BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE PIPELINE PROJECT	)	HP 07-001 **REBUTTAL TESTIMONY OF MICHAEL KOSKI**

Q1. State your name and occupation

A: Michael Koski. Trow Engineering Consultants, Inc., 1300 Metropolitan Boulevard, Suite 200, Tallahassee, Florida, 32308.

Q2. Did you provide direct testimony in this proceeding?

A. Yes

Q3. To whose direct testimony are you responding in this rebuttal testimony?

A. I am responding, in part, to the direct testimony filed by Scott Anderson.

Q4. Which portion of Mr. Anderson's testimony are you responding to?

A. I am responding to Mr. Anderson's statement that the land he rents would not produce because of the heat from the pipeline.

Q5. What is your response to that statement?

A. I do not anticipate that the operation of the pipeline will result in significant effects to soil temperatures. Accordingly, I do not anticipate any significant overall effects to crops and vegetation associated with heat generated by operating the pipeline.

Q.6 Does the relevant research support your opinion?

A. Yes. A review of research concerning the effects of elevated temperatures on crops and vegetation reflects results that are consistent with Keystone's expectations stated above. Table 1 summarizes typical results of some of these studies and is organized according to common vegetation and crop types that will be crossed by the Keystone pipeline. These data provide insight with respect to typical relevant trends. Specific responses of vegetation establishment and success to soil temperature in each study are also influenced by factors such as soil type, soil moisture, land management practices or competition with other vegetation species.

Table 1. Effects of elevated soil temperature on typical vegetation crossed by the Keystone pipeline

Reported Effects of Elevated Soil Temperature on Vegetation.		
Vegetation/Crop Type and Experimental Soil Temperature Range	**Enhanced Growth Effects**	**Negative Growth Effects**
Big bluestem: Tall-grass prairie species (44° to 95° F)[a]	• Earlier germination and emergence. • Faster growth rate. • Higher net photosynthesis. • Greater total biomass. • Strong growth dependence on soil temperature.	• No negative effects reported although optimum soil temperatures for greatest biomass production were 77° F.
Black oak, northern red oak, white oak: Deciduous forest species (65° to 95° F)	• Improved ectomycorrhizal development and root system length.[b] • Root initiation and growth increased with increasing temperatures (55° to 75° F).[c,d] • Root elongation rate linearly related to soil temperature.[e] • Root growth contributing factor to drought resistance.[e]	• None reported, although temperatures above 63° F had less effect on root growth in white oak than did soil water.[e] • Optimal temperatures typically 70° to 80° F.
Various pothole wetland species (41° to 86° F)[f]	• Stem density increased with increasing soil temperature. • Total and annual species richness positively correlated with temperature.	• None reported although perennial species richness was unresponsive to temperature increases.
Corn (50° to 105° F)	• Warmer early-season soil temperatures hasten plant emergence and development.[g] • Optimum germination occurs at soil temperatures of 85° F.[h] • Yield increases with higher soil temperatures at planting (75° to 85° F).[i] • Soil temperatures late in summer less important than air temperature.[i]	• None reported. Effect of high soil temperatures in late summer secondary to effects of high air temperature, low soil moisture, and corresponding drought.

Soybeans (50° to 109° F)	• Optimum soil temperatures for germination is 82° F.[j] • Soybean has competitive advantage over weeds when soil temperatures promote soybean germination.[k]	• None reported. Similar to corn, effect of high soil temperatures in late summer secondary to high air temperature, low soil moisture, and corresponding drought.[l]

a (Delucia et al. 1992); b (Dixon et al. ca 1980); c (Larson 1974); d (Teskey 1978); e (Teskey 1981); f (Seabloom 1998); g (Bollero 1996); h (Parsons 2001); i (Riley 1957); j (Tyagi & Tripathi 1983); k (Berglund & Helms 2003); l (www.ces.ncsu.edu/disaster/drought)

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www.ces.ncsu.edu/disaster/drought. Managing drought-stressed soybeans in the southeast.

Q.7 Will the Keystone pipeline be artificially heated?

A. No.

Q.8 Does that conclude your rebuttal testimony?

A. Yes.

Dated this 14 day of November, 2007.

MICHAEL KOSKI