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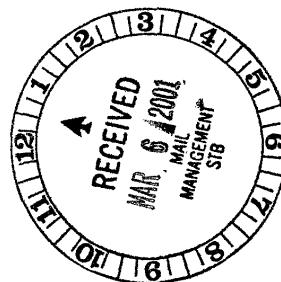
March 2, 2001

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Office of the Secretary

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Public Record

Office of the Secretary
Case Control Unit
STB Docket No. 33407
Surface Transportation Board
1925 K Street, NW
Washington, DC 20423-0001



Attention: Ms. Elaine Kaiser
Chief, Section of Environmental Analysis
Environmental Filing

Re: Comments on PRB Expansion DEIS
Presented to the Surface Transportation Board
Sections: 4.4.5.2 Geologic Hazards, 4.4.5.3 Soil Impacts, 4.4.12 Safety

Dear Ms. Kaiser:

In accordance with the authorization of the Midstates Coalition for Progress, McGhie & Betts Environmental Services, Inc. (MBESI) has completed an assessment of the proposed DM&E Alternatives B and C for rail line constructions between Wall, South Dakota, and Smithwick, South Dakota. MBESI is an environmental consulting company located in Rochester, Minnesota with a staff of three geologists and a soil scientist with over 70 years of combined experience in evaluating environmental and geological hazards.

We have conducted an investigation of the feasibility, impacts, and associated geologic hazards of the construction of the proposed DM&E alternatives B & C located between Wall, South Dakota, and Smithwick, South Dakota described in section 4.4 of the Draft Environmental Impact Statement (DEIS). These two alternatives propose construction of a new rail line along the Cheyenne River Valley through areas underlain by the Cretaceous Age Pierre Shale Formations, a geologic unit notoriously known for unstable conditions for slopes, foundations and roadbeds. In the text below we discuss the hazards of constructing over the Pierre Shale, a condition that is well documented in published texts and a problem serious enough to warrant land use restrictions in Colorado because of the high incidence of severe damage to roads, utilities, residences and commercial buildings. It is our opinion that the heaving shale hazard of the Pierre Shale correlates to an increased risk of derailments along the existing rail line and represents a serious risk for proposed Alternatives B & C. The DEIS fails to evaluate the added risk or



repercussions of the construction of Alternatives B and C through this geologically unstable area.

4.4.5.2 Geologic Hazards

“Heaving” Bedrock

The Pierre shale formation is described as a shaley mudstone with interbedded layers of bentonite. The mineralogy of the formation makes exposures extremely susceptible to erosion and the entire formation is described as a “heaving” bedrock unit (Noe, D., Colorado Geological Survey, 1997) that also generates expansive soils. A heaving bedrock unit describes bedrock that has differential heaving that occurs along non-horizontal stratigraphic units that increases or decreases in volume with hydration-induced swelling and rebound. Hydration-induced swelling is caused by chemical attraction and the addition of water within the crystal lattice structure of montmorillonite and bentonite clay minerals found in the Pierre Shale. Montmorillonite may expand 15 times its original dry volume and bentonite will expand 18 times its original dry volume giving soils with even minor amounts of these minerals the ability to swell more than 50% of the dry volume size creating tremendous force that can bend steel, pull apart concrete, or crush reinforced structures. Because of the geologic forces exerted by shrinking and swelling, shale increases of volume greater than 3% is considered to be a geologic hazard. According to Noe, “rebound is the time-dependent release of stress from unloading and disturbance of over-consolidated claystone – not the result of hydration-induced swelling. The combination of these mineral-water reactions and geologic forces have proven that standard techniques used for mitigation of expansive soils are unsuccessful.

Shrink/swell volume changes in soil in response to changes in moisture content are most severe in arid regions like western South Dakota that experience pronounced wet/dry seasonal cycles. The Cheyenne River Basin is in temperate arid climate with an average annual precipitation of 14.1 inches with 79% (11.1”) falling between April and September. The wet and dry seasonal pattern allows for cyclic shrinking and swelling that destabilizes and can destroy foundations, buildings and roadbeds as illustrated in figure 1.



Figure 1: Photograph of parallel, linear heave features associated with heaving bedrock. Heaving bedrock has caused extensive damage in this neighborhood, which overlies near-surface Pierre shale. (Noe, D., Colorado Geological Survey, 1997)



As seen in the heaving bedrock illustrated from Colorado in the above figure, the uplift is not uniform in areas of tilted strata. This situation exists in the Cheyenne River Valley where the Pierre Shale is tilted away from the Buffalo Gap Monocline south of Rapid City. In areas like the Cheyenne River Valley where the Pierre Shale Formation is tilted, heave features are usually dramatic and pose severe engineering limitations to any construction. The following figure illustrates the problem.

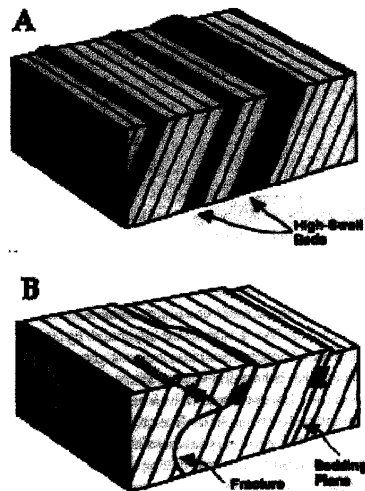


Figure 2: Block diagrams showing different types of heave features associated with heaving bedrock (modified from Noe and Dodson, 1995).

(A) Near-symmetrical heave features formed by differential swelling and/or rebound of individual bedrock layers, each having a different swell potential. This type of heaving results in straight-crested, longitudinal uplift of the ground surface, oriented parallel to bedding strike.

(B) Strongly asymmetrical heave features formed by thrust-like, shear-slip movement along bedding planes or fracture surfaces. The bedding-plane features are straight crested and are oriented parallel to bedding strike, whereas the fracture-plane features have curvilinear crests and may not necessarily be oriented parallel to bedding strike.

These types of differential swelling have caused restrictions on land use and development in areas of Colorado. In 1995 and 1996 ordinances were adopted in Colorado that are used to ensure that proposed development plans overlying the Pierre Shale Formation must consider heaving bedrock hazards.

As stated in section 4.4.5.2 of the DEIS, "In South Dakota and Wyoming, portions of all alternatives cross the Pierre Shale and Fort Union Formations" however, the DEIS does not note the fact that the dipping formations are not horizontal and the DEIS does not recognize the risk. Heaving, shrinking and swelling of a rail line, regardless of the extent, poses a threat to rail bed stability and operational safety. In our professional opinion it will be difficult or impossible to design and construct a new rail bed grade for Alternative B or C that will prevent the hazards associated with heaving shale of the Pierre Shale Formation.

4.4.5.3 Soil Impacts

The Pierre Shale is essentially non-resistant to erosion and is highly susceptible to landslides (Radbruch-Hall et al 1976). The high clay mineral content of these rocks makes exposed surfaces and cuts susceptible to slumps and earth flows, the physical characteristic responsible



for the unique and dramatic landforms in the Badlands. The DEIS states that the impacts of these slumps or slides, both during and after construction, could result in land or habitat disturbance, reduced water quality due to increased dissolved solids, and cause train derailments if a slump or landslide causes damage to the rail bed. In addition to the risks and hazards from slumps and slides, any excavation on this highly erodable formation will erode and create a visual blight on the landscape.

Mitigation needed to stabilize the highly erodable conditions is the subject of brief comments in section 4.4.5.2. of the DEIS. It is our professional opinion that the need for erosion mitigation measures is grossly understated for Alternatives B or C and we must assume that alternatives B & C would result in mass wasting, soil instability, and impairment of waters of the United States. The costs and environmental impacts of the mitigation and the viability of adequate design or appropriate mitigation must be addressed in the final EIS.

4.4.12 History of Rail Travel Safety in South Dakota Related to Bedrock Geology

As mentioned earlier, the bedrock geology of the areas proposed for alternatives B & C are primarily underlain by the Pierre Shale, a geologic unit that is highly erodable and unstable due to heaving, shrinking and swelling. The National Environmental Policy Act requires that reasonably foreseeable events must be analyzed during the environmental review process to determine whether a proposed alternative is suitable and to determine whether mitigation measures are necessary for the chosen alternative. The DEIS avoids the issue of foreseeable events by stating that derailments are unlikely events (Volume III-B, page 4.4-29), however, an analysis of derailments and train accidents that occurred in South Dakota over the past fifteen years show that train accidents and derailments are common along the existing railroad right-of-way that passes over the Pierre Shale. The evidence shows that derailments over the unstable bedrock of the Pierre Shale represent a reasonably foreseeable event if alternatives B or C are chosen.

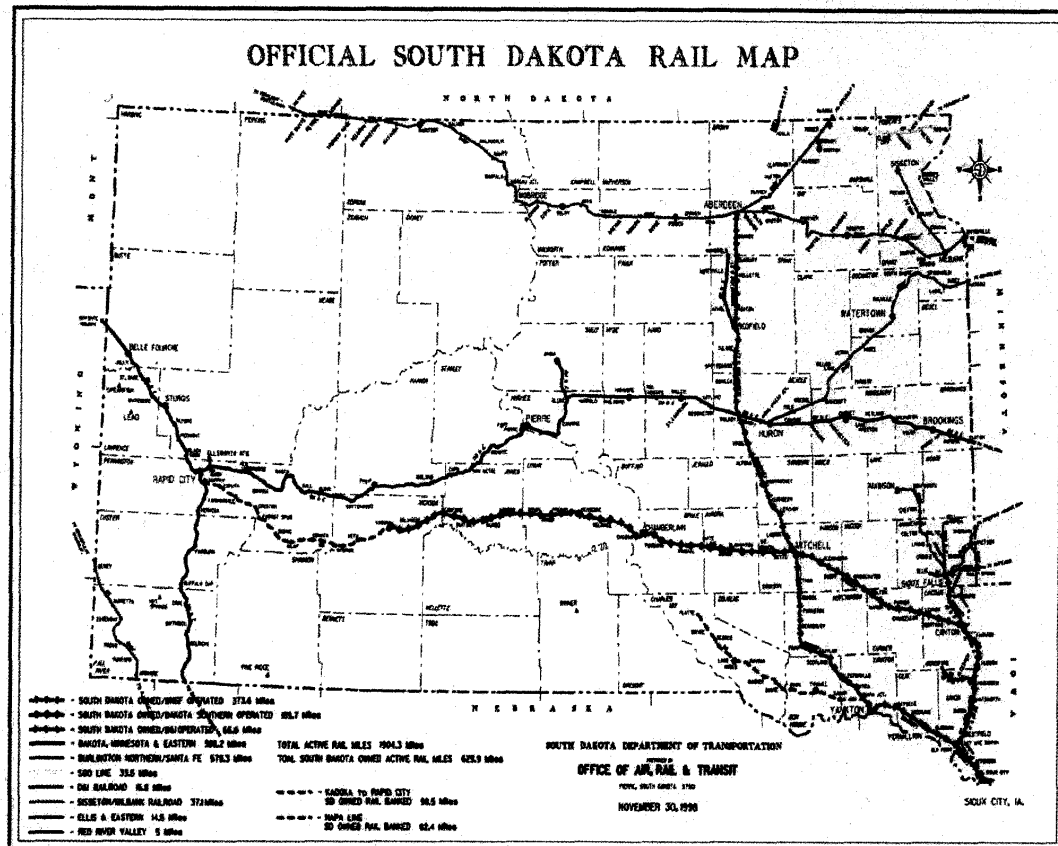
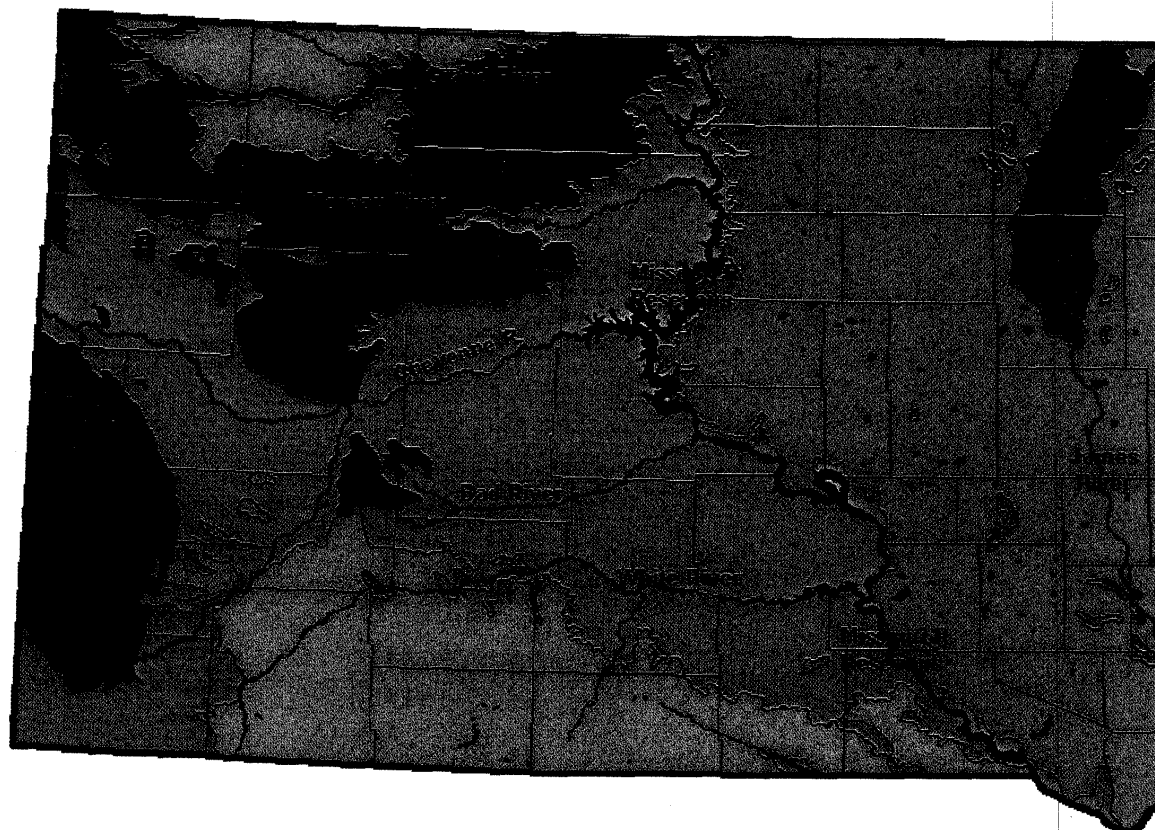


Figure 1: Map of all existing rail lines in South Dakota
(South Dakota Department of Transportation, 11/30/98)



Legend

Paleozoic (limestone, shale, sandstone)	Tertiary (silt, sandstone, clay)	Late Wisconsin Glacial Sediments
Jurassic and Triassic (shale, sandstone, redbeds)	Upper Cretaceous (sandstone, clay)	Glacial Lake Deposit (silt, sand)
Metamorphic Rocks (schist, slate, quartzite)	Upper Cretaceous (shale, chalk)	Illinoian Glacial Sediments
Igneous Rocks (granite, rhyolite, phonolite)	Lower Cretaceous (limestone, shale, sandstone)	Early Wisconsin Glacial Sediments

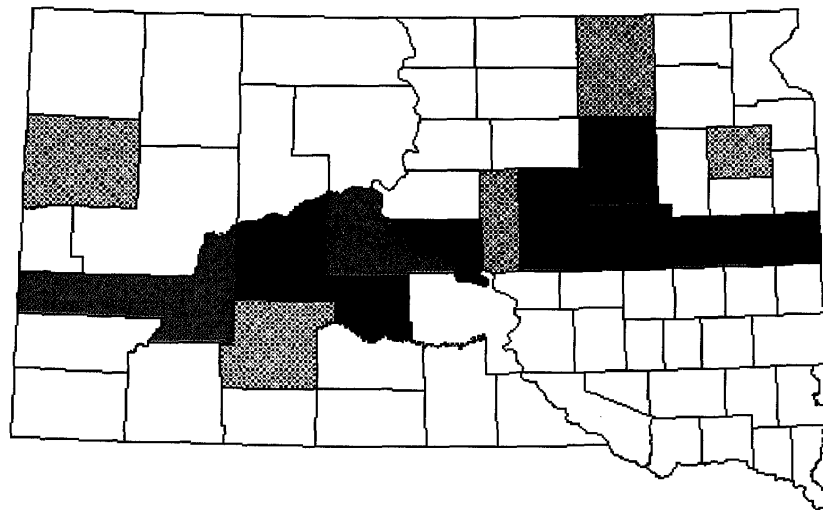
Figure 2: The above figure depicts the first encountered bedrock throughout the state of South Dakota. The area labeled as Upper Cretaceous (shale, chalk) generally refers to the Pierre shale formation. (South Dakota Geological Survey, 2001)



TRAIN ACCIDENTS FOR SOUTH DAKOTA, January 1975 TO November 2000

RAILROAD: Dakota, Minnesota & Eastern Railroad

TYPE OF TRACK: All



Nbr 1 2-3 6-10 11-25 > 25

Excludes Highway Rail Incidents

TRAIN ACCIDENTS BY TYPE AND MAJOR CAUSE BASED ON FORM FRA F 6180.54

**Selections: Railroad - Dakota, Minnesota & Eastern Railroad
State - SOUTH DAKOTA Type of Track - All
Time Frame - From January 1975 To November 2000**

County	Totals				Type of Accident	Causes			
	Accs	Deaths	Inj	Damage		Excessive Speed	Human Error	Other	Unk
HEADQUARTERS	25	0	0	1,306,834	25	4	1	1	12
BROOKINGS	16	0	0	2,076,800	16	1	2	1	1
BROWN	2	0	0	2,100	2	0	1	1	2
BUTTE	1	0	0	21,015	1	0	1	0	0
CODINGTON	1	0	0	7,005	1	0	1	0	0
DAKOTA	16	0	0	1,200	16	2	2	1	1
DEWITT	1	0	0	525	1	0	1	0	0
MINNEHAHA	1	0	0	2,100	1	0	1	0	0
YANKTON	1	0	0	2,100	1	0	1	0	0



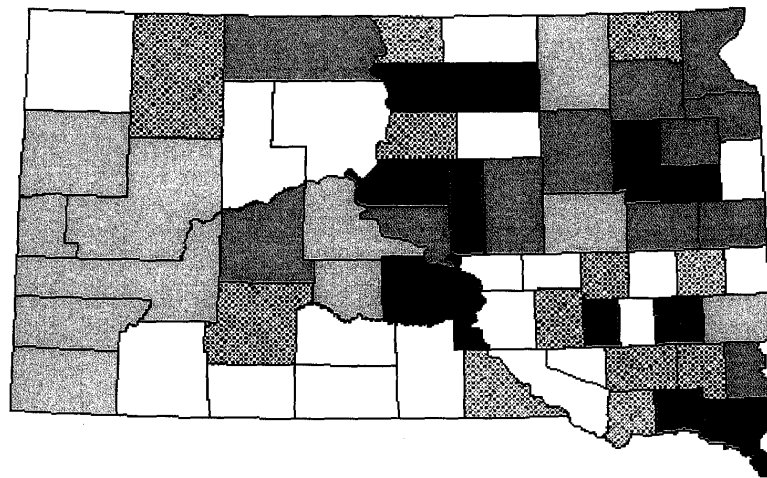
JACKSON	1	0	0	14,015	1	-	-	-	-	1
JONES	17	0	0	942,789	17	-	-	-	-	17
KINGSBURY	9	0	0	265,152	8	1	4	2	-	3
PENNINGTON	46	0	1	2,526,393	45	1	1	5	3	37
SPINK	8	0	0	358,567	8	-	-	2	-	6
STANLEY	40	0	0	1,341,726	39	1	3	-	3	34

Causes: Eqp=Equipment Defect Hmn=Human factor
Sig=Signal Defect Trk=Track Defect Othr=Other
Excludes Highway Rail Incidents

Figure 3: The above map and table shows all rail accidents, excluding highway rail accidents that have occurred on DM&E railroad in South Dakota over the past 15 years. Using the bedrock geology map (Figure 2) you can see that the majority of railroad accidents in the past 15 years have occurred on rail line that is underlain by the Pierre shale formation. Once the rail line crosses the Missouri River and is no longer directly underlain by the Pierre shale the rail accidents decrease. (Federal Railroad Administration, Office of Safety Analysis, 2001)

TRAIN ACCIDENTS FOR SOUTH DAKOTA, January 1975 TO November 2000

RAILROAD: ALL TYPE OF TRACK: All



Nbr 1 2-3 4-5
6-10 11-25 > 25

Excludes Highway Rail Incidents

TRAIN ACCIDENTS BY TYPE AND MAJOR CAUSE BASED ON FORM FRA F 6180.54



Selections: Railroad - ALL
State - SOUTH DAKOTA Type of Track - All
Time Frame - From January 1975 To November 2000

County	Totals				Type of Accident			Causes			
	Accs	Kld	Inj	Reportable Damage	Coll	Der	Othr	Eqp	Hmn	Othr	Trk
AURORA	2	0	0	19,726	-	2	-	-	-	-	2
BEADLE	47	0	0	1,471,643	1	46	-	2	14	2	29
BON HOMME	1	0	0	3,100	-	1	-	-	-	-	1
BROOKINGS	17	0	0	2,147,283	-	16	1	3	2	1	11
BROWN	50	0	3	1,062,825	-	48	2	5	6	1	38
BUTTE	40	0	0	768,139	-	40	-	3	7	4	26
CAMPBELL	1	0	0	7,475	-	1	-	-	-	-	1
CLARK	5	0	0	251,573	-	5	-	-	2	-	3
CLAY	4	0	0	539,550	-	4	-	-	-	-	4
CODINGTON	14	0	0	488,961	1	12	1	1	3	2	8
CORSON	16	0	1	609,147	1	14	1	6	4	-	6
CUSTER	60	0	3	4,855,535	1	54	5	10	1	2	47
DAVISON	5	0	0	223,466	-	4	1	-	1	-	4
DAY	12	0	1	675,736	-	11	1	4	1	1	6
EDMUNDS	9	0	0	241,611	-	8	1	2	2	1	4
FALL RIVER	83	0	2	5,554,911	11	63	9	18	14	7	44
GRANT	16	0	1	1,178,615	-	15	1	5	1	-	10
GREGORY	1	0	0	2,500	-	1	-	-	-	-	1
HAAKON	23	0	0	780,053	-	22	1	4	2	2	15
HAMLIN	7	0	0	380,634	-	7	-	-	-	-	7
HAND	15	0	0	917,460	-	15	-	2	1	1	11
HUGHES	16	0	0	1,068,423	-	16	-	1	1	1	13
HUTCHINSON	2	0	0	127,400	-	2	-	-	-	-	2
HYDE	4	0	0	182,360	-	4	-	1	-	-	3
JACKSON	2	0	0	38,115	-	2	-	-	-	-	2
JONES	37	0	1	1,361,870	-	37	-	3	-	2	32
KINGSBURY	13	0	0	332,527	-	12	1	4	2	-	7
LAKE	1	0	0	128,900	-	1	-	1	-	-	-
LAWRENCE	26	0	1	417,363	-	26	-	1	4	3	18
LINCOLN	12	0	0	568,032	-	12	-	-	-	2	10
LYMAN	7	0	0	169,924	-	7	-	-	-	-	7
MARSHALL	2	0	0	35,134	-	2	-	-	-	-	2
MCCOOK	5	0	0	32,708	-	5	-	-	-	-	5



MEADE	28	0	1	428,700	-	27	1	2	-	2	24
MINNEHAHA	69	0	3	1,897,494	5	62	2	8	14	6	41
PENNINGTON	123	0	3	3,394,666	1	118	4	2	9	11	101
PERKINS	3	0	0	68,300	-	3	-	2	-	-	1
POTTER	2	0	0	8,550	-	2	-	-	-	-	2
ROBERTS	21	0	0	352,893	-	19	2	4	1	1	15
SANBORN	2	0	0	97,800	-	2	-	-	-	1	1
SPINK	25	0	0	1,158,040	-	25	-	4	3	1	17
STANLEY	50	0	0	1,503,212	-	49	1	5	1	4	40
SULLY	4	0	0	36,200	-	4	-	-	-	-	4
TURNER	3	0	0	157,240	-	2	1	-	-	1	2
UNION	6	0	0	504,693	-	6	-	-	1	-	5
WALWORTH	10	0	0	139,737	-	9	1	2	-	1	7
YANKTON	5	0	1	269,262	-	5	-	-	1	-	4

Causes: Eqp=Equipment Defect Hmn=Human factor
Sig=Signal Defect Trk=Track Defect Othr=Other
Excludes Highway Rail Incidents

Figure 4: The above map and table shows all rail accidents, excluding highway rail accidents that have occurred on all railroads in South Dakota over the past 15 years. Using the bedrock geology map (figure 2) you can see that the majority of railroad accidents in the past 15 years have occurred on rail line that is underlain by the Pierre Shale formation. Once the rail line crosses the Missouri River and is no longer directly underlain by the Pierre Shale the rail accidents decrease. (Federal Railroad Administration, Office of Safety Analysis, 2001)

The above maps and tables show a direct correlation between railroad accidents and the occurrence of the Pierre Shale as the first encountered bedrock underlying the rail bed grade in South Dakota. Our analysis indicates that a majority of the railroad accidents that have occurred in the past 15 years have been on tracks underlain by the Pierre Shale indicating that unstable track conditions contributing to rail accidents is a clear and present danger for Alternatives B and C.

Geologic Hazards Associated with Disruption of Natural Landscape

The potential cutting, filling and the static and dynamic loading required to complete either alternative B or C would disrupt the native landscape along the ROW in the Cheyenne River valley. Removal of native and naturalized vegetation along the river valley during construction would destroy the sparse vegetative cover that anchors and dewater the highly erodable and heaving soils exacerbating the geologic risk. Vegetation and landscape design and management are important geotechnical techniques to abate the geologic hazards associated with erosion and swelling because vegetation causes changes in soil moisture conditions. Vegetation management techniques to stabilize erodable and swelling are difficult or impossible to effectively implement in cyclical semi-arid, temperate environments where massive land disturbance is conducted on steep slopes. The drastic changes to topography and vegetation necessary to create a rail bed



grade within the Cheyenne River Valley would cause damage to the land and the vegetation that anchors the soil. The impact to the vegetation may be impossible to rehabilitate. The DEIS does not adequately define the risk nor does the DEIS adequately inventory or describe the existing plant communities nor does the document define the slope restrictions or topsoil requirements to assure that plant salvage, seeding, germination, or growth is adequate to abate the known geologic hazards associated with massive grading.

Construction of the Proposed Alternatives B & C

Construction of either Alternative B or C in the Cheyenne River valley will require major grading including massive cut and fill sections in the geologically unstable Pierre Shale. As stated in the DEIS, section 4.4.5.2, Alternative B (Proposed Action), "The potential for slumps and landslides would be high where this alternative would cross steep slopes or where cutting or loading of slopes or unusually high precipitation events may cause landslides. In South Dakota, approximately 40.8 miles of the Pierre shale formation would be crossed." In order to maintain the proposed engineering constraints of 1-degree maximum curvature and 1 percent maximum grade, cutting and loading will need to be done extensively along the already unstable undisturbed banks of the Cheyenne River valley. Figure 5 illustrates the difficult and imprudent option presented in alternative B and C.

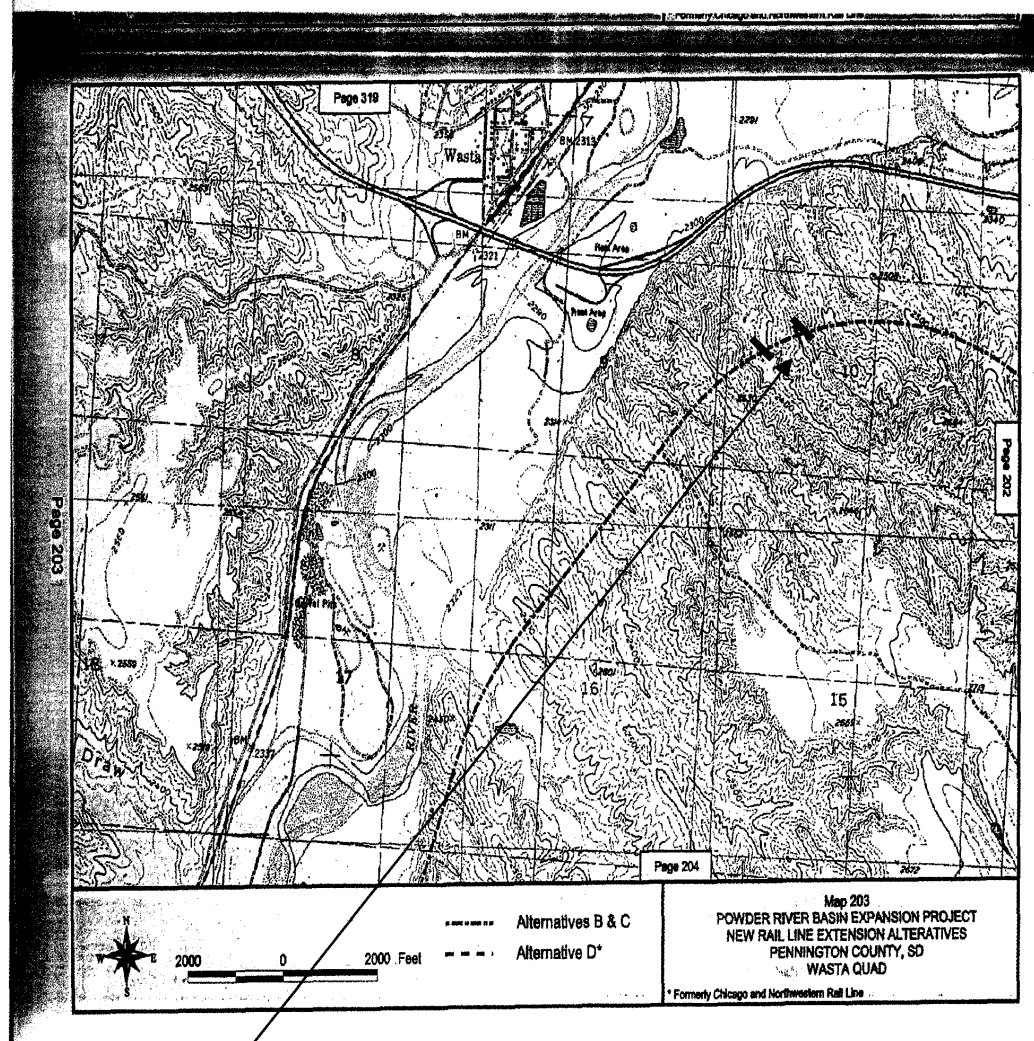


Figure 5: Within this 1000-foot section of proposed rail line in section 10 we find a maximum ground level elevation of 2500' and a minimum ground level elevation of 2360'. With a relief of 140' over 1000' a valley or ravine with a 14% slope must be cut and filled to construct the 1% maximum grade. The Pierre Shale is not suitable material for the fill section and must be over-excavated and re-filled in the cut section making Alternatives B & C unfeasible.

Conclusions

The DEIS does not disclose the amounts of cutting, filling and loading, does not adequately characterize the risk and geologic hazards of construction, does not adequately define the changes to surface hydrology and stormwater runoff that may cause or influence shrinking and



swelling, does not adequately inventory soil and bedrock conditions or the plant communities that serve to stabilize erosion and mass wasting, does not adequately define or characterize the reliability of design or mitigation measures and does not have adequate information for the public or approval agencies to evaluate the environmental impact or environmental risk associated with a new rail bed grade through the Pierre Shale.

The cumulative effect of increased erosion rates, geologic hazards of shrinking and swelling clay and disruption of the native ecosystem and the probability of rail accidents in areas now undisturbed make the feasibility of the construction of Alternatives B and C a rail line through the Cheyenne River valley difficult to comprehend and lead to the conclusion that Alternatives B and C are not feasible or prudent and do not meet the minimum NEPA standards for minimizing environmental impact on the environment or future generations.

Sincerely:

McGhie & Betts Environmental Services, Inc

Jeffrey S. Broberg, CPG, LPG, REM

Vice President

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