


Appendix H

Construction Techniques in the Sand Hills Region

Pipeline Construction in

Sand Hills Native Rangelands





TransCanada is committed to restoring the productive capability of all lands disturbed by pipeline construction. We implement a comprehensive program from project planning, through construction, to reclamation and monitoring, in order to ensure that disturbances are reduced as much as possible, and to restore lands crossed by our projects to their pre-construction productivity.

Native rangelands are important ecosystems that support a variety of uses such as livestock grazing, wildlife habitat and recreational opportunities. With over 50 years of experience building and operating pipelines, TransCanada has successfully reclaimed thousands of acres of native rangeland on pipeline rights-of-way throughout North America. Included in these efforts are successful pipeline reclamation projects in the arid native prairie regions of southern Alberta and southwestern Saskatchewan, including areas such as the Great Sand Hills of Saskatchewan.

Although we are experienced at native rangeland reclamation, we recognize that native rangelands within the Sand Hills region of southern South Dakota and central Nebraska creates unique challenges.

The Sand Hills are an extensive and biologically significant ecoregion encompassing approximately 23,000 square miles in South Dakota and Nebraska. Soils are typically sandy and fragile, forming blowouts and bare dunes where vegetation is not properly managed. The Sand Hills are not a uniform landscape, but a collection of diverse habitats that vary from exposed wind-swept ridges and blow outs, to areas of soil deposition on the windward side of hills, with wet meadows and alkali lakes in valley bottoms.

During project scoping, TransCanada engaged in discussions with several regional experts on Sand Hills ecology and restoration at universities and government agencies, including experts at the University of Nebraska, the University of South Dakota, the Natural Resources Conservation Service (NRCS) and state road departments.



Best Management Practices

The following best management practices will be applied to the Keystone XL Project.

Right-of-Way Siting

- Incorporate minor route re-alignments through the Sand Hills region.
- Attempt to locate the right-of-way in areas of higher soil moisture and greater soil structure while avoiding wetlands to the maximum extent possible.
- Re-alignments will typically remain within the overall 300-foot study corridor.

Right-of-Way Construction

Note: The construction right-of-way will be 110-feet wide, with a 50-foot permanent easement and a 60-foot temporary construction easement.

- Provide training to construction crews and establish and apply an Access Control Plan in the Sand Hills to minimize impacts to this sensitive ecosystem. TransCanada will ensure that the plan considers: timing of construction, the reduction of traffic volumes, restriction of equipment and vehicle types, and alternative mitigation measures to address site-specific issues.
- Avoid disturbance of the fragile soils and native vegetation, to the extent practicable.
- Conduct topsoil salvage in all areas where grading and excavation occurs. Topsoil shall be conserved and stored separately from subsoil, typically in long windrows adjacent to the trench. Protect topsoil piles from erosion through the use of best management



practices such as applying water, matting, mulch or tackifier. Once the pipe has been laid, subsoil will be returned to the trench, and topsoil re-spread to the original contour of the land for reclamation.

Right-of-Way Reclamation

- Revegetate the right-of-way in areas of native rangeland by using native seed adapted to the Sand Hills. Use seed mixes that have been developed with input from the local NRCS offices and through collaboration with regional experts. Adjust seed application rates accordingly to complement the application methods, seed bed and terrain constraints.
- Ensure all seed is certified noxious weed free and calculated on a pure live seed (PLS) basis.
- Use straw or native prairie hay as mulch, applied to the right-of-way and crimped into the soil to prevent wind erosion. Ensure all mulch is documented as noxious weed free. Annual cover-crops may also be used to provide a vegetative cover to control erosion.
- Consider use of hodder gaugers or imprinters to create impressions in the soil, reducing erosion, improving moisture retention and creating microsites for seed germination.
- Use sediment logs (straw wattles) where appropriate to manage soil erosion issues in place of slope breakers (short terraces) that are constructed of soil.
- Apply photodegradable matting on steep slopes or areas prone to extreme wind exposure such as north- or west-facing slopes and ridge tops. Use biodegradable pins in place of metal staples to hold the matting in place.
- Take into consideration soil, vegetative and regional moisture constraints, and the landowner's livestock grazing management to evaluate the need to implement fencing of the right-of-way from livestock to hasten vegetation re-establishment. Incorporate management concerns such as livestock access to water or movement within a pasture into any decisions. Compensate landowners for any grazing restrictions experienced due to fencing.



Post Construction

- TransCanada is committed to post-construction monitoring and repair. Revegetation with native species typically requires several growing seasons to become fully established. We will monitor reclamation on the right-of-way for several years and repair areas of failure. During monitoring, we will make sure landowners are informed of our efforts and intentions.
- Noxious weeds are a concern for landowners and TransCanada. We have developed noxious weed management plans specific to each state crossed by our project. These plans have been developed in consultation with state and county experts. We are committed to preventing the spread of noxious weeds via the right-of-way. In areas such as the Sand Hills, we may implement alternative or less invasive control measures to reduce effects to the sensitive ecosystem.
- TransCanada will work with landowners to prevent unauthorized use of the right-of-way by ensuring that fences are adequately replaced and any new access roads established for construction are removed and reclaimed.

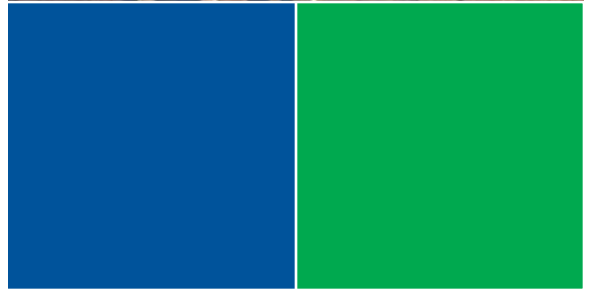
Pipeline Construction in Sand Hills Native Rangelands

About the Proponents

The Keystone Pipeline is a partnership between TransCanada and ConocoPhillips. TransCanada affiliates will construct and operate the pipeline.

ConocoPhillips is an international, integrated energy company with interests around the world. Headquartered in Houston, Texas, the company has approximately 32,600 employees and \$178 billion in assets. For more information, go to www.conocophillips.com.

TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure including natural gas pipelines, power generation and gas storage facilities. TransCanada's network of wholly owned pipelines extends more than 36,500 miles (59,000 kilometres), tapping into virtually all major gas supply basins in North America. TransCanada is one of the continent's largest providers of gas storage. TransCanada owns or has interests in approximately 10,900 megawatts of power generation in Canada and the United States. For more information, go to www.transcanada.com.



United States Department of State 4.3.1

Reference: Keystone XL Project Environmental Report
Soils

Request:

Can you confirm if experts from the University of Nebraska were consulted relative to the approach to construction in the Sand Hills area? Does the approach to construction in the Sand Hills area accommodate any changes to local climate? Are the proposed construction and restoration methods within the Sand Hills terrain still appropriate if during the life of the pipeline system, average rainfall in the Sand Hills area substantially increases or substantially decreases in response to climate change? Will grasslands in the Sand Hills be restored with native grasses?

Response:

Yes, experts at the University of Nebraska were consulted in July 2008 with regard to construction and reclamation in the Sandhills (see attached spreadsheet). University scientists who were consulted for the project included Dr. Jerry Volesky, Dr. Dave Wedin, and Dr. David Loope. Scientists at South Dakota State University were also contacted and included Dr. Alexander Smart and Dr. Eric Mousel. Mr. Gabe Robertson of the Nebraska Department of Roads was contacted on July 17, 2008, and again on April 28, 2009 regarding reclamation procedures the highway department uses in the Sandhills. Suggestions from university scientists and the Nebraska Department of Roads were incorporated into the draft Sandhills Construction/Reclamation Unit, a site specific-reclamation plan that itemizes construction, erosion control, and revegetation procedures in the Sandhills (see attached writeup).


Following consultation with university scientists and the Nebraska Department of Roads, a meeting was held with Michael Kucera, the State Resource Conservationist with the NRCS, in Lincoln, Nebraska, on November 17, 2008. Mr. Kucera was provided with the draft Sandhills Construction/Reclamation Unit for review and discussion. Minor revisions were made to the draft Sandhills Construction/Reclamation Unit to incorporate Mr. Kucera's input. A follow-up meeting with Mr. Kucera was held in June 2010, following release of the DEIS, for additional discussions regarding reclamation in the Sandhills and other parts of Nebraska.

Native perennial grass species will be used to revegetate the Sandhills and other native vegetation types that will be crossed by the project. Native grass species that will be used in the seed mix include those that were recorded during pedestrian surveys of the project, and that have been recommended by the NRCS, university scientists, and the Nebraska Department of Roads. These species have evolved in the central Great Plains and are adapted to the climate extremes that have occurred in the past and may occur again in the future. Should long-term precipitation

patterns in the Sandhills continue to change and vary, vegetation on the project would adapt similarly to vegetation in areas adjacent to the project.

Name	Title/Position	Association	Phone	Relative Experience with Sand Hills	Correspondence
Dr. Jerry Volesky	Associate Professor - Range and Forage Specialist	University of Nebraska Cooperative Extension	308-696-6710	Grazing management and systems research at the Gudmundsen Sandhills Laboratory	left mesg 7/14, he left mesg w me 7/15, spoke over phone on 7/15 12:30pm
Dr. Dave Wedin	Grasslands Ecologist	University of Nebraska - School of Natural Resources	402-472-9608 (o) 402-730-8543 (c)	Principal investigator on the Sand Hills Biocomplexity project	left mesg 7/14, spoke over phone on 7/17 2:30pm
Dr. Geoffrey M. Henebry	Senior Scientist, Professor	South Dakota State University	605-688-5351	Co-investigator on the Sand Hills Biocomplexity project	left mesg 7/15 - spoke over phone on 7/21
Dr. David Loope	Geosciences Professor	University of Nebraska	402-472-2647	Co-investigator on the Sand Hills Biocomplexity project	left mesg 7/15, spoke over phone on 7/17
Dr. Alexander "Sandy" Smart	Assistant Professor, Range Scientist	South Dakota State University	605-688-4017		spoke over phone on 7/15 3pm
Dr. Eric Mousel	Assistant Professor, Range Livestock Production Specialist	South Dakota State University	605-688-5455	Use to work at University of NE, has family that live in the Sand Hills	spoke over the phone on 7/18 2:30pm
Bob Atkenson	Area Engineer	NRCS - Holt County, Nebraska	402-336-3796	Has worked on sand blowout repair	left mesg 7/17 with receptionist, spoke over phone 7/17 at 3pm
Gabe Robertson	Highway Environmental Programs Specialist (Roadside Stabilization)	Nebraska Department of Roads	402-479-4685		spoke over phone on 7/17 10am – asked that I send an email, sent email on 7/17 10am, sent info. over email on 7/18 2pm

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SH
KEYSTONE XL STEELE CITY**

UNIT NAME:	SANDHILLS	
UNIT CODE:	SH	
UNIT DESCRIPTION:	Native prairie on sandy soils dominated primarily by warm- season grasses such as little bluestem, big bluestem, sand bluestem, prairie sandreed, and sideoats grama. Steep slopes are common. Soils are very fine and extremely prone to wind erosion.	
UNIT LOCATION:	The Sandhills occupy approximately 23,000 square miles primarily central Nebraska and limited areas of southern South Dakota. Keystone XL project cross the northeastern corner of the Sandhills primarily in Rock, Holt, Garfield, and Wheeler counties, Nebraska.	
UNIT GOALS:	<ul style="list-style-type: none"> • Maintain soil structure and stability to the greatest extent practicable. • Stabilize slopes to prevent erosion. • Restore native grass species. • Maintain wildlife habitat and livestock grazing production. • Complete all work to standards specified in the CMR Plan, contract documents and Details, applicable permits, easement descriptions, and Keystone’s satisfaction. 	
SPECIAL CONSIDERATIONS:	<ol style="list-style-type: none"> 1. Incorporate supplementary construction and reclamation procedures that may be provided by Keystone. 2. The ROW has been sited to avoid ridgetops and blowouts to the extent practicable. 3. Utilize tracked equipment or low-ground-pressure equipment to the maximum extent practicable on steep slopes or in areas with minimal vegetation cover. 4. Minimize grading and side-slope cuts to the maximum extent practicable. 5. Stabilize topsoil salvage piles with bio-degradable tackifier. 6. Apply straw or native hay mulch for erosion control after clean-up as directed by Keystone. 7. Install erosion control matting after regrading as specified by Keystone. Install erosion control matting over native hay mulch as specified by Keystone. In some areas, tackifier may be used in place of matting if approved by Keystone. 8. Permanent slope breakers are not anticipated unless specifically directed by Keystone. 9. Do not decompact the ROW unless specifically directed by Keystone. 10. Seed mix will be applied in two procedures with a drill <u>and</u> broadcast seeder in some locations as described under Seeding Method, Seed Mix and Rate. 11. Final cleanup, erosion control, and reseeding must be within 10 miles of mainline backfilling operations or as soon as practicable as determined by Keystone. 12. The ROW will not be utilized for access or project traffic following final cleanup within this Con/Rec Unit. 13. Fence revegetated ROW from livestock where necessary as directed by Keystone. 14. Install windfence to minimize wind at ridge tops and windward facing slopes as directed by Keystone. 	
CONSTRUCTION		
ROW WIDTH:	Typically 110 feet. Note that 200 feet of ROW has been identified in many areas within this type to allow for spoil storage in hilly terrain. Do not utilize the additional workspace unless necessary and directed by Keystone.	
CLEARING:	As specified in the CMR Plan. <u>ADDITIONAL REQUIREMENTS:</u> <ol style="list-style-type: none"> 1. Do not clear more than 110 feet of ROW unless directed by Keystone. 2. Leave root crowns and root structures in place to the maximum extent practicable. 	
TOPSOIL SALVAGE:	As specified in the CMR Plan to maintain the topsoil resource and reclamation potential. <u>ADDITIONAL REQUIREMENTS:</u> <ol style="list-style-type: none"> A. Utilize trench and working salvage (Detail 54) on slopes less than 5% where shown on Alignment Sheets or as directed by Keystone. B. Where grading is necessary, salvage topsoil from entire area to be graded (Detail 53). C. Salvage topsoil horizon at depths as shown on Alignment Sheets or as directed by Keystone. D. Stabilize topsoil salvage piles with bio-degradable tackifier as directed by Keystone. 	

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SH
KEYSTONE XL STEELE CITY**

TRENCHING:	As specified in the CMR Plan. <u>ADDITIONAL REQUIREMENTS:</u> A. Anticipate trenchwall instability. B. Insure that topsoil (salvaged or unsalvaged) is not lost to trench caving.
BACKFILL, DECOMPACTION AND REGRADING:	As specified in the CMR Plan to avoid slumping over the trench and match adjacent topography. <u>ADDITIONAL REQUIREMENTS:</u> A. Do not decompact the ROW (subsoil or topsoil) unless specifically directed by Keystone. B. Avoid scalping of undisturbed topsoil on the ROW when backfilling spoil and redistributing stockpiled topsoil. C. Final cleanup, erosion control, and reseeding must be within 10 miles of mainline backfilling operations or as soon as practicable as determined by Keystone.
TEMPORARY EROSION CONTROL:	As specified in the CMR Plan to limit dust, prevent off-site sedimentation or erosion, and accelerated erosion on the ROW. <u>ADDITIONAL REQUIREMENTS:</u> A. Stabilize topsoil salvage piles with biodegradable tackifier as directed by Keystone. B. Install other erosion control to prevent erosion within the ROW, and off-ROW impacts as directed by Keystone. C. Maintain and/or reinstall erosion control features to ensure proper function at all times.

RECLAMATION

SEEDBED PREPARATION:	As specified in the CMR Plan. <u>ADDITIONAL REQUIREMENTS:</u> A. Additional seedbed preparation may be necessary within this Con/Rec Unit at Keystone direction. B. Cultipack or roll ROW to firm topsoil prior to reseeding as authorized by Keystone. C. Hodder gouger or other imprinter may be used to create microsites for seed germination and lessen the effects of wind erosion as directed by Keystone. D. Composted manure may be used where and as directed by Keystone. Fresh manure is not acceptable.
SEEDING METHOD, SEED MIX AND RATE:	As specified in the CMR Plan. See Detail 70 for a description of seeding procedures and approved equipment. <u>ADDITIONAL REQUIREMENTS:</u> A. Where topography allows drill seeding, seed will be applied in two applications. The first application will be completed with an approved drill seeder using half the seed mix shown below; the second application will be completed with an approved broadcast seeder using the remaining half. Where topography is too steep or loose to operate a drill seeder, the entire seed mix will be applied using an approved broadcast seeder. B. Seed will be provided by Keystone and managed by the Contractor. The Contractor will store seed in a dry, secure location. C. The Contractor will store any unused seed in a dry, secure location and notify Keystone as to the seed's disposition. Keystone may elect to change the storage location. D. The SH seed mix will be applied at locations shown on the Alignment Sheets or as directed by Keystone. E. Use a chain to cover broad-cast seeded areas. Do not use a harrow to cover broadcast-seeded areas in the Sandhills unless directed by Keystone. Use of a harrow may bury seed too deeply. F. <u>Cover crop:</u> To aid in managing wind and water erosion potential, an annual cover crop (perennial ryegrass (var. Linn), a Keystone-approved annual grass/crop, or QuickGuard) may be seeded per Keystone direction.

**CONSTRUCTION/RECLAMATION UNIT SPECIFICATIONS: SH
KEYSTONE XL STEELE CITY**

		Sandhills (SH) Seed Mixture			BROADCAST SEEDING RATE ¹	
					Pounds PLS/Acre	
SCIENTIFIC NAME	COMMON NAME	VARIETY ²				
GRASSES:						
<i>Agropyron smithii</i>	Western wheatgrass	Barton, Rodan, Rosana	5.00	-	12	
<i>Andropogon hallii</i>	Sand bluestem	Champ, Garden County, Goldstrike	4.00	-	12	
<i>Bouteloua curtipendula</i>	Sideoats grama	Butte, Pierre, Trailway	3.00	-	14	
<i>Bouteloua gracilis</i>	Blue grama	Bad River	1.00	-	20	
<i>Calamovilfa longifolia</i>	Prairie sandreed	Goshen, Pronghorn	2.00	-	13	
<i>Eragrostis trichodes</i>	Sand lovegrass	Nebraska 27	0.40	-	13	
<i>Elymus canadensis</i>	Canada wildrye	Source identified	5.00	-	13	
<i>Lolium perenne</i> ³	Perennial ryegrass	Linn	3.80	-	20	
<i>Schizachyrium scoparium</i>	Little bluestem	Camper, Pastura	3.00	-	18	
<i>Panicum virgatum</i>	Switchgrass	Blackwell, Pathfinder, Nebraska 28	1.50	-	15	
TOTAL			28.70	-	150	
¹ Based on a broadcast seeding rate of approximately 150 Pure Live Seed (PLS) per square foot; total PLS/sq ft does not include perennial ryegrass which is used as a companion crop. Seed rates will be halved where drill seeding is used. ² These varieties are from Univ. of Nebraska-Lincoln Ext. Circ. 120; other named varieties listed by the USDA-NRCS in Nebraska are acceptable. ³ Perennial ryegrass may be used as a companion crop where additional erosion control is required or mulching is not possible. NOTE: Species or rates may be revised based on commercial availability or site-specific conditions.						
NRCS RECOMMENDED SEEDING DATES:	November 1 to June 30, depending on climatic conditions. These dates may be altered at Keystone direction. Seeding outside these dates may be allowed with Keystone approval.					
MULCHING AND MATTING:	As specified in the CMR Plan at locations shown on Alignment Sheets or as directed by Keystone. Refer to Detail 4 for erosion control matting, Detail 47 for weed free native hay or straw mulch. Cornstalks may be used for mulch with Keystone approval. ADDITIONAL REQUIREMENTS: A. All portions of the Project within this Con/Rec Unit will receive a companion crop and either straw mulch, cornstalk mulch, and/or erosion control matting at locations shown on Alignment Sheets or as directed by Keystone. B. Erosion control matting may be applied over native hay or straw mulch as directed by Keystone. C. Biodegradable pins approved by Keystone will be used in place of metal staples to anchor erosion control matting within this Con/Rec Unit. D. Areas where erosion control matting has been installed will be fenced to prevent livestock access as directed by Keystone.					
SLOPE AND TRENCH BREAKERS:	Slope breakers are not anticipated in this Con/Rec Unit unless specifically directed by Keystone since most erosion is caused by wind rather than water. Trench breakers will be installed where directed by Keystone.					
MANAGEMENT PRACTICES						
<ol style="list-style-type: none"> 1. Fence the revegetated ROW from livestock use as directed by Keystone. 2. Provide for livestock and wildlife access across the trench at locations convenient to livestock and the landowner as practicable per the CMR Plan. 3. Construction and reclamation practices may be modified from those presented to suit site conditions or permit requirements with Keystone approval. 4. Monitor revegetation and soil stability post construction. Areas of failed reclamation will be repaired. 5. Monitor and control noxious weeds as specified in the Nebraska and South Dakota Noxious Weed Management Plans. 						