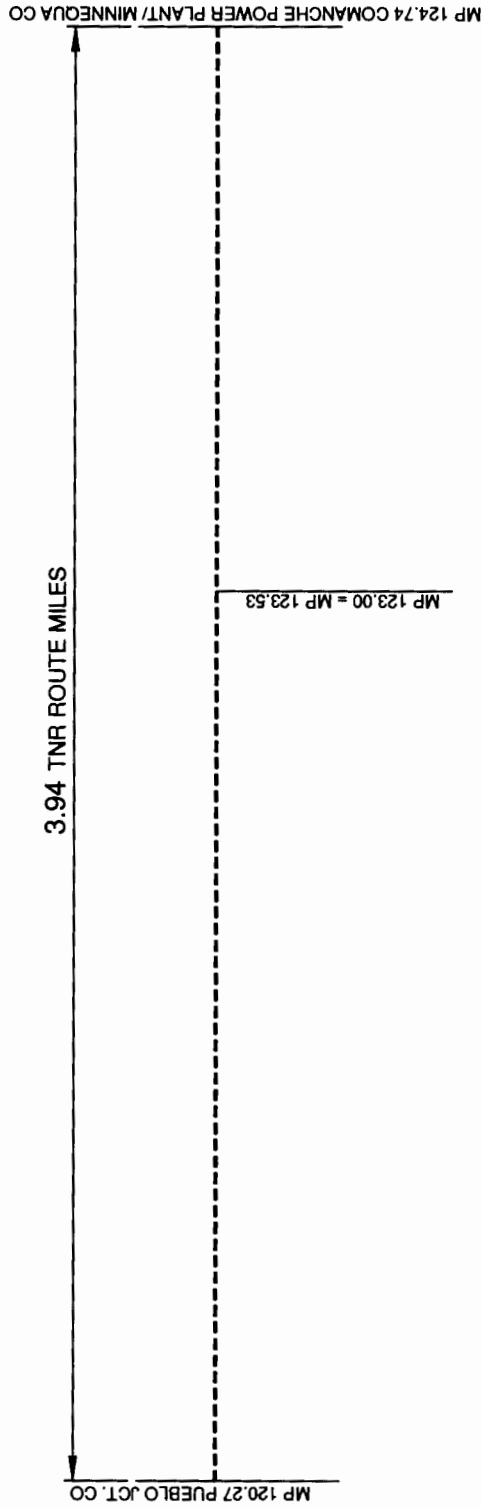
SUBDIVISION: **PIKES PEAK**

DATE: **7/16/04**

FROM: **SOUTH PARK JCT.** MP: **0.00**

TO: **ARAPAHOE POWER PLANT** MP: **7.00**

NOT TO SCALE



SEGMENT 5B
PAGE 13 OF 20

DIVISION: **POWDER RIVER**
SUBDIVISION: **SPANISH PEAKS**

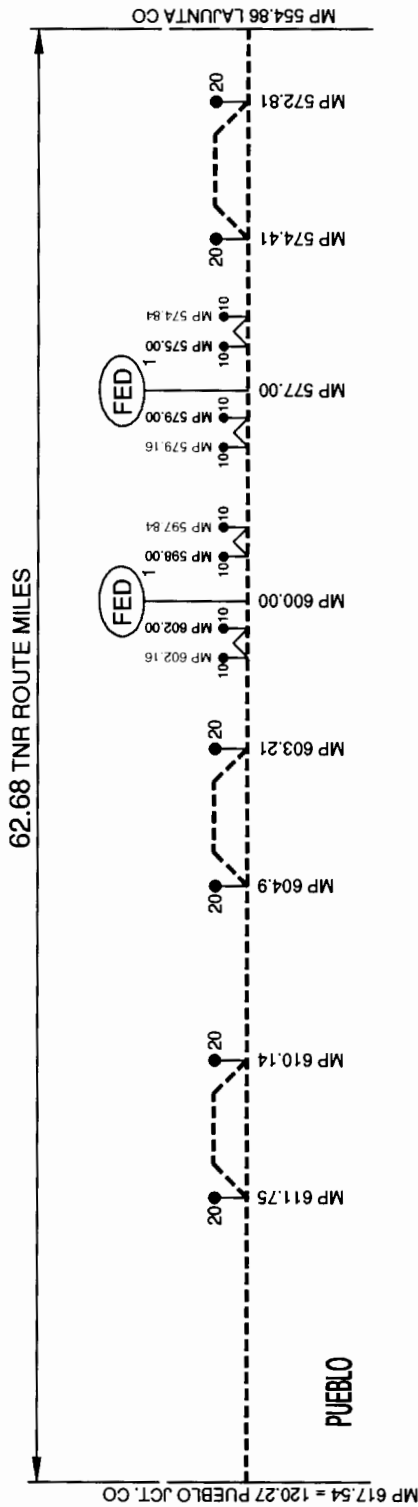
FROM: **PUEBLO** MP: **120.27**
TO: **COMANCHE POWER PLANT** MP: **124.74**

DATE: **7/16/04**
NOT TO SCALE

LEGEND:

- 136# PREMIUM CWR
- - - 136# STANDARD CWR
- - - 115# CWR CLASS 1 RELAY
- ⊙₁ FAILED EQUIPMENT DETECTOR WITH
NUMBER OF TRACKS COVERED
HB = HOT BEARING DETECTOR
DE OR DEB = DRAGGING EQUIPMENT DETECTOR
HW = HOT WHEEL DETECTOR
- ⊙₁ AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
NUMBER OF TRACKS COVERED
- * TURNOUT TYPES
24 - #24 ELECTRIC
20 - #20 ELECTRIC
14 - #14 ELECTRIC
14H - #14 HAND-THROWN
10S - #10 SPRING
10 - #10 HAND-THROWN
10E - #10 ELECTRIC
- * 20 = TURNOUT TYPE

EXHIBIT:
III-B-6



SEGMENT 6
PAGE 14 OF 20

EXHIBIT:
III-B-6

LEGEND:

- TURNOUT TYPE*
 - 24 - #24 ELECTRIC
 - 20 - #20 ELECTRIC
 - 14 - #14 ELECTRIC
 - 14H - #14 HAND-THROWN
 - 10S - #10 SPRING
 - 10 - #10 HAND-THROWN
 - 10E - #10 ELECTRIC
- 136# PREMIUM CWR
- - - 136# STANDARD CWR
- - - 115# CWR CLASS 1 RELAY
- (FED) 1 FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
- (AEI) 1 AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED
- HB = HOT BEARING DETECTOR
- DE OR DED = DRAGGING EQUIPMENT DETECTOR
- HW = HOT WHEEL DETECTOR

DIVISION: **POWDER RIVER**

SUBDIVISION: **PUEBLO**

DATE: **7/16/04**

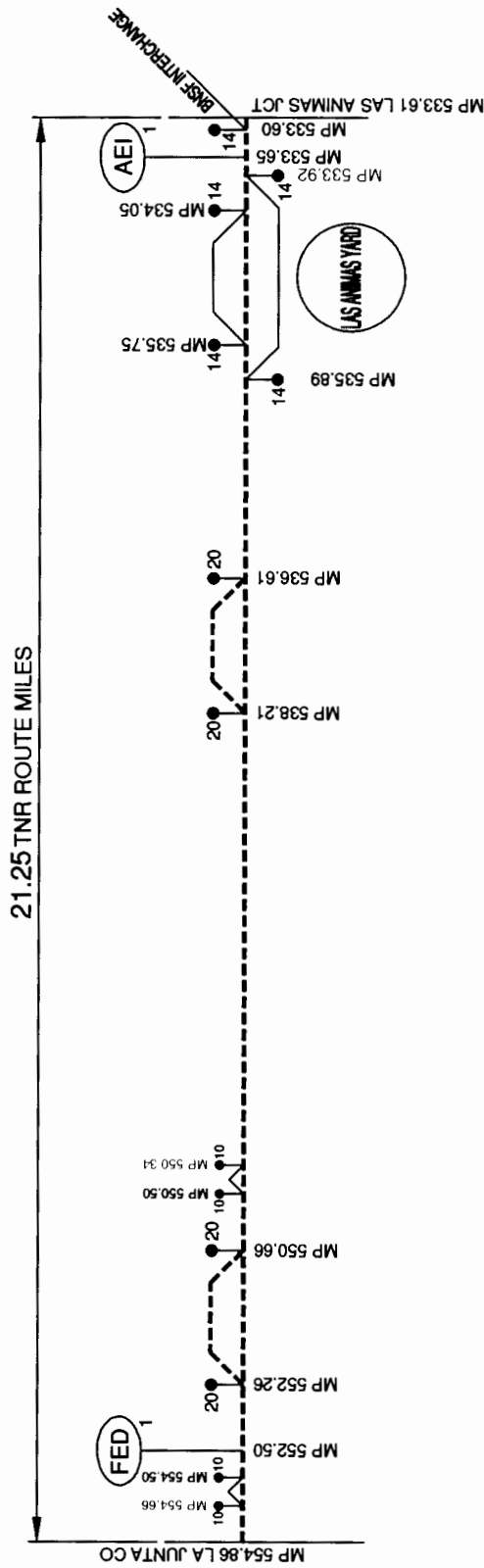
MP: **617.54**

MP: **554.86**

FROM: **PUEBLO**

TO: **LA JUNTA**

NOT TO SCALE



SEGMENT 7
PAGE 15 OF 20

EXHIBIT:
III-B-6

LEGEND:

- TURNOUT TYPE*
 - 24 - #24 ELECTRIC
 - 20 - #20 ELECTRIC
 - 14 - #14 ELECTRIC
 - 14H - #14 HAND-THROWN
 - 10S - #10 SPRING
 - 10 - #10 HAND-THROWN
 - 10E - #10 ELECTRIC
- 136# PREMIUM CWR
- 136# STANDARD CWR
- 115# CWR CLASS 1 RELAY
- FAILED EQUIPMENT DETECTOR WITH
 - NUMBER OF TRACKS COVERED
 - HB - HOT BEARING DETECTOR
 - DE OR DED - DRAGGING EQUIPMENT DETECTOR
 - HW - HOT WHEEL DETECTOR
- AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
 - NUMBER OF TRACKS COVERED

DIVISION: **KANSAS**

SUBDIVISION: **LA JUNTA**

FROM: **LA JUNTA**

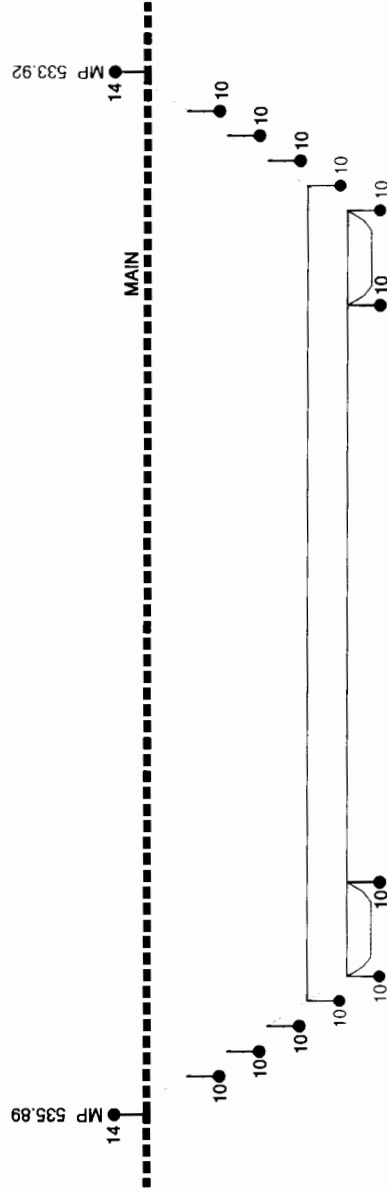
TO: **LAS ANIMAS JCT**

DATE: **7/16/04**

MP: **554.86**

MP: **533.61**

NOT TO SCALE



SEGMENT 7
PAGE 16 OF 20

EXHIBIT:
III-B-6

LEGEND:

- TURNOUT TYPE
 - 24 - #24 ELECTRIC
 - 20 - #20 ELECTRIC
 - 14 - #14 ELECTRIC
 - 14H - #14 HAND-THROWN
 - 10S - #10 SPRING
 - 10 - #10 HAND-THROWN
 - 10E - #10 ELECTRIC
- - 136# PREMIUM CWR
- - 136# STANDARD CWR
- - - 115# CWR CLASS 1 RELAY
- ⊖ - FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
- ⊖ - HOT BEARING DETECTOR
- ⊖ - DRAGGING EQUIPMENT DETECTOR
- ⊖ - HOT WHEEL DETECTOR
- ⊖ - AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED

DIVISION: **KANSAS**

SUBDIVISION: **LA JUNTA**

FROM: **LAS ANIMAS YARD**

TO:

DATE: **7/16/04**

MP: **535.85**

MP: **533.92**

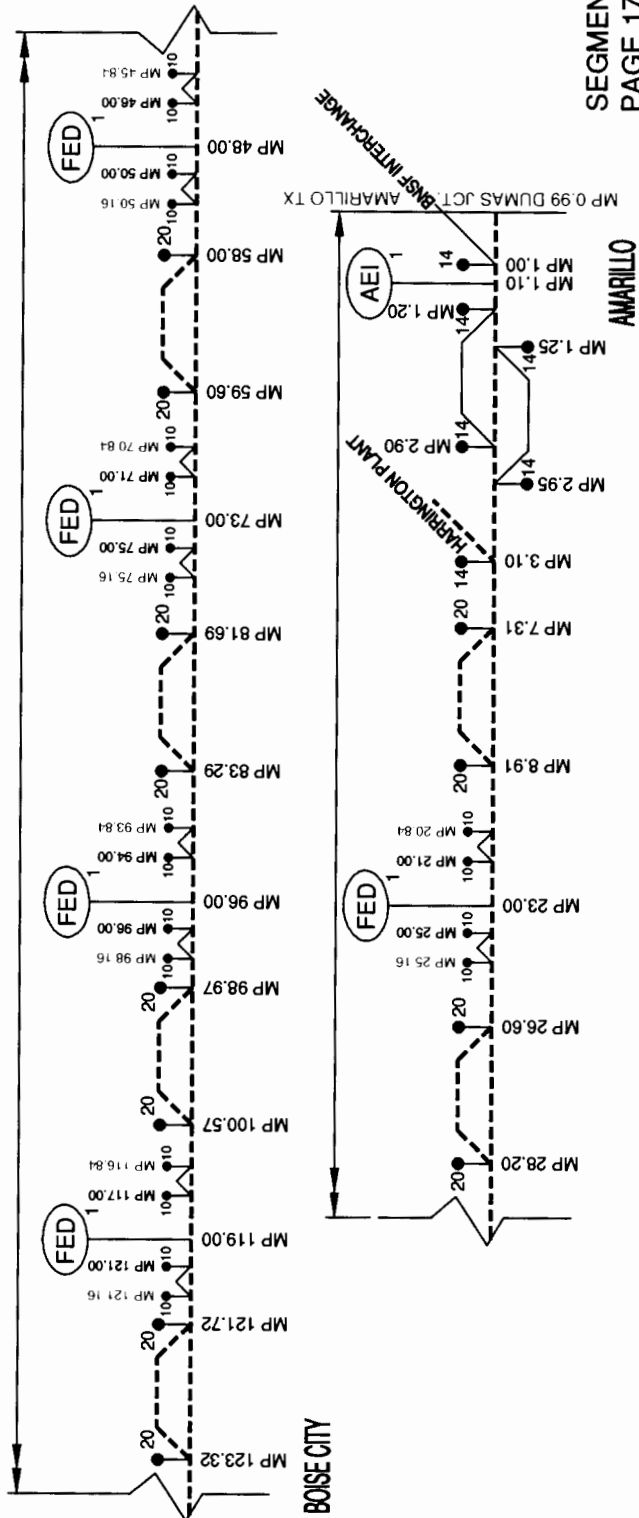
NOT TO SCALE

234.52 TNR ROUTE MILES

MP 221.60
MP 220.00
MP 219.16
MP 219.00
MP 217.00
MP 215.00
MP 214.84
MP 197.75
MP 196.15
MP 194.16
MP 194.00
MP 190.00
MP 189.84
MP 171.02
MP 169.42
MP 169.16
MP 169.00
MP 165.00
MP 164.84
MP 151.88
MP 150.28
MP 146.16
MP 148.00
MP 142.00
MP 141.84
MP 144.00

FED
FED
FED

MP 235.51/633.6 LAS ANIMAS JCT. CO



DIVISION: **KANSAS**
SUBDIVISION: **BOISE CITY**
FROM: **LAS ANIMAS JCT.**
TO: **DUMAS JCT.**

DATE: **7/16/04**
MP: **235.51**
MP: **0.95**

NOT TO SCALE

EXHIBIT: **III-B-6**

20 = TURNOUT TYPE

* TURNOUT TYPES
24 - #24 ELECTRIC
20 - #20 ELECTRIC
14- #14 ELECTRIC
14H- #14 HAND-THROWN
10S- #10 SPRING
10- #10 HAND-THROWN
10E- #10 ELECTRIC

LEGEND:
- - - - - 113# PREMIUM CWR
- - - - - 136# STANDARD CWR
- - - - - 115# CWR CLASS 1 RELAY

FAILED EQUIPMENT DETECTOR WITH
NUMBER OF TRACKS COVERED
HB = HOT BEARING DETECTOR
DE OR DED= DRAGGING EQUIPMENT DETECTOR
HW= HOT WHEEL DETECTOR
AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
NUMBER OF TRACKS COVERED

EXHIBIT:
III-B-6

5.17 TNR ROUTE MILES

MP 5.00 HARRINGTON POWER PLANT

SEGMENT 8B
PAGE 18 OF 20

DIVISION: **KANSAS**

SUBDIVISION: BOISE CITY

FROM:AMARILLO

MP: 0.00

TO:HARRINGTON POWER PLT. MP:5.00

DATE: 7/16/04

NOT TO SCALE

LEGEND:

- 136# PREMIUM CWR
- 136# STANDARD CWR
- 115# CWR CLASS 1 RELAY

FAILED EQUIPMENT DETECTOR WITH
 NUMBER OF TRACKS COVERED
 HB = HOT BEARING DETECTOR
 DE OR DE2 = DRAGGING EQUIPMENT
 HW = HOT WHEEL DETECTOR

FED,

 $\textcircled{\text{AEI}}_1$

20 = TURINOUT TYPE*

* TURNOUT TYPES

24 - #24 ELECTRIC
20 - #20 ELECTRIC
14- #14 ELECTRIC
14H- #14 HAND-THROWN
10S- #10 SPRING
10- #10 HAND-THROWN
10E- #10 ELECTRIC

AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
NUMBER OF TRACKS COVERED

EXHIBIT:

III-B-6

1.045 TNR ROUTE MILES

MP 1.045 S EASTERN ST = MP 757.6 RED RIVER VALLEY SUB

MP 0.00 = MP 0.99 DUMAS JCT. BOISE CITY SUB

SEGMENT 8A
PAGE 19 OF 20

EXHIBIT:
III-B-6

LEGEND:

- 136# PREMIUM CWR
- - - 136# STANDARD CWR
- - - 115# CWR CLASS 1 RELAY
- FED 1
- AEI 1
- 20 = TURNOUT TYPE
- 24 = #24 ELECTRIC
- 20 = #20 ELECTRIC
- 14 = #14 ELECTRIC
- 14H = #14 HAND-THROWN
- 10S = #10 SPRING
- 10 = #10 HAND-THROWN
- 10E = #10 ELECTRIC
- FAILED EQUIPMENT DETECTOR WITH NUMBER OF TRACKS COVERED
- HB = HOT BEARING DETECTOR
- DE OR DEED = DRAGGING EQUIPMENT DETECTOR
- HW = HOT WHEEL DETECTOR
- AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH NUMBER OF TRACKS COVERED

DIVISION: **TEXAS**

SUBDIVISION: **B.C./R.R.V. CONNECTION**

DATE: **7/16/04**

MP: **0.95**

FROM: **DUMAS JCT.**

TO: **S. EASTERN ST.**

MP: **757.6/332.6** NOT TO SCALE

[illegible]

SEGMENT 9
PAGE 20 OF 20

EXHIBIT:

III-B-6

LEGEND:

• **THROU TYPES**
 24 - #24 ELECTRIC
 20 - #20 ELECTRIC
 14H - #14 ELECTRIC
 14H - #14 HAND-THROWN
 10S - #10 SPRING
 10 - #10 HAND-THROWN
 10E - #10 ELECTRIC
 AUTOMATIC EQUIPMENT IDENTIFICATION SCANNER WITH
 NUMBER OF TRACKS COVERED

- 136# PREMIUM CWR
 - 136# STANDARD CWR
 - 115# CWR CLASS 1 RELAY

FAILED EQUIPMENT DETECTOR WITH
 NUMBER OF TRACKS COVERED
 HB = HOT BEARING DETECTOR
 DE OR DED = DRAGGING EQUIPMENT DETECTOR
 HW = HOT WHEEL DETECTOR

(FED) 1
 (AEI) 1

DATE: 7/16/04

MP: 757.62

MP: 156.75

FROM:AMARILLO
TO:W. TEXAS POWER

NOT TO SCALE

DIVISION: TEXAS

SUBDIVISION: RED RIVER VALLEY

III-F Road Property Investment

III-F Road Property Investment

MEMORANDUM

To: Karen H. Herren
From: Oakleigh J. Thorne
Date: July 14, 2004
Subject: Rebuttal for the Texas Northern Case

The following memo responds to the Reply evidence related to land costs submitted by BNSF in the AEP Texas v. BNSF rate case.

Systemwide Comments

1. BNSF concurred with every mile and val section as Tesh changed absolutely nothing except for yard acreage and easements in the total system.
2. Tesh provided no independent sale analogues for his own pricing decisions.
3. Tesh did not inspect any of the right-of-way (no narrative descriptions and no photographs are present in discovery).
4. If Denver is removed from the system, the total difference between our two cost opinions is \$503,760 - refer to the workbook **TNR_COUNTY_DOLLARS** and the second sheet (sans Denver).
5. BNSF reports significant cost differences in only two counties - Box Butte, Nebraska and Adams County, Colorado. Tesh is about \$700,000 to \$600,000, respectively, higher than my costs in these two counties. (Refer to the workbook mentioned above and either sheet within the notebook).
 - A.) The difference in Box Butte is solely attributed to the presence of the yard in the county. We accounted for the yard at the bottom of our acquisition total. Tesh included the yard in the county total. If the yard's land cost is removed, the difference between our two estimates is \$1,500.

- B.) The only difference between our respective estimates in Adams County is due to a math error by Tesh. He adds to the right-of-way land cost an amount of \$13,367,100 (identical to our estimate) and a radio tower pad cost of \$97,732 (identical to our estimate) and arrives at an incorrect total of \$13,953,725. The correct total is \$13,464,832 identical to our cost estimate.
6. For the states of Wyoming and Oklahoma, our costs were higher than Tesh's. Without using his own independently researched sales and without an inspection, it is impossible to determine the rationale for his election to use lower unit prices.
 7. In Texas, Tesh concurred with my values for all counties except Potter, where our estimates are higher than Tesh's estimates. The difference is attributed to our higher costs for the yard in the county.
 8. The length of valuation units (val sections) is based on our judgment after physical inspection of TNR's right-of-way. In the rural areas (generally all rights-of-way outside three major cities in Colorado), the line penetrates deserts, mesas and large expanses of wasteland where land prices are affected by grazing capacities. Naturally, under these topographic conditions, very long val sections are appropriate. Near and inside the urban cities of Denver, Colorado Springs and Pueblo, a much different approach is required.

Val section lengths were shorter in the urban areas based on zoning transitions or determined through actual right-of-way inspection where land uses changed. It is odd to criticize TNR's val section lengths when Tesh clearly stated that he made no independent analysis of the right-of-way and obviously made no physical on-the-ground inspections. In fact, he adopted TNR's val sections to derive his cost opinion.
 9. Again, BNSF uses our sale information regardless of transaction dates to form an opinion of the right-of-way costs. It is common practice to use sales which bridge the critical date to support pricing opinions. Sales occurring after the appraisal date can be used provided appropriate adjustments are applied. Appraisers have the latitude to go both forward (using historic sales) and backward (using sales after the appraisal date) to develop an opinion.
 10. A more sophisticated approach to the right-of-way pricing is necessary and possible in Colorado. Colorado is the only disclosure state (prices were reported in the deeds) in the system. Consequently, more data was available to support TNR's val section pricing opinions. As land prices increased from \$300 to \$500 per acre to \$10.00 per square foot and higher, the approach to the pricing analysis must change. The higher land prices in the urban areas mandate a far greater level of detail than the less expensive rural areas.

In the remaining non-disclosure states (no price is reported in the deed), sale data was sparse as we needed to obtain information from appraisers, brokers and assessors. The level of detail, quality and number of sales was limited. However, the approaches for

the urban versus rural areas never deviated from the commonly accepted professional practices required of appraisers.

Refer to the workbook **TNR_COUNTY-DOLLARS** with two sheets (with and without Denver included in the rail system).

Denver Observations

We have finalized our Denver comparative analysis. The attached second workbook, **METHODOLOGY_COMPARATIVE_TESTING**, includes the following three sheets:

All Data

Raw sales data used by BNSF listing sales by zoning category was developed by TNR. The table reports both unit prices by the acre and by the square foot. Tesh uses only the price per acre, however. The price per foot is found by dividing the price per acre by the 43,560 square feet in an acre.

Modified Sales Data

The database submitted by AEP Texas on Opening for land transactions and later used by BNSF to prepare its Reply was compiled by extracting relevant sales from First American, a vendor who supplies sales data over the web. The data was then sorted and arranged by zoning code to form the database from which several methods could be used to develop the costs of the ROW.

AEP Texas utilized a method referred to as the Quartile Approach which does not require an entry by entry analysis of the data in order to produce an accurate result. This method is explained in detail below, but for now it should be pointed out that this approach is favored in large-scale property acquisition analyses where disparate or limited information is present in the database. Linear and multiple regressions are statistical approaches that also can be used in real estate analysis. However, these techniques require a much larger sample size, above 200 data points, to obtain a credible result. The sample points by zoning category were too limited to use this approach.

On the other hand, use of less rigorous methods necessitates the need to more carefully analyze the data and either purge transactions judged to be incorrect or modify one or more data points for that sale to obtain a plausible result.

Misinformation relating to the transmission of large amounts of data on a single download is common. Generally, errors arise from invalid entries by the vendor or through some failure during transmission of the information over the Internet. The source of the transmission errors relates to bit packets that either separate or truncate the data producing erroneous single-point information (meaning an individual sale). Most commonly, zeros are dropped from one packet and/or added to the next packet in the transmission series. The most obvious of the errors are easily fixed by purging the entire sale or modifying the sale to obtain a plausible result compared to the prevailing data for that zoning.

Nevertheless, BNSF used a simple average approach to develop land costs utilizing the AEP Texas land database without modification. In doing so, BNSF failed to exclude inappropriate sales and ended up with a seriously skewed result. For example, Sale #47 listed in workbook **METHODOLOGY_COMPARATIVE_TESTING** (under the B-4 zone and also found in the workbook **III_F_1_DENVER_SALES** and cell V258 in the **ALL_DENVER** sheet) reports a land area of 62,500,000 square feet or 1,435 acres located in a western section of Denver. This is an obvious anomaly as it is highly improbable that any land parcel in this location is as large as 1,435 acres. Using a land area that is obviously wrong produces a unit price of \$192 per acre compared to the surrounding entries which ranged from between about \$100,000 to \$800,000 per acre. We modified the entry by dropping the last three zeros from the sale's land area. With the modification, the (now) 62,500 square foot area is in parity with the other sales at \$4.40 a square foot or \$191,664 per acre assuming the sale price of \$275,000 remains unchanged. Surprisingly, BNSF uses the sale despite the obvious error in the entry. Furthermore, use of either the weighted average or the quartile methods¹ ameliorate these statistically invalid sales. However, BNSF relies on a simple average approach and does not cull the anomalies.

Similarly, for Sales 49, 55 and 56, adding a zero to the land areas brings the price per square foot to \$5.24, \$4.63 and \$7.20, respectively. These prices are consistent with the typical costs to acquire land throughout the nation and in Denver for small neighborhood retail centers. The unadjusted list produces a range of units priced between \$0.00 to \$72.00 per square foot. After modification, the B4 sales represent a range of unit prices between \$2.49 to \$18.80, a far more clustered data set from which a simple unit price average could be developed.

Val Section Comparisons

Using the modified database, we applied correct unit prices to the same val sections used by BNSF and AEP Texas and developed a revised and well-supported land acquisition cost opinion that Tesh should have derived using bona-fide sales and either the weighted average or the quartile method.

The last or third workbook to complete the list of Excel files was developed using our data as it was manipulated by BNSF's appraiser - See **III_F_1_DENVER_SALES**. Within

¹ An explanation of these methods is found later in the text.

the workbook are two sheets, **SUMMARY** and **ALL_DENVER**. The second sheet is the database of sales developed by AEP Texas and adopted by BNSF.

Below is a list of substantive points of Tesh's analysis and his flawed methodology:

1. The first three points listed above under Systemwide Comments apply to Denver's val sections. Tesh failed to conduct his own independent research and used all of AEP Texas' sales data without removing specious sales from his computations. AEP Texas' quartile statistical method overcomes the aberrations in the data. It is interesting to note that BNSF agrees with 98.7% (1,101 miles ÷ 1,115.9 miles) of our pricing and zoning opinions. The only area with which Tesh appears to take issue is an area of about 15 miles in and around Denver. According to the BNSF/Tesh, AEP Texas/Thorne was about \$240 million off in this area. For reasons stated herein, we show that BNSF's numbers are not supportable and that AEP Texas' numbers were developed using thorough research and appropriate methodology for the analysis.
2. It is obvious that Tesh did not inspect the right-of-way or the sales as there is no narrative text or photographs describing the land surrounding the right-of-way that has been discovered to date. Moreover, if he had inspected the sales, certain specious transactions, such as Sale 47 of 1,435 acres would have been removed from the list if a simple average of unit prices was to be used.
3. Tesh adopted Thorne's val section lengths and zoning without question after admitting he made no independent analysis of the land but concludes to vastly different land costs, the bases of which are unknown except the application of a simple average approach which, as explained, does not produce an accurate result.
4. We confirmed that Tesh used our sales information as he reports the same flawed data in the same downloads from the provider. Several data points reported truncated information where a number of trailing zeros in the land areas were obviously not correct. The first sheet, **ALL_DATA**, in the workbook **METHODOLOGY_COMPARATIVE_TESTING** reports the sales by zoning group exactly as they appear on the BNSF sale pages. These sales were used to formulate the support for BNSF's value conclusion using an average approach. The bold red rows highlight obvious anomalies in the unit price per acre that are significantly different from the remaining sales in the list under each zoning group.
5. It is important to note that the TNR line **does not** enter the high land cost areas of Denver's Central Business District. The line is located on the western edge of the city in areas where land prices and neighborhoods are suffering the effects of urban blight. In these areas of the western and northern portions of Denver there is no evidence to support land prices of \$50.00 per square foot or more. No new construction activity has occurred for years in the northern (old heavy industrial district) and northwestern sections of the city. Only around the Convention Center and Stadium are land values higher than the norm.

6. Despite the obvious download or transcription errors committed by the data supplier, a review by any competent real estate professional (even without visiting Denver) could discern the presence of implausible sale prices per acre or per foot which should have nullified the simple averaging methodology. Given that both TNR and BNSF used the same data, a more sophisticated approach to the presence of specious sales in the database should have been used other than a straight simple averaging to avoid reporting implausible answers.
7. The red colored border and bold text rows represent specious or implausible unit prices. Refer to the workbook **METHODOLOGY_COMPARATIVE_TESTING** and the sheet **ALL_DATA**. The relationship of these extraordinarily high or low prices compared to the other prices in the list under each zoning category is obvious. The red bold rows should have been removed from the list or adjusted in some fashion to develop parity with the other sales in the list where prices are clustered.
8. Tesh applies a simple average per acre (the most statistically crude method which should be avoided)² to apply to my sales as zoned val sections. He simply adds the unit prices and divides by the number in the list. Due to the presence of several atypical unit prices (commonly referred to as outliers) , the value developed using a simple average is unreliable.
9. Concentrating on the first set of sales for the I2 zone, the very first sale at \$332.10 per square foot is obviously at odds with the remaining unit per square foot indications under the same zoning with a range of per unit prices between \$2.38 to \$12.56 per square foot. See **METHODOLOGY_COMPARATIVE_TESTING**. Refer to the workbook **III_F_1_DENVER_SALES** and the second sheet in the workbook **ALL_DENVER**. When the majority of sales report unit prices that are equal to roughly 2% of the price of the one highest sale, an average reviewer of the data would conclude that the sale is not correct. Moreover, given the location of the val section and the industrial use in the northern and oldest industrial district of the city, the high unit price for land is not economically feasible for one-story industrial buildings. Hence, the rationale for the use of the quartile method.
10. Use of the simple average method to determine unit prices produces flawed results. Under the simple average method (refer to Sale 1 under the I2 zone), the highest unit sale price of \$332.10 per foot is counted for as much as the lower sale prices but represents only 0.16% of the total land area in the sample (1,084 square feet ÷ 699,275 square feet). Moreover, if an average of the remaining five transactions (removing Sale 1) in the sample is calculated, the highest priced sale (Sale 1) is more than 66 times higher than the average of the remaining five sales: \$14,466,421 (Sale 1 price per acre) ÷ \$218,543 (the average of five sales) = 66.2. Thus, use of the simple average method significantly skews the results where, as here, a small amount of property is sold for a higher than normal price.

² William A. Spur & Chalres P. Bonini, STATISTICAL ANALYSIS FOR BUSINESS DECISIONS 131 (Richard D. Irwin, Inc.) (1967).

A similar example is Sale 40 (under the I1 zoning group). The indicated price per square foot for the sale is \$2,625 for a parcel of land reported to have only 120 square feet in land area. Again, the simple per acre average using this single transaction represents only 0.03% of the total land area in the zoning group (120 square feet ÷ 390,393 square feet). If the sale is removed from the list, the simple average per square foot falls to \$18.88 as opposed to \$97.98 per square foot.

11. The red bolded rows illuminate specious unit prices per foot, which should have been removed from the sample or adjusted in some way to compensate for obvious errors. For example, Sale 40 under the I1 zone lists the land area as 120 square feet and the unit price as \$2,625 per square foot. Even a lay person is aware that one could not put a structure on a site of only 120 square feet. Regardless, BNSF's appraiser ignores the obvious error and uses the flawed sale without adjustment under his simple average method. The quartile statistical method ameliorates the effect of the non-clustered data points on the conclusion (price per acre).
12. Another example is Sale 47 where the reported land area of 62,500,000 square feet is, again, implausible. The calculation indicates a per acre cost of only \$192. BNSF's failure to eliminate or adjust the sale leads to inaccurate results. The very low atypical unit price (an outlier) was averaged along with the other transactions in the list.
13. The proper method for avoiding the imbalance of very high unit prices are the weighted average or quartile methods. In the weighted average method, the sum of all sale prices in the list is divided by the total land area purchased. The total of the prices paid for all sales is divided by the sum of all the land purchased. The weighted average also requires some adjustment to the specious data points; regardless, the approach ameliorates the effect of the outliers. The quartile approach is adept at dealing with atypical data points, especially if the unit prices are grossly overstated as is the case with many of the sales.
14. As an illustration, the first group of sales are zoned I2 (industrial). BNSF determined that the total average land price for the zone is \$2,593,189 per acre or \$59.53 per square foot. A sale of 1,084 square feet for \$360,000 (which equates to \$14,466,421 per acre or \$332.10 per square foot) comprised one point in the list that impacted the flawed average. Refer to the workbook **III_F_1_DENVER_SALES**, the sheet **ALL_DENVER**, and cells U340 to X347. This obviously is wrong as no land in the old, heavy industrial section of northern Denver is worth \$300 per foot or an average value for the zone of \$59.53 per foot. There is no industrial land selling at \$60.00 per foot in the nation except perhaps in one of New York City's boroughs. The weighted average for the same list of sales is \$4.28 per foot, and the quartile for the same group is \$3.19 per foot. Both the weighted average and the quartile methods ameliorate the impact of these atypical sales. Common sense tells a disciplined professional that the land price analogue (Sale 1) is wrong and that there is no industrial zoned land in Denver worth \$60.00 per square foot.

SIDEBAR ISSUE ON USING STATISTICS (AVERAGES AND THE QUARTILE)

Probably the most often used descriptive statistic is the mean or average. The problem with averages is that the calculations are meant to describe typical occurrences³. Knowing an average value is only useful if the values you are measuring tend to cluster around that average. The mean⁴ is a particularly informative measure of the "central tendency" of a variable if it is reported along with its confidence intervals. The confidence intervals for the mean provide a range of values around the mean which represent the "true" (population) mean. The confidence interval offers a greater level of certainty regarding assumptions about the data set. However, the more the data set is affected by atypical (outliers) numbers, the confidence relating to a viable and credible prediction diminishes. Generally, the use of any common statistical techniques assumes that the samples underlying the measurements are at least of interval, meaning that equally spaced intervals on some defined scale can be compared in a meaningful manner.⁵ The data samples (land sale transactions) in this case fail to comply with the meaning of interval; they are disparate.

Outliers are atypical (by definition) and infrequent observations. A single outlier has a profound influence on the average or the slope of any regression line used to predict a variable. This is precisely the situation with Sales 1, 27, 40, 47, 63, 66, 74, 81, 86, 88 and 92 in the list of data points used by BNSF. These sales are found on the first sheet (**ALL_DATA**) in the workbook **METHODOLOGY COMPARATIVE TESTING**. The workbook submitted by BNSF, **III_F_1_DENVER_SALES**, also lists the same sales information in the raw downloaded format.

The confidence intervals for specific statistics (e.g., means or regression lines) give us a range of values around the statistic where the "true" (population) statistic can be expected to be located (with a given level of certainty). The larger the sample size, the more reliable its mean. The larger the variation within the sample, the less reliable the mean as is the case with BNSF's list. Not only is the list limited in data points (except for the I1 zone with 33 sales), but the variance is huge within each zoning group. The calculation of confidence intervals (must use a standard deviation calculation to develop a confidence interval) is based on the assumption that the variable is normally distributed in the population. The estimate may not be valid if this assumption is not met, unless the sample size is large, say $n=100$ or more. In fact, without a minimum sample of 20 it is impossible to develop any level of confidence in the outcome of an averaging process.⁶ Both BNSF and TNR are working with limited sample points.

³ For a discussion of problems with the average function, see
http://www.sqlservercentral.com/columnists/dpoole/sqlserverstatisticalfunctions_printversion.asp.

⁴ <http://www.statsoftinc.com/textbook/esc.html>.

⁵ Ibid.

⁶ http://www.math.csusb.edu/faculty/stanton/m262/confidence_means/confidence_means.html.

The simplistic average produces flawed results. Our quartile method of deriving TNR's projected land costs was developed using Excel's quartile formula, which produces a much more reliable result. Either the weighted average or the quartile produces a better clustered result when obviously disparate points (outliers) are present in a sample list. We compared the quartile approach and the weighted average results. Both techniques have about the same ability to overcome the wide separation in the raw data points.

Quartiles are a set of "cut points" that divide a sample of data into groups containing (as far as possible) equal numbers of observations. Quartiles are values that divide a sample of data into three groups containing (as far as possible) equal numbers of observations.⁷

A data set has three quartiles. References to quartiles often relate to just the outer two, the upper and the lower quartiles, with the second quartile being equal to the median. The lower quartile is the data value a quarter way up through the ordered data set; the upper quartile is the data value a quarter way down through the ordered data set.

Example

Raw Data:	6 47 49 15 43 41 7 39 43 41 36
Ordered Data:	6 7 15 36 39 41 41 43 43 47 49
Median:	41
Upper quartile:	43
Lower quartile:	15

Observations are broken into 25% divisions (quartile) and compared to the total sample. The statistical method is a credible one when widely divergent data points (outliers) are present in a list of samples. The interquartile distribution is not affected by extremes in the sample.

We used the lower quartile of the sample (raw land prices) consistent with the concept of the lowest cost and efficient railroad and to reduce the effect of sale point anomalies. Even so, our results are consistent with an analysis using the also appropriate weighted average approach, as demonstrated below.

The weighted average is commonly used by investors to determine the weighted cost of capital for corporations or other business entities. The process "takes into account the proportional relevance of each component rather than treating each component equally."⁸ Corporations use several different sources of capital to fund business activities. Each source has a different interest rate. The total interest paid during a period is divided by the total capital sources to derive the weighted cost of capital for the enterprise. Although the process has been applied to borrowed funds, its application to real estate is equally well known and is used in this rebuttal to substantiate the quartile method.

⁷http://www.stats.gla.ac.uk/steps/glossary/presenting_data.html#quart.

⁸http://www.investorwords.com/5854/weighted_average.html.

Comparative results of the raw unadjusted unit prices by zoning group are listed below for each of the three statistical methods. The quartile figures are taken from the workbook **III_F_1_DENVER_SALES** and the second sheet in the workbook, **ALL_DENVER**.

BNSF'S SIMPLE AVERAGE BY ZONE IS DERIVED FROM THE RAW DATA AND THE MODIFIED SALE DATA IS REPRESENTED IN THE QUARTILE COLUMNS. THE WEIGHTED AVERAGE IS CALCULATED USING THE RAW DATA.

<u>Land Zoning</u>	<u>BNSF's Simple Average</u>	<u>First Quartile Result</u>	<u>Second Quartile Result</u>	<u>Weighted Average</u>
I1	59.53	3.16	3.29	4.28
I0	10.44	2.91	7.52	3.53
I1	97.85	4.14	6.50	13.33
B4	21.92	4.52	5.14	0.04
R3	86.50	6.97	12.45	58.73
B2	32.83	7.08	11.01	19.75
B8	30.18	38.90	40.00	5.63
B3	20.68	2.47	3.92	3.67

Source: Thorne Consultants, Inc.

The R3 and B8 zone rates are difficult to simplify as the zone is split due to significantly different land use prices on each side of the right-of-way. Moreover, the B8 zone information is impaired by Sale 81, which was removed from the list for the quartile analysis.

15. We adjusted the data to determine the validity of the quartile. The second sheet in the workbook, **MODIFIED_SALE_DATA**, adjusts the raw data by adding or deleting zeros. These changes are footnoted in the sheet, and the adjustments produce a more plausible and statistically credible result. It is important to compare the **ALL_DATA** with the **MODIFIED_SALE_DATA** sheet as we did not change every red highlighted row. In the adjustment process, it was impossible to determine if a particular sale had truncated or incorrect data. These sales remain highlighted and are retained for the calculation despite their implausible unit price results. Tesh's simple average is also reported in this second sheet. The disparity in the results (unit price per foot) is related to the sales containing very small land areas with inordinately high unit sale prices.

16. The third sheet in the workbook, **VAL_SECTION_COMPARISONS**, recalculates each val section using the modified weighted average (developed by TNR), BNSF's conclusions and TNR's original quartile method.
17. BNSF reported a land cost estimate of \$286,345,909 for the right-of-way. The table calculations report a cost estimate of \$286,318,909. The difference of \$27,000 is due to rounding.
18. If averaging is to be used, then the weighted calculation provides a more reliable result. Our approach to using the weighted average in this rebuttal removes specious sales and adjusts others where we determined that truncated zeros in the download affect the analysis. The results obtained from the more sophisticated average produced a result near the quartile method. We also applied the same quartile statistical approach to the same modified sales to determine the reliability of TNR's opening conclusion.

<u>Submission</u>	<u>Dollars</u>
BNSF's Reply	286,345,909
Original Quartile Method at Opening	42,641,332
Rebuttal Weighted Average (modified sales)	40,833,160
Rebuttal First Quartile (modified sales)	36,000,835
Rebuttal Second Quartile (modified sales)	45,830,186
Modified Simple Averages (approach used by BNSF except with corrected data ⁹)	55,218,676

The rebuttal quartiles (first and second) and the weighted average clearly bracket TNR's opening land cost opinion.

19. BNSF grossly overstated the cost for Val-Section CO.DR.8 (zoned O-1). Tesh concluded that the 13.82 acres comprising the section were priced at \$71.76 per foot. In fact, the price should be \$45.66 per foot (\$1,988,950 per acre) by his own admission on the **SUMMARY** sheet in workbook **III_F_1_DENVER_SALES**.

BNSF Val-Section Price	\$43,196,453
Corrected Val-Section Price	<u>\$27,483,667</u>
Overstatement	\$15,712,786

This error, combined with the mathematical error in Adams County, results in an overstatement of about \$16.2 million.

20. Tesh's data does not illustrate any corridor premium mathematics, contrary to his statement in his text.

⁹See AEP Texas Reb. electronic workpaper file "**MODIFIED_SALE_DATA.**"

III-G Discounted Cash Flow Analysis

Computation of EIA Adjusted RCAF
Based on Global Insight Forecast and EIA/STB Productivity Change Ratio

Line No.	Quarter	Global Insight Forecast					EIA/STB Adjusted		EIA	EIA
		Productivity					Productivity		Revised	Adjusted
		RCAF-U	Annual	4th Root	PAF	RCAF-A	Annual	4th Root	PAF	RCAF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Note 1	Prior(5)*(4)	(2)/(5)	Note 2	Note 1	Prior(9)*(8)	(2)/(9)
										Note 3
QUARTERLY										
<u>STB Historical</u>										
1	2Q 2000	94.7	1.035	1.0086	1.7719	53.4	1.035	1.0086	1.7719	53.4
2	3Q 2000	94.7	1.035	1.0086	1.7871	53.0	1.020	1.0050	1.7808	53.2
3	4Q 2000	95.7	1.035	1.0086	1.8025	53.1	1.020	1.0050	1.7897	53.5
4	1Q 2001	97.8	1.035	1.0086	1.8180	53.8	1.020	1.0050	1.7986	54.4
5	2Q 2001	96.9	1.028	1.0069	1.8305	52.9	1.016	1.0040	1.8058	53.7
6	3Q 2001	97.2	1.028	1.0069	1.8431	52.7	1.016	1.0040	1.8130	53.6
7	4Q 2001	97.3	1.028	1.0069	1.8558	52.4	1.016	1.0040	1.8203	53.5
8	1Q 2002	96.9	1.028	1.0069	1.8686	51.9	1.016	1.0040	1.8276	53.0
9	2Q 2002	95.7	1.042	1.0103	1.8878	50.7	1.024	1.0059	1.8384	52.1
10	3Q 2002	95.7	1.042	1.0103	1.9072	50.2	1.024	1.0059	1.8492	51.8
11	4Q 2002	100.0	1.042	1.0103	1.9268	51.9	1.024	1.0059	1.8601	53.8
12	1Q 2003	99.6	1.042	1.0103	1.9466	51.2	1.024	1.0059	1.8711	53.2
13	2Q 2003	102.0	1.019	1.0047	1.9557	52.2	1.011	1.0027	1.8762	54.4
14	3Q 2003	102.0	1.019	1.0047	1.9649	51.9	1.011	1.0027	1.8813	54.2
15	4Q 2003	101.7	1.019	1.0047	1.9741	51.5	1.011	1.0027	1.8864	53.9
<u>Global Insight Forecast⁴</u>										
16	1Q 2004	101.7	1.019	1.0047	1.9834	51.3	1.011	1.0027	1.8915	53.8
17	2Q 2004	101.7	1.023	1.0057	1.9947	51.0	1.013	1.0032	1.8976	53.6
18	3Q 2004	103.0	1.023	1.0057	2.0061	51.3	1.013	1.0032	1.9037	54.1
19	4Q 2004	104.2	1.023	1.0057	2.0175	51.6	1.013	1.0032	1.9098	54.6
20	1Q 2005	104.4	1.023	1.0057	2.0290	51.5	1.013	1.0032	1.9159	54.5
21	2Q 2005	104.6	1.031	1.0077	2.0446	51.2	1.018	1.0045	1.9245	54.4
22	3Q 2005	105.4	1.031	1.0077	2.0603	51.2	1.018	1.0045	1.9332	54.5
23	4Q 2005	106.4	1.031	1.0077	2.0762	51.2	1.018	1.0045	1.9419	54.8
24	1Q 2006	107.8	1.031	1.0077	2.0922	51.5	1.018	1.0045	1.9506	55.3
25	2Q 2006	107.8	1.030	1.0074	2.1077	51.1	1.017	1.0042	1.9588	55.0
26	3Q 2006	107.8	1.030	1.0074	2.1233	50.8	1.017	1.0042	1.9670	54.8
27	4Q 2006	107.8	1.030	1.0074	2.1390	50.4	1.017	1.0042	1.9753	54.6
28	1Q 2007	110.4	1.030	1.0074	2.1548	51.2	1.017	1.0042	1.9836	55.7
29	2Q 2007	110.4	1.018	1.0045	2.1645	51.0	1.010	1.0025	1.9886	55.5
30	3Q 2007	110.4	1.018	1.0045	2.1742	50.8	1.010	1.0025	1.9936	55.4
31	4Q 2007	110.4	1.018	1.0045	2.1840	50.5	1.010	1.0025	1.9986	55.2
32	1Q 2008	112.8	1.018	1.0045	2.1938	51.4	1.010	1.0025	2.0036	56.3
33	2Q 2008	112.8	1.019	1.0047	2.2041	51.2	1.011	1.0027	2.0090	56.1
34	3Q 2008	112.8	1.019	1.0047	2.2145	50.9	1.011	1.0027	2.0144	56.0
35	4Q 2008	112.8	1.019	1.0047	2.2249	50.7	1.011	1.0027	2.0198	55.8
36	1Q 2009	115.4	1.019	1.0047	2.2354	51.6	1.011	1.0027	2.0253	57.0
37	2Q 2009	115.4	1.021	1.0052	2.2470	51.4	1.012	1.0030	2.0314	56.8
38	3Q 2009	115.4	1.021	1.0052	2.2587	51.1	1.012	1.0030	2.0375	56.6
39	4Q 2009	115.4	1.021	1.0052	2.2704	50.8	1.012	1.0030	2.0436	56.5
40	1Q 2010	118.1	1.021	1.0052	2.2822	51.7	1.012	1.0030	2.0497	57.6
41	2Q 2010	118.1	1.020	1.0050	2.2936	51.5	1.011	1.0027	2.0552	57.5
42	3Q 2010	118.1	1.020	1.0050	2.3051	51.2	1.011	1.0027	2.0607	57.3
43	4Q 2010	118.1	1.020	1.0050	2.3166	51.0	1.011	1.0027	2.0663	57.2
44	1Q 2011	121.0	1.020	1.0050	2.3282	52.0	1.011	1.0027	2.0719	58.4

Computation of EIA Adjusted RCAF
Based on Global Insight Forecast and EIA/STB Productivity Change Ratio

Line No.	Quarter	Global Insight Forecast					EIA/STB Adjusted		EIA	EIA
		RCAF-U	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Revised	Adjusted
	(1)	(2)	Annual	4th Root	PAF	RCAF-A	Annual	4th Root	PAF	RCAF
			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Note 1	Prior(5)*(4)	(2)/(5)	Note 2	Note 1	Prior(9)*(8)	(2)/(9)
										Note 3
45	2Q 2011	121.0	1.020	1.0050	2.3398	51.7	1.011	1.0027	2.0775	58.2
46	3Q 2011	121.0	1.020	1.0050	2.3515	51.5	1.011	1.0027	2.0831	58.1
47	4Q 2011	121.0	1.020	1.0050	2.3633	51.2	1.011	1.0027	2.0887	57.9
48	1Q 2012	123.8	1.020	1.0050	2.3751	52.1	1.011	1.0027	2.0943	59.1
49	2Q 2012	123.8	1.021	1.0052	2.3875	51.9	1.012	1.0030	2.1006	58.9
50	3Q 2012	123.8	1.021	1.0052	2.3999	51.6	1.012	1.0030	2.1069	58.8
51	4Q 2012	123.8	1.021	1.0052	2.4124	51.3	1.012	1.0030	2.1132	58.6
52	1Q 2013	126.9	1.021	1.0052	2.4249	52.3	1.012	1.0030	2.1195	59.9
53	2Q 2013	126.9	1.020	1.0050	2.4370	52.1	1.011	1.0027	2.1252	59.7
54	3Q 2013	126.9	1.020	1.0050	2.4492	51.8	1.011	1.0027	2.1309	59.6
55	4Q 2013	126.9	1.020	1.0050	2.4614	51.6	1.011	1.0027	2.1367	59.4
Projection for 2014-2020 ⁴										
56	1Q 2014	130.1	1.020	1.0050	2.4737	52.6	1.011	1.0027	2.1425	60.7
57	2Q 2014	130.1	1.020	1.0050	2.4861	52.3	1.011	1.0027	2.1483	60.6
58	3Q 2014	130.1	1.020	1.0050	2.4985	52.1	1.011	1.0027	2.1541	60.4
59	4Q 2014	130.1	1.020	1.0050	2.5110	51.8	1.011	1.0027	2.1599	60.2
60	1Q 2015	133.4	1.020	1.0050	2.5236	52.9	1.011	1.0027	2.1657	61.6
61	2Q 2015	133.4	1.020	1.0050	2.5362	52.6	1.011	1.0027	2.1715	61.4
62	3Q 2015	133.4	1.020	1.0050	2.5489	52.3	1.011	1.0027	2.1774	61.3
63	4Q 2015	133.4	1.020	1.0050	2.5616	52.1	1.011	1.0027	2.1833	61.1
64	1Q 2016	136.7	1.020	1.0050	2.5744	53.1	1.011	1.0027	2.1892	62.4
65	2Q 2016	136.7	1.020	1.0050	2.5873	52.8	1.011	1.0027	2.1951	62.3
66	3Q 2016	136.7	1.020	1.0050	2.6002	52.6	1.011	1.0027	2.2010	62.1
67	4Q 2016	136.7	1.020	1.0050	2.6132	52.3	1.011	1.0027	2.2069	61.9
68	1Q 2017	140.1	1.020	1.0050	2.6263	53.3	1.011	1.0027	2.2129	63.3
69	2Q 2017	140.1	1.020	1.0050	2.6394	53.1	1.011	1.0027	2.2189	63.1
70	3Q 2017	140.1	1.020	1.0050	2.6526	52.8	1.011	1.0027	2.2249	63.0
71	4Q 2017	140.1	1.020	1.0050	2.6659	52.6	1.011	1.0027	2.2309	62.8
72	1Q 2018	143.6	1.020	1.0050	2.6792	53.6	1.011	1.0027	2.2369	64.2
73	2Q 2018	143.6	1.020	1.0050	2.6926	53.3	1.011	1.0027	2.2429	64.0
74	3Q 2018	143.6	1.020	1.0050	2.7061	53.1	1.011	1.0027	2.2490	63.9
75	4Q 2018	143.6	1.020	1.0050	2.7196	52.8	1.011	1.0027	2.2551	63.7
76	1Q 2019	147.2	1.020	1.0050	2.7332	53.9	1.011	1.0027	2.2612	65.1
77	2Q 2019	147.2	1.020	1.0050	2.7469	53.6	1.011	1.0027	2.2673	64.9
78	3Q 2019	147.2	1.020	1.0050	2.7606	53.3	1.011	1.0027	2.2734	64.7
79	4Q 2019	147.2	1.020	1.0050	2.7744	53.1	1.011	1.0027	2.2795	64.6
80	1Q 2020	150.9	1.020	1.0050	2.7883	54.1	1.011	1.0027	2.2857	66.0
81	2Q 2020	150.9	1.020	1.0050	2.8022	53.9	1.011	1.0027	2.2919	65.8
82	3Q 2020	150.9	1.020	1.0050	2.8162	53.6	1.011	1.0027	2.2981	65.7
83	4Q 2020	150.9	1.020	1.0050	2.8303	53.3	1.011	1.0027	2.3043	65.5

Computation of EIA Adjusted RCAF
Based on Global Insight Forecast and EIA/STB Productivity Change Ratio

Line No.	Global Insight Forecast						EIA/STB Adjusted		EIA	EIA
	Productivity						Productivity		Revised	Adjusted
	Quarter	RCAF-U	Annual	4th Root	PAF	RCAF-A	Annual	4th Root	PAF	RCAF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Note 1	Prior(5)*(4)	(2)/(5)	Note 2	Note 1	Prior(9)*(8)	(2)/(9)
										Note 3
ANNUALLY										
	Annual	Simple Average of 4 Quarters				Simple Average of 4 Quarters				
84	2001	97.3	1.030	1.0073	1.8369	52.97	1.017	1.0043	1.8094	53.77
85	2002	97.1	1.039	1.0095	1.8976	51.16	1.022	1.0054	1.8438	52.65
86	2003	101.3	1.025	1.0061	1.9603	51.69	1.014	1.0035	1.8788	53.93
87	2004	102.7	1.022	1.0055	2.0004	51.31	1.013	1.0031	1.9007	54.01
88	2005	105.2	1.029	1.0072	2.0525	51.25	1.017	1.0042	1.9289	54.54
89	2006	107.8	1.030	1.0075	2.1156	50.96	1.017	1.0043	1.9629	54.92
90	2007	110.4	1.021	1.0052	2.1694	50.89	1.012	1.0029	1.9911	55.45
91	2008	112.8	1.019	1.0047	2.2093	51.06	1.011	1.0027	2.0117	56.07
92	2009	115.4	1.021	1.0051	2.2529	51.22	1.012	1.0029	2.0345	56.72
93	2010	118.1	1.020	1.0051	2.2994	51.36	1.011	1.0028	2.0580	57.39
94	2011	121.0	1.020	1.0050	2.3457	51.58	1.011	1.0027	2.0803	58.16
95	2012	123.8	1.021	1.0052	2.3937	51.72	1.012	1.0029	2.1038	58.85
96	2013	126.9	1.020	1.0051	2.4431	51.94	1.011	1.0028	2.1281	59.63
97	2014	130.1	1.020	1.0050	2.4923	52.20	1.011	1.0027	2.1512	60.48
98	2015	133.4	1.020	1.0050	2.5426	52.47	1.011	1.0027	2.1745	61.35
99	2016	136.7	1.020	1.0050	2.5938	52.70	1.011	1.0027	2.1981	62.19
100	2017	140.1	1.020	1.0050	2.6461	52.95	1.011	1.0027	2.2219	63.05
101	2018	143.6	1.020	1.0050	2.6994	53.20	1.011	1.0027	2.2460	63.94
102	2019	147.2	1.020	1.0050	2.7538	53.45	1.011	1.0027	2.2704	64.84
103	2020	150.9	1.020	1.0050	2.8093	53.72	1.011	1.0027	2.2950	65.75

¹ Fourth root of annual productivity in previous column.

² Productivity in column (3) or column (7) times relationship of cumulative EIA productivity from 1981-2002 to cumulative STB productivity for same period ($2.4 / 4.2 = 0.57142857$). Computations assume operations commence 2Q2000; therefore, first adjustment is 3Q2000.

³ Forecast RCAF-A adjusted for EIA/STB ratio from 1981-2002.

⁴ Global Insight forecast through year 2013 from Rail Cost Adjustment Factor Forecast - September 2003. Projection for 2014-2020 based on year 2012-2013 Global Insight forecast (RCAF-U at an assumed annual 2.5% rate, and annual productivity at an assumed 2.0% rate).

DECLARATION OF DR. DOUGLAS W. CAVES

I. Introduction

I am Douglas W. Caves, a Vice Chairman of Laurits R. Christensen Associates, Inc. ("Christensen Associates"), an economic research and consulting firm, located at 4610 University Avenue, Suite 700, Madison, WI 53705. I have a Bachelor of Arts degree in Biochemistry from Oklahoma State University, a Masters degree in Economics from Oklahoma State University, and a Doctorate in Economics from the University of Wisconsin-Madison. I wrote my doctoral thesis on "Measuring Productivity Growth in the U.S. Railroad Industry with an Estimate of Losses Resulting from Economic Regulation." I have directed Christensen Associates' research and consulting practice for the electric utility industry since 1978. I have been actively engaged in studying and analyzing capital costs, market entry factors and influences, inflation impacts and related economic issues as they apply to a number of industries, including railroads, airlines, electric utilities, telecommunications service providers and water and truck transportation firms.

I have testified in numerous jurisdictions, and my scholarly work has been published in a number of prestigious journals, including *American Economic Review*, *Journal of Political Economy*, *Econometrica*, and *The Review of Economics and Statistics*. Several of my published papers are based on estimates of capital costs and input price inflation for U.S. and Canadian railroads. I have also published papers that focus on the improvements of methodologies for measuring capital costs, price impacts, and productivity.

In addition to my academic research, I was actively involved in the development and implementation of the productivity measure that the Interstate Commerce Commission adopted in 1989 in its *Ex Parte No. 290 (Sub-No. 4)* docket, to modify the quarterly Rail Cost Adjustment Factor ("RCAF"). I submitted written testimony before the ICC on this subject on eleven separate occasions. I have also submitted expert testimony before the agency on issues related to capital costs, inflation forecasts and entry barriers under the stand-alone cost ("SAC") standards in Docket No. 42056, *Texas Municipal Power Agency v. The Burlington Northern and Santa Fe Railway Company*, in Docket No. 41191, *West Texas Utilities Company v. Burlington Northern Railroad Company*.

In this declaration, I respond to the declaration of BNSF witnesses Richard S. Higgins and Fred S. McChesney. Their declaration finds fault with AEP Texas' evidentiary case in support of a reduction in BNSF's rates for coal transportation to the Oklaunion Station in four areas: (1) that BNSF is revenue inadequate and therefore cannot be charging rates in excess of stand-alone cost; (2) that in the presence of Ramsey prices, there is by definition no possibility that any rate exceeds stand-alone cost; (3) that a finding that rates exceed stand-alone cost results only from the improper inclusion of cross-over traffic in the SARR traffic group; and (4) that AEP's application of the generalized percentage reduction method (GPRM) for allocating rate reductions under the Board's SAC methodology is unwarranted.

I demonstrate that their criticisms are invalid as they are contrary to established Board methodology and proper economic analysis. In particular: (1) whether BNSF is revenue inadequate based on traditional accounting costs is irrelevant to the theory of

contestability and the proper application of the SAC test; (2) the SAC test is not in conflict with Ramsey pricing but is an essential element of both the theory and practical implementation of Ramsey pricing; (3) the inclusion of cross-over traffic is not only permissible but is necessary for proper application of the SAC test; and (4) the GPRM method is a direct application of the Board's preference for adherence to Ramsey principles in administering the SAC test.

II. Whether BNSF is Revenue Inadequate, Based on Traditional Accounting Costs, is Irrelevant to the Proper Application of the SAC Test

Contestable markets give no weight to the historic accounting costs of incumbent firms. Entry will occur at lower prices if current technology and current capital replacement costs allow prices that are below prices set by the incumbent firm. This may cause an inefficient incumbent to lose some segments of its business or even go out of business completely, but that is the essence of how contestable markets promote efficiency. The SAC principles adopted by the Board reflect this reality, as the *Coal Rate Guidelines* recognize that a rate may be unreasonable even if the carrier is revenue inadequate.¹ Following the path set forth by Higgins and McChesney would result in an industry frozen in place by obsolescence and inefficiency.²

¹ *Coal Rate Guidelines* at 536:

We are also concerned that the notion of revenue adequacy as a rate constraint not be misused to freeze a carrier's rates artificially at the levels used to reach revenue adequacy. ... This constraint should not serve as a disincentive for carriers to improve their operations and lower their costs. ... a rate may be unreasonable even if the carrier is far short of revenue adequacy.

² Throughout their analysis Higgins and McChesney assume the SARR and the incumbent have the same cost structure. This assumption is contradicted by BNSF's own evidence, which purports to show that the TNR (the SARR in this case) begins with an initial 19% cost advantage. While AEP Texas demonstrates that BNSF's calculations are flawed and lead to an overstatement of this cost advantage, these calculations demonstrate that BNSF, itself, does not agree with the premise of Higgins and McChesney's analysis.

III. The SAC Test is not in Conflict with Ramsey Pricing, but is an Essential Element of Both the Theory and Practical Implementation of Ramsey Pricing

Higgins and McChesney argue that the existence of Ramsey prices makes it impossible to find, and a waste of time even to look for, prices in excess of stand-alone cost. Such a statement conflicts with the fundamental understanding of the structure of the railroad industry as expressed in the *Coal Rate Guidelines*: that the industry is not truly contestable.³ In a contestable market, SAC and Ramsey prices are directly related: indeed, it is SAC that sets a limit on the extent to which prices can be raised for customers with inelastic demand. The SAC level is the very point at which the customer's otherwise inelastic demand becomes perfectly elastic (from the viewpoint of the incumbent firm) by virtue of the fact that unencumbered entry would provide an alternative source of supply to such a customer. Thus, Ramsey prices, which are based on elasticities of demand, are capped in a contestable market by the SAC level—the level at which the customer can find an efficient alternative supplier and at which the customer's demand becomes highly elastic to the incumbent firm.

However, if the market is not truly contestable, then the monopoly provider does not face this cap and, in fact, may falsely claim to be following Ramsey principles by raising prices according to the customer's low elasticity, even as such prices exceed SAC. It is precisely to guard against this possibility that the SAC was incorporated into the *Coal Rate Guidelines*.⁴

³ For example, *Coal Rate Guidelines* at 529:

The railroad industry is recognized to have barriers to entry and exit and thus is not considered contestable for captive traffic.

⁴ For example, *Coal Rate Guidelines* at 529:

The argument of Higgins and McChesney attempts to circumvent this safeguard by promoting a narrow misconception of Ramsey prices that does not recognize the constraint imposed by SAC due to the hypothetical entry of an SARR. Moreover, Higgins and McChesney fail to recognize that the constraint imposed by the SAC test explicitly provides for a key element of contestable markets – that the SARR is likely to be more efficient than the incumbent railroad.⁵

IV. The Inclusion of Cross-Over Traffic is not Only Permissible, but is Necessary for Proper Application of the SAC Test

The SARR represents a contestable railroad that replaces the incumbent over some portion of the incumbent's network. In constructing its network and assembling its traffic group, the SARR's objective is to take advantage of production economies to maximize efficiency and profitability. This principle is clear in the *Coal Rate Guidelines* (pp. 543-544):

The parties will have broad flexibility to develop the least costly, most efficient plant. The plant should be designed to minimize construction (or acquisition) and operating costs and/or maximize the carriage of profitable traffic. In selecting the route of the SAC railroad, for instance, an overriding factor may be the effort to lower costs by taking advantage of economies of density. Generally, a stand-alone railroad would attempt to fully utilize plant capacity, adding other profitable traffic in order to reduce the average cost of operation. Thus, the stand-alone railroad may not represent the shortest route for the captive shipper, but the one with the highest traffic densities. The factors to be considered depend upon

[O]ur use of SAC introduces the competitive standard of contestability into a non-competitive market. ... This cost calculation produces a simulated competitive price standard against which actual rates can be compared.

⁵ *Coal Rate Guidelines* at 542:

The purpose of a SAC analysis is to determine the *least* cost at which an efficient competitor could provide the service, because by doing so we are simulating the competitive price for the market. ... we will be guided in individual cases by the least cost (theoretically) feasible SAC model.

As noted above in *n. 2*, in contradiction to Higgins and McChesney, BNSF, itself, recognizes that the SARR is likely to be more efficient than the incumbent.

individual circumstances. Hence the optimal size and placement of the physical plant must be determined on a case-by-case basis.

The ability to group traffic of different shippers is essential to theory of contestability. It allows the captive shipper to identify areas where production economies define an efficient subsystem or alternative system whose traffic is divertible to a hypothetical competitor. Without grouping, SAC would not be a very useful test, since the captive shipper would be deprived of the benefits of any inherent production economies.

A potential entrant in a contestable market will evaluate all possibilities for competing with an incumbent, including different levels of output, different product mixes, and different degrees of vertical integration. If the entrant is not fully vertically integrated (i.e., relies on upstream or downstream services) then it may rely on the residual incumbent to provide these upstream or downstream services.

To the extent the SARR exhibits economies of density, greater traffic volumes will reduce average costs. This includes carrying traffic over its network that may originate and/or terminate on the network of the residual incumbent—i.e., cross-over traffic. Therefore, elimination of cross-over traffic denies the SARR the benefits of economies of density, impeding the SARR's ability to maximize its efficiency and minimize costs, contrary to the Board's contestable markets paradigm.⁶ Restricting the SARR to only traffic that it can carry end-to-end or, conversely, requiring it to build a network to accommodate the end-to-end transport of all of its traffic is inconsistent with the SARR's role as an entrant in a contestable market and with the Board's procedures. Nowhere in the *Guidelines* does it state that the facilities of the SARR must be built so

⁶ In fact, to the extent that this cross-over traffic is actually carried over the incumbent's network, denying the SARR this traffic is to deny the SARR economies of density that the incumbent enjoys. This would put the SARR at an artificial economic disadvantage, contrary to the SAC procedure's contestable markets paradigm.

that all traffic is carried end-to-end by the SARR.⁷ In fact, the Board has acknowledged that cross-over traffic is “now a standard feature of SAC cases.”⁸

When including cross-over traffic, a key consideration is the way in which revenues are split between the SARR and the residual incumbent. AEP Texas has followed the practical MSP approach, which previously has been endorsed by the Board. Moreover, in this case, the approach is shown to allocate sufficient revenues to the residual incumbent – i.e., revenues that more than cover its attributable costs of handling the cross-over traffic.⁹ Absent a demonstration that such a split leaves the residual incumbent in an unsustainable position,¹⁰ there can be no basis for claiming any problem with the construction of the SARR and its traffic group. Importantly, the reduction in the complaining shipper’s rates to the SAC level will result in an unambiguous improvement in the overall social welfare obtained from the provision of railroad services.

Therefore, as an entrant in a contestable market, the SARR may choose not to carry all traffic end-to-end. This choice is not only consistent with the contestable market

⁷ The *Guidelines* provide no support for BNSF’s assertion that they require the construction of an end-to-end SARR or a revenue allocation scheme that makes the SAFF indifferent to construction or cross-over service:

As the name implies, and as initially conceived, the *stand-alone* cost test was designed to compare the costs incurred to build and operate a *stand-alone railroad* ... The only way to know whether there are sufficient revenues available to cover all the costs (both attributable and unattributable) of the facilities needed to service a traffic group is to posit the construction of all the necessary facilities ... (BNSF Reply at III.A-11)

⁸ *PSCo/Xcel* at 17.

⁹ For example, see *PSCo/Xcel* at 17-19.

¹⁰ Or no worse off if the incumbent is revenue inadequate.

paradigm, but also with the Board's policy of making SAC presentations manageable and realistically useful to captive shipper complainants.¹¹

V. The GPRM is a Direct Application of the Board's Preference for Ramsey Pricing

The Board has stated preferences both for Ramsey Pricing and for equal percentage reductions to remedy any finding of excessive rates. Unfortunately, these two preferences are internally inconsistent: equal percentage rate reductions don't reflect Ramsey principles (except in the special case where customers display equal elasticities of demand in which case their Ramsey prices should be equivalent anyway). This inconsistency, however, is easily remedied by using the Generalized Percentage Reduction Method (GPRM), which is a direct generalization of the Board's percentage reduction method.

By conforming to the principles of Ramsey pricing, the GPRM achieves several desirable properties. The GPRM allocates rate relief in an efficient manner, provides for fair and symmetric treatment of inelastic demands, and remedies an existing inconsistency in how revenue inadequacy and excess revenue situations are treated.

The GPRM is derived directly from the Ramsey pricing solution and therefore is consistent with Ramsey pricing principles.

A. The Derivation of the GPRM

To derive the GPRM we begin with the familiar Ramsey pricing condition that

$$[(P_i - MC_i)/P_i] = [\lambda/(1+\lambda)] (-1/\epsilon_i) \quad (1)$$

¹¹ *PSCo/Xcel* at 14-17.

Where λ is the LaGrange multiplier on the breakeven constraint and ϵ_i is the price elasticity of demand in the i th market. This result shows that the optimal markup of price over marginal cost is inversely proportional to the price elasticity of demand in the market.

Combining the first-order conditions given by equation (1), yields

$$[(P_i - MC_i)/P_i] / [(P_j - MC_j)/P_j] = E_{ji} \quad (2)$$

where E_{ji} is the relative elasticity of demand given by ϵ_j/ϵ_i . This result shows that Ramsey pricing implies that the *ratios of price markups* are determined by the relative elasticities.

Equation (2) can be rearranged to give

$$1 - MC_i/P_i = (1 - MC_j/P_j) E_{ji} \quad (3)$$

Treating MC_i , MC_j and E_{ji} as constants and differentiating equation (3) gives

$$(MC_i/P_i^2)dP_i = (MC_j/P_j^2) E_{ji} dP_j \quad (4)$$

which can be reorganized as

$$(dP_i/P_i) / (dP_j/P_j) = (P_i/P_j) (MC_j/MC_i) E_{ji} . \quad (5)$$

Equation (5) is the generalization of the percentage reduction rule that remains consistent with Ramsey pricing. The left-hand side of the equation is the percentage change in the price in market i divided by the percentage change in the price in market j .

The current equal percentage reduction rule is a special case of the generalized percentage reduction rule (i.e., the left-hand side of equation (7) is 1). An equal percentage reduction is only appropriate when the relative elasticity of demand is 1; i.e. when both customers have the same elasticity of demand. However, this is the

degenerative case where differentiated pricing serves no purpose, and both customers should face the same rate.¹²

B. Confirmation that the GPRM conforms to Ramsey Principles

We demonstrate the GPRM with a simple two-demand example. The demands, “inelastic” and “elastic,” are represented by

$$Q_{\text{Inelastic}} = 100 P^{-0.5} \text{ and } Q_{\text{Elastic}} = 100 P^{-1.25} .$$

The monopolist’s cost function is characterized by \$50 fixed cost and \$1 marginal cost for each demand. That is,

$$\text{Cost} = \$50 + Q_{\text{Inelastic}} + Q_{\text{Elastic}} .$$

Obviously, marginal cost pricing would leave a revenue shortfall equal to the fixed cost of \$50. The Ramsey pricing solution to this problem is

$$P_{\text{Inelastic}} = \$1.46 \quad Q_{\text{Inelastic}} = 82.84$$

$$P_{\text{Elastic}} = \$1.14 \quad Q_{\text{Elastic}} = 84.57$$

Thus, the inelastic demand bears a much greater percentage markup in price over marginal cost than does the elastic demand (46% versus 14%, or approximately a factor of 3).

Now, what if fixed costs were only \$40 instead of \$50? If so, then the Ramsey prices based on collecting of \$50 of contribution would result in a \$10 over collection, or 4.6% excess revenue (\$10/\$217). The Ramsey pricing solution that just collects the \$40 fixed cost would be

$$P_{\text{Inelastic}} = \$1.35 \quad Q_{\text{Inelastic}} = 86.14$$

¹² Differentiated pricing means different price to marginal cost ratios in different markets. As seen in equation (3), Ramsey pricing improves efficiency, or more accurately minimizes pricing inefficiency, by differentiated pricing according to an inverse elasticity rule. However, if the demand elasticities are the same, then no efficiency gain can be obtained by differentiated pricing.

$$P_{\text{Elastic}} = \$1.12 \quad Q_{\text{Elastic}} = 87.27.$$

Thus, compared to the original (\$50 fixed cost) Ramsey prices, $P_{\text{Inelastic}}$ has been reduced by 7.5% and P_{Elastic} has been reduced by 2.5%. This illustrates that Ramsey pricing principles dictate that the inelastic demand receives disproportional rate reductions just as it bears disproportional markups over marginal cost.

In this example, the ratio of percentage rate reductions is 3.0 (7.5%/2.5%). This is exactly the distribution of rate relief implied by the GPRM given in equation (5). That is,

$$\begin{aligned} (dP_{\text{Inelastic}}/P_{\text{Inelastic}})/(dP_{\text{Elastic}}/P_{\text{Elastic}}) &= (P_{\text{Inelastic}}/P_{\text{Elastic}}) (MC_{\text{Elastic}}/MC_{\text{Inelastic}}) (\epsilon_{\text{Inelastic}}/\epsilon_{\text{Elastic}}) \\ &= (1.35/1.12) (1/1) (1.25/0.5) \\ &= 3.0. \end{aligned}$$

Thus, the accuracy of the GPRM is confirmed as being consistent with Ramsey pricing principles in the allocation of rate relief from excess revenue collection.

VI. Conclusion

The analysis of Higgins and McChesney of the alleged inconsistencies between revenue adequacy, cross-over revenues and Ramsey pricing principles should be rejected. Their extreme positions are contrary to established practice and proper economic analysis. One need look no further than their assertion that Ramsey pricing is inconsistent with a showing of excess rates under the Board's stand-alone cost procedure as proof of the flaws in their analysis. Furthermore, it is clear that the GPRM proposed

by AEP Texas in this case provides a procedure for determining rate relief to captive shippers that is fully consistent with Ramsey pricing principles.