

EXECUTIVE SUMMARY

GOAL

The team of **Kadrmās Lee & Jackson (KLJ)** and **Rooney Engineering, Inc. (REI)** was commissioned by the State of North Dakota to develop a feasibility study for three (3) alternative routes to transport crude oil volumes from west-central North Dakota to one of three TransCanada/Keystone transcontinental distribution pipelines. These North Dakota Pipeline route alternatives are West to Keystone XL Pipeline in southeastern Montana, East to Keystone Pipeline in eastern North Dakota, and North to TransCanada Pipeline in southern Saskatchewan, Canada. The three alternative routes are shown on the next page. The following is a summary of the report findings.

METHODOLOGY

Two (2) sized pipeline systems were evaluated, a 10-inch and a 12-inch nominal diameter, for the each of the three (3) route alternatives to transport crude oil (light, sweet) to market from central North Dakota. The following were prepared for each of the alternatives:

- Route Selection based upon North Dakota production data.
- Hydraulic Modeling based upon North Dakota crude parameters
- Capital Cost Estimates.
- Economic Analysis (tariff required to generate a 15% Internal Rate of Return (IRR) shipping 55,000 BPD over a 20 year period)
- Interface Volume (the volume of mixing that occurs between the light Bakken crude and the heavier more viscous Canadian crude)

OUTCOME

The following table summarizes the system length, capital cost and tariff and interface for each of the alternatives.

Route	North		East		West	
Pipeline Length	169 miles		240 miles		188 miles	
System	10"	12"	10"	12"	10"	12"
System Capital Cost	\$195MM	\$199MM	\$242MM	\$252MM	\$210MM	\$215MM
Pipeline Cost/Mi	\$602M/Mi	\$698M/Mi	\$621M/Mi	\$715M/Mi	\$615M/Mi	\$707M/Mi
Ops Cost (\$/BBL)	\$0.26/BBL	\$0.19/BBL	\$0.31/BBL	\$0.21/BBL	\$0.26/BBL	\$0.21/BBL
Tariff @ 15% IRR	\$4.24/BBL	\$4.22/BBL	\$5.25/BBL	\$5.32/BBL	\$4.59/BBL	\$4.57/BBL
Interface Volume	18.5MBBL		10.9MBBL		20.8MBBL	
	<i>Interface volume per batch shipped on Keystone/TransCanada pipelines</i>					

Based upon the study findings the 12-inch Northern alignment appears to be the preferred alternative. The 12-inch North alternative is the most economic alternative with the most potential for future throughput increases. In addition, the North alignment is routed through the more prolific crude production areas both South and North of the border. Lastly, the North alignment has potential to interconnect with the Enbridge Mainline and the Enbridge Alberta Clipper through southern Saskatchewan in addition to the TransCanada System.

North Dakota Pipeline Feasibility Study

Legend

Stations

- Origin Stations
- Pump Stations
- Termination Stations
- Unloading Locations
- West Alternative MP
- North Alternative MP
- East Alternative MP

West Alternative
North Alternative
East Alternative
TransCanada Pipeline

