Kadrmas Lee & Jackson
Engineers Surveyors Planners

North Dakota Industrial Commission
Crude Oil Pipeline Feasibility Study
Bakken to Keystone Pipeline System

ROONEY ENGINEERING, INC.

April 15, 2009

CRUDE OIL PIPE PIPELINE FEASIBILITY STUDY
BAKKEN TO KEYSTONE PIPELINE SYSTEM

Prepared for
NORTH DAKOTA INDUSTRIAL COMMISSION

April 15, 2009

Prepared by:

Kadrmas Lee & Jackson
677 27th Ave. E
Dickinson, ND 58602
Phone: 701-483-1284
Fax: 701-483-2795
Jerry Krieg – Natural Resources Group Leader
Jerry.Krieg@kljeng.com

Rooney Engineering, Inc
12201 E Arapahoe Road, C-10
Centennial, CO 80112-3918
Phone: 303-792-5911
Fax: 303-792-0227
Dean Shauers, PE – President
dean.shauers@rooney-eng.com

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1.0 BACKGROUND

The United States portion of the Williston Basin is currently producing more than 267 thousand barrels of oil per day (267 MBPD). Of that, North Dakota is producing over 186MBPD. Eastern Montana is producing approximately 75 MBPD and South Dakota is producing approximately 5 MBPD.

The Williston Basin crude oil produced in the United States currently has four transportation options as follow:

True Oil Pipeline to Guernsey, WY (115 MBPD Capacity)
Enbridge ND Pipeline System to Clearbrook, MN (162 MBPD Capacity by 2010)
Tesoro Pipeline System to Mandan, ND (58 MBPD Refinery Capacity)
Railroad Transport (18 MPBD Current Capacity)

It is estimated that by the end of 2008 approximately 55 MBPD could be transported out of North Dakota by use of tank car.

The North Dakota Pipeline Authority actively supports and encourages a variety of expansion options, including:

1. Expanding Existing Pipeline Infrastructure
2. Construction of new Pipeline Systems
3. Expansion of existing Refinery Capacity
4. Construction of new Refining Facilities
5. Construction of alternative Transportation Methods such as rail loading

2.0 SUMMARY

The team of ***Kadrmas 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 pipelines as described as follows.

North to TransCanada Pipeline in southern Saskatchewan, Canada

East to Keystone Pipeline in eastern North Dakota

West to Keystone XL Pipeline in southeastern Montana

The route origination locations were selected based on the areas of highest initial production tests and production trends. The routes are shown in Appendix A.

The results of this study include route selection, hydraulic modeling, line sizing, capital cost estimates, and economic evaluation for each of the three alternative routes. In addition, the study provides a project schedule and estimates of anticipated crude batch interface volumes (the mixing of North Dakota crude oil with other crude oils on Keystone/TransCanada pipelines).

All of the alternatives used a design basis formulated around the United States Department of Transportation (USDOT) pipeline code 49CFR195. In addition, the operations and maintenance

expenses include expenses for the safety requirements promulgated by code and industry standards (i.e. One Call locates bi-weekly aerial survey, etc).

Two pipeline sizes, 10-inch and 12-inch nominal diameters for the system were investigated to determine which would provide the most economical combination of construction costs and operation costs to transport a targeted 55 MBPD (thousands of barrels per day). While the 12" system requires two (2) pump stations (Originating and Midpoint Booster) to transport the targeted 55 MBPD, the 10" system requires four (4) pump stations to transport the same 55 MBPD. In both the 10" and 12" system cases, the East route is the longer route. The 10" pipeline system has limited capacity to go beyond the 55 MPBD flow rate, especially on the East route. In contrast, the 12-inch system can accommodate a 55 MBPD flow rate with the two pump stations (Originating and Midpoint Booster), and then with the addition of two (2) more mainline pump stations (1/4 Point and ¾ Point Booster Stations) has the expanded capability to move an ultimate 95 MBPD.

The Capital Cost, Annual Operating Costs, and resulting Tariffs associated with each line size, to accommodate 55MBPD, are summarized as follows:

Table 1 -- Pipeline Options Associated Costs

System	Route	Capital Cost	Annual Operating Cost	Tariff ($/bbl)
10"	North	$ 195,313,700	$ 5,236,000	$4.24/BBL
	East	$ 242,034,800	$ 6,233,000	$5.24/BBL
	West	$210,509,200	$ 5,834,000	$4.59/BBL
12"	North	$ 198,768,400	$ 3,726,000	$4.22/BBL
	East	$ 251,816,700	$ 4,193,000	$5.32/BBL
	West	$ 215,096,700	$ 4,120,000	$4.57/BBL

Note: Tariff is based on a rate of return of 15% on 55 MBPD over a 20 year life.

An additional analysis was conducted on the tariff based upon a 10% rate of return and found that the tariff for the 12" North Case would be $3.49/BBL. This analysis was once again based upon a flow rate of 55 MBPD over 20 years.

The estimated cost to expand the 12" system to 95 MBPD is estimated at $31-million capital cost for quarter point stations plus additional storage tank capacity. The annual power cost would increase by $3,000,000.

In terms of interface, approximately 4-8% of the system crude oil would intermix in transport on the pipelines of the Keystone/TransCanada systems to Wood River, Illinois.

Economic analyses for a 20 year project life of both the 10" & 12" diameter line size alternatives, indicates the 12" system to be the optimal line size.

3.0 ROUTE SELECTION

In accordance with the Request for Proposals (RFP), three routes were reviewed in this study to interconnect with the Keystone/TransCanada Pipeline systems in Montana, Canada and North Dakota. Optimal starting locations in west-central North Dakota for the study pipeline system, for each of the three routes, were determined from both initial well production test data and discussions with the State of North Dakota staff. The resulting pipeline routes are shown in Appendix A of this report.

Approximate starting and ending points and pipeline lengths for each of the three route options are as follows:

NORTH ALTERNATIVE – Plaza, ND to Whitewood, Saskatchewan Canada (169 miles)

EAST ALTERNATIVE – Plaza, ND to Niagara, ND (240 miles)

WEST ALTERNATIVE – Stanley, ND to Fallon, MT (188 miles)

4.0 HYDRAULICS

4.1 DESIGN PARAMETERS

The design parameters for the hydraulic analysis of the pipeline are as follows:

- Flow rate – 55 MBPD
- System MOP – 1480 psig
- ANSI Rating - 600
- Pipeline Minimum Allowable Pressure – 50 psig
- Flowing Temperature – 20°F and 60°F
- Crude Oil Viscosity – 3 centistokes
- Crude Oil Specific Gravity – 0.82
- Pipeline Route Elevation Profiles are shown on hydraulic graphs in Appendix C

4.2 10-INCH LINE HYDRAULICS

Hydraulic data for the 10-inch line option provided in Appendix C is summarized below. Each of the four (4) pipeline pump stations along each pipeline route require a maximum discharge pressure of 1480 psig, to move the target flow of 55 MBPD of crude oil. These pump stations are at the Origin, Quarter Point, Mid-point, and Three-Quarter Point locations. In addition, two (2) in-route Truck Unloading Injection stations are designed for 1480 psi discharge pressure, to provide flexibility as to where the targeted 55 MBPD flow rate enters the pipeline system for each route option. Based on pump sizes and hydraulics, the horsepower (HP) required for each of the stations for each alternative is as follows:

4.2.1 North Alternative (Keystone/TransCanada – S.K., Canada)

Origination Station	1,280 HP
Quarter Point Station	1,240 HP
Mid Point Station	1,240 HP
Three Quarter Point Station	1,140 HP
Truck Rack Injection Station w/ 5.5 MBPD (2 stations)	300 HP
TransCanada Delivery Station w/ 750 MBPD delivery	2,100 HP
Total System Horsepower	7,300 HP

4.2.2 East Alternative (Keystone – Niagara, ND)

Origination Station	1,760 HP
Quarter Point Station	1,590 HP
Mid Point Station	1,660 HP
Three Quarter Point Station	1,760 HP
Truck Rack Injection Station w/ 5.5 MBPD (2 stations)	300 HP
Keystone Delivery Station w/ 750 MBPD delivery	2,300 HP
Total System Horsepower	9,370 HP

4.2.3 West Alternative (Keystone XL - Fallon, Montana)

Origination Station	1,430 HP
Quarter Point Station	1,390 HP
Mid Point Station	1,430 HP
Three Quarter Point Station	1,430 HP
Truck Rack Injection Station w/ 5.5 MBPD (2 stations)	300 HP
Keystone XL Delivery Station w/ 1 MMBPD delivery	3,200 HP
Total System Horsepower	9,180 HP

To accommodate necessary pump discharge pressures a pipeline Maximum Operating Pressure (MOP) of 1480 psig (ANSI Class 600) was selected. This takes into consideration potential pressure surge in the pipeline in the event flow is quickly stopped. The specific type of pipe selected is 10.75-inch outside diameter (OD), API-5L Grade X-56 pipe with a minimum wall thickness of 0.203 inches, to achieve the required MOP of the system.

4.3 MAXIMUM CAPACITY – 10" SYSTEM

With the use of larger pump motors, the maximum capacity of the 10-inch line with four (4) mainline pump stations for each route alternative would be as follows:

Maximum Flow Rates

Route Alternative	@ 60°F	@ 20°F
North Route	63.8 MBPD	63.4 MPBD
East Route	55.6 MBPD	55.5 MPBD
West Route	62.4 MBPD	61.9 MBPD

4.4 12-INCH LINE HYDRAULICS

Hydraulic data for the 12-inch line option provided in Appendix C is summarized as follows. Each of the two (2) pipeline pump stations for each route require a maximum discharge pressure of 1480 psig to move the target flow of 55MBPD of crude oil. These

pump stations are at the Origin and Mid-point. In addition, two (2) in-route Truck Unloading Injection stations are designed for 1480 psi discharge pressure, to provide flexibility as to where the targeted 55 MBPD flow rate enters the pipeline system for each route option. Based on pump sizes and hydraulics, the horsepower (HP) required for each of the stations for all thee alternatives are as follows:

4.4.1 North Alternative (Keystone/TransCanada – S.K., Canada)

Origination Station	1,000 HP
Mid Point Station	1,060 HP
Truck Rack Injection Station w/ 5.5 MBPD (2 stations)	300 HP
TransCanada Delivery Station w/ 750 MBPD delivery	2,300 HP
Total System Horsepower	4,660 HP

4.4.2 East Alternative (Keystone – Niagara, ND)

Origination Station	1,310 HP
Mid Point Station	1,430 HP
Truck Rack Injection Station w/ 5.5 MBPD (2 stations)	300 HP
Keystone Delivery Station w/ 750 MBPD delivery	2,300 HP
Total System Horsepower	5,340 HP

4.4.3 West Alternative (Keystone XL - Fallon, Montana)

Origination Station	1,210 HP
Mid Point Station	1,220 HP
Truck Rack Injection Station w/ 5.5 MBPD (2 stations)	300 HP
Keystone XL Delivery Station w/ 1 MMBPD delivery	3,200 HP
Total System Horsepower	5,930HP

To accommodate necessary pump discharge pressures a pipeline Maximum Operating Pressure (MOP) of 1480 psig (ANSI Class 600) was selected. This takes into consideration the potential pressure surge in the pipeline in the event flow is quickly stopped. The specific type of pipe selected is 12.75-inch outside diameter (OD), API-5L Grade X-60 pipe with a minimum wall thickness of 0.219 inches, to achieve the required MOP of the system.

Maximum & Ultimate Capacities – 12" System

With the use of larger pump motors, the maximum capacity of the 12-inch line with the two (2) mainline pump stations for each of the alternative would be as follows:

Maximum Flow Rates

Route Alternative	@ 60°F	@ 20°F
North Route	71.1 MBPD	70.7 MPBD
East Route	61.6 MBPD	61.4 MPBD
West Route	68.4 MBPD	68.1 MBPD

With the use of four (4) mainline pumps stations and still larger pump motors, ultimate capacities of the 12-inch pipeline are as follows:

Ultimate Flow Rates

Route Alternative	@ 60°F	@ 20°F
North Route	98.5 MBPD	97.9 MPBD
East Route	86.6 MBPD	86.3 MPBD
West Route	95.4 MBPD	95.0 MBPD

Based on this analysis the 12-inch diameter pipeline system provides more expansion capability at very little incremental capital cost and lower operating cost.

5.0 COST ESTIMATES

5.1 Overall Capital Costs are presented in Appendix B and summarized below.

Table 2 – System Capital Costs – ($-millions)

System		10”			12”	
Route	**North**	**East**	**West**	**North**	**East**	**West**
Pipeline	$102	$149	$115	$118	$172	$133
Stations	$53	$53	$55	$41	$40	$42
Tanks	$39	$39	$39	$39	$39	$39
SCADA	$1	$1	$1	$1	$1	$1
Totals	**$195**	**$242**	**$210**	**$199**	**$252**	**$215**

5.2 PUMP STATION

5.2.1 The Originating Pump Station includes a truck unloading receipt system and three (3) storage tanks. Pumping is supplied by a 200-hp vertical centrifugal tank booster pump with spare pump and two (2) in-series horizontal centrifugal mainline 1000-hp pumps with a spare pump.

5.2.2 The Booster Station(s) do not include either truck unloading receipt systems or storage. Pumping is supplied by the same mainline pump configuration as at the Originating Station: two (2) in-series horizontal centrifugal mainline 1,000-hp pumps with a spare pump.

5.2.3 Truck Unloading and Injection Station (2 each). Each Truck Unloading Injection Station has a truck rack receipt system, one (1) storage tank, and a 200-hp positive displacement (PD) pump, with one spare pump.

5.3 STORAGE TANK

Storage capacity at the Originating Station is based on the tankage of one (1) days receipts plus three (3) days down time. Storage capacity for the Truck Unload Stations is based on the tankage of one (1) days receipts plus three (3) days down time. The storage capacity for the terminal station is based on storing one (1) batch of crude oil destined for Keystone/TransCanada (275,000 barrels) plus three (3) days down time. A summary of the storage tank parameters are as shown below:

Table 3 – Storage Tanks

Station type	Originating	Truck Injection	Terminal	Total
Number of tanks	3 each	1 each x 2	4 each	9
Tank size (feet)	40 x 110	36 x 90	48 x 140	NA
Shell capacity/tank (BBL's)	68,000	40,800	132,000	NA
Total Working Capacity	162,000	32,000	440,000	666,000
Total Shell Capacity (BBL's)	204,000	40,800	528,000	813,600
Cost/Station ($-million)	$ 11.0	$ 3.3	$ 22.0	$39.6

5.4 Electrical Power

Capital costs are as follows:

Table 4 – Electrical Power Capital Cost (4-million)

Route	North	East	West
10" System	$ 1.9	$ 1.6	$ 2.0
12" System	$ 1.8	$ 1.4	$ 1.9

Annual Power costs for 55MBPD are as follows:

Table 5 – Annual Electrical Power Costs ($-million)

Route	North	East	West
10" System	$2.27	$3.15	$2.83
12" System	$1.19	$1.53	$1.54

6.0 KEY ESTIMATE ASSUMPTIONS

Assumptions used in this study's capital cost estimates are listed in Appendix F.

6.1 Key assumptions include the following:

- Summer Construction only, in one summer
- All major equipment on site at the beginning of construction
- Multiple construction contractors simultaneously working multiple sites
- All costs and equipment delivery lead times as of 2009 1st Quarter

7.0 ECONOMIC ANALYSIS

Discounted cash flow internal rate of return (DCF-IRR) economic analysis of each of the alternatives are included in Appendix D. The economic analysis is developed, to establish the tariff in US dollars per barrel for transport of 55 MPBD. The resultant shipping tariff prices, for each alternative, are as follows:

Table 6 – Pipeline System Tariffs

System	Route	$/BBL
10”	North	$4.25/BBL
	East	$5.24/BBL
	West	$4.59/BBL
12”	North	$4.22/BBL
	East	$5.32/BBL
	West	$4.57/BBL

Cautionary Note: Any new pipeline system may have difficulty in competing with the existing transportation pipelines in the area, in the event crude oil production falls below a point to support multiple area pipeline transportation alternatives available to shippers. Existing systems have been depreciated over a number of years, and as such do not require the larger capital repayment required of a new system. Alternatively a new pipeline system would have the advantage of new technology and metallurgy, allowing the new system to run more efficiently with fewer failures, less maintenance, and a higher degree of reliability.

Operating Costs

The yearly operating costs account for personnel wages and benefits, personnel vehicles, personnel communications, satellites, power, DOT inspection (when applicable), and insurance. All costs were assessed in March 2009 and the economics assume 3% inflation per year for the life of the pipeline. For the base and ultimate case scenarios it was assumed that an existing operator would construct own and operate the pipeline. As such management and control center operations were assumed to be in place and does not need to be replicated for this pipeline.

Ultimate Flow Case - The economics for the 12” Ultimate Flow case (i.e. four pump stations discharging maximum flow) were prepared for the North Alternative. The expanded capital cost for the system is estimated at $229MM. The incremental cost includes the quarter point pump stations and additional tankage to accommodate the 95 MBPD. A tariff of $2.93/BBL would be required to generate a 15% Rate of Return on the Ultimate Flow Case. The details for the North 12” Ultimate flow case are shown in Appendix H.

Independent Operator Case – The economics for the 12” Northern Route base case (i.e. 55 MBPD with only origination and mid-point booster stations) were prepared as if the pipeline was run by a newly formed independent operator. A tariff of $4.30 was required to generate a 15% Rate of Return. This increase in tariff is due to additional personnel, office space, and SCADA equipment which were assumed to already be in the possession of a major pipeline operator in the base case scenarios. The details for the Northern Route 12” Independent Operator flow case are shown in Appendix I

8.0 PROJECT SCHEDULE

The proposed project schedule for the alternative pipeline systems is presented in Appendix E. The project schedule start dates were adjusted for each route alternative in order to allow for a May 15 construction start. This would allow the full summer construction season to be afforded to construction. In brief, the schedule is the same for both the 10" and 12" systems and each of the three route alternatives: North, East, & West:

- **Year 1 – Design, Permit, Acquire ROW**
- **Year 2 -- Define, Order, and Obtain Equipment** (major equipment has up to 50 week delivery lead time from placement of order)
- **Year 3 – Construct** (summer)

9.0 INTERFACE MIXING

Pipelines typically operate on either a 'lot' or a 'fungible' basis. In 'lot operations', a specific volume of fluid is accepted for shipment and the identity of the liquid is maintained throughout the transportation process; the same material that was accepted for shipment at the origin is delivered at the destination. In 'fungible operations,' the pipeline operator delivers material that has the same product specification, but not the material of origin. Most pipelines prefer to operate in fungible service because it is more efficient (both operationally and economically) and offers more operational flexibility.

The Keystone/TransCanada Pipeline System transports a diversity of crude oils ranging from light sweet-crude to heavy sour-crude with varying physical and chemical properties. These crudes are typically placed into and transported (or batched) through the pipeline sequentially by density, sulfur content, and viscosity (batch sequence) in recurrent cycles. Pipeline operators, like Keystone / TransCanada, typically use recurring monthly schedule of 'cycles', shipping all available crude oils of the same type in sequence (batch cycle). These cycles typically range from five (5) to fifteen (15) days in duration depending on both upstream supply and downstream demand and storage capacities. The mode of operation, batch cycle, and batch size are set by Keystone/TransCanada pipeline, and reflect the upstream supply and demand for crude oil on a monthly basis by the shipper (usually a refiner) and negotiated contractual obligations.

Typically, crude oils are placed into the pipeline system as distinct batches, and while transiting the pipeline, mixing occurs at the interface boundary between the batches. The composition of this mixture or 'interface' reflects the relative placement of the batch in the sequence and combined physical and chemical characteristics of fluids on either side of the batch. Optimum batch sequencing reduces contamination or 'downgrade' of the different crude batches.

The volume of interfaces between batches varies with the pipeline's (listed in order of effect) inside pipe diameter, total length (transit), flow rate, and physical and chemical properties. In general, the larger the inside pipe diameter, the longer the pipe length, and the higher the viscosity, the larger the volume of interface will be generated. The calculation is particularly sensitive to the internal diameter of the pipeline. In addition to the creation of the interface that occurs in pipeline transit, creation of interface also occurs at pipeline facilities (station piping) and from changes in operating conditions.

The volume of interface generated depends on the size and frequency of the batches. The shipment of small frequent batches generates significantly more interface than larger less frequent batches and requires less tankage, and visa versa.

Specific Batch Schedule information was not available from TransCanada. As a result an assumption was made that one batch would be injected into the TransCanada system every five (5) days. The primary reasoning for the assumption was made in an effort to mitigate the interface volume and the cost of tankage. In increasing the batch volume to 275,000 barrels, the proportional amount of interface was reduced. The minimum established batch size on the TransCanada system is 100,000 barrels.

An estimation of the volume and characteristics of the interface generated between a batch of North Dakota crude oil (Bakken) and the lowest possible quality crude transported (accepted) down the Keystone/TransCanada pipeline was completed for each alternative pipeline route (North Dakota Study Pipeline Terminus to Wood River, Illinois). The results and details of the evaluation are summarized in Appendix G, Interface Volume - Characteristics Summary and Calculation Data.

The evaluation shows that the magnitude of the 'downgrade' (expressed as a percentage of the total batch volume) varies with the size of the batch, the physical and chemical properties of the downstream batch (Table G2.), and pipeline attributes (Table G3.). An estimate of the batch interface volume (the volume of North Dakota crude oil downgraded by such batch operations) is as follows, for each route alternative:

North Alternative Interface Volume	18,500 Barrels
East Alternative Interface Volume	10,900 Barrels
West Alternative Interface Volume	20,800 Barrels

These volumes reflect the interface volumes generated by simple pipeline transit only (steady-state, turbulent flow).

Crude oils including the interface generated during transport are valued by quality (e.g., true boiling point distillation, density, sulfur content, Reid vapor pressure, asphaltene content, paraffin content, etc.) and are price-adjusted by a discount to a specific quality crude 'marker' or 'benchmark' crude (e.g., West Texas Sweet). Price differentials are also affected by location, supply, and market conditions including refining capacities and efficiencies. A barrel of sweet light crude (0.14% sulfur, 38 API) is intrinsically worth more than a barrel of heavy sour crude (2.8% sulfur, 23 API gravity) because it will yield more high-value gasoline, diesel, and jet fuel without intensive refining.

The valuation and disposition of interface is highly variable and depends on the mode of operation of the pipeline, the amount and quality of interface generated, the negotiated commercial terms between the producer or marketer and carrier and refiner, the types and amounts of crude oils being received at the terminus, and the prevailing market conditions. The interface may be either mixed with the lower-quality crude oil or blended into a larger and higher-valued stream. The ratio of the two (blend) will be determined to ensure the key quality indicators are within boundary limits of the 'marker' crude. Specific tariff information with respect to interface management was not available from TransCanada.

The dilution of a hypothetical Bakken / heavy sour interface by the body of the batch (Bakken batch volume less interface volume) is summarized in Table G.4. The results of the dilution of the interface followed by Bakken in a 100,00 barrel tank is summarized in Table G.5, The properties of the resulting mixture in Table G.5 might may still be considered sweet light-crude, depending on the definition or 'marker' crude being used.

10.0 ROUTE ALTERNATIVE POSITIVE AND NEGATIVE ATTRIBUTES

The following positive and negative attributes, for each study pipeline route alternative, are based upon physical, environmental or political constraints of individual routes.

Table 7 – Route Positive & Negative Attributes

North Alternative

Positive Attributes	Negative Attributes
Shortest Route	Requires State Department as lead agency, for US/Canadian Border Crossings
Least Expensive Alternative	Requires Canadian Regulatory Approvals
Follows geographic trend of Bakken production	Relatively Large Interface Volume
Highest Maximum Throughput	Relatively large number of water obstacles
Allows for interconnection to Enbridge mainline and Alberta Clipper in Canada	
Allows Canadian Bakken Crude Shipment	

East Alternative

Positive Attributes	Negative Attributes
Entirely within the State of North Dakota	Longest Route
Relatively Small Interface Volume	Most Expensive Alternative
	Relatively large number of water obstacles
	Lowest Maximum Throughput
	Route Quickly Exits the Producing Areas

West Alternative

Positive Attributes	Negative Attributes
Relatively small number of water obstacles	Relatively Large Interface Volume
Relatively Few Road Crossings	Requires BIA Regulatory Approvals
Parallels an existing pipeline corridor	Crosses National Grasslands
Allows for production to be gathered south of the Missouri River	Higher Delivery Flow Rate required to deliver at 1.0 MMBPD to Keystone XL Pipeline
	Higher Energy Consumption

11.0 ABBREVIATIONS & TECHNICAL TERMS

- AFE - Authorization For Expenditure
- AFUDC – Accumulation of Funds Used during Construction (i.e. interest on construction loan)
- ANSI – American National Standard Institute
- ANSI Class 600 – pressure fittings, valves, and pipe rated for up to 1480 operating pressure
- Barrel – 1 US barrel = 42 US gallons.
- ARO – After Receipt of Order
- Batch – one uniform shipment of fluid moving down a pipeline, removed form a pipeline, or injected into a pipeline
- API – American Petroleum Institute
- API-5L – the API standard regulating petroleum line pipe
- API 653 – standard for periodic testing and maintaining a crude oil storage tank
- As-builts – drawings showing how a facility exists after construction

- Bakken crude – a type of crude recovered in west central North Dakota
- BBLS - Barrels
- BPD – barrels per day flow rate
- Bldg - Building
- Booster Station – pump station to help move fluid already in a pipeline further down the line
- BPD - Barrels Per Day
- CP - Cathodic Protection
- cTs or cs – centistokes; a measure of fluid viscosity
- CY or Cu Yd – cubic yards
- DCF-IRR – Discounted Cash Flow – Internal Rate of Return
- DOT – Department of Transportation
- Dwg - Drawing
- HDD – horizontal directional drill
- HP – horsepower
- HLAS – high level alarm switch, a switch which sends a signal when the liquid level in tank reaches a pre-determined high level
- HVAC – heating, ventilation, and air conditioning system
- Hydraulic gradient – graph of how much the pressure inside a pipeline drops, due to friction
- ILI - In-Line Inspection with Instrumented Scraper
- Interface – mixed volume which forms in a pipeline between two dissimilar batches of fluid
- Injection Station – additional fluid is added into a pipeline going past the station
- LACT – lease automated custody transfer
- L.F. – linear feet
- Line fill – the volume needed to fill a pipeline
- M – Thousand
- MACRS - Modified Accelerated Cost Recovery System
- MCC - Motor Control Center
- MBPD – thousands of barrels per day flow rate
- Mils – a measure of thickness, usually for paint or other coating – 1 inch = 1,000 mils
- MM - Million
- MMBPD – millions of barrels per day flow rate
- MOP – maximum operating pressure allowed for a pipeline
- MP – mile post
- MPG - Miles per Gallon
- MPY - Miles per Year
- NDE – non-destructive examination
- NPV - Net Present Value
- OD – outside diameter
- Originating Pump Station – the pump station at the beginning of a pipeline
- P&ID - Piping & Instrumentation Diagram
- PFD – Process Flow Diagram
- PL and P/L – pipeline
- PLC - Programmable Logic Controller
- Potential surge – a momentary increase in pipeline pressure, travelling as a wave down the full pipeline at the speed of sound in the fluid of the pipeline fill
- PS – pump station
- psi – measure of pressure, pounds per square inch
- ROR - Rate of Return
- ROW – Right-of-Way
- SCADA – supervisory control and data acquisition, allows equipment to be control remotely

- S.G. or SG – Specific gravity
- Tank Heal – the liquid volume at the bottom of a tank which is usually left in the tank, when a tank is emptied to its lowest working level
- VFD - Variable Frequency Drive
- Viscosity – the resistance of a fluid to shear (deformation)
- X-ray – a method for checking for weld defects
- $M – thousands of dollars
- $MM – millions of dollars
- % S -- Percent sulfur by weight

12.0 APPENDICES

A	Map -- Pipeline Route Alternatives
B	Capital Costs
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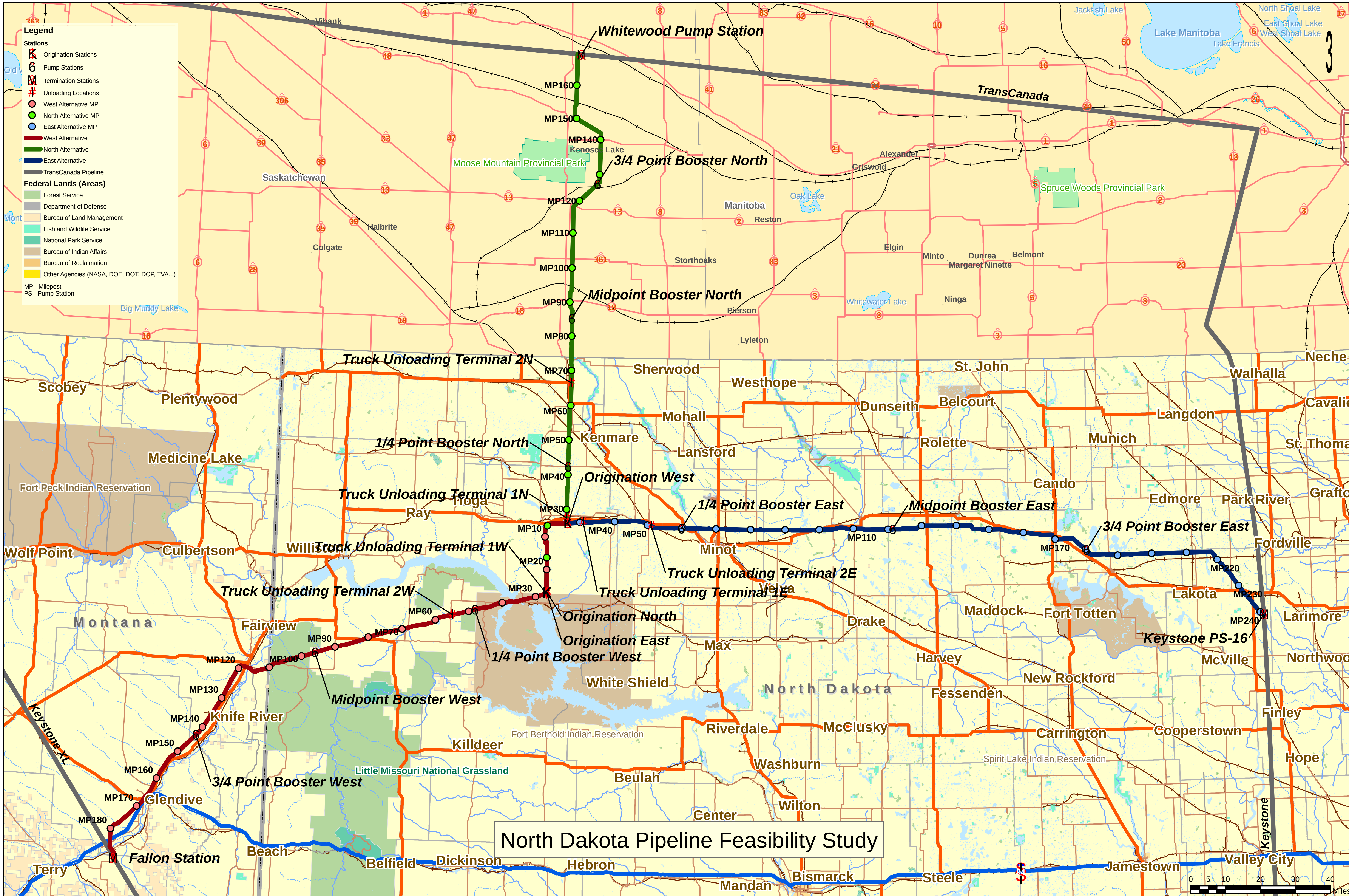
H	Ultimate Flow – 12” System
I	Independent Operator Case

APPENDIX A

Maps
Pipeline Route Alternatives

Appendix A

Map -- Pipeline Route Alternatives


North Dakota Pipeline Feasibility Study
3
Legend
Stations
Origination Stations
Pump Stations
Termination Stations
Unloading Locations
West Alternative MP
North Alternative MP
East Alternative MP
West Alternative
North Alternative
East Alternative
TransCanada Pipeline
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
MP - Milepost
PS - Pump Station
Whitewood Pump Station
MP160
MP150
MP140
3/4 Point Booster North
MP120
MP110
MP100
MP90
Midpoint Booster North
MP80
Truck Unloading Terminal 2N
MP70
MP60
MP50
1/4 Point Booster North
MP40
Origination West
Truck Unloading Terminal 1N
MP30
MP10
MP20
Truck Unloading Terminal 1W
Truck Unloading Terminal 2W
MP30
Origination North
Origination East
1/4 Point Booster West
MP60
MP70
MP90
MP100
MP120
Midpoint Booster West
MP130
MP140
MP150
3/4 Point Booster West
MP160
MP170
MP180
Fallon Station
MP40
MP50
1/4 Point Booster East
Truck Unloading Terminal 2E
Truck Unloading Terminal 1E
MP110
Midpoint Booster East
MP170
3/4 Point Booster East
MP220
MP230
MP240
Keystone PS-16
TransCanada
Keystone XL
Keystone
Saskatchewan
Manitoba
Montana
North Dakota
Moose Mountain Provincial Park
Spruce Woods Provincial Park
Fort Peck Indian Reservation
Fort Berthold Indian Reservation
Spirit Lake Indian Reservation
Little Missouri National Grassland
Lake Manitoba
Vibank
Halbrite
Colgate
Kenosee Lake
Reston
Storthoaks
Pierson
Lyleton
Alexander
Griswold
Oak Lake
Elgin
Minto
Dunrea
Belmont
Margaret Ninette
Ninga
Whitewater Lake
Big Muddy Lake
Jackfish Lake
North Shoal Lake
East Shoal Lake
West Shoal Lake
Lake Francis
Scobey
Plentywood
Medicine Lake
Wolf Point
Culbertson
Fairview
Williston
Ray
Tioga
Sherwood
Westhope
Mohall
Kenmare
Lansford
Minot
Velva
Max
Drake
White Shield
Riverdale
McClusky
Washburn
Wilton
Center
Beulah
Killdeer
Knife River
Glendive
Terry
Beach
Belfield
Dickinson
Hebron
Mandan
Bismarck
Steele
Jamestown
Valley City
St. John
Dunseith
Belcourt
Rolette
Cando
Munich
Langdon
Walhalla
Neche
Cavalier
St. Thomas
Edmore
Park River
Grafton
Fordville
Lakota
Larimore
Maddock
Fort Totten
Harvey
Fessenden
New Rockford
McVille
Northwood
Finley
Carrington
Cooperstown
Hope
0 5 10 20 30 40
Miles

3

Whitewood Pump Station

TransCanada

MP160

MP150

MP140

MP130

3/4 Point Booster North

MP120

MP110

MP100

MP90

Midpoint Booster North

MP80

MP70

Truck Unloading Terminal 2N

Bowbells

MP60

MP50

1/4 Point Booster North

MP40

MP30

Truck Unloading Terminal 1N

MP20

MP10

Origination North

Kenosee Lake

Moose Mountain Provincial Park

Saskatchewan

Manitoba

North Dakota

Oak Lake

Spruce Woods Provincial Park

Alexander

Griswold

Carberry Junction

Reston

Halbrite

Colgate

Storthoaks

Elgin

Minto

Margaret

Dunrea

Ninette

Belmont

Whitewater Lake

Ninga

Pierson

Lyleton

Portal

Westby

Fortuna

Crosby

Divide

Burke

Sheridan

Grenora

Alamo

Williams

Roosevelt

Bainville

Williston

Ray

Epping

Mountrail

Ward

McKenzie

Richland

Little Missouri National Grassland

Fort Berthold Indian Reservation

Sherwood

Antler

Loraine

Bowbells

Tolley

Kenmare

Renville

Mohall

Westhope

Souris

Bottineau

Maxbass

Kramer

Gardena

Overly

Rolette

Grano

Upham

Willow City

Glenburn

Carpio

Minot AFB

Deering

Des Lacs

Minot

Surrey

Granville

Towner

Rugby

Knox

Wolford

Leed

Pierce

McHenry

Balta

Benson

Maddock

Ryder

Drake

Fort Totten

St. John

Hansboro

Sarles

Belcourt

Dunseith

Calvin

Rolette

Towner

Cavalier

Perth

Mylo

Bottineau

0 3.5 7 14 21 28 Miles

North Dakota Pipeline Feasibility Study
North Alternative

Legend

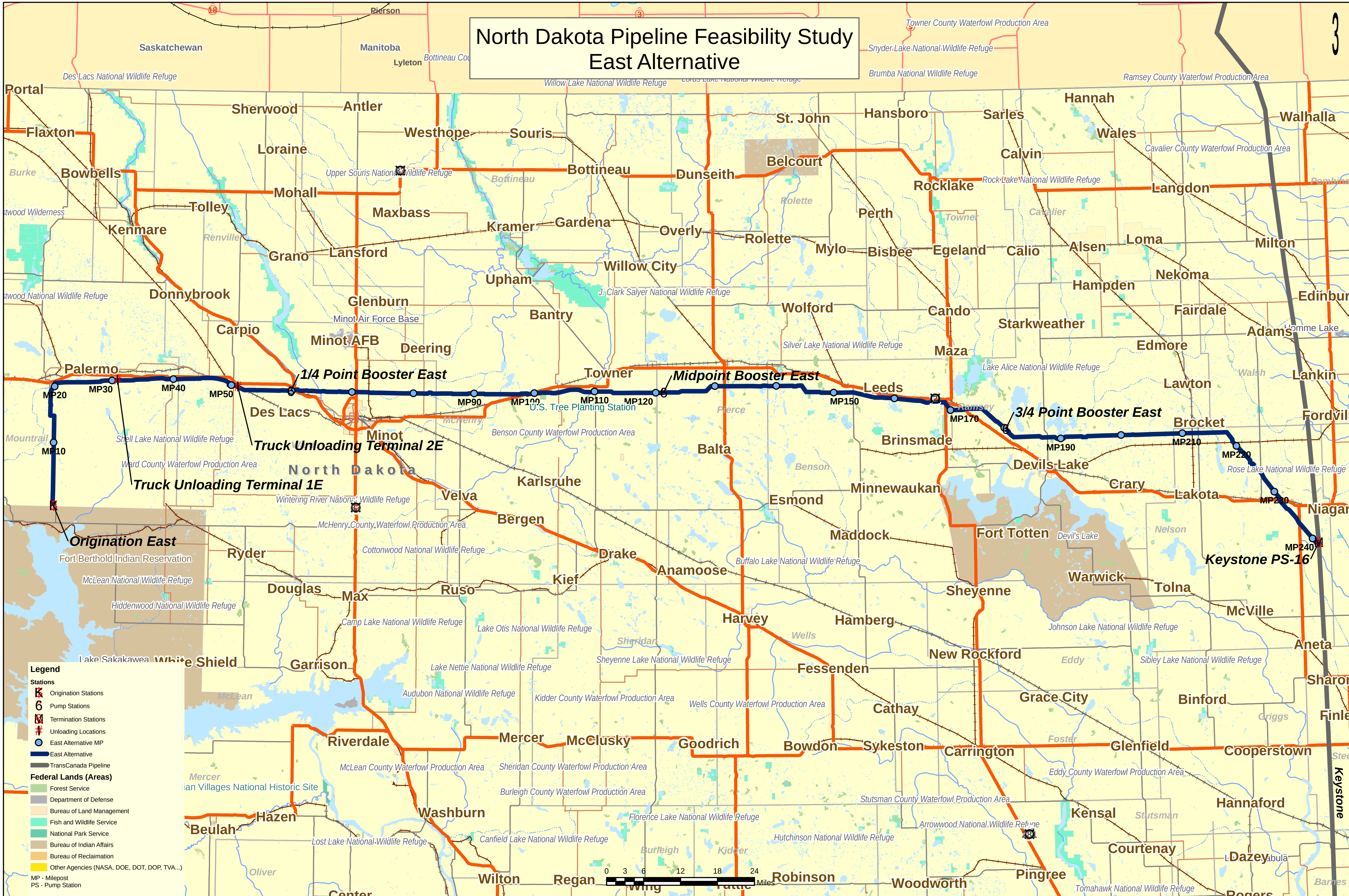
Stations

- Origination Stations
- Pump Stations
- Termination Stations
- Unloading Locations
- North Alternative MP
- North Alternative
- TransCanada Pipeline

Federal Lands (Areas)

- Forest Service
- Department of Defense
- Bureau of Land Management
- Fish and Wildlife Service
- National Park Service
- Bureau of Indian Affairs
- Bureau of Reclaimation
- Other Agencies (NASA, DOE, DOT, DOP, TVA...)

MP - Milepost
PS - Pump Station



North Dakota Pipeline Feasibility Study
East Alternative
3
Origination East
Truck Unloading Terminal 1E
Truck Unloading Terminal 2E
1/4 Point Booster East
Midpoint Booster East
3/4 Point Booster East
Keystone PS-16
MP10
MP20
MP30
MP40
MP50
MP90
MP100
MP110
MP120
MP150
MP170
MP190
MP210
MP220
MP230
MP240
North Dakota
Saskatchewan
Manitoba
Keystone
Legend
Stations
Origination Stations
Pump Stations
Termination Stations
Unloading Locations
East Alternative MP
East Alternative
TransCanada Pipeline
Federal Lands (Areas)
Forest Service
Department of Defense
Bureau of Land Management
Fish and Wildlife Service
National Park Service
Bureau of Indian Affairs
Bureau of Reclamation
Other Agencies (NASA, DOE, DOT, DOP, TVA...)
MP - Milepost
PS - Pump Station
0 3 6 12 18 24 Miles

North Dakota Pipeline Feasibility Study
West Alternative

3

Fort Peck Indian Reservation

Roosevelt

Poplar

Brockton

Culbertson

Bainville

Williston

Williams

Lake Sakakawea

Stanley

Palermo

Ross

MP10

Origination West

Shell Lake National Wildlife Refuge

MP20

Mountrail

McCone

Fort Union Trading Post National Historic Site

Truck Unloading Terminal 1W

MP40

MP30

Plaza

Truck Unloading Terminal 2W

MP50

1/4 Point Booster West

Parshall

Richland

Fairview

Alexander

Arnegard

MP70

MP60

Four Bears Village

New Town

MP80

Watford City

Fort Berthold Indian Reservation

McLean National Wildlife Refuge

MP90

Rawson

McKenzie

Fox Lake

Sidney

MP100

Midpoint Booster West

MP120

MP110

Mandaree

Richey

McLean

Montana

Montana

North Dakota

Theodore Roosevelt Wilderness

North Dakota

MP130

MP140

Knife River

3/4 Point Booster West

Little Missouri National Grassland

Dunn

Dunn Center

Killdeer

Halliday

Dodge

Mercer

MP150

Dawson

MP160

West Glendive

MP170

Glendive

Wibaux

Billings

Golden Valley

Keystone XL

Wibaux

Prairie

Theodore Roosevelt National Park

Stark

Beach

Sentinel Butte

Medora

Belfield

South Heart

Dickinson

Taylor

Fallon

Fallon Station

0 2 4 8 12 16 Miles

Richardton

Hebron

Legend

Stations

- Origination Stations
- Pump Stations
- Termination Stations
- Unloading Locations
- West Alternative MP
- West Alternative
- TransCanada Pipeline

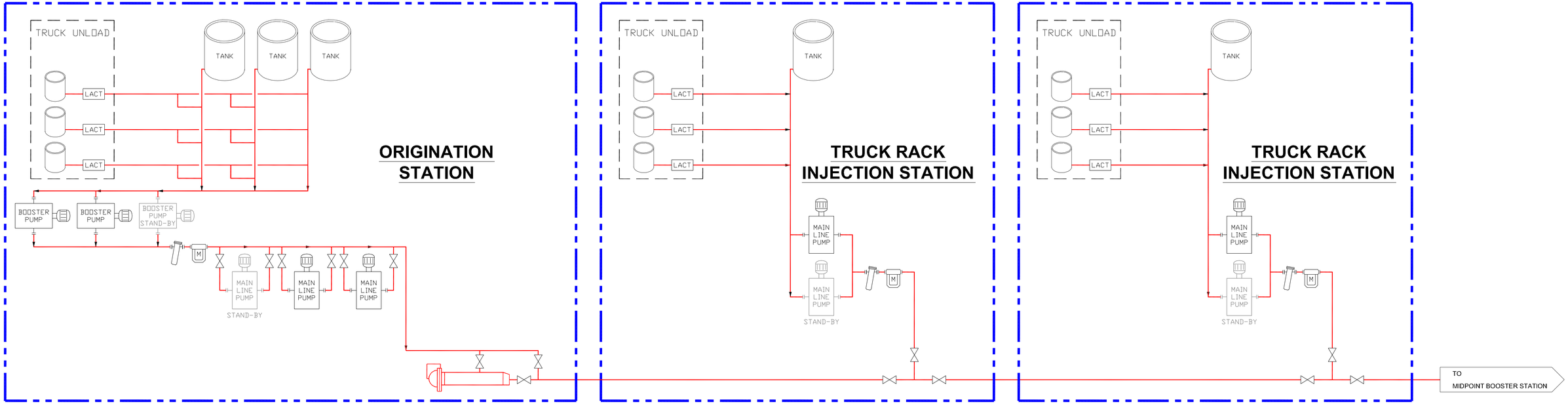
Federal Lands (Areas)

- Forest Service
- Department of Defense
- Bureau of Land Management
- Fish and Wildlife Service
- National Park Service
- Bureau of Indian Affairs
- Bureau of Reclamation
- Other Agencies (NASA, DOE, DOT, DOP, TVA...)

MP - Milepost
PS - Pump Station


Edmonton
Alberta
Hardisty
Calgary
Saskatchewan
Manitoba
Regina
Winnipeg
Ontario
Helena
Montana
North Dakota
Bismarck
Minnesota
Pierre
Wisconsin
Wyoming
South Dakota
Nebraska
Iowa
Chicago
Lincoln
Illinois
Indiana
Steele City
Springfield
Colorado
Kansas
Topeka
St. Louis
Patoka
Wood River
Missouri
Cushing
Oklahoma City
Arkansas
Oklahoma
Texas
Louisiana
Austin
Port Arthur
Houston
Keystone Pipeline
Proposed Keystone Expansion

Enbridge System Map



LEGEND

PUMP IN SERVICE

SPARE PUMP

VALVE

STRAINER

METER

STORAGE TANK

SCRAPER TRAP/LAUNCHER FOR CLEANING AND INSPECTING PIPELINE

LACT — LEASE AUTOMATED CUSTODY TRANSFER UNIT TO MEASURE & SAMPLE CRUDE OIL BEING RECEIVED FROM PRODUCERS

STATION BOUNDARY

PROPOSED PIPELINE

KEYSTONE/TRANSCANADA PIPELINE

REFERENCE DRAWINGS	
DWG. NO.	DESCRIPTION

REVISIONS							
NO.	DESCRIPTION	BY	DATE	CHK	DATE	APP	DATE
A	ISSUED FOR CLIENT REVIEW						

Kadrmas Lee & Jackson
Engineers Surveyors Planners

Rooney Engineering, Inc.
12201 E. Arapahoe Rd. C10
Centennial, CO 80112
(303) 792-5911

NORTH DAKOTA PIPELINE AUTHORITY

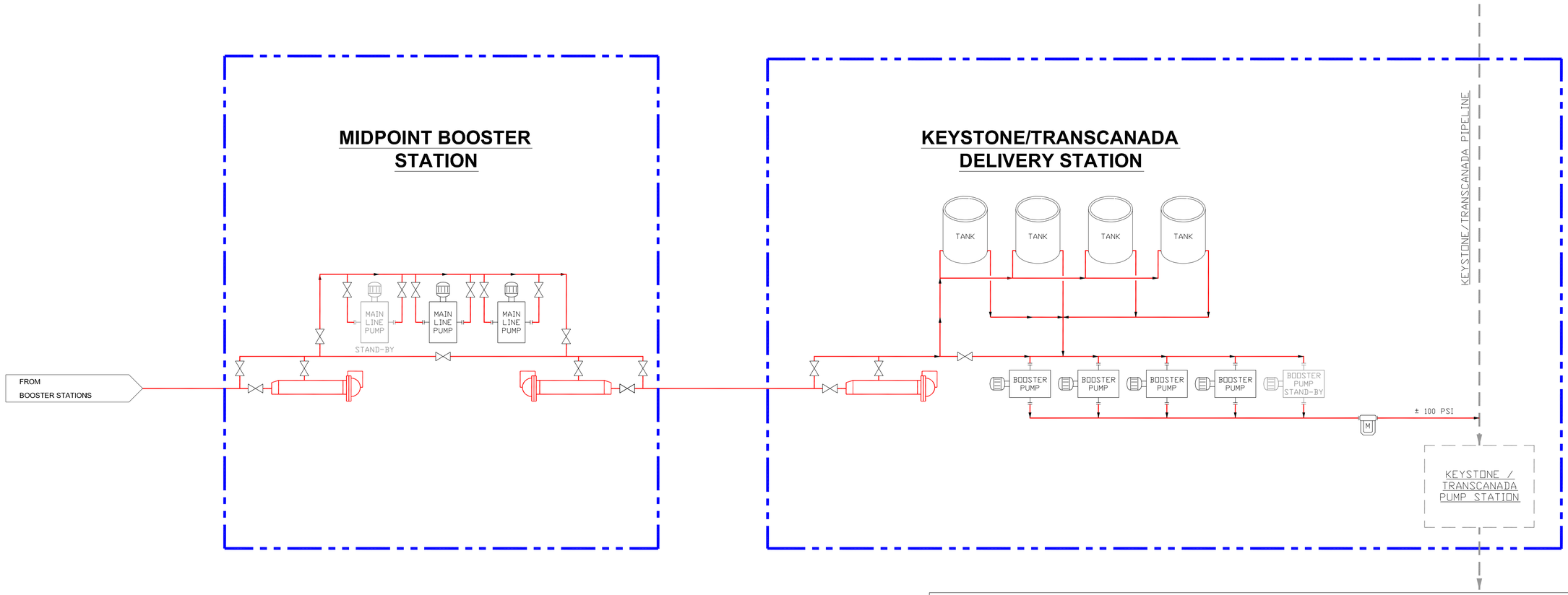
CRUDE OIL PIPELINE FEASIBILITY STUDY
PROCESS FLOW DIAGRAM
BASE CASE

SCALE: AS SHOWN | DWG. NUMBER: 2655-F-001 | REV: A

Plot Date: 4/14/2009 11:42:32 AM Plot By: David Whorton File Name: W:\KLJ\02655 - State of North Dakota Feasibility Study\CAD\PIPING\PFD\2655-F-001.dwg

MIDPOINT BOOSTER STATION

KEYSTONE/TRANSCANADA DELIVERY STATION



LEGEND

PUMP IN SERVICE — PUMP — SPARE PUMP — VALVE — STRAINER — METER — STORAGE TANK — SCRAPER TRAP/LAUNCHER FOR CLEANING AND INSPECTING PIPELINE

LACT — LEASE AUTOMATED CUSTODY TRANSFER UNIT TO MEASURE & SAMPLE CRUDE OIL BEING RECEIVED FROM PRODUCERS

STATION BOUNDARY

PROPOSED PIPELINE

KEYSTONE/TRANSCANADA PIPELINE

REFERENCE DRAWINGS		REVISIONS							
		A	ISSUED FOR CLIENT REVIEW						
DWG. NO.	DESCRIPTION	NO.	DESCRIPTION	BY	DATE	CHK	DATE	APP	DATE

Kadrmas Lee & Jackson Engineers Surveyors Planners

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NORTH DAKOTA PIPELINE AUTHORITY

CRUDE OIL PIPELINE FEASIBILITY STUDY
PROCESS FLOW DIAGRAM
BASE CASE

SCALE: AS SHOWN | DWG. NUMBER: 2655-F-002 | REV: A

APPENDIX B

Costs
10” and 12” Systems

Appendix B

Capital Costs

Initial Capital Cost -- Summary North Dakota Pipeline -- Feasibility Study

System	10" Pipeline			12" Pipeline		
Route	North	East	West	North	East	West
Total System Capital Cost	**$ 195,315,700**	**$ 242,034,800**	**$ 210,509,200**	**$ 198,768,400**	**$ 251,816,700**	**$ 215,096,700**
Pipeline						
Pipeline Route Right-of-Way	$ 4,120,800	$ 5,874,500	$ 4,605,300	$ 4,120,800	$ 5,874,500	$ 4,605,300
Pipe, Coating , & Freight	$ 19,731,000	$ 28,621,000	$ 22,185,000	$ 24,756,000	$ 35,853,000	$ 27,821,000
Block Valves, Launchers, Fittings	$ 2,126,000	$ 2,504,000	$ 2,047,000	$ 2,416,000	$ 2,850,000	$ 2,337,000
Mechanical Contractor	$ 37,541,000	$ 56,852,000	$ 43,612,000	$ 43,042,000	$ 63,782,000	$ 48,841,000
Engineering/Inspection/Const. Support	$ 20,138,000	$ 28,756,000	$ 22,660,000	$ 22,540,000	$ 32,627,000	$ 25,638,000
Tax on Materials @ 5%	$ 1,092,900	$ 1,556,300	$ 1,211,600	$ 1,358,600	$ 1,935,200	$ 1,507,900
Contingency -- 20%	$ 16,950,000	$ 24,832,800	$ 19,264,200	$ 19,646,600	$ 28,584,400	$ 22,150,000
Pipeline Totals	**$ 101,699,700**	**$ 148,996,600**	**$ 115,585,100**	**$ 117,880,000**	**$ 171,506,100**	**$ 132,900,200**
Pump Stations						
Major Equipment	14,688,500	14,688,500	15,389,200	10,805,700	10,805,700	11,506,400
Mechanical Materials	3,167,100	3,167,100	3,167,100	3,010,900	3,010,900	3,010,900
Electrical Materials	6,410,700	6,410,700	6,699,400	4,313,300	4,313,300	4,602,000
Civil Materials	1,025,600	1,025,600	1,037,300	871,000	871,000	882,700
Electrical Service / Substations	1,961,500	1,480,000	2,005,000	1,871,500	1,390,000	1,915,000
Control Building w/ HVAC	1,302,400	1,302,400	1,302,400	910,800	910,800	910,800
Mechanical Contract	5,132,400	5,132,400	5,132,400	3,886,800	3,886,800	3,886,800
Electrical Contract	2,705,000	2,705,000	2,705,000	2,025,000	2,025,000	2,025,000
Civil Contract	2,358,200	2,358,200	2,358,200	1,791,400	1,791,400	1,791,400
Miscellaneous contracts	616,600	616,600	616,600	487,800	487,800	487,800
Engineering/Inspection/Const. Support	3,744,500	3,744,500	3,744,500	2,825,900	2,825,900	2,825,900
Land -- Station Sites	70,000	70,000	70,000	62,000	62,000	62,000
Tax on Materials @ 5%	1,182,000	1,182,000	1,227,500	896,000	896,000	941,500
Contingency -- 20%	8,872,900	8,776,600	9,090,900	6,751,700	6,655,400	6,969,700
Pump Stations Totals	**$ 53,237,400**	**$ 52,659,600**	**$ 54,545,500**	**$ 40,509,800**	**$ 39,932,000**	**$ 41,817,900**
Storage Tanks						
Civil Construction	8,294,400	8,294,400	8,294,400	8,294,400	8,294,400	8,294,400
Tank Construction	13,920,400	13,920,400	13,920,400	13,920,400	13,920,400	13,920,400
Tank Testing & Protection	7,771,700	7,771,700	7,771,700	7,771,700	7,771,700	7,771,700
Electrical, Instrumentation & Mechanical	609,800	609,800	609,800	609,800	609,800	609,800
Engineering/Inspection/Const. Support	2,080,400	2,080,400	2,080,400	2,080,400	2,080,400	2,080,400
Tax on Materials @ 5%	172,100	172,100	172,100	172,100	172,100	172,100
Contingency -- 20%	6,569,800	6,569,800	6,569,800	6,569,800	6,569,800	6,569,800
Tank Totals	**39,418,600**	**39,418,600**	**39,418,600**	**39,418,600**	**39,418,600**	**39,418,600**
SCADA Center w/ 20% contingency	**960,000**	**960,000**	**960,000**	**960,000**	**960,000**	**960,000**

State of North Dakota
North Alternative - 10" Diameter
Pipeline Estimate Detail

3/31/2009

ASSUMPTIONS: Survey Length = 892,320 169 miles

Material Footages

Mainline Pipe =	886,920	10.75" x 0.203 X60			
Spare Mainline Pipe =	8,869	10.75" x 0.203 X60		1.0%	Spare
			Subtotal Std. =	895,789	
Directional Drill Length =	2,700	10.75" x 0.365 X60			
Bore Pipe =	2,700	10.75" x 0.365 X60			
			Subtotal Heavy Wall =	5,400	
Total Pipe =	**901,189**		**Total Pipe =**	**901,189**	

Number of Block Valves =	11	each	(includes MOV)
Number of Check Valves =	0	each	
Number of Launchers =	2	each	(Manual)
Number of Receivers =	2	each	(Manual)
Number of Spreads =	3	each	
Spread Progress =	0.6	Miles Per Day per Spread	
Work Months =	3.6	months	Note: Must be Less Than 5 months

Construction Footages

Mainline Pipe =	895,789	for construction estimate	
HDD Pipe =	2,700		
Bore Pipe =	2,700		
	901,189	170.68	Miles

1. Pig launchers/receivers are provided. Pipeline will be built to accommodate future smart pigs.
2. Construction in Summer (May 15 Construction Start)
3. All Cost is in March 2009 US dollars.
4. The permanent ROW width is 50'. Temporary ROW is 25'. (Total 75 feet).
5. Normal burial depth is assumed to be 3' of cover.
6. Stations are excluded from this estimate.
7. Rock is included in the estimate.
8. The pipeline construction cost provided by contractor
9. Fencing is included along ROW only
10.
11.
12.

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
North Alternative 10" Capital Cost Estimate - Rev. 0

10.75 inch Diameter | Estimated Cost | 31-Mar-09

Estimated Length = 901,189 feet 170.68 miles

LAND and RIGHT-of-WAY							**% of Total**
Permanent ROW @ 50' width (100% value) Agricultural (Length) 901,189		1034	Acres	$	1,500.00	$1,551,634	
Temporary Construction ROW @ 25' (50% value Agricultural(Length) 901,189		517	Acres	$	750.00	$387,909	
Agricultural Damages (50% of land value)		1552	Acres	$	750.00	$1,163,726	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Cost to Acquire		370	Man-Wks	$	2,500.00	$925,000	
Appraisal		37	Man-Wks	$	2,500.00	$92,500	
	Subtotal - ROW and Damages					**$4,120,800**	4.1%
LINE PIPE, COATING, & FREIGHT							
10.75", 0.203" X-60, TRL,14 Mils FBE		895,789	L.F.	**$**	**21.77**		
Pipe		895,789	L.F.	$	17.62	$15,779,881	
Coating, 14 mils FBE		895,789	L.F.	$	2.46	$2,205,931	
Freight		895,789	L.F.	$	1.70	$1,518,990	
10.75", 0.365" X-60, TRL,14 Mils FBE, ARO		2,700	L.F.	**$**	**41.90**		
Pipe		2,700	L.F.	$	30.78	$83,112	
Coating, 14 mils FBE		2,700	L.F.	$	2.46	$6,649	
Freight		2,700	L.F.	$	2.94	$7,940	
ARC for HDD and Roads		2,700	L.F.	$	5.71	$15,425	
10.75", 0.365" X-60, TRL,14 Mils FBE, ARO		2,700	L.F.	**$**	**41.90**		
Pipe		2,700	L.F.	$	30.78	$83,112	
Coating, 14 mils FBE		2,700	L.F.	$	2.46	$6,649	
Freight		2,700	L.F.	$	2.94	$7,940	
ARC for HDD and Roads		2,700	L.F.	$	5.71	$15,425	
		901,189				$19,731,000	
	Subtotal - Pipe & Coating					**$19,731,000**	19.4%
FITTINGS & APPURTENANCES							
Block Valve SCADA Equipment		11	EA. @	$	22,000.00	$242,000	
Block Valves (with fabricated tails)		11	EA. @	$	22,370.00	$246,070	
Check Valves (with fabricated tails)		0	EA. @	$	-	$0	
PipeSak	1	170	Lot	$	1,500.00	$255,000	
Fabricated Launcher Assemblies		2	Lot	$	60,350.00	$120,700	
Fabricated Receover Assemblies		2	Lot	$	60,599.00	$121,198	
Fittings	1.2	1	Lot	$	797,000.00	$797,000	
Markers & Test Stations		683	Lot	$	50.00	$34,150	
Cathodic Protection		3	Lot	$	50,000.00	$170,680	
Freight @	7%	1	Lot	$	139,100.00	$139,100	
						$2,126,000	
	Subtotal - Fittings & Appurtenances					**$2,126,000**	2.1%

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
North Alternative 10" Capital Cost Estimate - Rev. 0

								% of Total
PIPELINE CONSTRUCTION								
Mainline Construction - 10"		886,920	LF	$	24.00	$21,286,080		
HDD installation (Welding included in mainline cc		2,700	LF	$	135.00	$364,500		
Rock	10%	88,692	CU YD	$	110.00	$9,756,120		
Environmental	10%	88,692	LF	$	4.00	$354,768		
Padding	100%	901,189	LF	$	2.40	$2,162,854		
Seed and Mulch		1,536	Acre	$	500.00	$768,182		
Sack Weights (For negative buoyancy)		170	Ea	$	550.00	$93,500		
Rock Shield	10%	90,100	LF	$	8.20	$738,820		
Extra Depth		0	LF	$	0.60	$0		
Road Crossings:								
Uncased Crossings		2,700	LF	$	117.50	$317,250		
Ditch Breaker	1	170	Ea	$	475.00	$80,750		
CP Test Station (not shown on alignment sheets)		20	EA	$	150.00	$3,000		
Silt Fence	1%	8,869	LF	$	7.00	$62,084		
Straw Bales		1,000	Ea	$	15.00	$15,000		
Fencing	2%	17,738	LF	$	15.00	$266,076		
Select dirt/sand		2,000	LF	$	100.00	$200,000		
Left Blank		0	Lot	$	-	$0		
Mobilization		1	Lot	$	250,000.00	$250,000		
Performance Bond (not applicable)		0	Lot	$	-	$0		
Left Blank		0	Lot	$	-	$0		
Left Blank		0	Lot	$	-	$0		
Left Blank		0	Lot	$	-	$0		
STATION CONSTRUCTION								
Pig Trap Fab & Install		4	EA @	$	40,000.00	$160,000		
Pig Trap Foundations (included above)		4	EA @	$	-	$0		
Block/Check Valve Sets		11	EA @	$	27,500.00	$302,500		
Site Work		1	Lot	$	100,000.00	$100,000		
Block Valve SCADA Electrical Contract		11	Lot	$	20,000.00	$220,000		
Left Blank		0	EA @	$	-	$0		
Painting		1	Lot	$	40,000.00	$40,000		
	Subtotal - Construction						**$37,541,000**	36.9%
	Subtotal ROW, Materials & Construction						$63,518,800	
	Tax on Materials	5.0%	North Dakota State Tax				$1,092,900	1.1%
	Subtotal						**$64,612,000**	
	Engineering and Construction Management						$7,107,320	7.0%
	Survey						$1,938,360	1.9%
	Geotechnical Investigations (for HDD)						$25,000	0.0%
	X-Ray (9) crews	845	Cr days @		$1,700.00		$1,439,400	1.4%
	Permitting				6%		$3,876,720	3.8%
	As-Builts				1%		$646,120	0.6%
	Inspection (18) total	1690	Man Days		$1,100.00		$1,874,000	1.8%
	Legal (by others)				5%		$3,230,600	3.2%
							$20,138,000	
					Project Subtotal		**$84,750,000**	
			Contingency		20%		**$16,950,000**	16.7%
					CUMULATIVE COST		**$101,700,000**	100.0%
					$/DIM		$55,428	

State of North Dakota
East Alternative - 10" Diameter
Pipeline Estimate Detail

3/31/2009

ASSUMPTIONS: Survey Length = 1,272,480 241 miles

Material Footages

Mainline Pipe =	1,240,480	10.75" x 0.203 X60			
Spare Mainline Pipe =	12,405	10.75" x 0.203 X60		1.0%	Spare
			Subtotal Std. =	1,252,885	
Directional Drill Length =	16,000	10.75" x 0.365 X60			
Bore Pipe =	16,000	10.75" x 0.365 X60			
			Subtotal Heavy Wall =	32,000	
Total Pipe =	**1,284,885**		**Total Pipe =**	**1,284,885**	

Number of Block Valves =	7	each	(includes MOV)
Number of Check Valves =	0	each	
Number of Launchers =	2	each	(Manual)
Number of Receivers =	2	each	(Manual)
Number of Spreads =	4	each	
Spread Progress =	0.6	Miles Per Day per Spread	
Work Months =	3.9	months	Note: Must be Less Than 5 months

Construction Footages

Mainline Pipe =	1,252,885	for construction estimate	
HDD Pipe =	16,000		
Bore Pipe =	16,000		
	1,284,885	243.35	Miles

1 Pig launchers/receivers are provided. Pipeline will be built to accommodate future smart pigs.
2 Construction in Summer (May 15 Construction Start)
3 All Cost is in March 2009 US dollars.
4 The permanent ROW width is 50'. Temporary ROW is 25'. (Total 75 feet).
5 Normal burial depth is assumed to be 3' of cover.
6 Stations are excluded from this estimate.
7 Rock is included in the estimate.
8 The pipeline construction cost provided by contractor
9 Fencing is included along ROW only

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
East Alternative 10" Capital Cost Estimate - Rev. 0

10.75 inch Diameter | Estimated Cost | 31-Mar-09

Estimated Length =	1,284,885 feet		243.35 miles				
LAND and RIGHT-of-WAY							**% of Total**
Permanent ROW @ 50' width (100% value)		1475	Acres	$	1,500.00	$2,212,267	
Agricultural (Length) 1,284,885							
Temporary Construction ROW @ 25' (50% value		737	Acres	$	750.00	$553,067	
Agricultural(Length) 1,284,885							
Agricultural Damages (50% of land value)		2212	Acres	$	750.00	$1,659,200	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Cost to Acquire		527	Man-Wks	$	2,500.00	$1,317,500	
Appraisal		53	Man-Wks	$	2,500.00	$132,500	
Subtotal - ROW and Damages						**$5,874,500**	3.9%
LINE PIPE, COATING, & FREIGHT							
10.75", 0.203" X-60, TRL,14 Mils FBE		1,252,885	L.F.	**$**	**21.77**		
Pipe		1,252,885	L.F.	$	17.62	$22,070,341	
Coating, 14 mils FBE		1,252,885	L.F.	$	2.46	$3,085,299	
Freight		1,252,885	L.F.	$	1.70	$2,124,517	
10.75", 0.365" X-60, TRL,14 Mils FBE, ARO		16,000	L.F.	**$**	**41.90**		
Pipe		16,000	L.F.	$	30.78	$492,514	
Coating, 14 mils FBE		16,000	L.F.	$	2.46	$39,401	
Freight		16,000	L.F.	$	2.94	$47,050	
ARC for HDD and Roads		16,000	L.F.	$	5.71	$91,410	
10.75", 0.365" X-60, TRL,14 Mils FBE, ARO		16,000	L.F.	**$**	**41.90**		
Pipe		16,000	L.F.	$	30.78	$492,514	
Coating, 14 mils FBE		16,000	L.F.	$	2.46	$39,401	
Freight		16,000	L.F.	$	2.94	$47,050	
ARC for HDD and Roads		16,000	L.F.	$	5.71	$91,410	
		1,284,885				$28,621,000	
Subtotal - Pipe & Coating						**$28,621,000**	19.2%
FITTINGS & APPURTENANCES							
Block Valve SCADA Equipment		7	EA. @	$	22,000.00	$154,000	
Block Valves (with fabricated tails)		7	EA. @	$	22,370.00	$156,590	
Check Valves (with fabricated tails)		0	EA. @	$	-	$0	
PipeSak	1	240	Lot	$	1,500.00	$360,000	
Fabricated Launcher Assemblies		2	Lot	$	60,350.00	$120,700	
Fabricated Receover Assemblies		2	Lot	$	60,599.00	$121,198	
Fittings	1.2	1	Lot	$	1,136,000.00	$1,136,000	
Markers & Test Stations		973	Lot	$	50.00	$48,650	
Cathodic Protection		5	Lot	$	50,000.00	$243,349	
Freight @	7%	1	Lot	$	163,800.00	$163,800	
						$2,504,000	
Subtotal - Fittings & Appurtenances						**$2,504,000**	1.7%

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
East Alternative 10" Capital Cost Estimate - Rev. 0

							% of Total
PIPELINE CONSTRUCTION							
Mainline Construction - 10"		1,240,480	LF	$	25.50	$31,632,240	
HDD installation (Welding included in mainline cc		16,000	LF	$	135.00	$2,160,000	
Rock	10%	124,048	CU YD	$	110.00	$13,645,280	
Environmental	10%	124,048	LF	$	4.00	$496,192	
Padding	100%	1,284,885	LF	$	2.40	$3,083,724	
Seed and Mulch		2,191	Acre	$	500.00	$1,095,455	
Sack Weights (For negative buoyancy)		240	Ea	$	550.00	$132,000	
Rock Shield	10%	128,500	LF	$	8.20	$1,053,700	
Extra Depth		0	LF	$	0.60	$0	
Road Crossings:							
Uncased Crossings		16,000	LF	$	117.50	$1,880,000	
Ditch Breaker	1	240	Ea	$	475.00	$114,000	
CP Test Station (not shown on alignment sheets)		20	EA	$	150.00	$3,000	
Silt Fence	1%	12,405	LF	$	7.00	$86,834	
Straw Bales		1,000	Ea	$	15.00	$15,000	
Fencing	2%	24,810	LF	$	15.00	$372,144	
Select dirt/sand		2,000	LF	$	100.00	$200,000	
Left Blank		0	Lot	$	-	$0	
Mobilization		1	Lot	$	250,000.00	$250,000	
Performance Bond (not applicable)		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
STATION CONSTRUCTION							
Pig Trap Fab & Install		4	EA @	$	40,000.00	$160,000	
Pig Trap Foundations (included above)		4	EA @	$	-	$0	
Block/Check Valve Sets		7	EA @	$	27,500.00	$192,500	
Site Work		1	Lot	$	100,000.00	$100,000	
Block Valve SCADA Electrical Contract		7	Lot	$	20,000.00	$140,000	
Left Blank		0	EA @	$	-	$0	
Painting		1	Lot	$	40,000.00	$40,000	
Subtotal - Construction						**$56,852,000**	38.2%
Subtotal ROW, Materials & Construction						$93,851,500	
Tax on Materials	5.0%	North Dakota State Tax				$1,556,300	1.0%
Subtotal						**$95,408,000**	
Engineering and Construction Management						$10,494,880	7.0%
Survey						$2,862,240	1.9%
Geotechnical Investigations (for HDD)						$25,000	0.0%
X-Ray (12) crews	1205	Cr days @			$1,700.00	$2,051,400	1.4%
Permitting					6%	$5,724,480	3.8%
As-Builts					1%	$954,080	0.6%
Inspection (24) total	2410	Man Days			$1,100.00	$1,874,000	1.3%
Legal (by others)					5%	$4,770,400	3.2%
						$28,756,000	
					Project Subtotal	**$124,164,000**	
				Contingency	20%	**$24,832,800**	16.7%
					CUMULATIVE COST	**$148,996,800**	100.0%
					$/DIM	$56,956	

State of North Dakota
West Alternative - 10" Diameter
Pipeline Estimate Detail

3/31/2009

ASSUMPTIONS: Survey Length = 997,920 189 miles

Material Footages

Mainline Pipe =	985,920	10.75" x 0.203 X60			
Spare Mainline Pipe =	9,859	10.75" x 0.203 X60		1.0%	Spare
			Subtotal Std. =	995,779	
Directional Drill Length =	6,000	10.75" x 0.365 X60			
Bore Pipe =	6,000	10.75" x 0.365 X60			
			Subtotal Heavy Wall =	12,000	
Total Pipe =	**1,007,779**		**Total Pipe =**	**1,007,779**	

Number of Block Valves =	6	each	(includes MOV)
Number of Check Valves =	0	each	
Number of Launchers =	2	each	(Manual)
Number of Receivers =	2	each	(Manual)
Number of Spreads =	3	each	
Spread Progress =	0.6	Miles Per Day per Spread	
Work Months =	4.0	months	Note: Must be Less Than 5 months

Construction Footages

Mainline Pipe =	995,779	for construction estimate	
HDD Pipe =	6,000		
Bore Pipe =	6,000		
	1,007,779	190.87	Miles

1. Pig launchers/receivers are provided. Pipeline will be built to accommodate future smart pigs.
2. Construction in Summer (May 15 Construction Start)
3. All Cost is in March 2009 US dollars.
4. The permanent ROW width is 50'. Temporary ROW is 25'. (Total 75 feet).
5. Normal burial depth is assumed to be 3' of cover.
6. Stations are excluded from this estimate.
7. Rock is included in the estimate.
8. The pipeline construction cost provided by contractor
9. Fencing is included along ROW only
10.
11.
12.

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
West Alternative 10" Capital Cost Estimate - Rev. 0

10.75 inch Diameter | Estimated Cost | 31-Mar-09

Estimated Length =	1,007,779 feet		190.87 miles				
LAND and RIGHT-of-WAY							**% of Total**
Permanent ROW @ 50' width (100% value)		1157	Acres	$	1,500.00	$1,735,157	
Agricultural (Length) 1,007,779							
Temporary Construction ROW @ 25' (50% value		578	Acres	$	750.00	$433,789	
Agricultural(Length) 1,007,779							
Agricultural Damages (50% of land value)		1735	Acres	$	750.00	$1,301,368	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Cost to Acquire		413	Man-Wks	$	2,500.00	$1,032,500	
Appraisal		41	Man-Wks	$	2,500.00	$102,500	
	Subtotal - ROW and Damages					**$4,605,300**	4.0%
LINE PIPE, COATING, & FREIGHT							
10.75", 0.203" X-60, TRL,14 Mils FBE		995,779	L.F.	**$**	**21.77**		
Pipe		995,779	L.F.	$	17.62	$17,541,267	
Coating, 14 mils FBE		995,779	L.F.	$	2.46	$2,452,162	
Freight		995,779	L.F.	$	1.70	$1,688,543	
10.75", 0.365" X-60, TRL,14 Mils FBE, ARO		6,000	L.F.	**$**	**41.90**		
Pipe		6,000	L.F.	$	30.78	$184,693	
Coating, 14 mils FBE		6,000	L.F.	$	2.46	$14,775	
Freight		6,000	L.F.	$	2.94	$17,644	
ARC for HDD and Roads		6,000	L.F.	$	5.71	$34,279	
10.75", 0.365" X-60, TRL,14 Mils FBE, ARO		6,000	L.F.	**$**	**41.90**		
Pipe		6,000	L.F.	$	30.78	$184,693	
Coating, 14 mils FBE		6,000	L.F.	$	2.46	$14,775	
Freight		6,000	L.F.	$	2.94	$17,644	
ARC for HDD and Roads		6,000	L.F.	$	5.71	$34,279	
		1,007,779				$22,185,000	
	Subtotal - Pipe & Coating					**$22,185,000**	19.2%
FITTINGS & APPURTENANCES							
Block Valve SCADA Equipment		6	EA. @	$	22,000.00	$132,000	
Block Valves (with fabricated tails)		6	EA. @	$	22,370.00	$134,220	
Check Valves (with fabricated tails)		0	EA. @	$	-	$0	
PipeSak	1	190	Lot	$	1,500.00	$285,000	
Fabricated Launcher Assemblies		2	Lot	$	60,350.00	$120,700	
Fabricated Receover Assemblies		2	Lot	$	60,599.00	$121,198	
Fittings	1.2	1	Lot	$	891,000.00	$891,000	
Markers & Test Stations		763	Lot	$	50.00	$38,150	
Cathodic Protection		4	Lot	$	50,000.00	$190,867	
Freight @	7%	1	Lot	$	133,900.00	$133,900	
						$2,047,000	
	Subtotal - Fittings & Appurtenances					**$2,047,000**	1.8%

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
West Alternative 10" Capital Cost Estimate - Rev. 0

							% of Total
PIPELINE CONSTRUCTION							
Mainline Construction - 10"		985,920	LF	$	25.50	$25,140,960	
HDD installation (Welding included in mainline cc		6,000	LF	$	135.00	$810,000	
Rock	10%	98,592	CU YD	$	110.00	$10,845,120	
Environmental	10%	98,592	LF	$	4.00	$394,368	
Padding	100%	1,007,779	LF	$	2.40	$2,418,670	
Seed and Mulch		1,718	Acre	$	500.00	$859,091	
Sack Weights (For negative buoyancy)		190	Ea	$	550.00	$104,500	
Rock Shield	10%	100,800	LF	$	8.20	$826,560	
Extra Depth		0	LF	$	0.60	$0	
Road Crossings:							
Uncased Crossings		6,000	LF	$	117.50	$705,000	
Ditch Breaker	1	190	Ea	$	475.00	$90,250	
CP Test Station (not shown on alignment sheets)		20	EA	$	150.00	$3,000	
Silt Fence	1%	9,859	LF	$	7.00	$69,014	
Straw Bales		1,000	Ea	$	15.00	$15,000	
Fencing	2%	19,718	LF	$	15.00	$295,776	
Select dirt/sand		2,000	LF	$	100.00	$200,000	
Left Blank		0	Lot	$	-	$0	
Mobilization		1	Lot	$	250,000.00	$250,000	
Performance Bond (not applicable)		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
STATION CONSTRUCTION							
Pig Trap Fab & Install		4	EA @	$	40,000.00	$160,000	
Pig Trap Foundations (included above)		4	EA @	$	-	$0	
Block/Check Valve Sets		6	EA @	$	27,500.00	$165,000	
Site Work		1	Lot	$	100,000.00	$100,000	
Block Valve SCADA Electrical Contract		6	Lot	$	20,000.00	$120,000	
Left Blank		0	EA @	$	-	$0	
Painting		1	Lot	$	40,000.00	$40,000	
Subtotal - Construction						**$43,612,000**	37.7%
Subtotal ROW, Materials & Construction						$72,449,300	
Tax on Materials	5.0%	North Dakota State Tax				$1,211,600	1.0%
Subtotal						**$73,661,000**	
Engineering and Construction Management						$8,102,710	7.0%
Survey						$2,209,830	1.9%
Geotechnical Investigations (for HDD)						$25,000	0.0%
X-Ray (9) crews	945	Cr days @			$1,700.00	$1,609,400	1.4%
Permitting					6%	$4,419,660	3.8%
As-Builts					1%	$736,610	0.6%
Inspection (18) total	1890	Man Days			$1,100.00	$1,874,000	1.6%
Legal (by others)					5%	$3,683,050	3.2%
						$22,660,000	
					Project Subtotal	**$96,321,000**	
			Contingency		20%	**$19,264,200**	16.7%
					CUMULATIVE COST	**$115,585,200**	100.0%
					$/DIM	$56,333	

State of North Dakota
North Alternative - 12" Diameter
Pipeline Estimate Detail

3/31/2009

ASSUMPTIONS: Survey Length = 892,320 169 miles

Material Footages

Mainline Pipe =	886,920	12.75" x 0.219 X60			
Spare Mainline Pipe =	8,869	12.75" x 0.219 X60		1.0%	Spare
			Subtotal Std. =	895,789	
Directional Drill Length =	2,700	12.75" x 0.375 X60			
Bore Pipe =	2,700	12.75" x 0.375 X60			
			Subtotal Heavy Wall =	5,400	
Total Pipe =	**901,189**		**Total Pipe =**	**901,189**	

Number of Block Valves =	11	each	(includes MOV)
Number of Check Valves =	0	each	
Number of Launchers =	2	each	(Manual)
Number of Receivers =	2	each	(Manual)
Number of Spreads =	3	each	
Spread Progress =	0.6	Miles Per Day per Spread	
Work Months =	3.6	months	Note: Must be Less Than 5 months

Construction Footages

Mainline Pipe =	895,789	for construction estimate	
HDD Pipe =	2,700		
Bore Pipe =	2,700		
	901,189	170.68	Miles

1. Pig launchers/receivers are provided. Pipeline will be built to accommodate future smart pigs.
2. Construction in Summer (May 15 Construction Start)
3. All Cost is in March 2009 US dollars.
4. The permanent ROW width is 50'. Temporary ROW is 25'. (Total 75 feet).
5. Normal burial depth is assumed to be 3' of cover.
6. Stations are excluded from this estimate.
7. Rock is included in the estimate.
8. The pipeline construction cost provided by contractor
9. Fencing is included along ROW only
10.
11.
12.

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
North Alternative 12" Capital Cost Estimate - Rev. 0

12.75 inch Diameter | Estimated Cost | 31-Mar-09

Estimated Length = 901,189 feet 170.68 miles

LAND and RIGHT-of-WAY							**% of Total**
Permanent ROW @ 50' width (100% value) Agricultural (Length) 901,189		1034	Acres	$	1,500.00	$1,551,634	
Temporary Construction ROW @ 25' (50% value Agricultural(Length) 901,189		517	Acres	$	750.00	$387,909	
Agricultural Damages (50% of land value)		1552	Acres	$	750.00	$1,163,726	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Cost to Acquire		370	Man-Wks	$	2,500.00	$925,000	
Appraisal		37	Man-Wks	$	2,500.00	$92,500	
	Subtotal - ROW and Damages					**$4,120,800**	3.5%
LINE PIPE, COATING, & FREIGHT							
12.75", 0.219" X-60, TRL,14 Mils FBE		895,789	L.F.	**$**	**27.33**		
Pipe		895,789	L.F.	$	22.01	$19,714,051	
Coating, 14 mils FBE		895,789	L.F.	$	2.80	$2,511,684	
Freight		895,789	L.F.	$	2.52	$2,259,180	
12.75", 0.375" X-60, TRL,14 Mils FBE, ARO		2,700	L.F.	**$**	**50.24**		
Pipe		2,700	L.F.	$	37.21	$100,480	
Coating, 14 mils FBE		2,700	L.F.	$	2.80	$7,570	
Freight		2,700	L.F.	$	3.48	$9,402	
ARC for HDD and Roads		2,700	L.F.	$	6.74	$18,205	
12.75", 0.375" X-60, TRL,14 Mils FBE, ARO		2,700	L.F.	**$**	**50.24**		
Pipe		2,700	L.F.	$	37.21	$100,480	
Coating, 14 mils FBE		2,700	L.F.	$	2.80	$7,570	
Freight		2,700	L.F.	$	3.48	$9,402	
ARC for HDD and Roads		2,700	L.F.	$	6.74	$18,205	
		901,189				$24,756,000	
	Subtotal - Pipe & Coating					**$24,756,000**	21.0%
FITTINGS & APPURTENANCES							
Block Valve SCADA Equipment		11	EA. @	$	22,000.00	$242,000	
Block Valves (with fabricated tails)		11	EA. @	$	26,205.00	$288,255	
Check Valves (with fabricated tails)		0	EA. @	$	-	$0	
PipeSak	1	170	Lot	$	1,500.00	$255,000	
Fabricated Launcher Assemblies		2	Lot	$	77,286.00	$154,572	
Fabricated Receover Assemblies		2	Lot	$	78,441.00	$156,882	
Fittings	1	1	Lot	$	956,000.00	$956,000	
Markers & Test Stations		683	Lot	$	50.00	$34,150	
Cathodic Protection		3	Lot	$	50,000.00	$170,680	
Freight @	7%	1	Lot	$	158,000.00	$158,000	
						$2,416,000	
	Subtotal - Fittings & Appurtenances					**$2,416,000**	2.0%

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
North Alternative 12" Capital Cost Estimate - Rev. 0

							% of Total
PIPELINE CONSTRUCTION							
Mainline Construction - 12"		886,920	LF	$	30.00	$26,607,600	
HDD installation (Welding included in mainline cc		2,700	LF	$	160.00	$432,000	
Rock	10%	88,692	CU YD	$	110.00	$9,756,120	
Environmental	10%	88,692	LF	$	4.00	$354,768	
Padding	100%	901,189	LF	$	2.40	$2,162,854	
Seed and Mulch		1,536	Acre	$	500.00	$768,182	
Sack Weights (For negative buoyancy)		170	Ea	$	550.00	$93,500	
Rock Shield	10%	90,100	LF	$	8.20	$738,820	
Extra Depth		0	LF	$	0.60	$0	
Road Crossings:							
Uncased Crossings		2,700	LF	$	135.00	$364,500	
Ditch Breaker	1	170	Ea	$	475.00	$80,750	
CP Test Station (not shown on alignment sheets)		20	EA	$	150.00	$3,000	
Silt Fence	1%	8,869	LF	$	7.00	$62,084	
Straw Bales		1,000	Ea	$	15.00	$15,000	
Fencing	2%	17,738	LF	$	15.00	$266,076	
Select dirt/sand		2,000	LF	$	100.00	$200,000	
Left Blank		0	Lot	$	-	$0	
Mobilization		1	Lot	$	250,000.00	$250,000	
Performance Bond (not applicable)		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
STATION CONSTRUCTION							
Pig Trap Fab & Install		4	EA @	$	45,000.00	$180,000	
Pig Trap Foundations (included above)		4	EA @	$	-	$0	
Block/Check Valve Sets		11	EA @	$	31,500.00	$346,500	
Site Work		1	Lot	$	100,000.00	$100,000	
Block Valve SCADA Electrical Contract		11	Lot	$	20,000.00	$220,000	
Left Blank		0	EA @	$	-	$0	
Painting		1	Lot	$	40,000.00	$40,000	
Subtotal - Construction						**$43,042,000**	36.5%
Subtotal ROW, Materials & Construction						$74,334,800	
Tax on Materials	5.0%	North Dakota State Tax				$1,358,600	1.2%
Subtotal						**$75,693,000**	
Engineering and Construction Management						$8,326,230	7.1%
Survey						$2,270,790	1.9%
Geotechnical Investigations (for HDD)						$25,000	0.0%
X-Ray (6) crews	563	Cr days @			$1,700.00	$960,500	0.8%
Permitting					6%	$4,541,580	3.9%
As-Builts					1%	$756,930	0.6%
Inspection (18) total	1690	Man Days			$1,100.00	$1,874,000	1.6%
Legal (by others)					5%	$3,784,650	3.2%
						$22,540,000	
					Project Subtotal	**$98,233,000**	
				Contingency	20%	**$19,646,600**	16.7%
					CUMULATIVE COST	**$117,879,600**	100.0%
					$/DIM	$54,168	

State of North Dakota
East Alternative - 12" Diameter
Pipeline Estimate Detail

3/31/2009

ASSUMPTIONS: Survey Length = 1,272,480 241 miles

Material Footages

Mainline Pipe =	1,240,480	12.75" x 0.219 X60		
Spare Mainline Pipe =	12,405	12.75" x 0.219 X60	1.0%	Spare
			Subtotal Std. =	1,252,885
Directional Drill Length =	16,000	12.75" x 0.375 X60		
Bore Pipe =	16,000	12.75" x 0.375 X60		
			Subtotal Heavy Wall =	32,000
Total Pipe =	**1,284,885**		**Total Pipe =**	**1,284,885**

Number of Block Valves =	7	each	(includes MOV)
Number of Check Valves =	0	each	
Number of Launchers =	2	each	(Manual)
Number of Receivers =	2	each	(Manual)
Number of Spreads =	4	each	
Spread Progress =	0.6	Miles Per Day per Spread	
Work Months =	3.9	months	Note: Must be Less Than 5 months

Construction Footages

Mainline Pipe =	1,252,885	for construction estimate	
HDD Pipe =	16,000		
Bore Pipe =	16,000		
	1,284,885	243.35	Miles

1. Pig launchers/receivers are provided. Pipeline will be built to accommodate future smart pigs.
2. Construction in Summer (May 15 Construction Start)
3. All Cost is in March 2009 US dollars.
4. The permanent ROW width is 50'. Temporary ROW is 25'. (Total 75 feet).
5. Normal burial depth is assumed to be 3' of cover.
6. Stations are excluded from this estimate.
7. Rock is included in the estimate.
8. The pipeline construction cost provided by contractor
9. Fencing is included along ROW only
10.
11.
12.

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
East Alternative 12" Capital Cost Estimate - Rev. 0

12.75 inch Diameter | Estimated Cost | 31-Mar-09

Estimated Length = 1,284,885 feet 243.35 miles

LAND and RIGHT-of-WAY							**% of Total**
Permanent ROW @ 50' width (100% value) Agricultural (Length) 1,284,885		1475	Acres	$	1,500.00	$2,212,267	
Temporary Construction ROW @ 25' (50% value Agricultural(Length) 1,284,885		737	Acres	$	750.00	$553,067	
Agricultural Damages (50% of land value)		2212	Acres	$	750.00	$1,659,200	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Cost to Acquire		527	Man-Wks	$	2,500.00	$1,317,500	
Appraisal		53	Man-Wks	$	2,500.00	$132,500	
	Subtotal - ROW and Damages					**$5,874,500**	3.4%
LINE PIPE, COATING, & FREIGHT							
12.75", 0.219" X-60, TRL,14 Mils FBE		1,252,885	L.F.	**$**	**27.33**		
Pipe		1,252,885	L.F.	$	22.01	$27,572,821	
Coating, 14 mils FBE		1,252,885	L.F.	$	2.80	$3,512,936	
Freight		1,252,885	L.F.	$	2.52	$3,159,775	
12.75", 0.375" X-60, TRL,14 Mils FBE, ARO		16,000	L.F.	**$**	**50.24**		
Pipe		16,000	L.F.	$	37.21	$595,438	
Coating, 14 mils FBE		16,000	L.F.	$	2.80	$44,862	
Freight		16,000	L.F.	$	3.48	$55,717	
ARC for HDD and Roads		16,000	L.F.	$	6.74	$107,883	
12.75", 0.375" X-60, TRL,14 Mils FBE, ARO		16,000	L.F.	**$**	**50.24**		
Pipe		16,000	L.F.	$	37.21	$595,438	
Coating, 14 mils FBE		16,000	L.F.	$	2.80	$44,862	
Freight		16,000	L.F.	$	3.48	$55,717	
ARC for HDD and Roads		16,000	L.F.	$	6.74	$107,883	
		1,284,885				$35,853,000	
	Subtotal - Pipe & Coating					**$35,853,000**	20.9%
FITTINGS & APPURTENANCES							
Block Valve SCADA Equipment		7	EA. @	$	22,000.00	$154,000	
Block Valves (with fabricated tails)		7	EA. @	$	26,205.00	$183,435	
Check Valves (with fabricated tails)		0	EA. @	$	-	$0	
PipeSak	1	240	Lot	$	1,500.00	$360,000	
Fabricated Launcher Assemblies		2	Lot	$	77,286.00	$154,572	
Fabricated Receover Assemblies		2	Lot	$	78,441.00	$156,882	
Fittings	1	1	Lot	$	1,363,000.00	$1,363,000	
Markers & Test Stations		973	Lot	$	50.00	$48,650	
Cathodic Protection		5	Lot	$	50,000.00	$243,349	
Freight @	7%	1	Lot	$	186,500.00	$186,500	
						$2,850,000	
	Subtotal - Fittings & Appurtenances					**$2,850,000**	1.7%

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
East Alternative 12" Capital Cost Estimate - Rev. 0

PIPELINE CONSTRUCTION							**% of Total**
Mainline Construction - 12"		1,240,480	LF	$	30.50	$37,834,640	
HDD installation (Welding included in mainline cc		16,000	LF	$	160.00	$2,560,000	
Rock	10%	124,048	CU YD	$	110.00	$13,645,280	
Environmental	10%	124,048	LF	$	4.00	$496,192	
Padding	100%	1,284,885	LF	$	2.40	$3,083,724	
Seed and Mulch		2,191	Acre	$	500.00	$1,095,455	
Sack Weights (For negative buoyancy)		240	Ea	$	550.00	$132,000	
Rock Shield	10%	128,500	LF	$	8.20	$1,053,700	
Extra Depth		0	LF	$	0.60	$0	
Road Crossings:							
Uncased Crossings		16,000	LF	$	135.00	$2,160,000	
Ditch Breaker	1	240	Ea	$	475.00	$114,000	
CP Test Station (not shown on alignment sheets)		20	EA	$	150.00	$3,000	
Silt Fence	1%	12,405	LF	$	7.00	$86,834	
Straw Bales		1,000	Ea	$	15.00	$15,000	
Fencing	2%	24,810	LF	$	15.00	$372,144	
Select dirt/sand		2,000	LF	$	100.00	$200,000	
Left Blank		0	Lot	$	-	$0	
Mobilization		1	Lot	$	250,000.00	$250,000	
Performance Bond (not applicable)		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
Left Blank		0	Lot	$	-	$0	
STATION CONSTRUCTION							
Pig Trap Fab & Install		4	EA @	$	45,000.00	$180,000	
Pig Trap Foundations (included above)		4	EA @	$	-	$0	
Block/Check Valve Sets		7	EA @	$	31,500.00	$220,500	
Site Work		1	Lot	$	100,000.00	$100,000	
Block Valve SCADA Electrical Contract		7	Lot	$	20,000.00	$140,000	
Left Blank		0	EA @	$	-	$0	
Painting		1	Lot	$	40,000.00	$40,000	
Subtotal - Construction						**$63,782,000**	37.2%
Subtotal ROW, Materials & Construction						$108,359,500	
Tax on Materials	5.0%	North Dakota State Tax				$1,935,200	1.1%
Subtotal						**$110,295,000**	
Engineering and Construction Management						$12,132,450	7.1%
Survey						$3,308,850	1.9%
Geotechnical Investigations (for HDD)						$25,000	0.0%
X-Ray (12) crews	1205	Cr days @			$1,700.00	$2,051,400	1.2%
Permitting					6%	$6,617,700	3.9%
As-Builts					1%	$1,102,950	0.6%
Inspection (24) total	2410	Man Days			$1,100.00	$1,874,000	1.1%
Legal (by others)					5%	$5,514,750	3.2%
						$32,627,000	
					Project Subtotal	**$142,922,000**	
				Contingency	20%	**$28,584,400**	16.7%
					CUMULATIVE COST	**$171,506,400**	100.0%
					$/DIM	$55,276	

State of North Dakota
West Alternative - 12" Diameter
Pipeline Estimate Detail

3/31/2009

ASSUMPTIONS: Survey Length = 997,920 189 miles

Material Footages

Mainline Pipe =	985,920	12.75" x 0.219 X60		
Spare Mainline Pipe =	9,859	12.75" x 0.219 X60	1.0%	Spare
			Subtotal Std. =	995,779
Directional Drill Length =	6,000	12.75" x 0.375 X60		
Bore Pipe =	6,000	12.75" x 0.375 X60		
			Subtotal Heavy Wall =	12,000
Total Pipe =	**1,007,779**		**Total Pipe =**	**1,007,779**

Number of Block Valves =	6	each	(includes MOV)
Number of Check Valves =	0	each	
Number of Launchers =	2	each	(Manual)
Number of Receivers =	2	each	(Manual)
Number of Spreads =	3	each	
Spread Progress =	0.6	Miles Per Day per Spread	
Work Months =	4.0	months	Note: Must be Less Than 5 months

Construction Footages

Mainline Pipe =	995,779	for construction estimate	
HDD Pipe =	6,000		
Bore Pipe =	6,000		
	1,007,779	190.87	Miles

1. Pig launchers/receivers are provided. Pipeline will be built to accommodate future smart pigs.
2. Construction in Summer (May 15 Construction Start)
3. All Cost is in March 2009 US dollars.
4. The permanent ROW width is 50'. Temporary ROW is 25'. (Total 75 feet).
5. Normal burial depth is assumed to be 3' of cover.
6. Stations are excluded from this estimate.
7. Rock is included in the estimate.
8. The pipeline construction cost provided by contractor
9. Fencing is included along ROW only
10.
11.
12.

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
West Alternative 12" Capital Cost Estimate - Rev. 0

12.75 inch Diameter | Estimated Cost | 31-Mar-09

Estimated Length = 1,007,779 feet 190.87 miles

LAND and RIGHT-of-WAY							**% of Total**
Permanent ROW @ 50' width (100% value) Agricultural (Length) 1,007,779		1157	Acres	$	1,500.00	$1,735,157	
Temporary Construction ROW @ 25' (50% value Agricultural(Length) 1,007,779		578	Acres	$	750.00	$433,789	
Agricultural Damages (50% of land value)		1735	Acres	$	750.00	$1,301,368	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Left Blank				$	-	$0	
Cost to Acquire		413	Man-Wks	$	2,500.00	$1,032,500	
Appraisal		41	Man-Wks	$	2,500.00	$102,500	
	Subtotal - ROW and Damages					**$4,605,300**	3.5%
LINE PIPE, COATING, & FREIGHT							
12.75", 0.219" X-60, TRL,14 Mils FBE		995,779	L.F.	**$**	**27.33**		
Pipe		995,779	L.F.	$	22.01	$21,914,578	
Coating, 14 mils FBE		995,779	L.F.	$	2.80	$2,792,043	
Freight		995,779	L.F.	$	2.52	$2,511,355	
12.75", 0.375" X-60, TRL,14 Mils FBE, ARO		6,000	L.F.	**$**	**50.24**		
Pipe		6,000	L.F.	$	37.21	$223,289	
Coating, 14 mils FBE		6,000	L.F.	$	2.80	$16,823	
Freight		6,000	L.F.	$	3.48	$20,894	
ARC for HDD and Roads		6,000	L.F.	$	6.74	$40,456	
12.75", 0.375" X-60, TRL,14 Mils FBE, ARO		6,000	L.F.	**$**	**50.24**		
Pipe		6,000	L.F.	$	37.21	$223,289	
Coating, 14 mils FBE		6,000	L.F.	$	2.80	$16,823	
Freight		6,000	L.F.	$	3.48	$20,894	
ARC for HDD and Roads		6,000	L.F.	$	6.74	$40,456	
		1,007,779				$27,821,000	
	Subtotal - Pipe & Coating					**$27,821,000**	20.9%
FITTINGS & APPURTENANCES							
Block Valve SCADA Equipment		6	EA. @	$	22,000.00	$132,000	
Block Valves (with fabricated tails)		6	EA. @	$	26,205.00	$157,230	
Check Valves (with fabricated tails)		0	EA. @	$	-	$0	
PipeSak	1	190	Lot	$	1,500.00	$285,000	
Fabricated Launcher Assemblies		2	Lot	$	77,286.00	$154,572	
Fabricated Receover Assemblies		2	Lot	$	78,441.00	$156,882	
Fittings	1	1	Lot	$	1,069,000.00	$1,069,000	
Markers & Test Stations		763	Lot	$	50.00	$38,150	
Cathodic Protection		4	Lot	$	50,000.00	$190,867	
Freight @	7%	1	Lot	$	152,900.00	$152,900	
						$2,337,000	
	Subtotal - Fittings & Appurtenances					**$2,337,000**	1.8%

North Dakota Pipeline Authority
Connection to the Keystone and Keystone XL Pipelines
West Alternative 12" Capital Cost Estimate - Rev. 0

								% of Total
PIPELINE CONSTRUCTION								
Mainline Construction - 12"		985,920	LF	$	30.50	$30,070,560		
HDD installation (Welding included in mainline cc		6,000	LF	$	160.00	$960,000		
Rock	10%	98,592	CU YD	$	110.00	$10,845,120		
Environmental	10%	98,592	LF	$	4.00	$394,368		
Padding	100%	1,007,779	LF	$	2.40	$2,418,670		
Seed and Mulch		1,718	Acre	$	500.00	$859,091		
Sack Weights (For negative buoyancy)		190	Ea	$	550.00	$104,500		
Rock Shield	10%	100,800	LF	$	8.20	$826,560		
Extra Depth		0	LF	$	0.60	$0		
Road Crossings:								
Uncased Crossings		6,000	LF	$	135.00	$810,000		
Ditch Breaker	1	190	Ea	$	475.00	$90,250		
CP Test Station (not shown on alignment sheets)		20	EA	$	150.00	$3,000		
Silt Fence	1%	9,859	LF	$	7.00	$69,014		
Straw Bales		1,000	Ea	$	15.00	$15,000		
Fencing	2%	19,718	LF	$	15.00	$295,776		
Select dirt/sand		2,000	LF	$	100.00	$200,000		
Left Blank		0	Lot	$	-	$0		
Mobilization		1	Lot	$	250,000.00	$250,000		
Performance Bond (not applicable)		0	Lot	$	-	$0		
Left Blank		0	Lot	$	-	$0		
Left Blank		0	Lot	$	-	$0		
Left Blank		0	Lot	$	-	$0		
STATION CONSTRUCTION								
Pig Trap Fab & Install		4	EA @	$	45,000.00	$180,000		
Pig Trap Foundations (included above)		4	EA @	$	-	$0		
Block/Check Valve Sets		6	EA @	$	31,500.00	$189,000		
Site Work		1	Lot	$	100,000.00	$100,000		
Block Valve SCADA Electrical Contract		6	Lot	$	20,000.00	$120,000		
Left Blank		0	EA @	$	-	$0		
Painting		1	Lot	$	40,000.00	$40,000		
Subtotal - Construction							**$48,841,000**	36.8%
Subtotal ROW, Materials & Construction							$83,604,300	
Tax on Materials	5.0%	North Dakota State Tax					$1,507,900	1.1%
Subtotal							**$85,112,000**	
Engineering and Construction Management							$9,362,320	7.0%
Survey							$2,553,360	1.9%
Geotechnical Investigations (for HDD)							$25,000	0.0%
X-Ray (9) crews	945	Cr days @			$1,700.00		$1,609,400	1.2%
Permitting					6%		$5,106,720	3.8%
As-Builts					1%		$851,120	0.6%
Inspection (18) total	1890	Man Days			$1,100.00		$1,874,000	1.4%
Legal (by others)					5%		$4,255,600	3.2%
							$25,638,000	
					Project Subtotal		**$110,750,000**	
			Contingency		20%		**$22,150,000**	16.7%
					CUMULATIVE COST		**$132,900,000**	100.0%
					$/DIM		$54,611	

Pump Station Cost Estimate -- Summary

Total System Pump Station Costs	10" System			12" System		
Route	**North**	**East**	**West**	**North**	**East**	**West**
Originating Station	10,275,400	10,425,400	10,875,400	10,275,400	10,425,400	10,875,400
1/4 Point Booster Station	6,363,800	6,363,800	6,363,800	-----	-----	-----
Midpoint Booster Station	6,363,800	6,363,800	6,363,800	6,363,800	6,363,800	6,363,800
3/4 Point Booster Station	6,363,800	6,363,800	6,363,800	-----	-----	-----
Truck Rack Injection Station #1	3,354,400	3,354,400	3,354,400	3,354,400	3,354,400	3,354,400
Truck Rack Injection Station #2	3,354,400	3,354,400	3,354,400	3,354,400	3,354,400	3,354,400
Keystone Delivery Station	17,161,800	16,434,000	17,869,900	17,161,800	16,434,000	17,869,900
Totals	**53,237,400**	**52,659,600**	**54,545,500**	**40,509,800**	**39,932,000**	**41,817,900**

All Stations per Route	System	10" System			12" System		
	Route	**North**	**East**	**West**	**North**	**East**	**West**
Major Equipment -- Pumps & Motors, Valves, Meter systems		14,688,500	14,688,500	15,389,200	10,805,700	10,805,700	11,506,400
Mechanical Materials -- Pipe, Fittings, Misc. Mechanical,		3,167,100	3,167,100	3,167,100	3,010,900	3,010,900	3,010,900
Electrical Material		6,410,700	6,410,700	6,699,400	4,313,300	4,313,300	4,602,000
Civil Material		1,025,600	1,025,600	1,037,300	871,000	871,000	882,700
Electrical Service / Substation		1,961,500	1,480,000	2,005,000	1,871,500	1,390,000	1,915,000
Control Building w/ HVAC		1,302,400	1,302,400	1,302,400	910,800	910,800	910,800
Mechanical Contract		5,132,400	5,132,400	5,132,400	3,886,800	3,886,800	3,886,800
Electrical Contract		2,705,000	2,705,000	2,705,000	2,025,000	2,025,000	2,025,000
Civil Contract		2,358,200	2,358,200	2,358,200	1,791,400	1,791,400	1,791,400
Miscellaneous Contracts -- Fencing, Legal/Land, Geotechnical,		616,600	616,600	616,600	487,800	487,800	487,800
Inspection		851,600	851,600	851,600	639,200	639,200	639,200
Engineering and Project Management		2,892,900	2,892,900	2,892,900	2,186,700	2,186,700	2,186,700
Land -- Station Sites		70,000	70,000	70,000	62,000	62,000	62,000
Tax on Materials @ 5%		1,182,000	1,182,000	1,227,500	896,000	896,000	941,500
Contingency @ 20%		8,872,900	8,776,600	9,090,900	6,751,700	6,655,400	6,969,700
Totals		**53,237,400**	**52,659,600**	**54,545,500**	**40,509,800**	**39,932,000**	**41,817,900**

Tank Costs

Tank Construction Costs

Location		Originating Station	Truck Rack Injection #1	Truck Rack Injection #2	Keystone Delivery	Totals	Basis
Tank Characteristics per Station	No. of Tanks	3	1	1	4	**9**	
	Tank Size (feet)	40 X 110	36 X 90	36 X 90	48 X 140		
	Shell Capacity (BBLS)	67,713	40,796	40,796	131,621	**811,215**	
	Working Volume/tank (BBLS)	54,269	31,766	31,766	110,000	**666,339**	
	Costs						
Civil Construction		1,844,200	793,100	793,100	4,864,000	**8,294,400**	2008 Similar Tanks & 2009 Quote
Tank Construciton (including materials)		4,130,400	1,056,600	1,056,600	7,676,800	**13,920,400**	Average five (5) 2009 Quotes
Tank Testing & Protection		2,286,100	595,300	595,300	4,295,000	**7,771,700**	2008 Similar Tanks & 2009 Quote
Electrical, Instrumentation, and Mechanical Equipment		160,700	53,600	53,600	341,900	**609,800**	2009 Quotes
Engineering, Inspection, & Construction Mangement		656,500	201,800	201,800	1,020,300	**2,080,400**	2008 Similar Tanks and Estimates
Tax on Materials @ 5%		49,700	13,000	13,000	96,400	**172,100**	
Contingency @ 20%		1,825,500	542,700	542,700	3,658,900	**6,569,800**	
	Totals	**10,953,100**	**3,256,100**	**3,256,100**	**21,953,300**	**39,418,600**	

	Station	Originating	Truck #1	Truck #2	Keystone Delivery	Totals
Tank Heal	# Tanks	3	1	1	4	**9**
	Size	40 X 110	36 X 90	36 X 90	48 X 140	
	Per Tank Size (BBLS)	5,920	3,963	3,963	9,590	
	Total Heel At Location (BBLS)	17,760	3,963	3,963	38,360	**64,046**

	Station	Originating	Truck #1	Truck #2	Keystone Delivery	Totals	Basis
API 653 Periodic Inspection -- Costs	# Tanks	3	1	1	4		
	Out of Service API 653	$ 2,225,400	$ 741,800	$ 741,800	$ 3,607,200	$ 7,316,200	See Note #2
	In-Service API 653	$ 48,000	$ 16,000	$ 16,000	$ 72,000	$ 152,000	Year's 5 and 10 (API 653)

Notes:
#1 -- 10 year API 653 Out-of-Service Inspection will take each tank out of service for approximately 5 months. This will effect truck unload facilities the hardest.
#2 -- Divided Between Year's 8, 9, 10, 11, and 12 (Assumes Acceptance of API 653 Similar Service Determination)

Electrical Power Cost -- Summary

Exchange Rate: CN$/US$= 1.24

10" Pipeline 55,OOO BPD -- Base Case and Ultimate Case

Stations / Route Alternatives		Originating	Booster	Injection	Booster	Booster	Keystone	Totals	
North Route to TransCanada in Saskatchewan Canada	Capital Cost	$1,000,000	$45,000	$10,000	$45,000	$45,000	$806,500	**$1,961,500**	Capital Cost
	HP LOAD	1,279	1,233	200	1,233	1,138	2,133	7,415	HP LOAD
	Energy $	$30,077	$28,979	$4,301	$27,863	$25,776	$4,430	$125,727	Energy $
	Demand $	$12,445	$11,998	$1,946	$7,809	$8,931	$18,705	$63,781	Demand $
	Total Monthly Power $	$42,522	$40,977	$6,247	$35,673	$34,708	$23,134	**$189,508**	Total Monthly Power $
East Route to Keystone in eastern North Dakota	Capital Cost	$1,125,000	$45,000	$10,000	$45,000	$45,000	$200,000	**$1,480,000**	Capital Cost
	HP LOAD	1,754	1,589	200	1,660	1,754	2,133	9,290	HP LOAD
	Energy $	$41,441	$37,476	$4,301	$39,175	$41,441	$3,788	$171,924	Energy $
	Demand $	$17,074	$15,459	$1,946	$16,151	$17,074	$20,753	$90,402	Demand $
	Total Monthly Power $	$58,515	$52,935	$6,247	$55,326	$58,515	$24,541	**$262,326**	Total Monthly Power $
West Route to TransCanada in Saskatchewan Canada	Capital Cost	$1,500,000	$45,000	$10,000	$45,000	$45,000	$350,000	**$2,005,000**	Capital Cost
	HP LOAD	1,421	1,387	200	1,423	1,423	3,246	9,299	HP LOAD
	Energy $	$33,472	$32,661	$4,301	$33,511	$33,511	$3,788	$145,544	Energy $
	Demand $	$13,828	$13,497	$1,946	$13,844	$13,844	$31,587	$90,492	Demand $
	Total Monthly Power $	$47,300	$46,158	$6,247	$47,354	$47,354	$35,375	**$236,036**	Total Monthly Power $

Exchange Rate: CN$/US$= 1.24

12" Pipeline 55,OOO BPD -- Base Case

Stations / Route Alternatives		Originating	Midpoint Booster	Truck Injection	Keystone	Totals	
North Route to TransCanada in Saskatchewan Canada	Capital Cost	$1,000,000	$45,000	$10,000	$806,500	**$1,871,500**	Capital Cost
	HP LOAD	995	1,057	200	2,133	4,585	HP LOAD
	Energy $	$23,287	$23,964	$4,301	$4,430	$60,283	Energy $
	Demand $	$9,679	$6,635	$1,946	$18,705	$38,911	Demand $
	Total Monthly Power $	$32,966	$30,598	$6,247	$23,134	**$99,200**	Total Monthly $
East Route to Keystone in eastern North Dakota	Capital Cost	$1,125,000	$45,000	$10,000	$200,000	**$1,390,000**	Capital Cost
	HP LOAD	1,303	1,423	200	2,133	5,258	HP LOAD
	Energy $	$30,643	$33,511	$4,301	$3,788	$76,543	Energy $
	Demand $	$12,675	$13,844	$1,946	$20,753	$51,164	Demand $
	Total Monthly Power $	$43,318	$47,354	$6,247	$24,541	**$127,708**	Total Monthly $
West Route to Keystone XL in Montana	Capital Cost	$1,500,000	$45,000	$10,000	$350,000	**$1,915,000**	Capital Cost
	HP LOAD	1,208	1,221	200	3,246	6,075	HP LOAD
	Energy $	$28,380	$28,696	$4,301	$3,788	$69,465	Energy $
	Demand $	$11,754	$11,882	$1,946	$31,587	$59,116	Demand $
	Total Monthly Power $	$40,133	$40,578	$6,247	$35,375	**$128,600**	Total Monthly $

12" Pipeline 95,000 BPD -- Ultimate Case

Stations / Route Alternatives		Originating	1/4 Point Booster	Truck Injection	Midpoint Booster	3/4 Point Booster	Keystone	Totals	
North Route to Keystone XL in Montana	Capital Cost	$1,000,000	$45,000	$10,000	$45,000	$45,000	$806,500	**$1,961,500**	Capital Cost
	HP LOAD	2,863	2,618	200	2,536	2,700	2,133	13,250	HP LOAD
	Energy $	$39,130	$62,072	$4,301	$56,829	$60,486	$7,316	$234,434	Energy $
	Demand $	$27,865	$25,477	$1,946	$16,537	$21,188	$18,705	$113,663	Demand $
	Total Monthly Power $	$66,995	$87,548	$6,247	$73,366	$81,674	$26,020	**$348,100**	TOTAL MONTHLY $

Notes

1 Motor efficiency is 96% per Siemens TEFC 4160VAC for 1000-2000HP
2 VFD/Motor Efficiency is ~ 95% at 90% of rated speed per Walbom-Carlson, 1998.
3 VFD Efficiency is ~97.5% per Allen Bradley
4 Costs for the North Altenative from the Mid-Point Booster northward were adjusted for the Canandian to US dollar rate shown at the top of this page

FIXED OPERATING EXPENSE ESTIMATE DETAIL
10in Northern Pipeline Route

Block Valves	11
Truck Unloading Racks	2
Booster Stations	4
Termination Station	1
Pipeline Length (mi)	170

DESCRIPTION		QUANTITY	PER YEAR	TOTAL EXTENSION	QTY AUTO	AUTO EXTEND
ENGINEERING						
ELECTRICAL ENGINEER		1.00	$75,000	$75,000	1	1
MECHANICAL ENGINEER		1.00	$75,000	$75,000	1	1
CP TECHNICIAN		1.00	$60,000	$60,000	1	1
DRAFTING		1.00	$50,000	$50,000		0
OPERATIONS AND MAINTENANCE						
OPERATIONS & MAINTENANCE MANAGER		1.00	$104,000	$104,000	1	1
MEASUREMENTS COORDINATOR		0.13	$75,000	$9,375	1	0
ENVIRONMENTAL/SAFETY COORDINATOR		0.13	$70,000	$8,750	1	0
MAINTENANCE						
MAINTENANCE SUPERVISOR (1 for PL termination station)		1.00	$84,500	$84,500	1	1
MECHANICAL TECHNICIAN (1 per booster station)		4.00	$58,500	$234,000	1	4
ELECTRICAL TECHNICIAN - CONTROLS (.5 per station)		2.50	$58,500	$146,250	1	3
ELECTRICAL TECHNICIAN (POWER)		1.00	$58,500	$58,500	1	1
LINE RIDER (1 per 60mi pipeline)		2.83	$46,800	$132,600	1	3
OPERATIONS						
OPERATIONS SUPERVISOR/SCHEDULER.		0.50	$75,000	$37,500	1	1
PIPELINE CONTROLLER		1.00	$52,000	$52,000		0
SYSTEMS ANALYST		1.00	$65,000	$65,000		0
FIELD GAUGER (1 per truck rack)		3.00	$45,000	$135,000	1	3
OFFICE STAFF						
OFFICE MANAGER/EMPLOYEE RELATIONS		1.00	$40,000	$40,000		0
SECRETARY		1.00	$30,000	$30,000		0
ACCOUNTING						0
CONTROLLER		1.00	$80,000	$80,000		0
ACCOUNTANT		1.00	$40,000	$40,000		0
	TOTAL	26		$1,517,475	16	19
VACATION AND BENEFIT EXPENSE @ 35% OF SALARY			35%	$531,116		
	SUBTOTAL			$531,116		
AUTOMOBILE EXPENSES						
DEPRECIATION ($40K/3 YEARS)		19	$13,333	$254,444		
MAINTENANCE ($300/MONTH)		19	$3,600	$68,700		
FUEL (24,000 MPY @ 15 MPG @$1.90)		19	$3,040	$58,013		
	SUBTOTAL			$381,158		
COMMUNICATIONS						
CELLULAR PHONES (VEHICLES)		19	$1,440	$27,480		
BACKUP COMMUNICATIONS CIRCUITS		18	$100	$1,800		
LONG DISTANCE		1	$5,000	$5,000		
SATELLITE & ANALOG DATA CIRCUITS		18	$50	$900		
	SUBTOTAL			$34,280		
	GRAND TOTAL			$2,464,000		

FIXED OPERATING EXPENSE ESTIMATE DETAIL
10in Eastern Pipeline Route

Block Valves	7
Truck Unloading Racks	2
Booster Stations	4
Termination Station	1
Pipeline Length (mi)	240

DESCRIPTION	QUANTITY	PER YEAR	TOTAL EXTENSION	QTY AUTO	AUTO EXTEND
ENGINEERING					
ELECTRICAL ENGINEER	1.00	$75,000	$75,000	1	1
MECHANICAL ENGINEER	1.00	$75,000	$75,000	1	1
CP TECHNICIAN	1.00	$60,000	$60,000	1	1
DRAFTING	1.00	$50,000	$50,000		0
OPERATIONS AND MAINTENANCE					
OPERATIONS & MAINTENANCE MANAGER	1.00	$104,000	$104,000	1	1
MEASUREMENTS COORDINATOR	0.13	$75,000	$9,375	1	0
ENVIRONMENTAL/SAFETY COORDINATOR	0.13	$70,000	$8,750	1	0
MAINTENANCE					
MAINTENANCE SUPERVISOR (1 for PL termination station)	1.00	$84,500	$84,500	1	1
MECHANICAL TECHNICIAN (1 per booster station)	4.00	$58,500	$234,000	1	4
ELECTRICAL TECHNICIAN - CONTROLS (.5 per station)	2.50	$58,500	$146,250	1	3
ELECTRICAL TECHNICIAN (POWER)	1.00	$58,500	$58,500	1	1
LINE RIDER (1 per 60mi pipeline)	4.00	$46,800	$187,200	1	4
OPERATIONS					
OPERATIONS SUPERVISOR/SCHEDULER.	0.50	$75,000	$37,500	1	1
PIPELINE CONTROLLER	1.00	$52,000	$52,000		0
SYSTEMS ANALYST	1.00	$65,000	$65,000		0
FIELD GAUGER (1 per truck rack)	3.00	$45,000	$135,000	1	3
OFFICE STAFF					
OFFICE MANAGER/EMPLOYEE RELATIONS	1.00	$40,000	$40,000		0
SECRETARY	1.00	$30,000	$30,000		0
ACCOUNTING					0
CONTROLLER	1.00	$80,000	$80,000		0
ACCOUNTANT	1.00	$40,000	$40,000		0
TOTAL	27		$1,572,075	16	20
VACATION AND BENEFIT EXPENSE @ 35% OF SALARY		35%	$550,226		
SUBTOTAL			$550,226		
AUTOMOBILE EXPENSES					
DEPRECIATION ($40K/3 YEARS)	20	$13,333	$270,000		
MAINTENANCE ($300/MONTH)	20	$3,600	$72,900		
FUEL (24,000 MPY @ 15 MPG @$1.90)	20	$3,040	$61,560		
SUBTOTAL			$404,460		
COMMUNICATIONS					
CELLULAR PHONES (VEHICLES)	20	$1,440	$29,160		
BACKUP COMMUNICATIONS CIRCUITS	14	$100	$1,400		
LONG DISTANCE	1	$5,000	$5,000		
SATELLITE & ANALOG DATA CIRCUITS	14	$50	$700		
SUBTOTAL			$35,560		
GRAND TOTAL			$2,562,300		

FIXED OPERATING EXPENSE ESTIMATE DETAIL
10in Western Pipeline Route

Block Valves	5
Truck Unloading Racks	2
Booster Stations	4
Termination Station	1
Pipeline Length (mi)	190

DESCRIPTION		QUANTITY	PER YEAR	TOTAL EXTENSION	QTY AUTO	AUTO EXTEND
ENGINEERING						
ELECTRICAL ENGINEER		1.00	$75,000	$75,000	1	1
MECHANICAL ENGINEER		1.00	$75,000	$75,000	1	1
CP TECHNICIAN		1.00	$60,000	$60,000	1	1
DRAFTING		1.00	$50,000	$50,000		0
OPERATIONS AND MAINTENANCE						
OPERATIONS & MAINTENANCE MANAGER		1.00	$104,000	$104,000	1	1
MEASUREMENTS COORDINATOR		0.13	$75,000	$9,375	1	0
ENVIRONMENTAL/SAFETY COORDINATOR		0.13	$70,000	$8,750	1	0
MAINTENANCE						
MAINTENANCE SUPERVISOR (1 for PL termination station)		1.00	$84,500	$84,500	1	1
MECHANICAL TECHNICIAN (1 per booster station)		4.00	$58,500	$234,000	1	4
ELECTRICAL TECHNICIAN - CONTROLS (.5 per station)		2.50	$58,500	$146,250	1	3
ELECTRICAL TECHNICIAN (POWER)		1.00	$58,500	$58,500	1	1
LINE RIDER (1 per 60mi pipeline)		3.17	$46,800	$148,200	1	3
OPERATIONS						
OPERATIONS SUPERVISOR/SCHEDULER.		0.50	$75,000	$37,500	1	1
PIPELINE CONTROLLER		1.00	$52,000	$52,000		0
SYSTEMS ANALYST		1.00	$65,000	$65,000		0
FIELD GAUGER (1 per truck rack)		3.00	$45,000	$135,000	1	3
OFFICE STAFF						
OFFICE MANAGER/EMPLOYEE RELATIONS		1.00	$40,000	$40,000		0
SECRETARY		1.00	$30,000	$30,000		0
ACCOUNTING						0
CONTROLLER		1.00	$80,000	$80,000		0
ACCOUNTANT		1.00	$40,000	$40,000		0
	TOTAL	26		$1,533,075	16	19
VACATION AND BENEFIT EXPENSE @ 35% OF SALARY			35%	$536,576		
	SUBTOTAL			$536,576		
AUTOMOBILE EXPENSES						
DEPRECIATION ($40K/3 YEARS)		19	$13,333	$258,889		
MAINTENANCE ($300/MONTH)		19	$3,600	$69,900		
FUEL (24,000 MPY @ 15 MPG @$1.90)		19	$3,040	$59,027		
	SUBTOTAL			$387,816		
COMMUNICATIONS						
CELLULAR PHONES (VEHICLES)		19	$1,440	$27,960		
BACKUP COMMUNICATIONS CIRCUITS		12	$100	$1,200		
LONG DISTANCE		1	$5,000	$5,000		
SATELLITE & ANALOG DATA CIRCUITS		12	$50	$600		
	SUBTOTAL			$34,160		
	GRAND TOTAL			$2,491,600		

FIXED OPERATING EXPENSE ESTIMATE DETAIL
12in Northern Pipeline Route

Block Valves	11
Truck Unloading Racks	2
Booster Stations	2
Termination Station	1
Pipeline Length (mi)	170

DESCRIPTION		QUANTITY	PER YEAR	TOTAL EXTENSION	QTY AUTO	AUTO EXTEND
ENGINEERING						
ELECTRICAL ENGINEER		1.00	$75,000	$75,000	1	1
MECHANICAL ENGINEER		1.00	$75,000	$75,000	1	1
CP TECHNICIAN		1.00	$60,000	$60,000	1	1
DRAFTING		1.00	$50,000	$50,000		0
OPERATIONS AND MAINTENANCE						
OPERATIONS & MAINTENANCE MANAGER		1.00	$104,000	$104,000	1	1
MEASUREMENTS COORDINATOR		0.13	$75,000	$9,375	1	0
ENVIRONMENTAL/SAFETY COORDINATOR		0.13	$70,000	$8,750	1	0
MAINTENANCE						
MAINTENANCE SUPERVISOR (1 for PL termination station)		1.00	$84,500	$84,500	1	1
MECHANICAL TECHNICIAN (1 per booster station)		2.00	$58,500	$117,000	1	2
ELECTRICAL TECHNICIAN - CONTROLS (.5 per station)		1.50	$58,500	$87,750	1	2
ELECTRICAL TECHNICIAN (POWER)		1.00	$58,500	$58,500	1	1
LINE RIDER (1 per 60mi pipeline)		2.83	$46,800	$132,600	1	3
OPERATIONS						
OPERATIONS SUPERVISOR/SCHEDULER		0.50	$75,000	$37,500	1	1
PIPELINE CONTROLLER		1.00	$52,000	$52,000		0
SYSTEMS ANALYST		1.00	$65,000	$65,000		0
FIELD GAUGER (1 per truck rack)		2.00	$45,000	$90,000	1	2
OFFICE STAFF						
OFFICE MANAGER/EMPLOYEE RELATIONS		1.00	$40,000	$40,000		0
SECRETARY		1.00	$30,000	$30,000		0
ACCOUNTING						0
CONTROLLER		1.00	$80,000	$80,000		0
ACCOUNTANT		1.00	$40,000	$40,000		0
	TOTAL	22		$1,296,975	11	15
VACATION AND BENEFIT EXPENSE @ 35% OF SALARY			35%	$453,941		
	SUBTOTAL			$453,941		
AUTOMOBILE EXPENSES						
DEPRECIATION ($40K/3 YEARS)		15	$13,333	$197,778		
MAINTENANCE ($300/MONTH)		15	$3,600	$53,400		
FUEL (24,000 MPY @ 15 MPG @$1.90)		15	$3,040	$45,093		
	SUBTOTAL			$296,271		
COMMUNICATIONS						
CELLULAR PHONES (VEHICLES)		15	$1,440	$21,360		
BACKUP COMMUNICATIONS CIRCUITS		16	$100	$1,600		
LONG DISTANCE		1	$5,000	$5,000		
SATELLITE & ANALOG DATA CIRCUITS		16	$50	$800		
	SUBTOTAL			$27,960		
	GRAND TOTAL			$2,075,100		

FIXED OPERATING EXPENSE ESTIMATE DETAIL
12in Eastern Pipeline Route

Block Valves	7
Truck Unloading Racks	2
Booster Stations	2
Termination Station	1
Pipeline Length (mi)	240

DESCRIPTION	QUANTITY	PER YEAR	TOTAL EXTENSION	QTY AUTO	AUTO EXTEND
ENGINEERING					
ELECTRICAL ENGINEER	1.00	$75,000	$75,000	1	1
MECHANICAL ENGINEER	1.00	$75,000	$75,000	1	1
CP TECHNICIAN	1.00	$60,000	$60,000	1	1
DRAFTING	1.00	$50,000	$50,000		0
OPERATIONS AND MAINTENANCE					
OPERATIONS & MAINTENANCE MANAGER	1.00	$104,000	$104,000	1	1
MEASUREMENTS COORDINATOR	0.13	$75,000	$9,375	1	0
ENVIRONMENTAL/SAFETY COORDINATOR	0.13	$70,000	$8,750	1	0
MAINTENANCE					
MAINTENANCE SUPERVISOR (1 for PL termination station)	1.00	$84,500	$84,500	1	1
MECHANICAL TECHNICIAN (1 per booster station)	2.00	$58,500	$117,000	1	2
ELECTRICAL TECHNICIAN - CONTROLS (.5 per station)	1.50	$58,500	$87,750	1	2
ELECTRICAL TECHNICIAN (POWER)	1.00	$58,500	$58,500	1	1
LINE RIDER (1 per 60mi pipeline)	4.00	$46,800	$187,200	1	4
OPERATIONS					
OPERATIONS SUPERVISOR/SCHEDULER	0.50	$75,000	$37,500	1	1
PIPELINE CONTROLLER	1.00	$52,000	$52,000		0
SYSTEMS ANALYST	1.00	$65,000	$65,000		0
FIELD GAUGER (1 per truck rack)	2.00	$45,000	$90,000	1	2
OFFICE STAFF					
OFFICE MANAGER/EMPLOYEE RELATIONS	1.00	$40,000	$40,000		0
SECRETARY	1.00	$30,000	$30,000		0
ACCOUNTING					0
CONTROLLER	1.00	$80,000	$80,000		0
ACCOUNTANT	1.00	$40,000	$40,000		0
TOTAL	23		$1,351,575	11	16
VACATION AND BENEFIT EXPENSE @ 35% OF SALARY		35%	$473,051		
SUBTOTAL			$473,051		
AUTOMOBILE EXPENSES					
DEPRECIATION ($40K/3 YEARS)	16	$13,333	$213,333		
MAINTENANCE ($300/MONTH)	16	$3,600	$57,600		
FUEL (24,000 MPY @ 15 MPG @$1.90)	16	$3,040	$48,640		
SUBTOTAL			$319,573		
COMMUNICATIONS					
CELLULAR PHONES (VEHICLES)	16	$1,440	$23,040		
BACKUP COMMUNICATIONS CIRCUITS	12	$100	$1,200		
LONG DISTANCE	1	$5,000	$5,000		
SATELLITE & ANALOG DATA CIRCUITS	12	$50	$600		
SUBTOTAL			$29,240		
GRAND TOTAL			$2,173,400		

FIXED OPERATING EXPENSE ESTIMATE DETAIL
12in Western Pipeline Route

Block Valves	5
Truck Unloading Racks	2
Booster Stations	2
Termination Station	1
Pipeline Length (mi)	190

DESCRIPTION	QUANTITY	PER YEAR	TOTAL EXTENSION	QTY AUTO	AUTO EXTEND
ENGINEERING					
ELECTRICAL ENGINEER	1.00	$75,000	$75,000	1	1
MECHANICAL ENGINEER	1.00	$75,000	$75,000	1	1
CP TECHNICIAN	1.00	$60,000	$60,000	1	1
DRAFTING	1.00	$50,000	$50,000		0
OPERATIONS AND MAINTENANCE					
OPERATIONS & MAINTENANCE MANAGER	1.00	$104,000	$104,000	1	1
MEASUREMENTS COORDINATOR	0.13	$75,000	$9,375	1	0
ENVIRONMENTAL/SAFETY COORDINATOR	0.13	$70,000	$8,750	1	0
MAINTENANCE					
MAINTENANCE SUPERVISOR (1 for PL termination station)	1.00	$84,500	$84,500	1	1
MECHANICAL TECHNICIAN (1 per booster station)	2.00	$58,500	$117,000	1	2
ELECTRICAL TECHNICIAN - CONTROLS (.5 per station)	1.50	$58,500	$87,750	1	2
ELECTRICAL TECHNICIAN (POWER)	1.00	$58,500	$58,500	1	1
LINE RIDER (1 per 60mi pipeline)	3.17	$46,800	$148,200	1	3
OPERATIONS					
OPERATIONS SUPERVISOR/SCHEDULER	0.50	$75,000	$37,500	1	1
PIPELINE CONTROLLER	1.00	$52,000	$52,000		0
SYSTEMS ANALYST	1.00	$65,000	$65,000		0
FIELD GAUGER (1 per truck rack)	2.00	$45,000	$90,000	1	2
OFFICE STAFF					
OFFICE MANAGER/EMPLOYEE RELATIONS	1.00	$40,000	$40,000		0
SECRETARY	1.00	$30,000	$30,000		0
ACCOUNTING					0
CONTROLLER	1.00	$80,000	$80,000		0
ACCOUNTANT	1.00	$40,000	$40,000		0
TOTAL	22		$1,312,575	11	15
VACATION AND BENEFIT EXPENSE @ 35% OF SALARY		35%	$459,401		
SUBTOTAL			$459,401		
AUTOMOBILE EXPENSES					
DEPRECIATION ($40K/3 YEARS)	15	$13,333	$202,222		
MAINTENANCE ($300/MONTH)	15	$3,600	$54,600		
FUEL (24,000 MPY @ 15 MPG @$1.90)	15	$3,040	$46,107		
SUBTOTAL			$302,929		
COMMUNICATIONS					
CELLULAR PHONES (VEHICLES)	15	$1,440	$21,840		
BACKUP COMMUNICATIONS CIRCUITS	10	$100	$1,000		
LONG DISTANCE	1	$5,000	$5,000		
SATELLITE & ANALOG DATA CIRCUITS	10	$50	$500		
SUBTOTAL			$27,840		
GRAND TOTAL			$2,102,700		

FIXED OPERATING EXPENSE ESTIMATE DETAIL
12in Northern Pipeline Route - Ultimate Case

Block Valves	11
Truck Unloading Racks	2
Booster Stations	4
Termination Station	1
Pipeline Length (mi)	170

DESCRIPTION		QUANTITY	PER YEAR	TOTAL EXTENSION	QTY AUTO	AUTO EXTEND
ENGINEERING						
ELECTRICAL ENGINEER		1	$75,000	$75,000	1	1
MECHANICAL ENGINEER		1	$75,000	$75,000	1	1
CP TECHNICIAN		1	$60,000	$60,000	1	1
DRAFTING		1	$50,000	$50,000		0
OPERATIONS AND MAINTENANCE						
OPERATIONS & MAINTENANCE MANAGER		1	$104,000	$104,000	1	1
MEASUREMENTS COORDINATOR		0	$75,000	$9,375	1	0
ENVIRONMENTAL/SAFETY COORDINATOR		0	$70,000	$8,750	1	0
MAINTENANCE						
MAINTENANCE SUPERVISOR (1 for PL termination station)		1	$84,500	$84,500	1	1
MECHANICAL TECHNICIAN (1 per booster station)		4	$58,500	$234,000	1	4
ELECTRICAL TECHNICIAN - CONTROLS (.5 per station)		3	$58,500	$146,250	1	3
ELECTRICAL TECHNICIAN (POWER)		1	$58,500	$58,500	1	1
LINE RIDER (1 per 60mi pipeline)		3	$46,800	$132,600	1	3
OPERATIONS						
OPERATIONS SUPERVISOR/SCHEDULER.		1	$75,000	$37,500	1	1
PIPELINE CONTROLLER		1	$52,000	$52,000		0
SYSTEMS ANALYST		1	$65,000	$65,000		0
FIELD GAUGER (1 per truck rack)		3	$45,000	$135,000	1	3
OFFICE STAFF						
OFFICE MANAGER/EMPLOYEE RELATIONS		1	$40,000	$40,000		0
SECRETARY		1	$30,000	$30,000		0
ACCOUNTING						0
CONTROLLER		1	$80,000	$80,000		0
ACCOUNTANT		1	$40,000	$40,000		0
	TOTAL	26		$1,517,475	16	19
VACATION AND BENEFIT EXPENSE @ 35% OF SALARY			35%	$531,116		
	SUBTOTAL			$531,116		
AUTOMOBILE EXPENSES						
DEPRECIATION ($40K/3 YEARS)		19	$13,333	$254,444		
MAINTENANCE ($300/MONTH)		19	$3,600	$68,700		
FUEL (24,000 MPY @ 15 MPG @$1.90)		19	$3,040	$58,013		
	SUBTOTAL			$381,158		
COMMUNICATIONS						
CELLULAR PHONES (VEHICLES)		19	$1,440	$27,480		
BACKUP COMMUNICATIONS CIRCUITS		18	$100	$1,800		
LONG DISTANCE		1	$5,000	$5,000		
SATELLITE & ANALOG DATA CIRCUITS		18	$50	$900		
	SUBTOTAL			$34,280		
	GRAND TOTAL			$2,464,000		

North Dakota Pipeline Feasibility Study – Insurance Coverage

10.75" System

			West Route	North Route	East Route
			Length (Miles)		
			188	162	241
			Capital Cost (USD)		
		Pipeline	**$115,585,100**	**$101,699,700**	**$148,996,600**
		Stations	**$94,924,100**	**$93,616,000**	**$93,038,200**
General Liability					
Limit $1,000,000 per occurrence					
$2,000,000 aggregate					
Rate	$160 per mile		$30,080	$25,920	$38,560
Pollution					
Limit $1,000,000 per occurrence					
Rates	$16 per mile		$7,500	$7,500	$7,500
			10% of GL minimum of $7500/year		
Property					
Based on Pipeline Value					
$0.03 per $100 for PL		$100	$34,676	$30,510	$44,699
$0.33 per $100 for Stations		$100	$313,250	$308,933	$307,026
Business Interruption (N/A)					
			$0	$0	$0
Umbrella					
Limit $10,000,000					
Premium	$75,000		$75,000	$75,000	$75,000
Excess Limit of 20,000,000 (total of $30MM)					
Limit Excess of $10MM					
Use	$20,000,000 Excess Limit				
Rates	$2,500 per MM		$50,000.00	$50,000.00	$50,000.00
		Totals	$510,505.06	$497,862.71	$522,785.04

North Dakota Pipeline Feasibility Study – Insurance Coverage

12.75" System

				West Route	North Route	East Route
				Length (Miles)		
				188	162	241
				Capital Cost (USD)		
			Pipeline	$132,900,200	$117,880,000	$171,506,100
			Stations	$82,196,500	$80,888,400	$80,310,600
General Liability						
Limit $1,000,000 per occurrence						
$2,000,000 aggregate						
Rate	$160	per mile		$30,080	$25,920	$38,560
Pollution						
Limit $1,000,000 per occurrence						
Rates	$16	per mile		$7,500	$7,500	$7,500
				10% of GL minimum of $7500/year		
Property						
Based on Pipeline Value						
$0.03 per $100 for PL			$100	$39,870	$35,364	$51,452
$0.33 per $100 for Stations			$100	$271,248	$266,932	$265,025
Business Interruption (N/A)						
				$0	$0	$0
Umbrella						
Limit $10,000,000						
Premium	$75,000			$75,000	$75,000	$75,000
Excess Limit of 20,000,000 (total of $30MM)						
Limit Excess of $10MM						
Use	$20,000,000	Excess Limit				
Rates	$2,500	per MM		$50,000.00	$50,000.00	$50,000.00
			Totals	$473,700	$460,700	$487,500

North Dakota Pipeline Feasibility Study – Insurance Coverage

12.75" System - Ultimate

			West Route	North Route	East Route
			Length (Miles)		
			188	162	241
			Capital Cost (USD)		
		Pipeline		**$117,880,000**	
		Stations		**$112,046,400**	
General Liability					
Limit $1,000,000 per occurrence					
$2,000,000 aggregate					
Rate	$160	per mile		$25,920	
Pollution					
Limit $1,000,000 per occurrence					
Rates	$16	per mile		$7,500	
			10% of GL minimum of $7500/year		
Property					
Based on Pipeline Value					
$0.03 per $100 for PL		$100		$35,364	
$0.33 per $100 for Stations		$100		$369,753	
Business Interruption (N/A)					
			$0	$0	$0
Umbrella					
Limit $10,000,000					
Premium	$75,000			$75,000	
Excess Limit of 20,000,000 (total of $30MM)					
Limit Excess of $10MM					
Use	$20,000,000	Excess Limit			
Rates	$2,500	per MM		$50,000.00	
		Totals	$0.00	$563,500.00	$0.00

North Dakota Pipeline Feasibility Study – Insurance Coverage

12.75in System - Independent Operator

			West Route	North Route	East Route
			Length (Miles)		
			188	162	241
			Capital Cost (USD)		
		Pipeline		$117,880,000	
		Stations		$81,278,400	
General Liability					
Limit $1,000,000 per occurrence					
$2,000,000 aggregate					
Rate	$160	per mile		$25,920	
Pollution					
Limit $1,000,000 per occurrence					
Rates	$16	per mile		$7,500	
			10% of GL minimum of $7500/year		
Property					
Based on Pipeline Value					
$0.03 per $100 for PL		$100		$35,364	
$0.33 per $100 for Stations		$100		$268,219	
Business Interruption (N/A)					
			$0	$0	$0
Umbrella					
Limit $10,000,000					
Premium	$75,000			$75,000	
Excess Limit of 20,000,000 (total of $30MM)					
Limit Excess of $10MM					
Use	$20,000,000	Excess Limit			
Rates	$2,500	per MM		$50,000.00	
		Totals	$0.00	$462,000.00	$0.00

APPENDIX C

Hydraulics
10” and 12” Systems

Appendix C

Hydraulics -- 10" & 12" Systems

Notes:

- ***Base Case*** *is 55,000 BPD*
    - *10" System – Originating Station and ¼ Point, Midpoint, & ¾ Booster Stations*
    - *12" System – Originating Station and Midpoint Booster Station*
- ***Maximum Flow Case*** *is Base Case pumps with larger impellers, to achieve maximum pipeline system flow with Base Case pumps, without adding additional booster pump stations.*
- ***Ultimate Flow Case*** *(for 12" System) is Base Case pumps with larger impellers plus adding ¼ Point & ¾ Point Booster Stations*

C-1 **North Route – Hydraulic Gradient Graph** – delivery to TransCanada Pipeline's Whitewood Pump Station in southern Saskatchewan, Canada

10" System -- Base Case and Maximum

12" System – Base Case; Maximum Flow Case; & Ultimate Flow Case

C-2 **East Route – Hydraulic Gradient Graph** – delivery to Keystone Pipeline's Niagara Pump Station in eastern North Dakota

10" System -- Base Case and Maximum

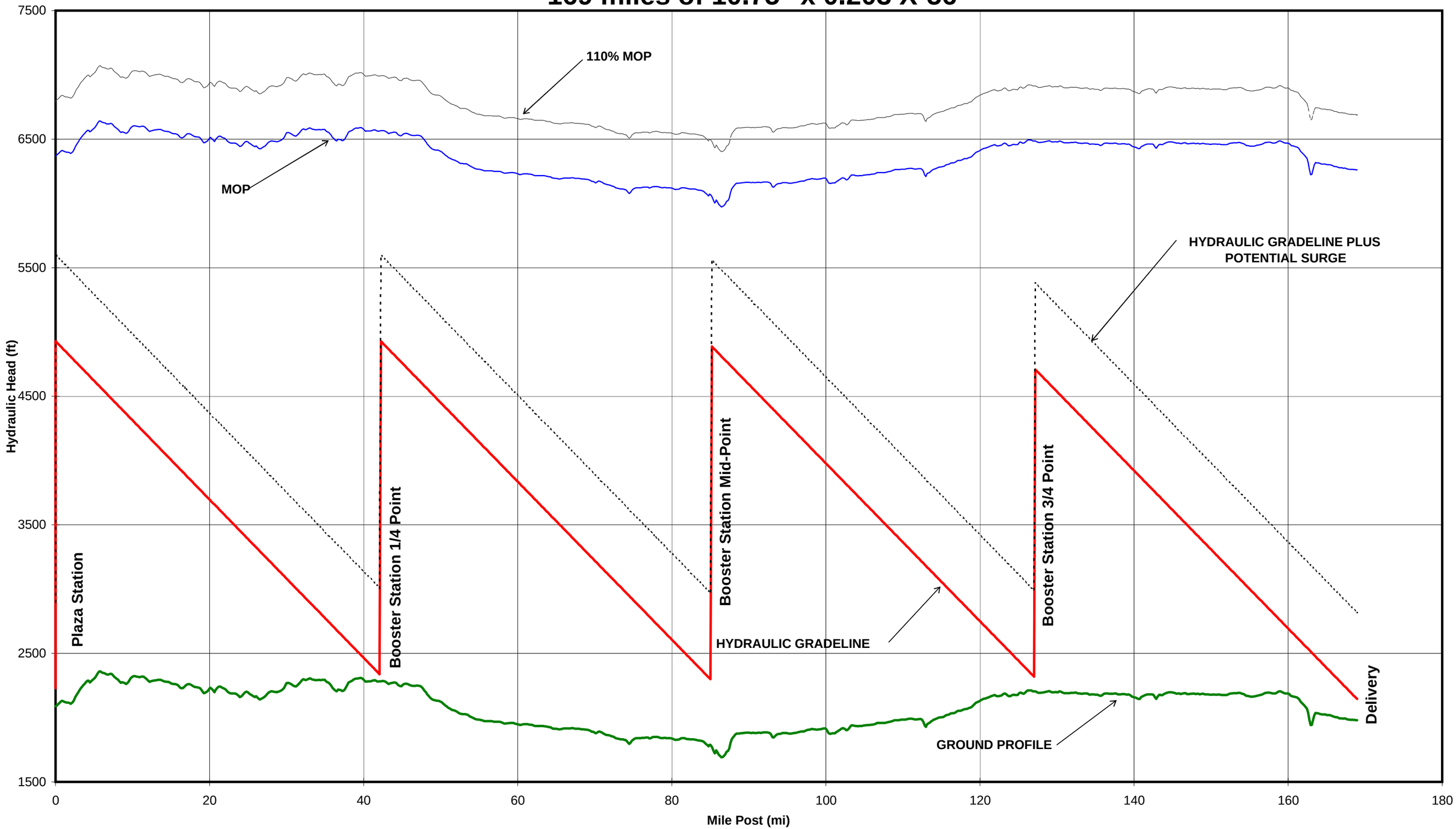
12" System – Base Case; Maximum Flow Case; & Ultimate Flow Case

C-3 **West Route – Hydraulic Gradient Graph** – for delivery to Keystone XL Fallon Pump Station in southeastern Montana

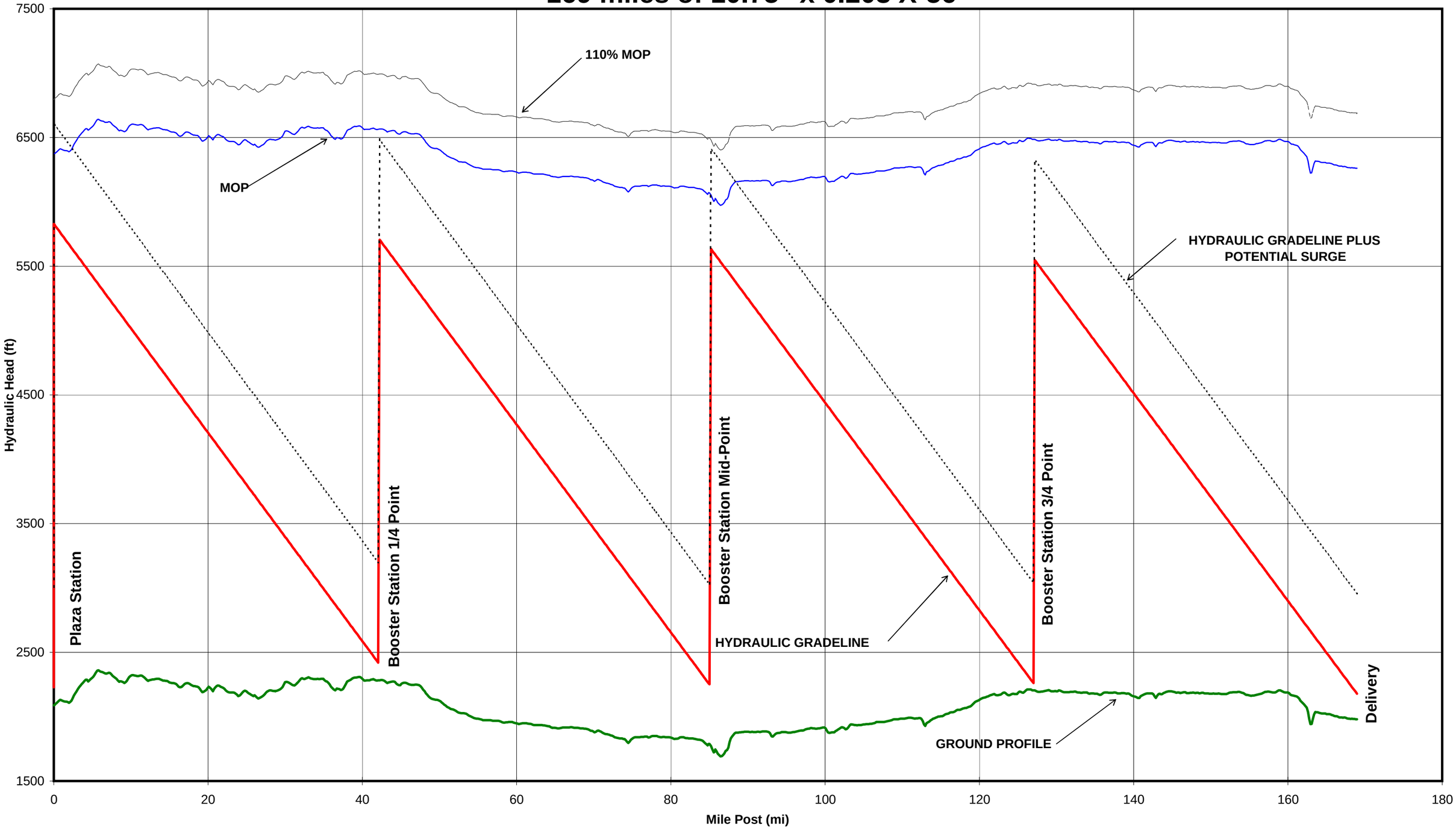
10" System -- Base Case and Maximum

12" System – Base Case; Maximum Flow Case; & Ultimate Flow Case

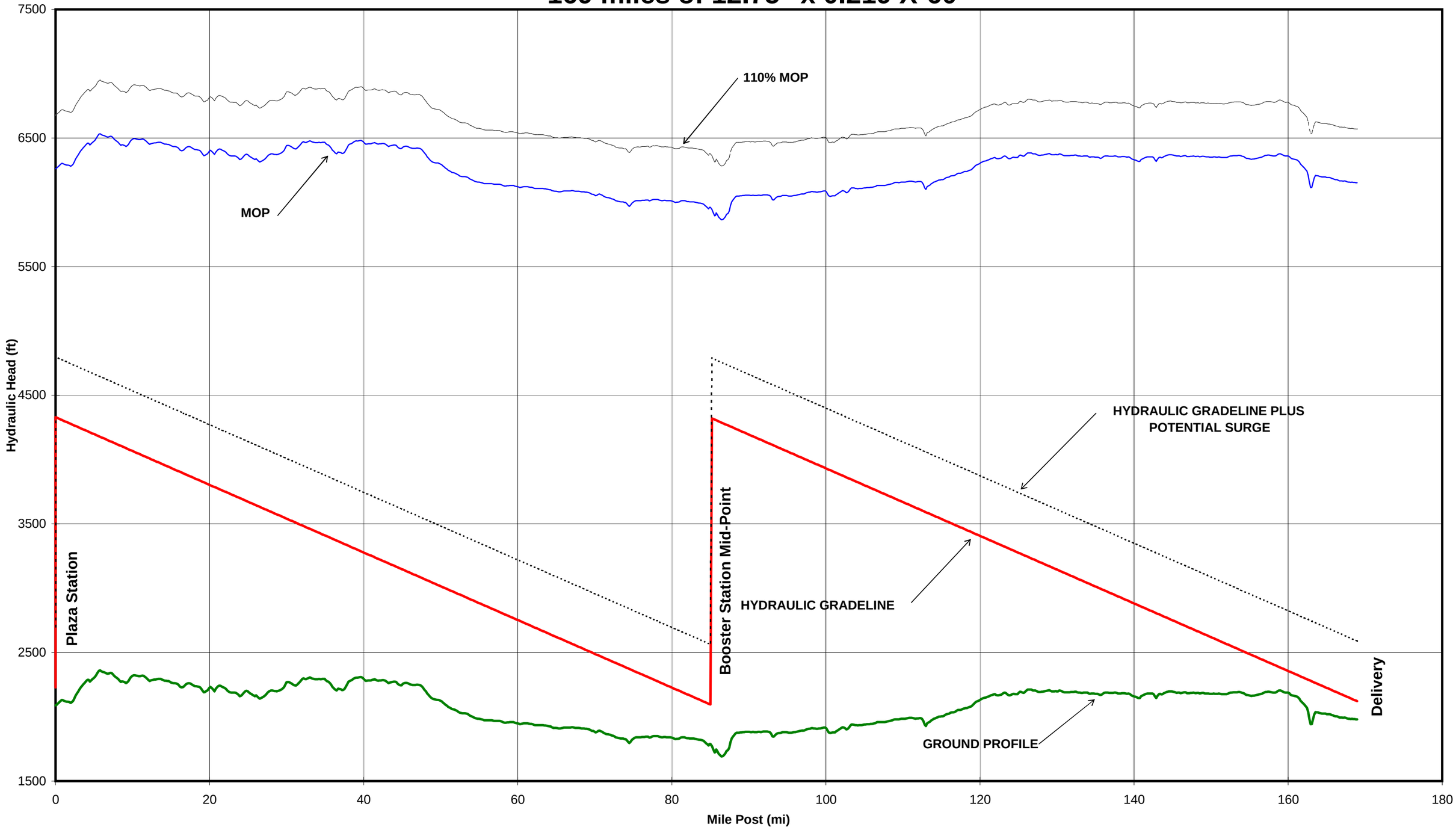
North 10" 55MBPD - Plaza to Whitewood PS - Sweet Crude (2.8cs)
169 miles of 10.75" x 0.203 X-56



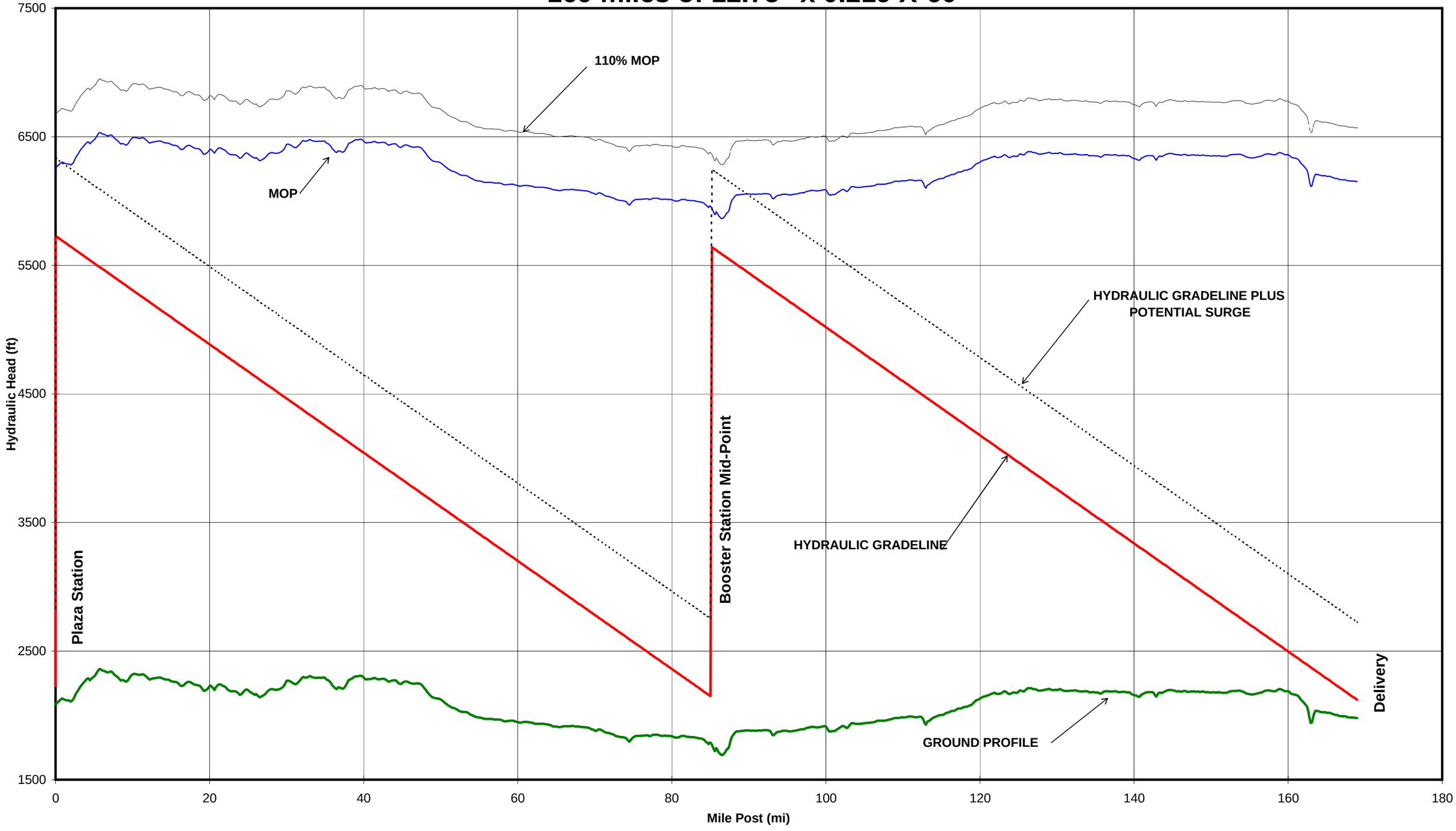
North 10" Maximum - Plaza to Whitewood PS - 63.8MBPD - Sweet Crude (2.8cs)
169 miles of 10.75" x 0.203 X-56



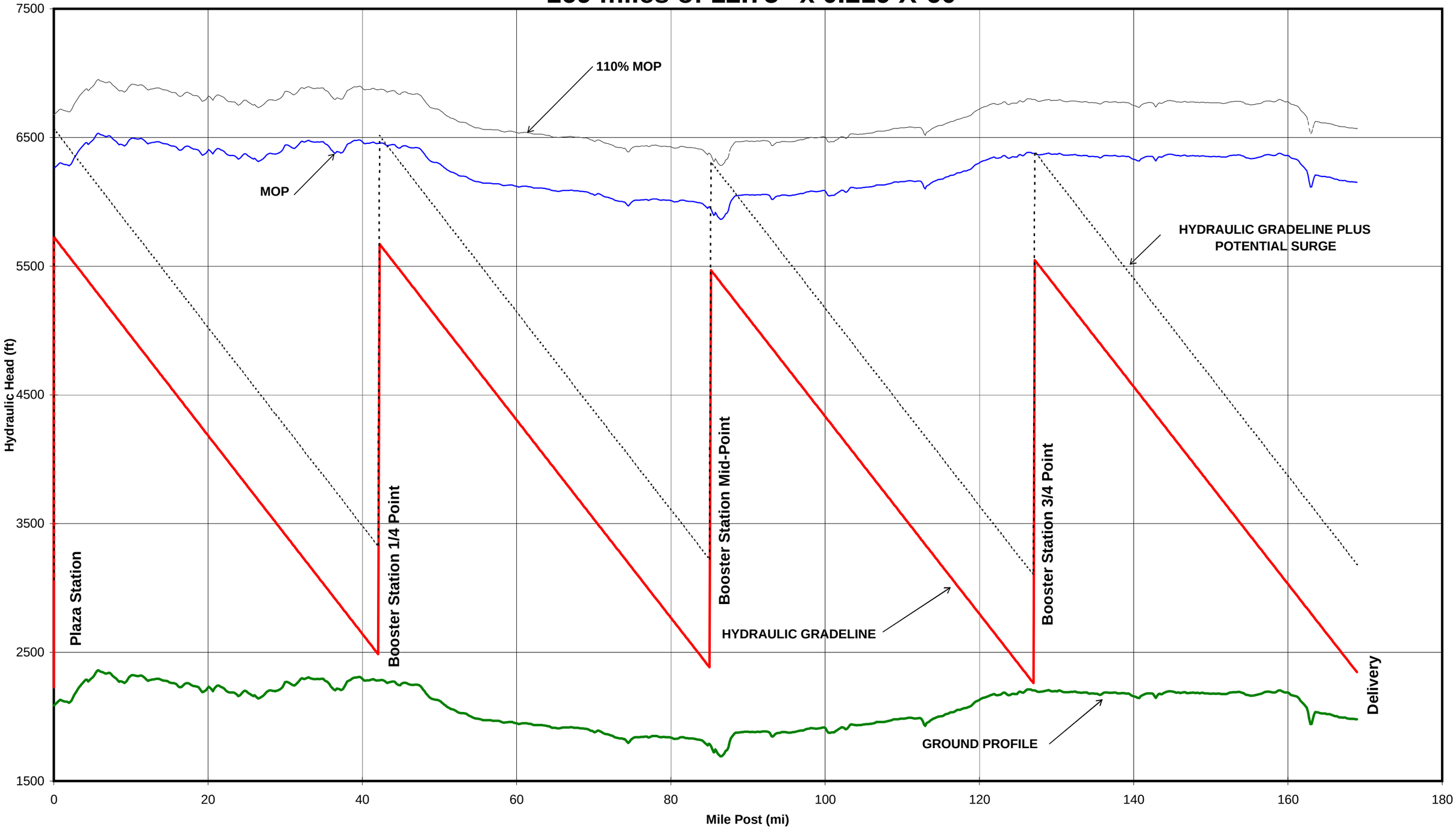
North 12" 55MBPD - Plaza to Whitewood PS - Sweet Crude (2.8cs)
169 miles of 12.75" x 0.219 X-60



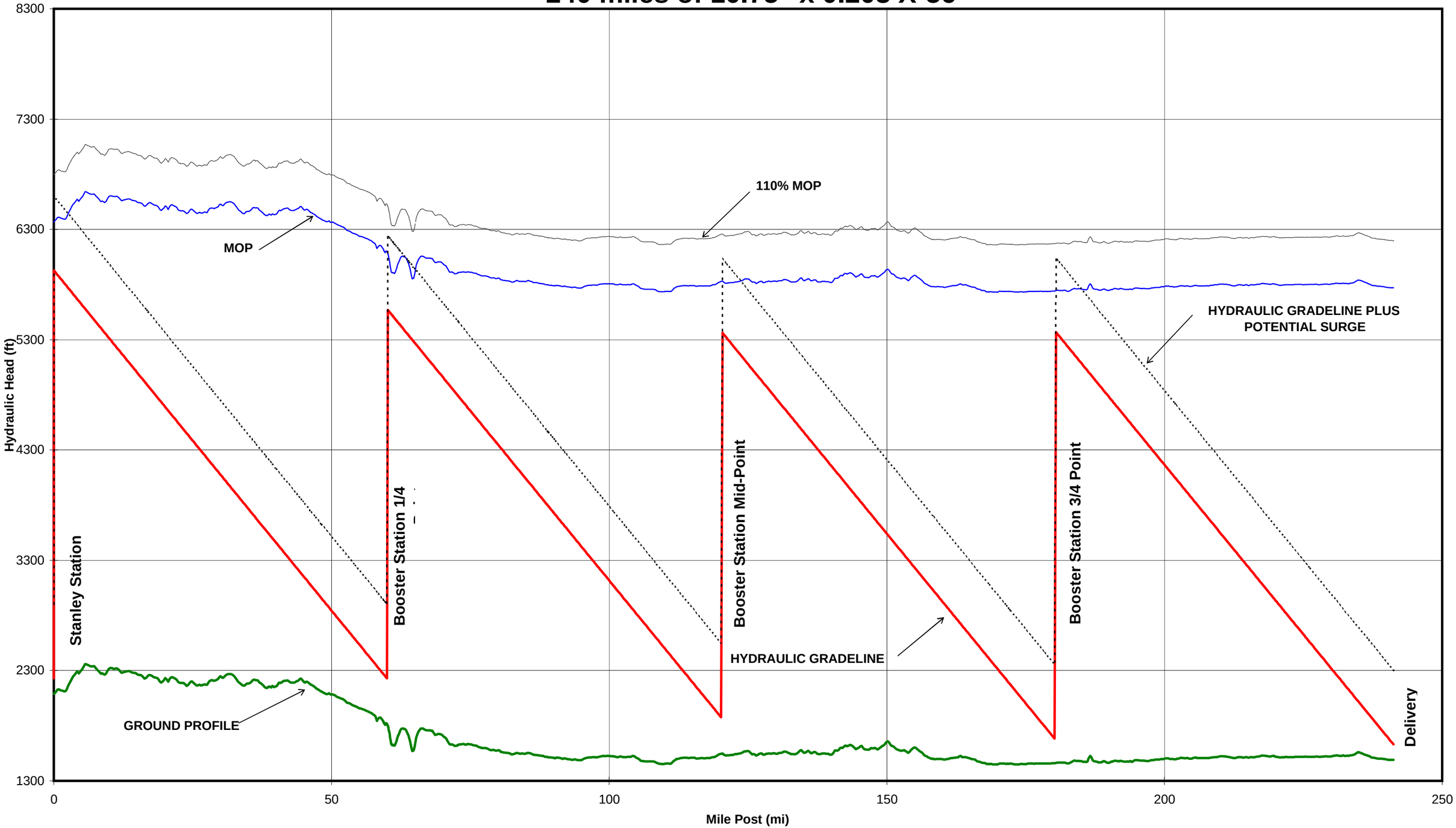
North 12" Maximum - Plaza to Whitewood PS - 71.1MBPD Sweet Crude (2.8cs)
169 miles of 12.75" x 0.219 X-60



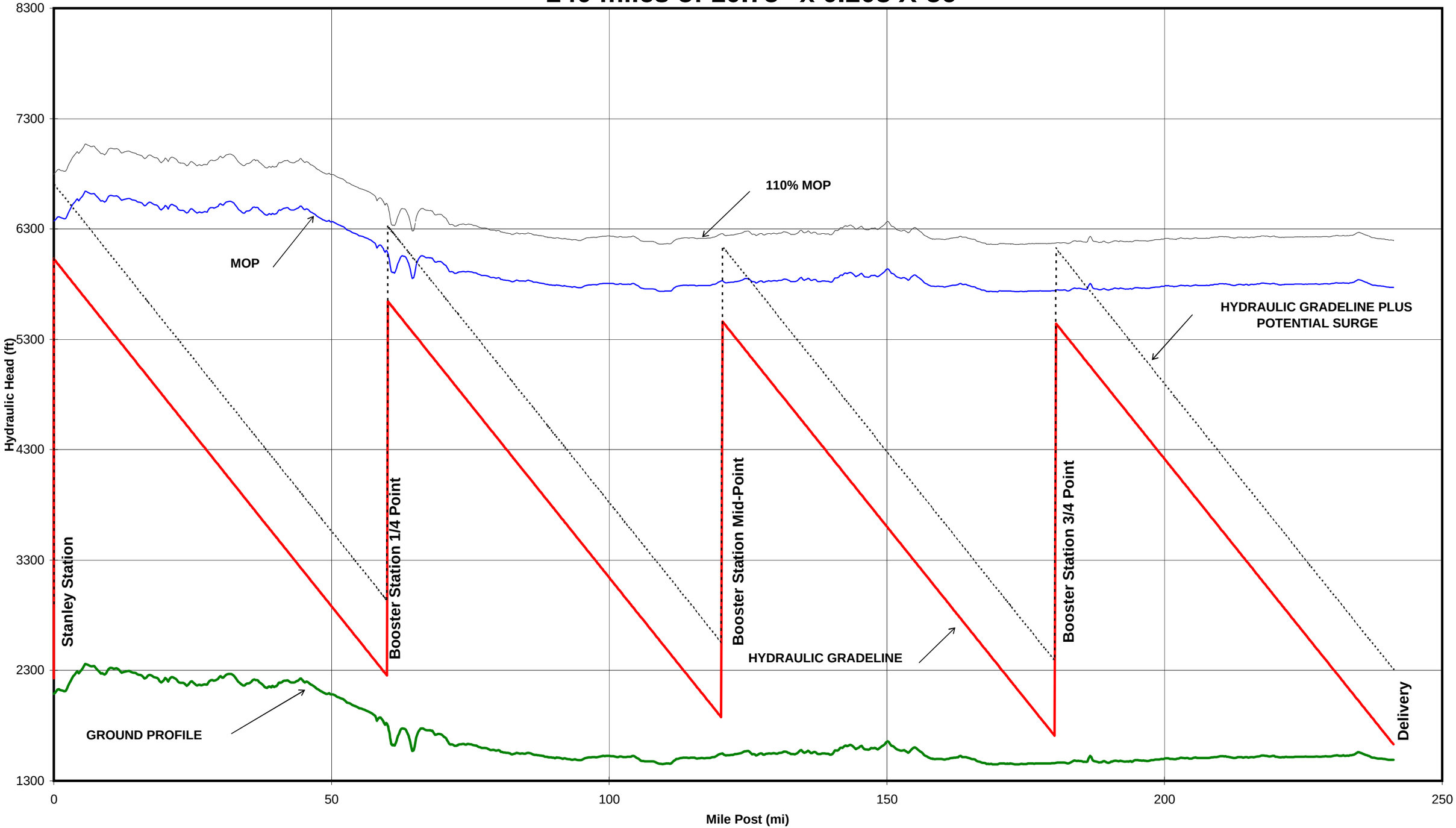
North 12" Ultimate - Plaza to Whitewood PS - 98.5MBPD - Sweet Crude (2.8cs)
169 miles of 12.75" x 0.219 X-60



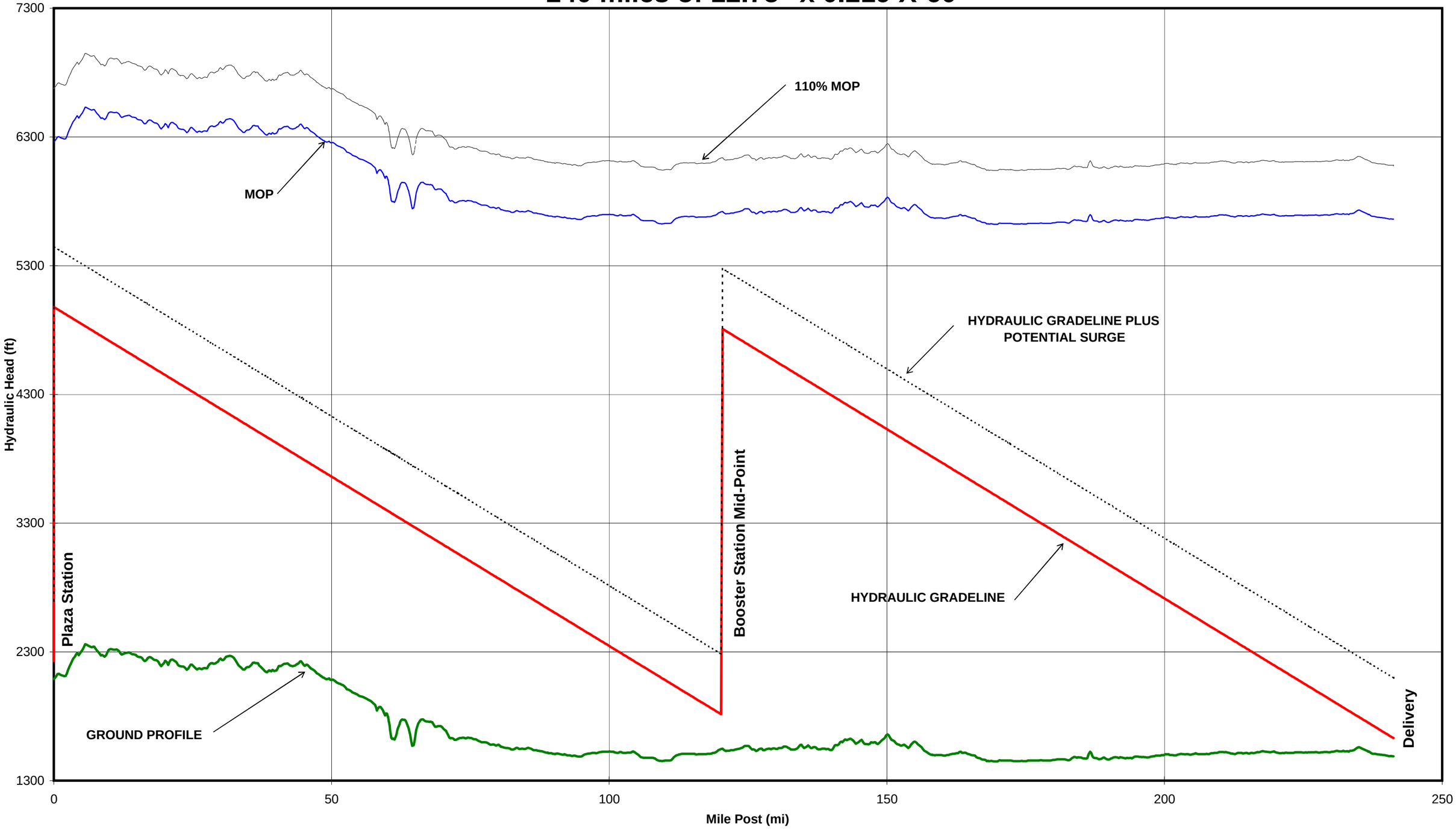
East 10" 55MBPD - Plaza to Niagara PS - Sweet Crude (2.8cs)
240 miles of 10.75" x 0.203 X-56



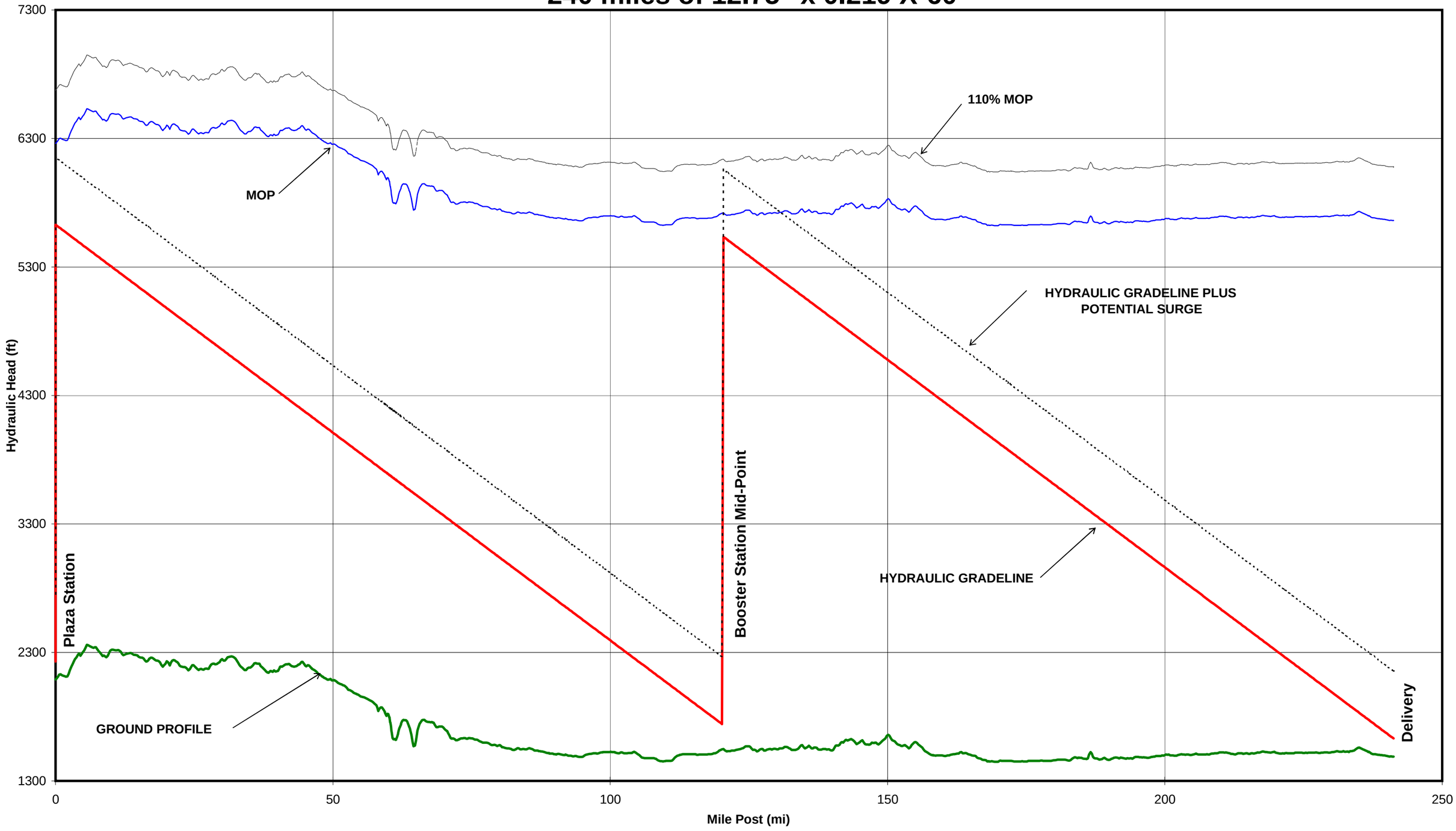
East 10" Maximum - Plaza to Niagara PS - 55.6MBPD - Sweet Crude (2.8cs)
240 miles of 10.75" x 0.203 X-56



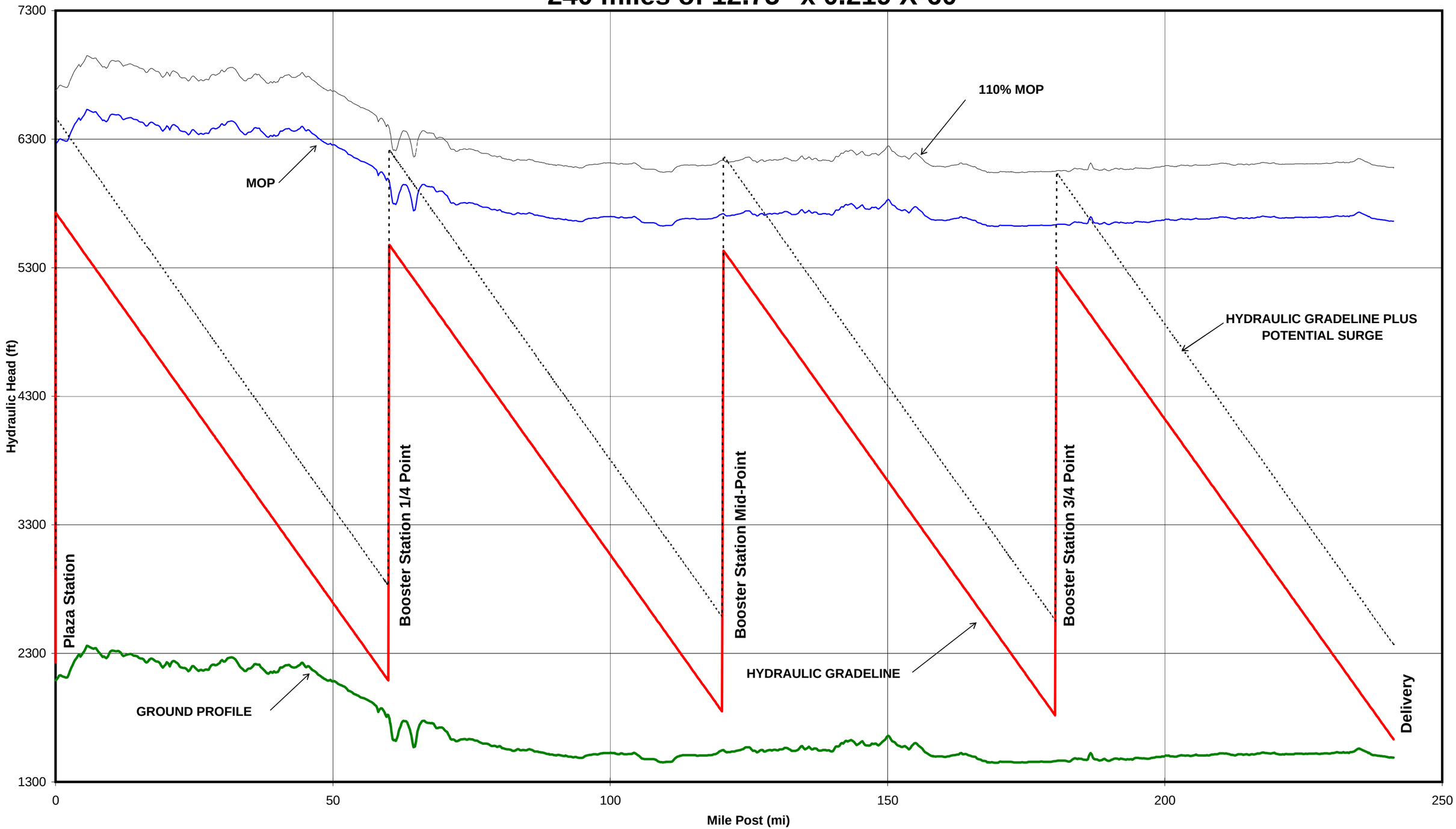
East 12" 55MBPD - Plaza to Niagara PS - Sweet Crude (2.8cs)
240 miles of 12.75" x 0.219 X-60



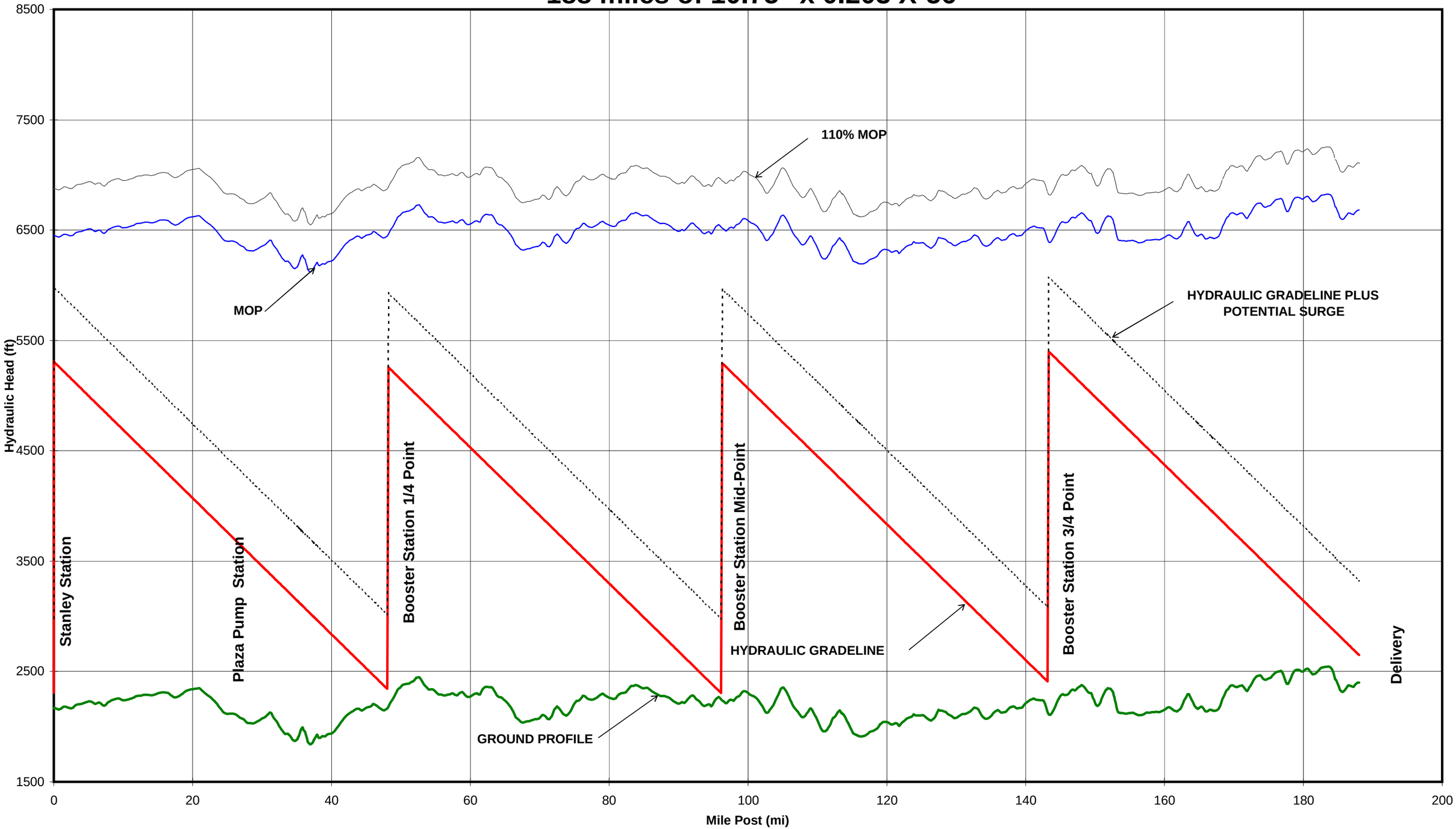
East 12" Maximum - Plaza to Niagara PS - 61.6MBPD - Sweet Crude (2.8cs)
240 miles of 12.75" x 0.219 X-60



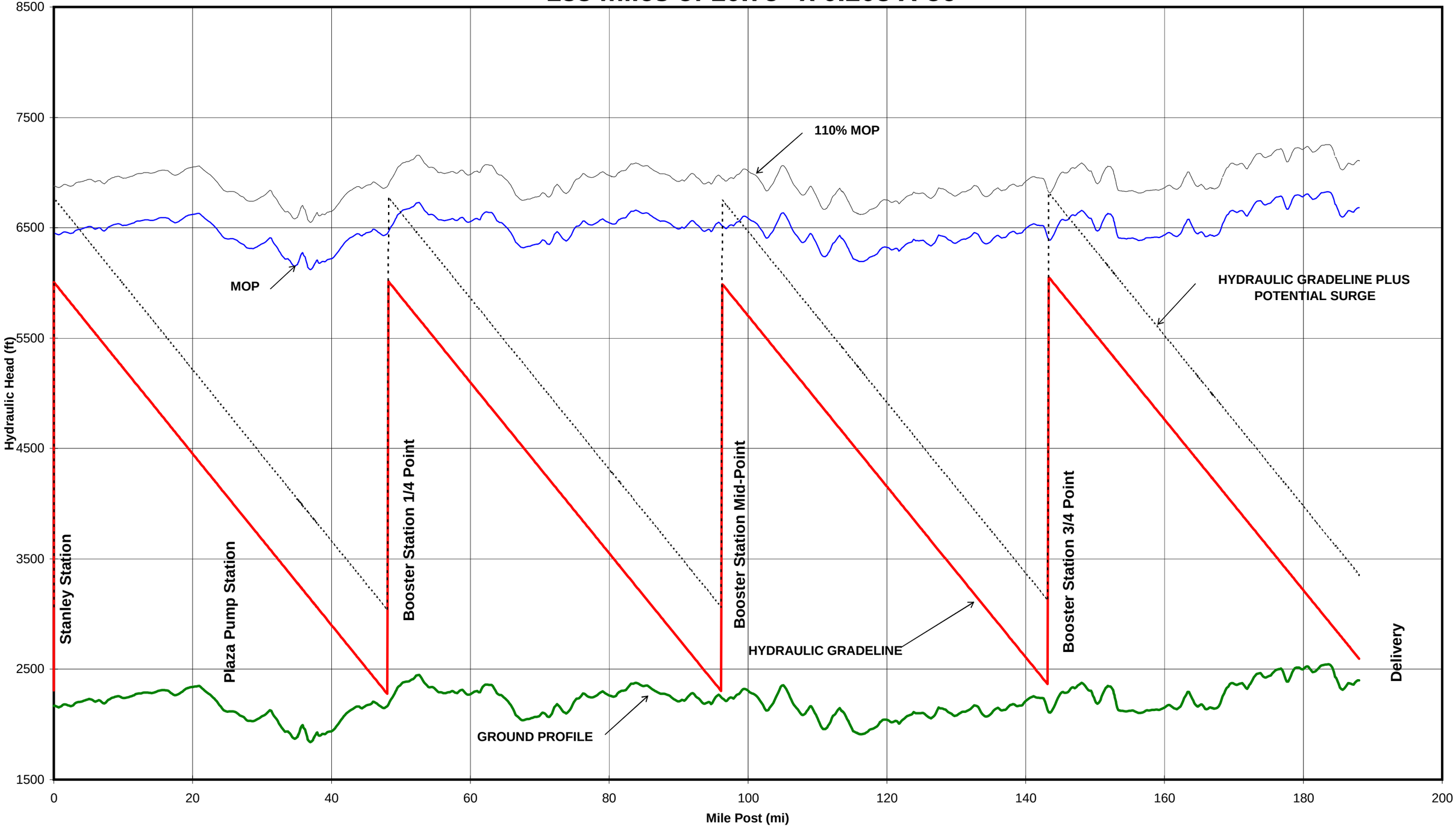
East 12" Ultimate - Plaza to Niagara PS - 86.6MBPD - Sweet Crude (2.8cs)
240 miles of 12.75" x 0.219 X-60



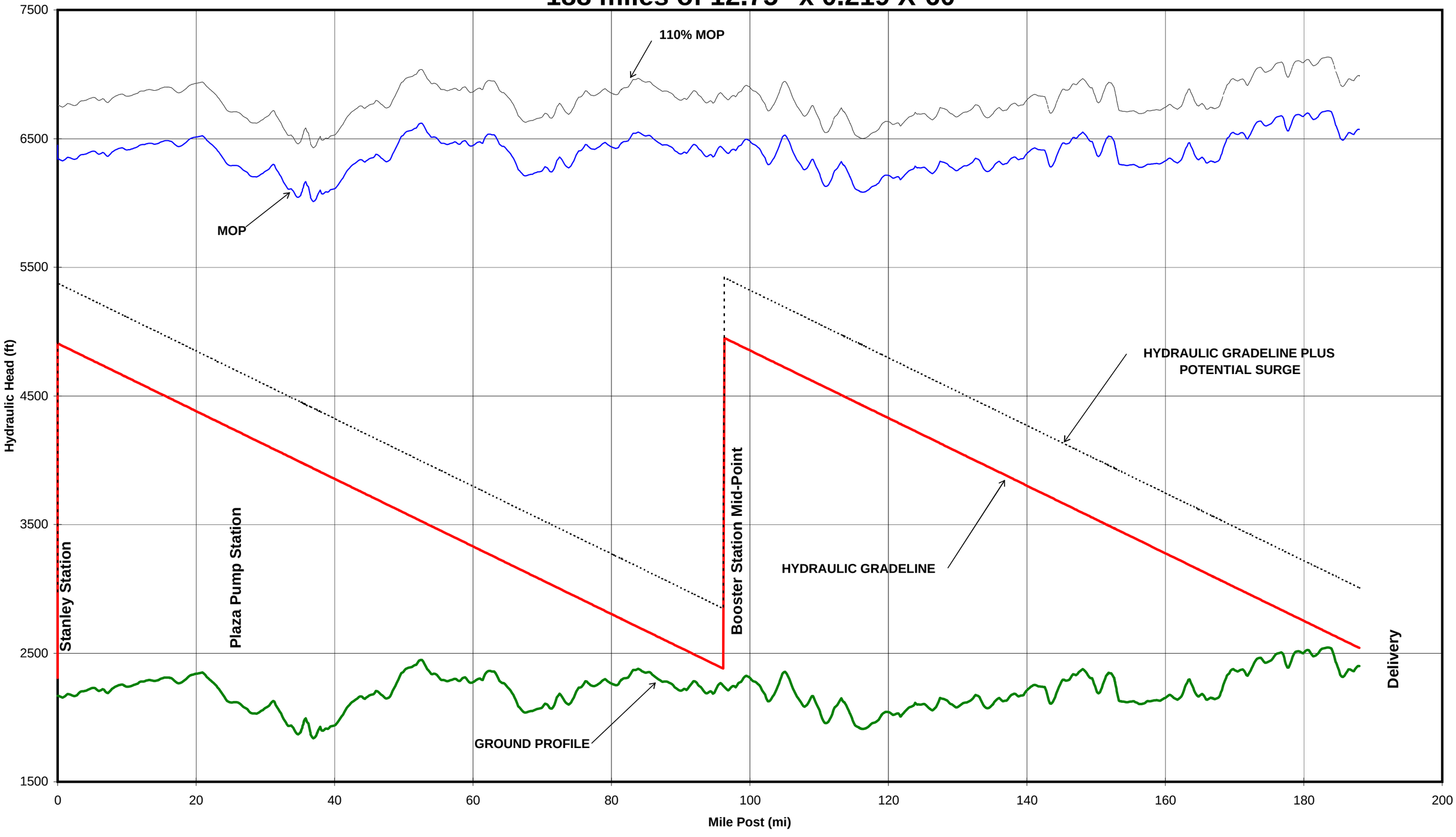
West 10" 55MBPD - Stanley to Fallon (XL) Pipeline - Sweet Crude (2.8cs)
188 miles of 10.75" x 0.203 X-56



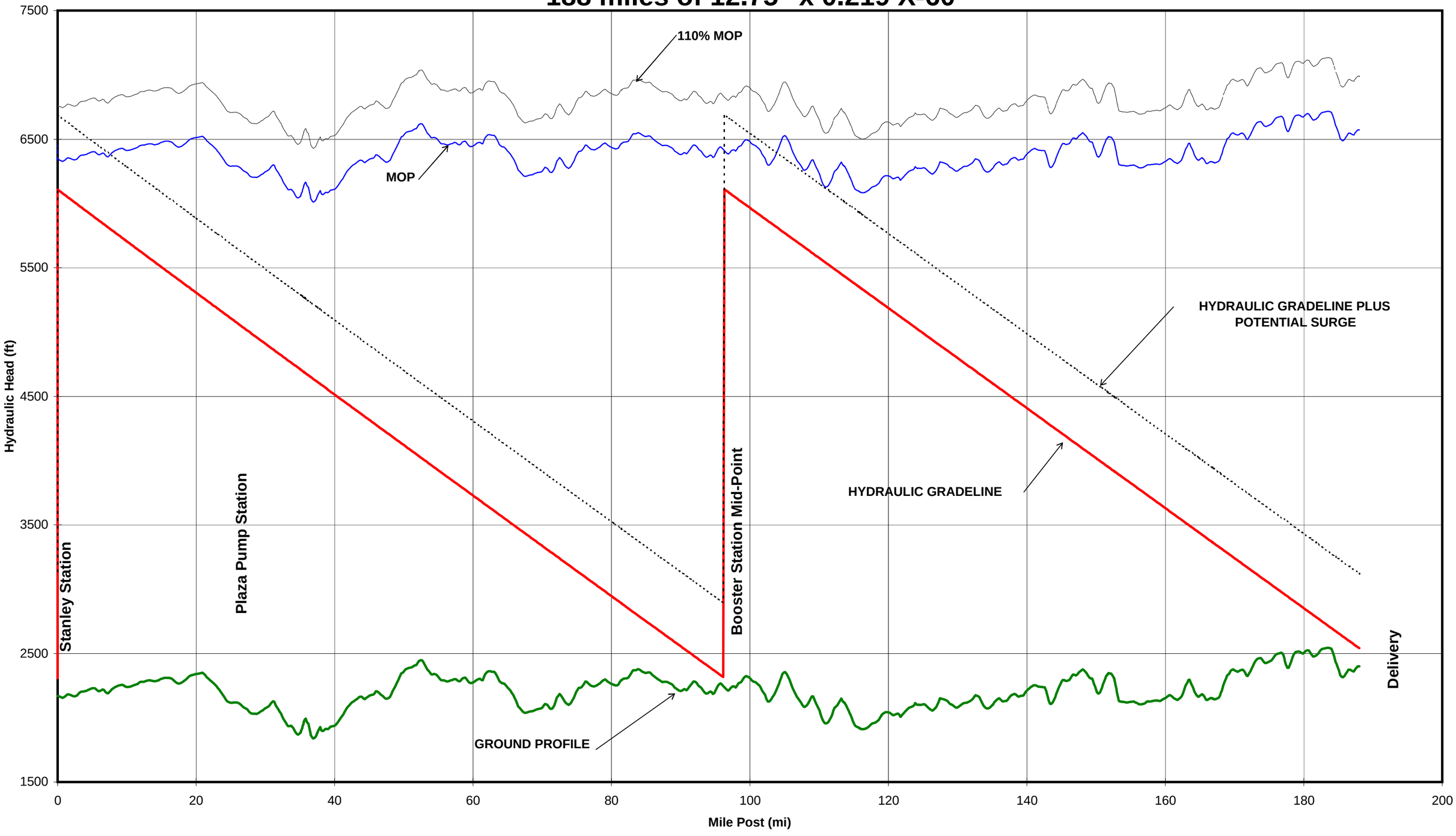
West 10" Maximum - Stanley to Fallon (XL) Pipeline - 62.4MBPD - Sweet Crude (2.8cs)
188 miles of 10.75" x 0.203 X-56



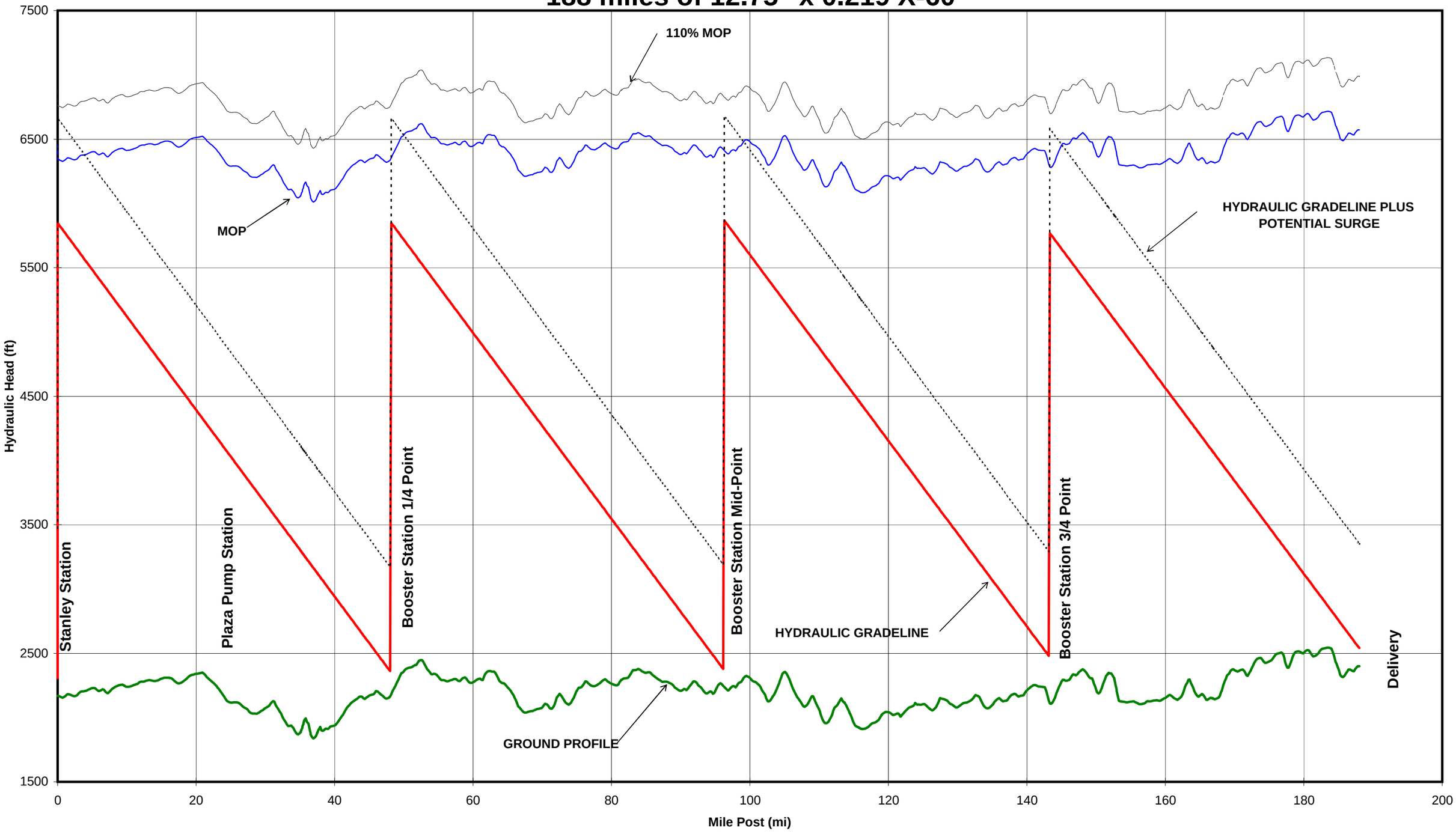
West 12" 55MBPD - Stanley to Fallon (XL) Pipeline - Sweet Crude (2.8cs)
188 miles of 12.75" x 0.219 X-60



West 12" Maximum - Stanley to Fallon (XL) Pipeline - 68.4MBPD - Sweet Crude (2.8cs)
188 miles of 12.75" x 0.219 X-60



West 12" Ultimate - Stanley to Fallon (XL) Pipeline - 95.2MBPD - Sweet Crude (2.8cs)
188 miles of 12.75" x 0.219 X-60



APPENDIX D

Economics Analysis

Appendix D

Economic Analysis

D-1 10"' System Economic Analysis – 55MBPD Base Case

10 " North Route

10" East Route

10" West Route

D-2 12"' System Economic Analysis – 55MBPD Base Case

12" North Route

12" East Route

12" West Route

D-3 12"' System Economic Analysis – North Route -- Ultimate Flow Case

North Dakota Pipeline

ECONOMIC ANALYSIS

12in Northern Pipeline Route - Independent Operator

Review the rate of return on a pipeline run by an independent operator at 55,000BPD for 20 years

FULL INVESTMENT (x 1,000)	$199,146
AFUDC	$12,945
TOTAL LOAN VALUE (x 1,000)	$212,091
TARIFF $/BBL	$4.30
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$104,891
8.50%	$94,144
9.00%	$84,048
9.50%	$74,556
10.00%	$65,626
10.50%	$57,220
11.00%	$49,302
11.50%	$41,838
12.00%	$34,798

(x 1,000)

DESCRIPTION	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$212,091	$206,628	$200,810	$194,615	$188,016	$180,988	$173,504	$165,533	$157,044	$148,003	$138,375	$128,121	$117,200	$105,569	$93,183	$79,991	$65,942	$50,979	$35,045	$18,074	$2,659,711
PRINCIPAL PAYMENT				$5,463	$5,818	$6,196	$6,599	$7,028	$7,484	$7,971	$8,489	$9,041	$9,628	$10,254	$10,921	$11,631	$12,387	$13,192	$14,049	$14,962	$15,935	$16,971	$18,074	$212,091
INTEREST PAYMENT				$13,786	$13,431	$13,053	$12,650	$12,221	$11,764	$11,278	$10,760	$10,208	$9,620	$8,994	$8,328	$7,618	$6,862	$6,057	$5,199	$4,286	$3,314	$2,278	$1,175	$172,881
ANNUAL Q (BBLS)			55,000	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	220,825
TARIFF $/BBL		$4.300		$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	$4.30	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$1,726,450
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$3,089		$3,089	$3,181	$3,277	$3,375	$3,476	$3,580	$3,688	$3,798	$3,912	$4,030	$4,151	$4,275	$4,403	$4,536	$4,672	$4,812	$4,956	$5,105	$5,258	$5,416	$82,989
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$603	$0	$0	$2,448	$2,448	$2,072	$2,448	$1,632	$0	$0	$784	$0	$0	$0	$0	$0	$12,435
POWER EXPENSE	3.00%	$1,190		$1,190	$1,226	$1,263	$1,301	$1,340	$1,380	$1,421	$1,464	$1,508	$1,553	$1,600	$1,648	$1,697	$1,748	$1,801	$1,855	$1,910	$1,968	$2,027	$2,087	$31,986
INSURANCE	3.00%	$462		$462	$476	$490	$505	$520	$536	$552	$568	$585	$603	$621	$640	$659	$678	$699	$720	$741	$764	$787	$810	$12,414
INTEREST EXPENSE				$13,786	$13,431	$13,053	$12,650	$12,221	$11,764	$11,278	$10,760	$10,208	$9,620	$8,994	$8,328	$7,618	$6,862	$6,057	$5,199	$4,286	$3,314	$2,278	$1,175	$172,881
AD VALOREM TAX @	5.00%			$10,074	$9,067	$8,160	$7,344	$6,609	$5,948	$5,322	$4,697	$4,316	$4,316	$4,316	$4,316	$4,316	$4,316	$4,316	$4,316	$4,316	$4,316	$4,316	$4,316	$109,015
15-YEAR MACRS DEPRECIATION				$10,605	$20,149	$18,134	$16,331	$14,698	$13,213	$12,513	$12,513	$12,535	$12,513	$12,535	$12,513	$12,535	$12,513	$12,535	$6,257	$0	$0	$0	$0	$212,091
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$47,117	$38,793	$41,946	$44,817	$46,856	$49,901	$51,548	$50,074	$50,810	$51,615	$51,658	$52,971	$55,094	$55,669	$55,460	$63,164	$70,112	$70,857	$71,657	$72,518	$1,092,638
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$19,671	$16,196	$17,513	$18,711	$19,562	$20,834	$21,521	$20,906	$21,213	$21,549	$21,567	$22,115	$23,002	$23,242	$23,155	$26,371	$29,272	$29,583	$29,917	$30,276	$456,176
NET INCOME AFTER TAX				$27,446	$22,597	$24,434	$26,106	$27,294	$29,067	$30,027	$29,168	$29,597	$30,065	$30,091	$30,855	$32,092	$32,427	$32,305	$36,793	$40,840	$41,274	$41,740	$42,242	$636,462
GROSS REVENUE				$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$86,323	$1,726,450
LESS: PRINCIPAL & INTEREST				$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$19,249	$384,972
OPERATING EXPENSE				$4,741	$4,883	$5,030	$5,181	$5,939	$5,496	$5,661	$8,279	$8,454	$8,258	$8,819	$8,195	$6,759	$6,962	$7,955	$7,386	$7,608	$7,836	$8,071	$8,313	$139,825
TAXES (INCOME + AD VALOREM)				$29,746	$25,263	$25,673	$26,055	$26,171	$26,782	$26,844	$25,603	$25,529	$25,865	$25,883	$26,431	$27,318	$27,558	$27,471	$30,687	$33,588	$33,899	$34,233	$34,593	$565,191
ANNUAL CASH FLOW			-212,091	$32,587	$36,927	$36,371	$35,838	$34,963	$34,796	$34,569	$33,192	$33,090	$32,950	$32,371	$32,448	$32,996	$32,553	$31,648	$29,000	$25,878	$25,339	$24,769	$24,168	$636,453
CUMULATIVE CASH FLOW				$32,587	$69,514	$105,885	$141,723	$176,686	$211,482	$246,051	$279,243	$312,333	$345,283	$377,654	$410,102	$443,098	$475,651	$507,299	$536,299	$562,177	$587,516	$612,285	$636,453	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

North Dakota Pipeline

ECONOMIC ANALYSIS

10in Northern Pipeline Route

Review the rate of return on a 55,000 BPD pipeline through North Dakota operating for 20yrs.

North 1
East 0
West 0

Select Route

FULL INVESTMENT (x 1,000)	$195,304
AFUDC	$12,695
TOTAL LOAN VALUE (x 1,000)	$207,998
TARIFF $/BBL	$4.25
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$102,748
8.50%	$92,224
9.00%	$82,337
9.50%	$73,040
10.00%	$64,293
10.50%	$56,059
11.00%	$48,301
11.50%	$40,988
12.00%	$34,091

(x 1,000)

	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$207,998	$202,641	$196,936	$190,859	$184,388	$177,496	$170,156	$162,339	$154,014	$145,148	$135,705	$125,649	$114,939	$103,532	$91,385	$78,448	$64,669	$49,996	$34,368	$17,725	$2,608,390
PRINCIPAL PAYMENT				$5,357	$5,706	$6,076	$6,471	$6,892	$7,340	$7,817	$8,325	$8,866	$9,443	$10,056	$10,710	$11,406	$12,148	$12,937	$13,778	$14,674	$15,627	$16,643	$17,725	$207,998
INTEREST PAYMENT				$13,520	$13,172	$12,801	$12,406	$11,985	$11,537	$11,060	$10,552	$10,011	$9,435	$8,821	$8,167	$7,471	$6,730	$5,940	$5,099	$4,204	$3,250	$2,234	$1,152	$169,545
ANNUAL Q (BBLS)			55,000	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	401,500
TARIFF $/BBL		$4.245		$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$1,704,514
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,464		$2,464	$2,538	$2,614	$2,692	$2,773	$2,856	$2,942	$3,030	$3,121	$3,215	$3,311	$3,411	$3,513	$3,618	$3,727	$3,839	$3,954	$4,073	$4,195	$4,321	$66,209
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$535	$0	$0	$1,626	$1,626	$2,066	$1,626	$813	$0	$0	$696	$0	$0	$0	$0	$0	$8,988
POWER EXPENSE	3.00%	$2,274		$2,274	$2,342	$2,413	$2,485	$2,560	$2,636	$2,715	$2,797	$2,881	$2,967	$3,056	$3,148	$3,242	$3,340	$3,440	$3,543	$3,649	$3,759	$3,872	$3,988	$61,106
INSURANCE	3.00%	$498		$498	$513	$528	$544	$560	$577	$594	$612	$631	$650	$669	$689	$710	$731	$753	$776	$799	$823	$848	$873	$13,377
INTEREST EXPENSE				$13,520	$13,172	$12,801	$12,406	$11,985	$11,537	$11,060	$10,552	$10,011	$9,435	$8,821	$8,167	$7,471	$6,730	$5,940	$5,099	$4,204	$3,250	$2,234	$1,152	$169,545
AD VALOREM TAX @	5.00%			$9,880	$8,892	$8,003	$7,202	$6,481	$5,833	$5,220	$4,606	$4,261	$4,261	$4,261	$4,261	$4,261	$4,261	$4,261	$4,261	$4,261	$4,261	$4,261	$4,261	$107,252
15-YEAR MACRS DEPRECIATION				$10,400	$19,760	$17,784	$16,016	$14,414	$12,958	$12,272	$12,272	$12,293	$12,272	$12,293	$12,272	$12,293	$12,272	$12,293	$6,136	$0	$0	$0	$0	$207,998
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$46,190	$38,009	$41,083	$43,881	$45,917	$48,827	$50,422	$49,730	$50,402	$50,360	$51,188	$52,465	$53,736	$54,274	$54,116	$61,572	$68,359	$69,061	$69,817	$70,631	$1,070,039
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$19,284	$15,869	$17,152	$18,320	$19,170	$20,385	$21,051	$20,762	$21,043	$21,025	$21,371	$21,904	$22,435	$22,659	$22,594	$25,706	$28,540	$28,833	$29,148	$29,488	$446,741
NET INCOME AFTER TAX				$26,906	$22,140	$23,931	$25,560	$26,747	$28,442	$29,371	$28,968	$29,359	$29,335	$29,817	$30,561	$31,301	$31,614	$31,523	$35,866	$39,819	$40,228	$40,668	$41,143	$623,298
GROSS REVENUE				$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$85,226	$1,704,514
LESS: PRINCIPAL & INTEREST				$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$18,877	$377,544
OPERATING EXPENSE				$5,236	$5,393	$5,555	$5,721	$6,428	$6,070	$6,252	$8,066	$8,259	$8,898	$8,663	$8,061	$7,465	$7,689	$8,615	$8,157	$8,402	$8,654	$8,914	$9,181	$149,679
TAXES (INCOME + AD VALOREM)				$29,164	$24,761	$25,155	$25,522	$25,652	$26,219	$26,271	$25,368	$25,304	$25,286	$25,632	$26,165	$26,696	$26,921	$26,855	$29,968	$32,801	$33,094	$33,410	$33,750	$553,994
ANNUAL CASH FLOW			($207,998)	$31,948	$36,194	$35,638	$35,104	$34,268	$34,060	$33,825	$32,914	$32,785	$32,163	$32,053	$32,122	$32,187	$31,738	$30,878	$28,223	$25,145	$24,600	$24,024	$23,417	$623,286
CUMULATIVE CASH FLOW				$31,948	$68,142	$103,780	$138,884	$173,152	$207,212	$241,037	$273,951	$306,736	$338,899	$370,952	$403,074	$435,261	$466,999	$497,877	$526,100	$551,245	$575,845	$599,869	$623,286	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

North Dakota Pipeline

ECONOMIC ANALYSIS

10in Eastern Pipeline Route

Review the rate of return on a 55,000 BPD pipeline through North Dakota operating for 20yrs.

North 0
East 1
West 0

Select Route

FULL INVESTMENT (x 1,000)	$242,023
AFUDC	$15,731
TOTAL LOAN VALUE (x 1,000)	$257,754
TARIFF $/BBL	$5.24
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$127,389
8.50%	$114,334
9.00%	$102,067
9.50%	$90,534
10.00%	$79,684
10.50%	$69,469
11.00%	$59,846
11.50%	$50,775
12.00%	$42,219

(x 1,000)

	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$257,754	$251,115	$244,045	$236,515	$228,496	$219,955	$210,859	$201,172	$190,856	$179,869	$168,167	$155,705	$142,433	$128,299	$113,245	$97,213	$80,139	$61,955	$42,590	$21,965	$3,232,349
PRINCIPAL PAYMENT				$6,639	$7,070	$7,530	$8,019	$8,541	$9,096	$9,687	$10,317	$10,987	$11,701	$12,462	$13,272	$14,135	$15,053	$16,032	$17,074	$18,184	$19,366	$20,625	$21,965	$257,754
INTEREST PAYMENT				$16,754	$16,323	$15,863	$15,373	$14,852	$14,297	$13,706	$13,076	$12,406	$11,691	$10,931	$10,121	$9,258	$8,339	$7,361	$6,319	$5,209	$4,027	$2,768	$1,428	$210,103
ANNUAL Q (BBLS)			55,000	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	401,500
TARIFF $/BBL		$5.240		$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24	$5.24
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
GROSS REVENUE				$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$2,103,860
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,562		$2,562	$2,639	$2,718	$2,800	$2,884	$2,970	$3,060	$3,151	$3,246	$3,343	$3,444	$3,547	$3,653	$3,763	$3,876	$3,992	$4,112	$4,235	$4,362	$4,493	$68,850
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$535	$0	$0	$1,626	$1,626	$2,066	$1,626	$813	$0	$0	$696	$0	$0	$0	$0	$0	$8,988
POWER EXPENSE	3.00%	$3,148		$3,148	$3,242	$3,340	$3,440	$3,543	$3,649	$3,759	$3,872	$3,988	$4,107	$4,231	$4,357	$4,488	$4,623	$4,761	$4,904	$5,051	$5,203	$5,359	$5,520	$84,586
INSURANCE	3.00%	$523		$523	$538	$555	$571	$588	$606	$624	$643	$662	$682	$703	$724	$745	$768	$791	$814	$839	$864	$890	$917	$14,046
INTEREST EXPENSE				$16,754	$16,323	$15,863	$15,373	$14,852	$14,297	$13,706	$13,076	$12,406	$11,691	$10,931	$10,121	$9,258	$8,339	$7,361	$6,319	$5,209	$4,027	$2,768	$1,428	$210,103
AD VALOREM TAX @	5.00%			$12,243	$11,019	$9,917	$8,925	$8,032	$7,229	$6,468	$5,708	$5,260	$5,260	$5,260	$5,260	$5,260	$5,260	$5,260	$5,260	$5,260	$5,260	$5,260	$5,260	$132,657
15-YEAR MACRS DEPRECIATION				$12,888	$24,487	$22,038	$19,847	$17,862	$16,058	$15,208	$15,208	$15,233	$15,208	$15,233	$15,208	$15,233	$15,208	$15,233	$7,604	$0	$0	$0	$0	$257,754
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$57,075	$46,945	$50,762	$54,237	$56,897	$60,383	$62,369	$61,910	$62,773	$62,835	$63,767	$65,164	$66,555	$67,233	$67,216	$76,300	$84,722	$85,604	$86,554	$87,576	$1,326,877
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$23,829	$19,599	$21,193	$22,644	$23,754	$25,210	$26,039	$25,847	$26,208	$26,234	$26,623	$27,206	$27,787	$28,070	$28,063	$31,855	$35,372	$35,740	$36,136	$36,563	$553,971
NET INCOME AFTER TAX				$33,246	$27,345	$29,569	$31,593	$33,142	$35,173	$36,330	$36,062	$36,565	$36,602	$37,144	$37,958	$38,768	$39,163	$39,153	$44,445	$49,351	$49,864	$50,418	$51,013	$772,906
GROSS REVENUE				$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$105,193	$2,103,860
LESS: PRINCIPAL & INTEREST				$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$23,393	$467,857
OPERATING EXPENSE				$6,233	$6,420	$6,613	$6,811	$7,550	$7,226	$7,442	$9,292	$9,522	$10,199	$10,003	$9,441	$8,887	$9,153	$10,123	$9,711	$10,002	$10,302	$10,611	$10,930	$176,470
TAXES (INCOME + AD VALOREM)				$36,072	$30,618	$31,110	$31,569	$31,786	$32,439	$32,507	$31,555	$31,467	$31,493	$31,882	$32,466	$33,046	$33,329	$33,322	$37,115	$40,631	$40,999	$41,396	$41,823	$686,628
ANNUAL CASH FLOW			($257,754)	$39,495	$44,761	$44,077	$43,420	$42,463	$42,135	$41,850	$40,953	$40,811	$40,107	$39,915	$39,893	$39,866	$39,317	$38,354	$34,974	$31,166	$30,498	$29,793	$29,047	$772,895
CUMULATIVE CASH FLOW				$39,495	$84,256	$128,333	$171,753	$214,216	$256,351	$298,201	$339,154	$379,965	$420,072	$459,987	$499,880	$539,746	$579,063	$617,417	$652,391	$683,557	$714,055	$743,848	$772,895	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

North Dakota Pipeline

ECONOMIC ANALYSIS

10in Western Pipeline Route

Review the rate of return on a 55,000 BPD pipeline through North Dakota operating for 20yrs.

North 0
East 0
West 1

Select Route

FULL INVESTMENT (x 1,000)	$210,497
AFUDC	$13,682
TOTAL LOAN VALUE (x 1,000)	$224,180
TARIFF $/BBL	$4.59
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$110,656
8.50%	$99,321
9.00%	$88,671
9.50%	$78,658
10.00%	$69,236
10.50%	$60,366
11.00%	$52,010
11.50%	$44,133
12.00%	$36,703

(x 1,000)

	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$224,180	$218,405	$212,256	$205,707	$198,732	$191,304	$183,393	$174,968	$165,995	$156,439	$146,262	$135,423	$123,880	$111,587	$98,494	$84,550	$69,700	$53,885	$37,042	$19,104	$2,811,307
PRINCIPAL PAYMENT				$5,774	$6,149	$6,549	$6,975	$7,428	$7,911	$8,425	$8,973	$9,556	$10,177	$10,839	$11,543	$12,294	$13,093	$13,944	$14,850	$15,815	$16,843	$17,938	$19,104	$224,180
INTEREST PAYMENT				$14,572	$14,196	$13,797	$13,371	$12,918	$12,435	$11,921	$11,373	$10,790	$10,169	$9,507	$8,803	$8,052	$7,253	$6,402	$5,496	$4,531	$3,503	$2,408	$1,242	$182,735
ANNUAL Q (BBLS)			55,000	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	401,500
TARIFF $/BBL		$4.585		$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	$4.59	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$1,840,967
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,492		$2,492	$2,566	$2,643	$2,723	$2,804	$2,888	$2,975	$3,064	$3,156	$3,251	$3,349	$3,449	$3,552	$3,659	$3,769	$3,882	$3,998	$4,118	$4,242	$4,369	$66,950
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$535	$0	$0	$1,626	$1,626	$2,066	$1,626	$813	$0	$0	$696	$0	$0	$0	$0	$0	$8,988
POWER EXPENSE	3.00%	$2,832		$2,832	$2,917	$3,005	$3,095	$3,188	$3,284	$3,382	$3,484	$3,588	$3,696	$3,807	$3,921	$4,038	$4,160	$4,284	$4,413	$4,545	$4,682	$4,822	$4,967	$76,109
INSURANCE	3.00%	$510		$510	$526	$542	$558	$575	$592	$610	$628	$647	$666	$686	$707	$728	$750	$772	$795	$819	$844	$869	$895	$13,716
INTEREST EXPENSE				$14,572	$14,196	$13,797	$13,371	$12,918	$12,435	$11,921	$11,373	$10,790	$10,169	$9,507	$8,803	$8,052	$7,253	$6,402	$5,496	$4,531	$3,503	$2,408	$1,242	$182,735
AD VALOREM TAX @	5.00%			$10,649	$9,584	$8,625	$7,762	$6,985	$6,287	$5,626	$4,964	$4,602	$4,602	$4,602	$4,602	$4,602	$4,602	$4,602	$4,602	$4,602	$4,602	$4,602	$4,602	$115,712
15-YEAR MACRS DEPRECIATION				$11,209	$21,297	$19,167	$17,262	$15,536	$13,966	$13,227	$13,227	$13,249	$13,227	$13,249	$13,227	$13,249	$13,227	$13,249	$6,613	$0	$0	$0	$0	$224,180
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$49,785	$40,962	$44,269	$47,278	$49,508	$52,596	$54,309	$53,683	$54,390	$54,372	$55,223	$56,528	$57,826	$58,398	$58,274	$66,247	$73,553	$74,300	$75,105	$75,973	$1,152,578
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$20,785	$17,102	$18,482	$19,738	$20,670	$21,959	$22,674	$22,413	$22,708	$22,700	$23,056	$23,600	$24,142	$24,381	$24,329	$27,658	$30,708	$31,020	$31,356	$31,719	$481,201
NET INCOME AFTER TAX				$29,000	$23,860	$25,787	$27,539	$28,838	$30,637	$31,635	$31,270	$31,682	$31,671	$32,167	$32,927	$33,684	$34,017	$33,945	$38,589	$42,844	$43,280	$43,749	$44,254	$671,377
GROSS REVENUE				$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$92,048	$1,840,967
LESS: PRINCIPAL & INTEREST				$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$20,346	$406,914
OPERATING EXPENSE				$5,834	$6,010	$6,190	$6,376	$7,102	$6,764	$6,967	$8,802	$9,017	$9,679	$9,467	$8,889	$8,319	$8,568	$9,521	$9,090	$9,363	$9,644	$9,933	$10,231	$165,763
TAXES (INCOME + AD VALOREM)				$31,434	$26,685	$27,108	$27,501	$27,655	$28,246	$28,300	$27,377	$27,310	$27,303	$27,658	$28,203	$28,745	$28,984	$28,932	$32,261	$35,311	$35,623	$35,959	$36,321	$596,913
ANNUAL CASH FLOW			($224,180)	$34,434	$39,007	$38,405	$37,826	$36,945	$36,692	$36,436	$35,523	$35,375	$34,720	$34,577	$34,610	$34,639	$34,150	$33,250	$30,352	$27,029	$26,436	$25,810	$25,150	$671,366
CUMULATIVE CASH FLOW				$34,434	$73,441	$111,846	$149,672	$186,617	$223,309	$259,745	$295,268	$330,643	$365,363	$399,940	$434,550	$469,189	$503,339	$536,589	$566,941	$593,970	$620,406	$646,216	$671,366	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

North Dakota Pipeline

ECONOMIC ANALYSIS

12in Northern Pipeline Route

Review the rate of return on a 55,000 BPD pipeline through North Dakota operating for 20yrs.

North 1
East 0
West 0

Select Route

FULL INVESTMENT (x 1,000)	$198,756
AFUDC	$12,919
TOTAL LOAN VALUE (x 1,000)	$211,676
TARIFF $/BBL	$4.22
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$105,156
8.50%	$94,374
9.00%	$84,245
9.50%	$74,724
10.00%	$65,768
10.50%	$57,337
11.00%	$49,396
11.50%	$41,912
12.00%	$34,854

(x 1,000)

DESCRIPTION	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$211,676	$206,224	$200,417	$194,233	$187,648	$180,634	$173,164	$165,209	$156,737	$147,714	$138,104	$127,870	$116,970	$105,363	$93,000	$79,834	$65,813	$50,880	$34,976	$18,038	$2,654,502
PRINCIPAL PAYMENT				$5,452	$5,806	$6,184	$6,586	$7,014	$7,470	$7,955	$8,472	$9,023	$9,610	$10,234	$10,899	$11,608	$12,362	$13,166	$14,022	$14,933	$15,904	$16,937	$18,038	$211,676
INTEREST PAYMENT				$13,759	$13,405	$13,027	$12,625	$12,197	$11,741	$11,256	$10,739	$10,188	$9,601	$8,977	$8,312	$7,603	$6,849	$6,045	$5,189	$4,278	$3,307	$2,273	$1,172	$172,543
ANNUAL Q (BBLS)			55,000	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	401,500
TARIFF $/BBL		$4.224		$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	$4.22	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$1,695,936
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,075		$2,075	$2,137	$2,201	$2,268	$2,336	$2,406	$2,478	$2,552	$2,629	$2,708	$2,789	$2,872	$2,959	$3,047	$3,139	$3,233	$3,330	$3,430	$3,533	$3,639	$55,759
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$535	$0	$0	$1,626	$1,626	$2,066	$1,626	$813	$0	$0	$696	$0	$0	$0	$0	$0	$8,988
POWER EXPENSE	3.00%	$1,190		$1,190	$1,226	$1,263	$1,301	$1,340	$1,380	$1,421	$1,464	$1,508	$1,553	$1,600	$1,648	$1,697	$1,748	$1,801	$1,855	$1,910	$1,968	$2,027	$2,087	$31,986
INSURANCE	3.00%	$461		$461	$475	$489	$503	$519	$534	$550	$567	$584	$601	$619	$638	$657	$677	$697	$718	$739	$761	$784	$808	$12,379
INTEREST EXPENSE				$13,759	$13,405	$13,027	$12,625	$12,197	$11,741	$11,256	$10,739	$10,188	$9,601	$8,977	$8,312	$7,603	$6,849	$6,045	$5,189	$4,278	$3,307	$2,273	$1,172	$172,543
AD VALOREM TAX @	5.00%			$10,055	$9,049	$8,144	$7,329	$6,596	$5,936	$5,312	$4,688	$4,240	$4,240	$4,240	$4,240	$4,240	$4,240	$4,240	$4,240	$4,240	$4,240	$4,240	$4,240	$107,987
15-YEAR MACRS DEPRECIATION				$10,584	$20,109	$18,098	$16,299	$14,669	$13,187	$12,489	$12,489	$12,510	$12,489	$12,510	$12,489	$12,510	$12,489	$12,510	$6,244	$0	$0	$0	$0	$211,676
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$46,673	$38,396	$41,574	$44,472	$46,606	$49,612	$51,291	$50,673	$51,513	$51,538	$52,436	$53,786	$55,131	$55,747	$55,670	$63,318	$70,300	$71,091	$71,940	$72,851	$1,094,618
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$19,486	$16,030	$17,357	$18,567	$19,458	$20,713	$21,414	$21,156	$21,507	$21,517	$21,892	$22,456	$23,017	$23,275	$23,242	$26,435	$29,350	$29,680	$30,035	$30,415	$457,003
NET INCOME AFTER TAX				$27,187	$22,366	$24,217	$25,905	$27,148	$28,899	$29,877	$29,517	$30,006	$30,021	$30,544	$31,330	$32,114	$32,473	$32,428	$36,883	$40,950	$41,410	$41,905	$42,435	$637,615
GROSS REVENUE				$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$84,797	$1,695,936
LESS: PRINCIPAL & INTEREST				$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$19,211	$384,218
OPERATING EXPENSE				$3,726	$3,838	$3,953	$4,072	$4,729	$4,320	$4,449	$6,209	$6,346	$6,928	$6,634	$5,971	$5,313	$5,472	$6,332	$5,805	$5,979	$6,159	$6,344	$6,534	$109,112
TAXES (INCOME + AD VALOREM)				$29,541	$25,079	$25,501	$25,896	$26,054	$26,649	$26,726	$25,844	$25,746	$25,757	$26,132	$26,695	$27,257	$27,514	$27,482	$30,675	$33,590	$33,920	$34,275	$34,655	$564,990
ANNUAL CASH FLOW			($211,676)	$32,318	$36,668	$36,131	$35,617	$34,803	$34,616	$34,410	$33,533	$33,493	$32,900	$32,820	$32,919	$33,016	$32,599	$31,772	$29,105	$26,016	$25,506	$24,967	$24,397	$637,606
CUMULATIVE CASH FLOW				$32,318	$68,986	$105,117	$140,734	$175,537	$210,153	$244,563	$278,096	$311,589	$344,489	$377,309	$410,228	$443,244	$475,843	$507,615	$536,720	$562,736	$588,242	$613,209	$637,606	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

North Dakota Pipeline

ECONOMIC ANALYSIS

12in Eastern Pipeline Route

Review the rate of return on a 55,000 BPD pipeline through North Dakota operating for 20yrs.

North 0
East 1
West 0

Select Route

FULL INVESTMENT (x 1,000)	$251,805
AFUDC	$16,367
TOTAL LOAN VALUE (x 1,000)	$268,172
TARIFF $/BBL	$5.32
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$133,532
8.50%	$119,839
9.00%	$106,977
9.50%	$94,887
10.00%	$83,514
10.50%	$72,809
11.00%	$62,727
11.50%	$53,224
12.00%	$44,263

(x 1,000)

DESCRIPTION	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$268,172	$261,265	$253,909	$246,074	$237,731	$228,845	$219,382	$209,303	$198,570	$187,138	$174,964	$161,998	$148,190	$133,484	$117,822	$101,142	$83,378	$64,459	$44,311	$22,853	$3,362,992
PRINCIPAL PAYMENT				$6,907	$7,356	$7,834	$8,343	$8,886	$9,463	$10,079	$10,734	$11,431	$12,174	$12,966	$13,808	$14,706	$15,662	$16,680	$17,764	$18,919	$20,148	$21,458	$22,853	$268,172
INTEREST PAYMENT				$17,431	$16,982	$16,504	$15,995	$15,453	$14,875	$14,260	$13,605	$12,907	$12,164	$11,373	$10,530	$9,632	$8,676	$7,658	$6,574	$5,420	$4,190	$2,880	$1,485	$218,594
ANNUAL Q (BBLS)			55,000	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	401,500
TARIFF $/BBL		$5.315		$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	$5.32	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$2,133,973
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,173		$2,173	$2,239	$2,306	$2,375	$2,446	$2,520	$2,595	$2,673	$2,753	$2,836	$2,921	$3,008	$3,099	$3,192	$3,287	$3,386	$3,488	$3,592	$3,700	$3,811	$58,400
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$535	$0	$0	$1,626	$1,626	$2,066	$1,626	$813	$0	$0	$696	$0	$0	$0	$0	$0	$8,988
POWER EXPENSE	3.00%	$1,532		$1,532	$1,578	$1,626	$1,675	$1,725	$1,777	$1,830	$1,885	$1,941	$2,000	$2,060	$2,121	$2,185	$2,251	$2,318	$2,388	$2,459	$2,533	$2,609	$2,687	$41,179
INSURANCE	3.00%	$488		$488	$502	$517	$533	$549	$565	$582	$600	$618	$636	$655	$675	$695	$716	$737	$760	$782	$806	$830	$855	$13,099
INTEREST EXPENSE				$17,431	$16,982	$16,504	$15,995	$15,453	$14,875	$14,260	$13,605	$12,907	$12,164	$11,373	$10,530	$9,632	$8,676	$7,658	$6,574	$5,420	$4,190	$2,880	$1,485	$218,594
AD VALOREM TAX @	5.00%			$12,738	$11,464	$10,318	$9,285	$8,356	$7,521	$6,730	$5,939	$5,335	$5,335	$5,335	$5,335	$5,335	$5,335	$5,335	$5,335	$5,335	$5,335	$5,335	$5,335	$136,371
15-YEAR MACRS DEPRECIATION				$13,409	$25,476	$22,929	$20,649	$18,584	$16,707	$15,822	$15,822	$15,849	$15,822	$15,849	$15,822	$15,849	$15,822	$15,849	$7,911	$0	$0	$0	$0	$268,172
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$58,927	$48,457	$52,499	$56,187	$59,051	$62,734	$64,880	$64,550	$65,670	$65,840	$66,880	$68,394	$69,904	$70,707	$70,818	$80,345	$89,215	$90,243	$91,345	$92,525	$1,389,169
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$24,602	$20,231	$21,918	$23,458	$24,654	$26,192	$27,087	$26,950	$27,417	$27,488	$27,923	$28,554	$29,185	$29,520	$29,566	$33,544	$37,247	$37,676	$38,136	$38,629	$579,978
NET INCOME AFTER TAX				$34,325	$28,226	$30,581	$32,729	$34,397	$36,543	$37,792	$37,600	$38,253	$38,352	$38,958	$39,840	$40,719	$41,187	$41,251	$46,801	$51,968	$52,566	$53,208	$53,896	$809,191
GROSS REVENUE				$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$106,699	$2,133,973
LESS: PRINCIPAL & INTEREST				$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$24,338	$486,766
OPERATING EXPENSE				$4,193	$4,319	$4,449	$4,582	$5,255	$4,861	$5,007	$6,783	$6,938	$7,538	$7,262	$6,618	$5,979	$6,158	$7,038	$6,533	$6,729	$6,931	$7,139	$7,353	$121,666
TAXES (INCOME + AD VALOREM)				$37,340	$31,695	$32,236	$32,743	$33,010	$33,712	$33,817	$32,888	$32,752	$32,823	$33,258	$33,889	$34,520	$34,855	$34,901	$38,879	$42,582	$43,011	$43,471	$43,964	$716,349
ANNUAL CASH FLOW			($268,172)	$40,826	$46,346	$45,675	$45,034	$44,095	$43,786	$43,536	$42,688	$42,670	$41,999	$41,841	$41,853	$41,861	$41,347	$40,420	$36,948	$33,048	$32,417	$31,750	$31,042	$809,182
CUMULATIVE CASH FLOW				$40,826	$87,172	$132,847	$177,881	$221,976	$265,762	$309,298	$351,986	$394,656	$436,655	$478,496	$520,349	$562,210	$603,557	$643,977	$680,925	$713,973	$746,390	$778,140	$809,182	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

North Dakota Pipeline

ECONOMIC ANALYSIS

12in Western Pipeline Route

Review the rate of return on a 55,000 BPD pipeline through North Dakota operating for 20yrs.

North 0
East 0
West 1

Select Route

FULL INVESTMENT (x 1,000)	$215,085
AFUDC	$13,981
TOTAL LOAN VALUE (x 1,000)	$229,065
TARIFF $/BBL	$4.57
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$113,718
8.50%	$102,055
9.00%	$91,098
9.50%	$80,798
10.00%	$71,109
10.50%	$61,989
11.00%	$53,398
11.50%	$45,302
12.00%	$37,666

(x 1,000)

DESCRIPTION	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$229,065	$223,165	$216,882	$210,190	$203,063	$195,473	$187,390	$178,781	$169,613	$159,849	$149,450	$138,375	$126,580	$114,018	$100,640	$86,393	$71,219	$55,060	$37,849	$19,520	$2,872,576
PRINCIPAL PAYMENT				$5,900	$6,283	$6,692	$7,127	$7,590	$8,083	$8,609	$9,168	$9,764	$10,399	$11,075	$11,795	$12,561	$13,378	$14,248	$15,174	$16,160	$17,210	$18,329	$19,520	$229,065
INTEREST PAYMENT				$14,889	$14,506	$14,097	$13,662	$13,199	$12,706	$12,180	$11,621	$11,025	$10,390	$9,714	$8,994	$8,228	$7,411	$6,542	$5,616	$4,629	$3,579	$2,460	$1,269	$186,717
ANNUAL Q (BBLS)			55,000	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	20,075	401,500
TARIFF $/BBL		$4.574		$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	$4.57	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$1,836,461
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,103		$2,103	$2,166	$2,231	$2,298	$2,367	$2,438	$2,511	$2,586	$2,664	$2,744	$2,826	$2,911	$2,998	$3,088	$3,181	$3,276	$3,374	$3,475	$3,580	$3,687	$56,500
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$535	$0	$0	$1,626	$1,626	$2,066	$1,626	$813	$0	$0	$696	$0	$0	$0	$0	$0	$8,988
POWER EXPENSE	3.00%	$1,543		$1,543	$1,589	$1,637	$1,686	$1,737	$1,789	$1,843	$1,898	$1,955	$2,014	$2,074	$2,136	$2,200	$2,266	$2,334	$2,404	$2,476	$2,551	$2,627	$2,706	$41,466
INSURANCE	3.00%	$474		$474	$488	$503	$518	$533	$549	$566	$583	$600	$618	$637	$656	$675	$696	$717	$738	$760	$783	$806	$831	$12,728
INTEREST EXPENSE				$14,889	$14,506	$14,097	$13,662	$13,199	$12,706	$12,180	$11,621	$11,025	$10,390	$9,714	$8,994	$8,228	$7,411	$6,542	$5,616	$4,629	$3,579	$2,460	$1,269	$186,717
AD VALOREM TAX @	5.00%			$10,881	$9,793	$8,813	$7,931	$7,138	$6,424	$5,748	$5,073	$4,591	$4,591	$4,591	$4,591	$4,591	$4,591	$4,591	$4,591	$4,591	$4,591	$4,591	$4,591	$116,894
15-YEAR MACRS DEPRECIATION				$11,453	$21,761	$19,585	$17,638	$15,874	$14,271	$13,515	$13,515	$13,538	$13,515	$13,538	$13,515	$13,538	$13,515	$13,538	$6,757	$0	$0	$0	$0	$229,065
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$50,480	$41,520	$44,957	$48,090	$50,440	$53,647	$55,460	$54,922	$55,825	$55,885	$56,818	$58,207	$59,593	$60,256	$60,226	$68,441	$75,992	$76,844	$77,758	$78,739	$1,184,101
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$21,076	$17,335	$18,769	$20,077	$21,059	$22,397	$23,155	$22,930	$23,307	$23,332	$23,721	$24,302	$24,880	$25,157	$25,144	$28,574	$31,727	$32,082	$32,464	$32,874	$494,362
NET INCOME AFTER TAX				$29,405	$24,186	$26,187	$28,012	$29,382	$31,249	$32,306	$31,992	$32,518	$32,553	$33,096	$33,906	$34,713	$35,099	$35,081	$39,867	$44,265	$44,762	$45,294	$45,866	$689,739
GROSS REVENUE				$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$91,823	$1,836,461
LESS: PRINCIPAL & INTEREST				$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$20,789	$415,783
OPERATING EXPENSE				$4,120	$4,243	$4,370	$4,502	$5,172	$4,776	$4,919	$6,693	$6,845	$7,442	$7,162	$6,515	$5,874	$6,050	$6,927	$6,418	$6,611	$6,809	$7,013	$7,224	$119,683
TAXES (INCOME + AD VALOREM)				$31,956	$27,127	$27,583	$28,009	$28,197	$28,822	$28,903	$28,003	$27,898	$27,923	$28,312	$28,893	$29,471	$29,748	$29,735	$33,165	$36,318	$36,674	$37,055	$37,465	$611,257
ANNUAL CASH FLOW			($229,065)	$34,958	$39,663	$39,080	$38,523	$37,665	$37,436	$37,211	$36,338	$36,291	$35,669	$35,559	$35,625	$35,689	$35,236	$34,371	$31,450	$28,105	$27,551	$26,965	$26,345	$689,730
CUMULATIVE CASH FLOW				$34,958	$74,621	$113,701	$152,224	$189,889	$227,325	$264,536	$300,874	$337,165	$372,834	$408,393	$444,018	$479,707	$514,943	$549,314	$580,764	$608,869	$636,420	$663,385	$689,730	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

North Dakota Pipeline

ECONOMIC ANALYSIS

12in Northern Pipeline Route - Ultimate Flow

Review the rate of return on a pipeline operating at 95,000BPD for 20 years

FULL INVESTMENT (x 1,000)	$229,914
AFUDC	$14,944
TOTAL LOAN VALUE (x 1,000)	$244,859
TARIFF $/BBL	$2.93
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
RATE of RETURN	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$120,450
8.50%	$108,117
9.00%	$96,528
9.50%	$85,631
10.00%	$75,378
10.50%	$65,724
11.00%	$56,629
11.50%	$48,054
12.00%	$39,966

(x 1,000)

DESCRIPTION	INFLATION	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$244,859	$238,552	$231,836	$224,682	$217,064	$208,951	$200,310	$191,108	$181,307	$170,870	$159,754	$147,915	$135,307	$121,880	$107,579	$92,350	$76,130	$58,856	$40,459	$20,866	$3,070,635
PRINCIPAL PAYMENT				$6,307	$6,717	$7,153	$7,618	$8,113	$8,641	$9,202	$9,800	$10,438	$11,116	$11,839	$12,608	$13,428	$14,300	$15,230	$16,220	$17,274	$18,397	$19,593	$20,866	$244,859
INTEREST PAYMENT				$15,916	$15,506	$15,069	$14,604	$14,109	$13,582	$13,020	$12,422	$11,785	$11,107	$10,384	$9,614	$8,795	$7,922	$6,993	$6,003	$4,948	$3,826	$2,630	$1,356	$199,591
ANNUAL Q (BBLS)			95,000	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	381,425
TARIFF $/BBL		$2.931		$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	$2.93	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$2,032,921
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,464		$2,464	$2,538	$2,614	$2,692	$2,773	$2,856	$2,942	$3,030	$3,121	$3,215	$3,311	$3,411	$3,513	$3,618	$3,727	$3,839	$3,954	$4,073	$4,195	$4,321	$66,209
YEARLY MAINTENANCE EXPENSE	3.00%			$0	$0	$0	$0	$603	$0	$0	$2,448	$2,448	$2,072	$2,448	$1,632	$0	$0	$784	$0	$0	$0	$0	$0	$12,435
POWER EXPENSE	3.00%	$4,177		$4,177	$4,303	$4,432	$4,565	$4,701	$4,843	$4,988	$5,137	$5,292	$5,450	$5,614	$5,782	$5,956	$6,134	$6,318	$6,508	$6,703	$6,904	$7,111	$7,325	$112,243
INSURANCE	3.00%	$564		$564	$580	$598	$616	$634	$653	$673	$693	$714	$735	$757	$780	$803	$828	$852	$878	$904	$931	$959	$988	$15,141
INTEREST EXPENSE				$15,916	$15,506	$15,069	$14,604	$14,109	$13,582	$13,020	$12,422	$11,785	$11,107	$10,384	$9,614	$8,795	$7,922	$6,993	$6,003	$4,948	$3,826	$2,630	$1,356	$199,591
AD VALOREM TAX @	5.00%			$11,631	$10,468	$9,421	$8,478	$7,630	$6,867	$6,145	$5,422	$5,082	$5,082	$5,082	$5,082	$5,082	$5,082	$5,082	$5,082	$5,082	$5,082	$5,082	$5,082	$127,049
15-YEAR MACRS DEPRECIATION				$12,243	$23,262	$20,935	$18,854	$16,969	$15,255	$14,447	$14,447	$14,471	$14,447	$14,471	$14,447	$14,471	$14,447	$14,471	$7,223	$0	$0	$0	$0	$244,859
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$54,652	$44,990	$48,577	$51,837	$54,226	$57,590	$59,432	$58,046	$58,733	$59,538	$59,578	$60,898	$63,025	$63,615	$63,418	$72,113	$80,054	$80,830	$81,668	$82,574	$1,255,393
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$22,817	$18,783	$20,281	$21,642	$22,640	$24,044	$24,813	$24,234	$24,521	$24,857	$24,874	$25,425	$26,313	$26,559	$26,477	$30,107	$33,422	$33,746	$34,097	$34,475	$524,127
NET INCOME AFTER TAX				$31,835	$26,207	$28,296	$30,195	$31,587	$33,546	$34,619	$33,812	$34,212	$34,681	$34,704	$35,473	$36,712	$37,055	$36,941	$42,006	$46,631	$47,083	$47,572	$48,099	$731,267
GROSS REVENUE				$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$101,646	$2,032,921
LESS: PRINCIPAL & INTEREST				$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$22,223	$444,450
OPERATING EXPENSE				$7,205	$7,421	$7,643	$7,873	$8,712	$8,352	$8,603	$11,309	$11,575	$11,473	$12,131	$11,605	$10,272	$10,580	$11,682	$11,225	$11,561	$11,908	$12,266	$12,633	$206,028
TAXES (INCOME + AD VALOREM)				$34,448	$29,251	$29,702	$30,120	$30,269	$30,911	$30,957	$29,657	$29,603	$29,939	$29,956	$30,507	$31,395	$31,641	$31,559	$35,189	$38,505	$38,829	$39,179	$39,557	$651,176
ANNUAL CASH FLOW			-244,859	$37,771	$42,751	$42,078	$41,430	$40,442	$40,160	$39,863	$38,458	$38,245	$38,011	$37,336	$37,311	$37,755	$37,201	$36,182	$33,009	$29,357	$28,686	$27,979	$27,233	$731,258
CUMULATIVE CASH FLOW				$37,771	$80,522	$122,600	$164,030	$204,472	$244,632	$284,495	$322,953	$361,198	$399,209	$436,545	$473,856	$511,611	$548,812	$584,994	$618,003	$647,360	$676,046	$704,025	$731,258	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

APPENDIX E

Project Schedule

Appendix E

Project Schedule

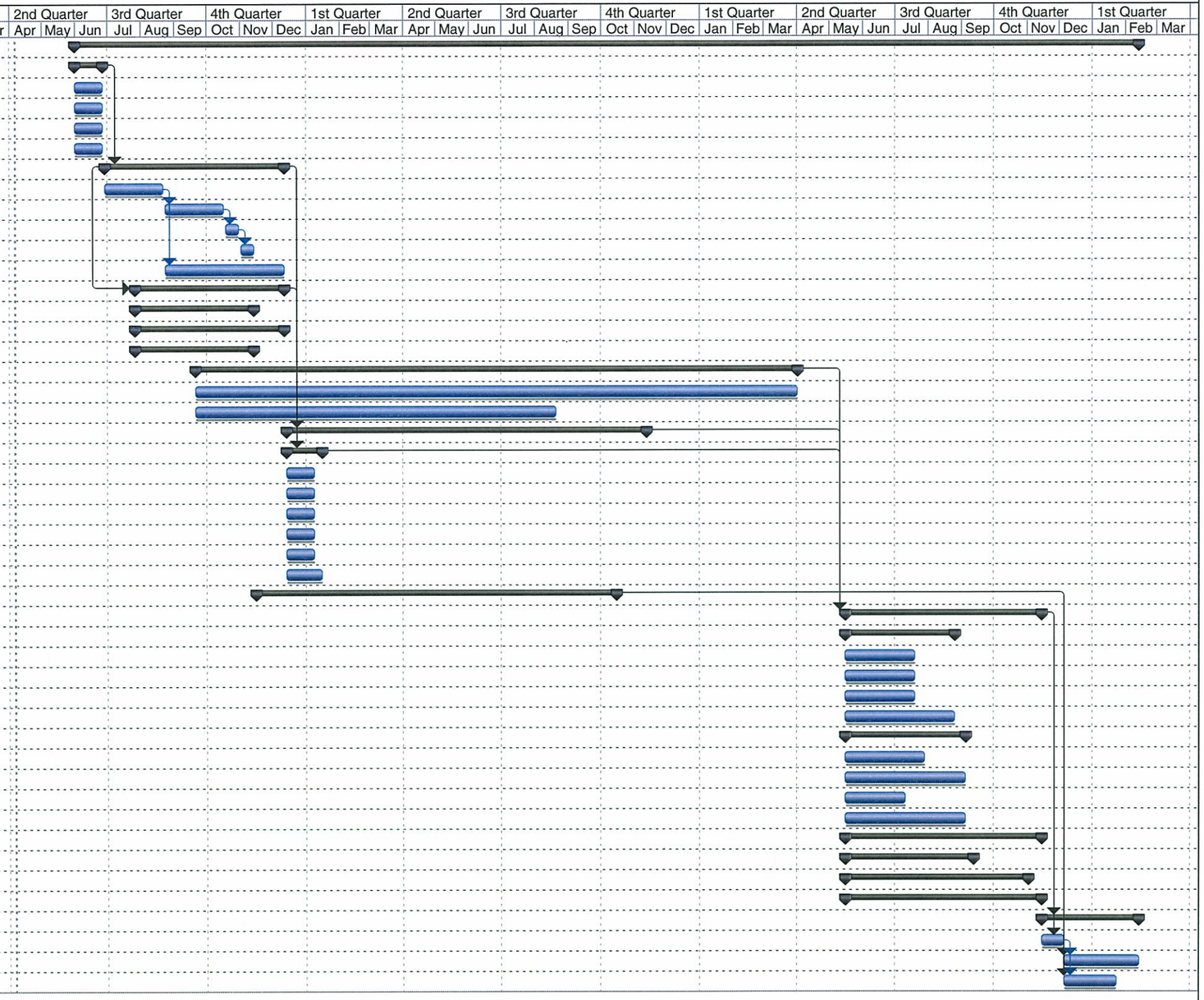
E-1 North Route – Project Schedule

E-2 East Route – Project Schedule

E-3 West Route – Project Schedule

North Dakota Pipeline
Conceptual Study

ID	Task Name	Duration	Start	Finish
1	**Northern Route Schedule**	**705.94 days**	**Mon 6/1/09**	**Mon 2/13/12**
2	**Preliminary**	**20 days**	**Mon 6/1/09**	**Fri 6/26/09**
3	Preliminary Engineering Design	1 mon	Mon 6/1/09	Fri 6/26/09
4	Preliminary Drafting Design	1 mon	Mon 6/1/09	Fri 6/26/09
5	Preliminary Cost Estimate	1 mon	Mon 6/1/09	Fri 6/26/09
6	Develop/Approve AFE	1 mon	Mon 6/1/09	Fri 6/26/09
7	**Detailed Engineering Design**	**120 days**	**Mon 6/29/09**	**Fri 12/11/09**
8	Develop Design Basis	2 mons	Mon 6/29/09	Fri 8/21/09
9	Develop Material & Construction Specifications	2 mons	Mon 8/24/09	Fri 10/16/09
10	Develop Pipeline Construction Schedule	2 wks	Mon 10/19/09	Fri 10/30/09
11	Develop Station Construction Schedule	2 wks	Mon 11/2/09	Fri 11/13/09
12	Develop Material Specifications & Procurement Su	4 mons	Mon 8/24/09	Fri 12/11/09
13	**Detailed Drafting Design**	**100 days**	**Mon 7/27/09**	**Fri 12/11/09**
14	**Pipeline**	**80 days**	**Mon 7/27/09**	**Fri 11/13/09**
17	**Stations**	**100 days**	**Mon 7/27/09**	**Fri 12/11/09**
22	**Tanks**	**80 days**	**Mon 7/27/09**	**Fri 11/13/09**
25	**ROW & Permit Acquisition**	**400 days**	**Mon 9/21/09**	**Fri 4/1/11**
26	Environmental Review	20 mons	Mon 9/21/09	Fri 4/1/11
27	ROW Acquisition	12 mons	Mon 9/21/09	Fri 8/20/10
28	**Procurement**	**240 days**	**Mon 12/14/09**	**Fri 11/12/10**
42	**Contracts (Bid & Award)**	**25 days**	**Mon 12/14/09**	**Fri 1/15/10**
43	Pipeline Contractor	1 mon	Mon 12/14/09	Fri 1/8/10
44	Power Contracts	1 mon	Mon 12/14/09	Fri 1/8/10
45	Station Civil	1 mon	Mon 12/14/09	Fri 1/8/10
46	Station Mechanical	1 mon	Mon 12/14/09	Fri 1/8/10
47	Station Electrical	1 mon	Mon 12/14/09	Fri 1/8/10
48	Station Tanks	25 days	Mon 12/14/09	Fri 1/15/10
49	**Utility Power**	**240 days**	**Mon 11/16/09**	**Fri 10/15/10**
51	**Construction**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
52	**Pipeline**	**110 days**	**Mon 5/16/11**	**Fri 8/26/11**
53	Miles 1-60	3.5 mons	Mon 5/16/11	Wed 7/20/11
54	Miles 61-120	3.5 mons	Mon 5/16/11	Wed 7/20/11
55	Miles 121-170	3.5 mons	Mon 5/16/11	Wed 7/20/11
56	Block Valves	5.5 mons	Mon 5/16/11	Fri 8/26/11
57	**Stations**	**120 days**	**Mon 5/16/11**	**Mon 9/5/11**
58	Truck Offloading Terminals	4 mons	Mon 5/16/11	Fri 7/29/11
59	Origination Station	6 mons	Mon 5/16/11	Mon 9/5/11
60	Booster Stations (1-3)	3 mons	Mon 5/16/11	Mon 7/11/11
61	Keystone Delivery Station	6 mons	Mon 5/16/11	Mon 9/5/11
62	**Tanks**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
63	**Qty 2 - 90' Diameter Tanks**	**128 days**	**Mon 5/16/11**	**Mon 9/12/11**
84	**Qty 3 - 110' Diameter Tanks**	**183 days**	**Mon 5/16/11**	**Wed 11/2/11**
114	**Qty 4 - 140' Diameter Tanks**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
152	**Commissioning**	**65 days**	**Mon 11/14/11**	**Mon 2/13/12**
153	Mechanical	3 wks	Mon 11/14/11	Mon 12/5/11
154	Station Electrical - Team 1	10 wks	Mon 12/5/11	Mon 2/13/12
155	Block Valve Electrical - Team 2	7 wks	Mon 12/5/11	Mon 1/23/12

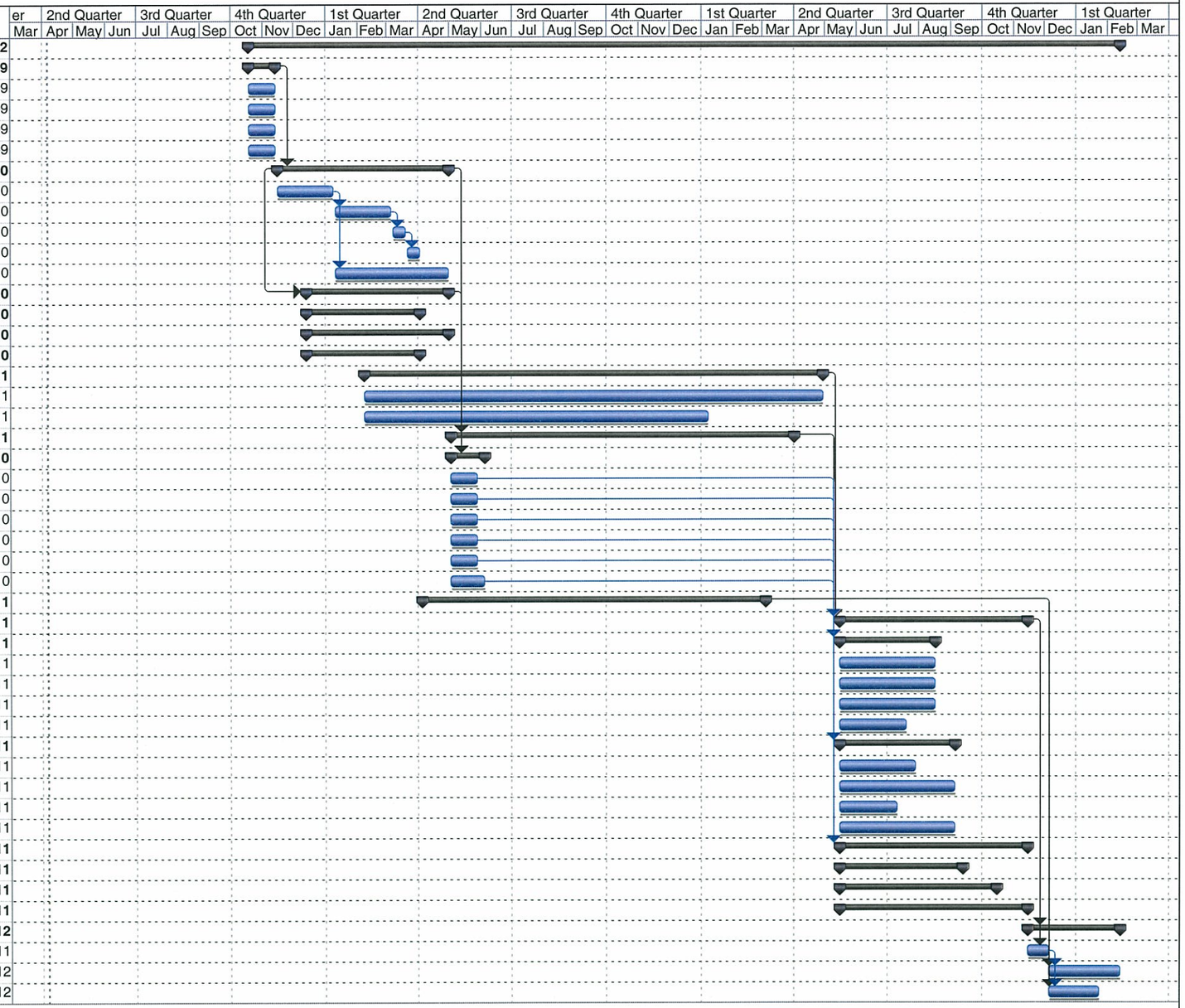


Project: Northern Route Schedule 200
Date: Mon 4/6/09

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

North Dakota Pipeline
Conceptual Study

ID	Task Name	Duration	Start	Finish
1	**Eastern Route Schedule**	**605.94 days**	**Mon 10/19/09**	**Mon 2/13/12**
2	**Preliminary**	**20 days**	**Mon 10/19/09**	**Fri 11/13/09**
3	Preliminary Engineering Design	1 mon	Mon 10/19/09	Fri 11/13/09
4	Preliminary Drafting Design	1 mon	Mon 10/19/09	Fri 11/13/09
5	Preliminary Cost Estimate	1 mon	Mon 10/19/09	Fri 11/13/09
6	Develop/Approve AFE	1 mon	Mon 10/19/09	Fri 11/13/09
7	**Detailed Engineering Design**	**120 days**	**Mon 11/16/09**	**Fri 4/30/10**
8	Develop Design Basis	2 mons	Mon 11/16/09	Fri 1/8/10
9	Develop Construction Specifications	2 mons	Mon 1/11/10	Fri 3/5/10
10	Develop Pipeline Construction Schedule	2 wks	Mon 3/8/10	Fri 3/19/10
11	Develop Station Construction Schedule	2 wks	Mon 3/22/10	Fri 4/2/10
12	Develop Material Specification & Procurement Support	4 mons	Mon 1/11/10	Fri 4/30/10
13	**Detailed Drafting Design**	**100 days**	**Mon 12/14/09**	**Fri 4/30/10**
14	**Pipeline**	**80 days**	**Mon 12/14/09**	**Fri 4/2/10**
17	**Stations**	**100 days**	**Mon 12/14/09**	**Fri 4/30/10**
22	**Tanks**	**80 days**	**Mon 12/14/09**	**Fri 4/2/10**
25	**ROW & Permit Acquisition**	**320 days**	**Mon 2/8/10**	**Fri 4/29/11**
26	Environmental Review	16 mons	Mon 2/8/10	Fri 4/29/11
27	ROW Acquisition	12 mons	Mon 2/8/10	Fri 1/7/11
28	**Procurement**	**240 days**	**Mon 5/3/10**	**Fri 4/1/11**
42	**Contracts (Bid & Award)**	**25 days**	**Mon 5/3/10**	**Fri 6/4/10**
43	Pipeline Contractor	1 mon	Mon 5/3/10	Fri 5/28/10
44	Power Contracts	1 mon	Mon 5/3/10	Fri 5/28/10
45	Station Civil	1 mon	Mon 5/3/10	Fri 5/28/10
46	Station Mechanical	1 mon	Mon 5/3/10	Fri 5/28/10
47	Station Electrical	1 mon	Mon 5/3/10	Fri 5/28/10
48	Station Tanks	25 days	Mon 5/3/10	Fri 6/4/10
49	**Utility Power**	**240 days**	**Mon 4/5/10**	**Fri 3/4/11**
51	**Construction**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
52	**Pipeline**	**100 days**	**Mon 5/16/11**	**Wed 8/17/11**
53	Miles 1-80	5 mons	Mon 5/16/11	Wed 8/17/11
54	Miles 81-160	5 mons	Mon 5/16/11	Wed 8/17/11
55	Miles 161-240	5 mons	Mon 5/16/11	Wed 8/17/11
56	Block Valves	3.5 mons	Mon 5/16/11	Wed 7/20/11
57	**Stations**	**120 days**	**Mon 5/16/11**	**Mon 9/5/11**
58	Truck Offloading Terminals	4 mons	Mon 5/16/11	Fri 7/29/11
59	Origination Station	6 mons	Mon 5/16/11	Mon 9/5/11
60	Booster Stations (1-3)	3 mons	Mon 5/16/11	Mon 7/11/11
61	Keystone Delivery Station	6 mons	Mon 5/16/11	Mon 9/5/11
62	**Tanks**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
63	**Qty 2 - 90' Diameter Tanks**	**128 days**	**Mon 5/16/11**	**Mon 9/12/11**
84	**Qty 3 - 110' Diameter Tanks**	**164 days**	**Mon 5/16/11**	**Sat 10/15/11**
114	**Qty 4 - 140' Diameter Tanks**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
152	**Commissioning**	**65 days**	**Mon 11/14/11**	**Mon 2/13/12**
153	Mechanical	3 wks	Mon 11/14/11	Mon 12/5/11
154	Station Electrical - Team 1	10 wks	Mon 12/5/11	Mon 2/13/12
155	Block Valve Electrical - Team 2	7 wks	Mon 12/5/11	Mon 1/23/12

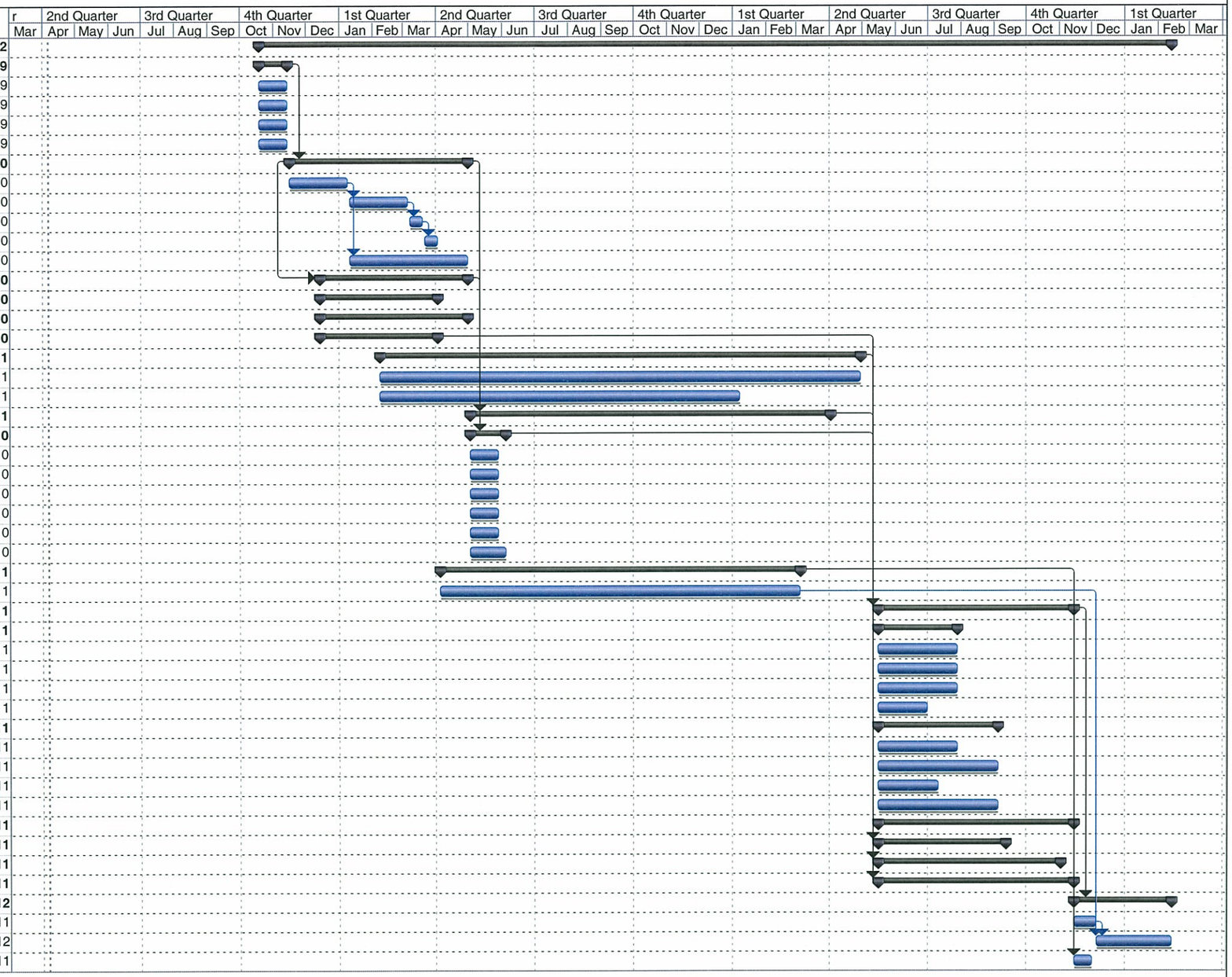


Project: Eastern Route Schedule 2003
Date: Mon 4/6/09

Task — Progress — Summary — External Tasks — Deadline
Split — Milestone — Project Summary — External Milestone

North Dakota Pipeline
Conceptual Study

ID	Task Name	Duration	Start	Finish
1	**Western Route Schedule**	**605.94 days**	**Mon 10/19/09**	**Mon 2/13/12**
2	**Preliminary**	**20 days**	**Mon 10/19/09**	**Fri 11/13/09**
3	Preliminary Engineering Design	1 mon	Mon 10/19/09	Fri 11/13/09
4	Preliminary Drafting Design	1 mon	Mon 10/19/09	Fri 11/13/09
5	Preliminary Cost Estimate	1 mon	Mon 10/19/09	Fri 11/13/09
6	Develop/Approve AFE	1 mon	Mon 10/19/09	Fri 11/13/09
7	**Detailed Engineering Design**	**120 days**	**Mon 11/16/09**	**Fri 4/30/10**
8	Develop Design Basis	2 mons	Mon 11/16/09	Fri 1/8/10
9	Develop Material & Construction Specificat	2 mons	Mon 1/11/10	Fri 3/5/10
10	Develop Pipeline Construction Schedule	2 wks	Mon 3/8/10	Fri 3/19/10
11	Develop Station Construction Schedule	2 wks	Mon 3/22/10	Fri 4/2/10
12	Develop Material Specifications & Procuren	4 mons	Mon 1/11/10	Fri 4/30/10
13	**Detailed Drafting Design**	**100 days**	**Mon 12/14/09**	**Fri 4/30/10**
14	**Pipeline**	**80 days**	**Mon 12/14/09**	**Fri 4/2/10**
17	**Stations**	**100 days**	**Mon 12/14/09**	**Fri 4/30/10**
22	**Tanks**	**80 days**	**Mon 12/14/09**	**Fri 4/2/10**
25	**ROW & Permit Acquisition**	**320 days**	**Mon 2/8/10**	**Fri 4/29/11**
26	Environmental Review	16 mons	Mon 2/8/10	Fri 4/29/11
27	ROW Acquisition	12 mons	Mon 2/8/10	Fri 1/7/11
28	**Procurement**	**240 days**	**Mon 5/3/10**	**Fri 4/1/11**
42	**Contracts (Bid & Award)**	**25 days**	**Mon 5/3/10**	**Fri 6/4/10**
43	Pipeline Contractor	1 mon	Mon 5/3/10	Fri 5/28/10
44	Power Contracts	1 mon	Mon 5/3/10	Fri 5/28/10
45	Station Civil	1 mon	Mon 5/3/10	Fri 5/28/10
46	Station Mechanical	1 mon	Mon 5/3/10	Fri 5/28/10
47	Station Electrical	1 mon	Mon 5/3/10	Fri 5/28/10
48	Station Tanks	25 days	Mon 5/3/10	Fri 6/4/10
49	**Utility Power**	**240 days**	**Mon 4/5/10**	**Fri 3/4/11**
50	Acquire & Construct	12 mons	Mon 4/5/10	Fri 3/4/11
51	**Construction**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
52	**Pipeline**	**80 days**	**Mon 5/16/11**	**Fri 7/29/11**
53	Miles 1-65	4 mons	Mon 5/16/11	Fri 7/29/11
54	Miles 66-130	4 mons	Mon 5/16/11	Fri 7/29/11
55	Miles 131-195	4 mons	Mon 5/16/11	Fri 7/29/11
56	Block Valves	2.5 mons	Mon 5/16/11	Fri 7/1/11
57	**Stations**	**120 days**	**Mon 5/16/11**	**Mon 9/5/11**
58	Truck Offloading Terminals	4 mons	Mon 5/16/11	Fri 7/29/11
59	Origination Station	6 mons	Mon 5/16/11	Mon 9/5/11
60	Booster Stations (1-3)	3 mons	Mon 5/16/11	Mon 7/11/11
61	Keystone Delivery Station	6 mons	Mon 5/16/11	Mon 9/5/11
62	**Tanks**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
63	**Qty 2 - 90' Diameter Tanks**	**128 days**	**Mon 5/16/11**	**Mon 9/12/11**
84	**Qty 3 - 110' Diameter Tanks**	**183 days**	**Mon 5/16/11**	**Wed 11/2/11**
114	**Qty 4 - 140' Diameter Tanks**	**196 days**	**Mon 5/16/11**	**Mon 11/14/11**
152	**Commissioning**	**65 days**	**Mon 11/14/11**	**Mon 2/13/12**
153	Mechanical	3 wks	Mon 11/14/11	Mon 12/5/11
154	Station Electrical - Team 1	10 wks	Mon 12/5/11	Mon 2/13/12
155	Block Valve Electrical - Team 2	2.5 wks	Mon 11/14/11	Thu 12/1/11



Project: Western Route Schedule 200
Date: Mon 4/6/09

Task — Progress — Summary — External Tasks — Deadline
Split — Milestone — Project Summary — External Milestone

APPENDIX F

Assumptions

Appendix F

Assumptions

F-1 Economic Analysis

F-2 Pipeline Operations

F-3 Interface on Keystone/TransCanada Pipeline Systems

F-4 Construction Costs in general

F-5 Pipeline Construction Costs

F-6 Pump Station Construction Costs

F-7 Tank Construction Costs

F-8 Power & Utility Costs

F-9 Ultimate Flow Construction Costs

Assumptions
North Dakota Pipeline Feasibility Study

Economic Analysis

1. Pipeline flow rate will be 55,000BPD for the life of the pipeline
2. No dismantlement cost in year 20 – salvage value at least matches dismantling cost
3. Tariff will remain constant over the entire life of the pipeline
4. Yearly Operating Expenses will increase 3% per year
5. ILI runs in years 5, 10, and 15
6. DOT in-service tank inspections in years 5 and 15
7. DOT out-of service inspections spread over years 8-12
8. Power cost will increase 3% per year
9. Insurance will increase 3% per year
10. 15 year MACRS depreciation on capital cost.
11. Shippers will own crude oil line fill and tank heel proportional to shipper throughput.
12. No loss of revenue during tank out-of-service inspection. Assume oil will be trucked to the next closest truck offloading rack.
13. United States Federal (35%) and State (6.75%) Tax was utilized for economic analysis. Canada has a combined Federal and Provincial income tax rate of 32%.

Pipeline Operations

1. Both 10” and 12” systems transport sweet crude oil. Volumes of sour crude oil received are minor enough that when blended with the larger volumes of sweet crude oil, the resulting crude meets the specifications for sweet crude oil storage, transportation, and handling.
2. No segregation of sweet and sour crude oil.
3. Both 10 & 12” Pipeline Systems to include:
    a. Mainline Originating Station, including metering, pumps and pig launcher.
    b. Mainline Quarter-Point (10” only) and Midpoint Booster Stations,
    c. Truck Unloading and Injection Stations (assumed 15% of the volume would be injected into the pipeline at each of the two unloading facilities)

d. Terminus Pump Station, including meter station to deliver 100 psig to the suction side of the Keystone Station. The injection flow rate into Keystone varies by system, and accordingly the horsepower requirements vary.

4. Crude oil volumes are received from Customer Owned and Operated Truck Racks into the study pipeline system at three points: Origin Station and two system pipeline Truck Unloading Injection Stations.

5. Crude oil received from Customer provided truck unloading racks are from Customer owned and operated crude oil truck unloading facilities into customer tanks, then delivered to the study pipeline system via customer owned LACT units (Lease Automated Custody Transfer units), which meter and sample crude oil volumes being delivered. Facilities downstream of the LACT units are built, owned, and operated by the owner of the study pipeline system.

6. Storage tanks have been included to accommodate:

   a. Three (3) day receipt storage at all 10' and 12" Pipeline system receipt points: Originating Station and Truck Unloading Injection Stations

   b. Tank storage requirements at the Keystone/TransCanada termini of the study pipeline are sized to accommodate injection in to the Keystone/TransCanada pipelines on a three (3) day sequence, plus have three (3) days storage for Keystone/TransCanada pipeline system downtime.

Interface on Keystone/TransCanada Pipeline Systems

1. Interface calculation modified from Shaker, N. O. and Mansour, R., Pilot Line Verifies Calculations for Interface Length, Mixing (1999); Oil and Gas Journal. Vol. 97. No. 21. 66-69. 1999

2. Viscosity Blending Number taken from Robert E. Maples (2000), Petroleum Refinery Process Economics, 2nd Edition, Pennwell Books, ISBN 0-87814-779-9

3. Fluid Characteristics:

   a. Miscible

   b. Newtonian Fluid

   c. Turbulent Flow

4. Calculations are based on 55MBPD Flow Rates.

5. Pipe and Pipeline Characteristics

   a. Flow Rate – Constant / "Tight-Lined"

   b. Pipe internal diameter (ID): constant for each pipe segment (A and AA)

   c. Pipeline Segments: do not include bends, fitting, pumps, valves, etc.

   d. Pipeline Lengths: approximate

e. Batch – "Heart-Cut"

f. Terminus: Wood River, Illinois

g. Temperature: pipe, oil, and ground 40° F, constant

6. North Dakota Feasibility Study Fluid Data (B):

   a. 3.9 cSt @ 40 Degrees F.

   b. S. G. = .82

   c. Wt. % S = 0.19%

   d. API Gravity: 40.9

7. Keystone/TransCanada Pipeline Fluid Data (A):

   a. 350 cSt @ All Temperatures (Diakow, D, and Shauers, D, Keystone Pipeline Facts, Rooney Engineering, Inc., Written Communication, January 23, 2009)

   b. S. G. = .94 (Diakow, D, and Shauers, D, Keystone Pipeline Facts, Rooney Engineering, Inc., Written Communication, January 23, 2009)

   c. Wt. % S = 4.8, highest assay shipped (Crude Quality Inc., Heavy Crude Quality Project Analyses Summary (January 2009), Peace River Heavy, Average Weight Percent Sulfur, 2009)

   d. API Gravity: 19.0

Construction Costs in General

1. Pipeline Design in accordance with 49CFR195

2. Summer Construction

3. Capital cost estimate include all material and labor to install, test and inspect

4. Includes 20% cost contingency

5. An existing pipeline operating company would construct and operate the study pipeline system, and as such would have an existing control center and management staff in place to operate the line as an extension of their existing system.

6. Engineering design, pipeline construction, construction management, radiographic inspection and as-builts are in accordance to the Department of Transportation (DOT) regulations. This estimate includes final route selection, pipeline centerline survey, preparation of construction drawings, construction contract documents, material specifications, material procurement and expediting, pipeline construction, construction management, construction inspection and the preparation of as-builts and job books after the project has been completed.

7. Engineering support has been included in the estimate to assist in commissioning of the pipeline.

8. Cost of Contractor Performance and Payment Bond are not included in cost estimates.

9. Anticipated legal fees have been included.

10. Unforeseen conditions, including hazardous waste requiring special handling and disposal, are not anticipated and have not been included in this study.

11. All costs are in 1st Quarter 2009 U. S. Dollars.

12. All lead times, for major equipment orders are as of 1'st Quarter Year 1 order dates, though schedule issues would not allow ordering by 1st Quarter Year 1.

Pipeline Construction Costs

1. Costs based on an examination of topographic and aerial maps only.

2. Pipeline consisting of 10-inch x 0.203-inch wall thickness API 5L grade X56 pipe **OR** 12-inch x 0.219-inch wall thickness API 5L grade X60 pipe, coated with 14 -16 mils of fusion bond epoxy corrosion coating and shrink sleeve joints. Both 10-inch and 12-inch systems estimated have been designed to an ANSI 600 Specification.

3. Piping for horizontal directional drills consisting of either 10-inch x 0.365-inch wall thickness API 5L grade X56 **OR** 12-inch x 0.375-inch wall thickness API 5L grade X60 pipe coated with 14-16 mils of fusion bond epoxy corrosion coating and abrasive resistant outer jacket.

4. Isolation block valve assemblies as required per code

5. Impressed Current Cathodic Protection.

6. SCADA monitoring equipment is included.

7. The cost includes an estimate of the cost to acquire and pay for costs associated with right-of-way for the pipeline. Right-of-way cost includes legal surveys and plats.

8. Costs include estimates to acquire all permits, including environmental permits.

9. Environmental mitigation monitoring is not anticipated to be required by regulatory and or private parties / agencies.

10. The pipeline will be installed with three (3) feet of cover in accordance with 49CFR195. REI has assumed rock sawing or blasting will not be required during excavation. REI has also assumed that the soil will be suitable to be back filled in the ditch. The estimate does include excavating and segregating round rock found from the glacial till.

11. After the pipeline route ditch has been excavated, the pipeline lowered in and backfilled, the pipeline trench will be wheel roll compacted. Cost has not included for additional mechanical compaction.

12. After construction is complete, the right-of-way will be restored to its original contour and re-seeded with commercially available seed.

Pump Station Construction Costs

1. Simultaneous construction of all pump stations and during summer conditions only
2. All major equipment, pipe, valves, and fittings available on site before beginning of construction
3. No unusual soil conditions
4. Includes pipe and valves to and from storage tanks
5. Customers deliver to station receipt manifold and supply their own truck rack tanks and Lease Automated Custody Transfer (LACT) units

Tank Construction Costs

1. Storage Tank size is based on the following
    a. Originating Station – one day's volume received plus three (3) days storage
    b. Truck Unloading Injection Station – one day's volume received plus three (3) days storage
    c. Keystone/TransCanada Delivery Station – one (1) Keystone/TransCanada batch of 275,000 barrels plus three (3) day's station receipt storage, at 55MBPD
2. Separate fill / suction connections
3. Flow rate in to and out of tanks must be limited, to keep tank floating roof movement at less than 8 ft / hour
4. Injection by terminus requires suction from two tanks simultaneously
5. Construction staffing costs
    a. One (1) Inspector assigned to each tank
    b. One (1) Full Time Tank Project Manager and 1.5 Man-Years Support
    c. Does not include Chief Inspector
6. Tank construction schedule
    a. Three tank construction and coating contractors or crews: one for each tank size
    b. Tanks built concurrently - multiple crews

Power & Utility Costs

1. The Utility voltage is assumed to be 4160VAC at all pump station locations and 480VAC or 220VAC at truck rack injection stations.

2. Since all electrical motors above 10 HP have the potential to adversely disturb rural power systems, those motors have either "soft start" motor starters or "variable frequency drives" (VFD). Another reason VFDs were utilized for all the large motors is for operational flexibility and power savings.

3. The standby 4160VAC pump at each major station shares a VFD with one of the other main pumps. Also, the VFD's at the origination and midpoint booster stations are assumed to be shared between the mainline pumps rather than having one VFD per pump as is done at the terminal station.

4. Electrical power consumption cost was estimated based on the actual kilowatt-hours derived from the head calculations in the hydraulic models for each alternative.

5. All the proposed stations appear to be in the general vicinity of electrical power lines. Budgetary quotes were obtained for several stations, but not for all. The cost of extending utility power to each site was estimated using budgetary quotes for similar installations.

6. The effective electrical rate at each station was derived from representative costs for the area and for the type of load at the particular station.

7. When calculating energy costs in Canada, the exchange rate of 1 US$ = C$1.24 was used. This rate will vary in the future.

Ultimate Flow Construction Costs

1. Pipeline will operate at 95,000 BPD.

2. Pipeline Costs – No incremental cost for pipeline

3. Pump Station Costs:

    a. Change out impellers on pumps at existing station, for larger impellers – motors in Base Case (55,000 BPD) already sized for Ultimate Case needs

    b. Construct ¼ and ¾ Point Booster Stations on 12" System identical to already existing Midpoint Booster Station

4. Tank Costs:

    a. Add four (4) tanks for a capital cost of $18,171,800.

    b. Add Inspection Maintenance Cost for four (4) tanks: Year Five (5), $68,000; Year Ten (10), $3,287,200; Year Fifteen (15), $68,000

APPENDIX G

Interface on
Keystone / TransCanada Pipeline Systems

Appendix G

Interface/Transmix on Keystone/TransCanada

Interface Volume / Characteristics Summary and Calculation Data

Table G.1 **Interface Volume / Characteristics Summary**	**North Dakota Pipeline Injection Station**		
	TransCanada (North)	Keystone (East)	Keystone XL (West)
North Dakota Injection Station to Wood River, Illinois			
Volume (BBL) (1)	**18,496*** **	**10,924*** **	**20,800*** **
Temperature (Degrees F)	40.00	40.00	40.00
Viscosity (cSt)	19.70	19.70	19.70
API Gravity (Degrees)	29.22	29.22	29.22
S. G.	0.88	0.88	0.88
Wt. % S (2)	2.65	2.65	2.65

(1) Interface calculation modified from Shaker, N. O. and Mansour, R., Pilot Line Verifies Calculations for Interface Length, Mixing (1999); Oil and Gas Journal, Vol. 97, No. 21, Pages 66-69, 1999.

(2) Weight Percent Sulfur calculation modified from Mecham, T. J., Crude Oil Mass Mixing Program, Written Communication; December 31, 2008.

Table G.2 **Crude Characteristics**	**Properties**				
	Temperature (Degrees F)	Viscosity (cSt)	API Gravity (Degrees)	S. G.	Wt. % S
Bakken Characteristics(1)	40.00	3.94	40.90	0.82	0.19
TransCanada Maximum (Worst Case Combinations)	40.00	350.00 (2)	19.00	0.940(2)	4.80 (3)

(1) Mecham, T., November 8, 2008.

(2) Diakow, D, and Shauers, D, Keystone Pipeline Facts, Rooney Engineering, Inc., Written Communication, January 23, 2009.

(3) Crude Quality Inc., Heavy Crude Quality Project Analyses Summary (January 2009), Peace River Heavy, Average Weight Percent Sulfur, 2009.

Table G.3 Pipeline Characteristics	Pipelines		
	TransCanada (North) Whitewood, Saskatchewan to Wood River, Illinois	Keystone (East) Niagara, North Dakota to Wood River, Illinois	Keystone XL (West) - Fallon, Montana to Wood River, Illinois
Flow Rate (bph) Segment A	27,375	27,375	41,667
Flow Rate (bph) Segment AA	27,375	n/a	27,375
Pipeline Length (ft.)	6,993,729	5,203,123	5,610,686
Length (ft.), Segment A (1)	1,032,451	5,203,123	3,316,843
Pipe Internal Diameter (in.), Segment A (1)	33.438	29.438	35.438
Length (ft), Segment AA(1)	5,961,278	n/a	2,293,843
Pipe Internal Diameter (in.), Segment AA(1)	29.438	n/a	29.438

(1) Diakow, D., Written Communication, March 20, 2009.

Table G.4 Bakken Batch Downgrade / Characteristics Summary	North Dakota Pipeline Injection Station		
	TransCanada (North)	Keystone (East)	Keystone XL (West)
North Dakota Injection Station to Wood River, Illinois			
Batch Volume (BBL)	275,000	275,000	275,000
Interface Volume (BBL)	18,496	10,924	20,800
% Interface	7	4	8
Temperature (Degrees F)	40.00	40.00	40.00
Viscosity (cSt)	4.27	4.13	4.42
API Gravity (Degrees)	40.1	40.4	40.0
S. G.	0.82	0.82	0.83
Wt. % S (2)	0.37	0.30	0.39

Table G.5 **Bakken / Interface Tank Mixing Summary**	**Wood River, Illinois Terminus**		
	TransCanada (North) Whitewood, Saskatchewan to Wood River, Illinois	Keystone (East) Niagara, North Dakota to Wood River, Illinois	Keystone XL (West) - Fallon, Montana to Wood River, Illinois
Tank Size (BBL, working volume)	110,000	110,000	110,000
Volume Interface	**18,496**	**10,924**	**20,800**
Volume Bakken	91,504	99,076	89,200
Properties Mixture			
Temperature (Degrees F)	40.00	40.00	40.00
Viscosity (cSt)	4.86	4.45	5.00
API Gravity (Degrees)	38.81	39.66	38.56
S. G.	0.83	0.83	0.83
Wt. % S	0.63	0.45	0.68

***Assumptions:
Newtonian Fluid
Fluids Are Miscible
Turbulent Flow
Viscosity Blending Number Determination From Robert E. Maples (2000), Petroleum Refinery Process Economics, 2nd Edition, Pennwell Books, ISBN 0-87814-779-9
Calculations Are Based On 'Name Plate' Flow Rates
Constant Flow Rates / 'Tight-Lined'
Pipeline Segments Do Not Include Bends, Fittings, Pumps, Valves, Etc.
Pipeline Lengths Are Approximate
Pipe Internal Diameters Are Constant Unless Noted
Constant Pipeline Temperature (Winter Conditions)
'Heart-Cut' Into Heavy Sour Batch
TransCanada Heavy Sour's Viscosity Is 350 cSt At All Temperatures
100% Of Interface (Head) Diluted By Bakken In 110,000 Barrel Receiving Tank

APPENDIX H

Ultimate Flow - 12” Systems

Appendix H

Ultimate Flow

Ultimate Flow – Cost Increase Summary

Capital Cost Increase

To construct either the 12" System North Route for an ultimate flow of 95,000 BPD, the System Costs increase as follows:

	Cost Increase
Add ¼ Point & ¾ Point Booster Stations	$ 12,675,800
Add one tank each(with containment dike) at Originating Station, each of two (2) Truck Unloading Injection Stations, and Keystone Delivery Station	$ 18,171,800
Additional Pump Station construction, materials, and land to provide for additional tanks at Originating Station and Truck Unload Injection Stations	$ 310,400
Total Capital Cost Increase – Ultimate Flow	**$ 31,158,000**

Tank Inspection Costs Increase

- The API 653 In-Service Inspection Cost at Year 5 and Year 15 would be $68,000 respectively for the additional tanks.
- The API 653 Out-of-Service Inspection Cost at Year 10 would be $3,287,200 for the additional tanks
- The API inspection costs are average actual costs and include taxes; however, ***no*** contingency was included.

North Dakota Pipeline

ECONOMIC ANALYSIS

12in Northern Pipeline Route - Ultimate Case

Review the rate of return on a pipeline operating at 55,000 BPD for 5yrs. and at 98,500BPD for the next 15 yrs

FULL INVESTMENT (x 1,000)	$228,778
FIRST YEAR INTEREST (during construction)	$14,871
TOTAL LOAN VALUE (x 1,000)	$243,649
TARIFF $/BBL	$2.92
YEARS NOTE PAID OVER	20
NOTE INTEREST RATE	6.50%
TAX RATE	41.75%
DISMANTLEMENT YR 20 (x1000)	$0
IROR	15.00%

NET PRESENT VALUE

DISCOUNT RATE	NPV @ (x 1,000)
8.00%	$119,825
8.50%	$107,555
9.00%	$96,025
9.50%	$85,184
10.00%	$74,983
10.50%	$65,379
11.00%	$56,330
11.50%	$47,799
12.00%	$39,752

(x 1,000)

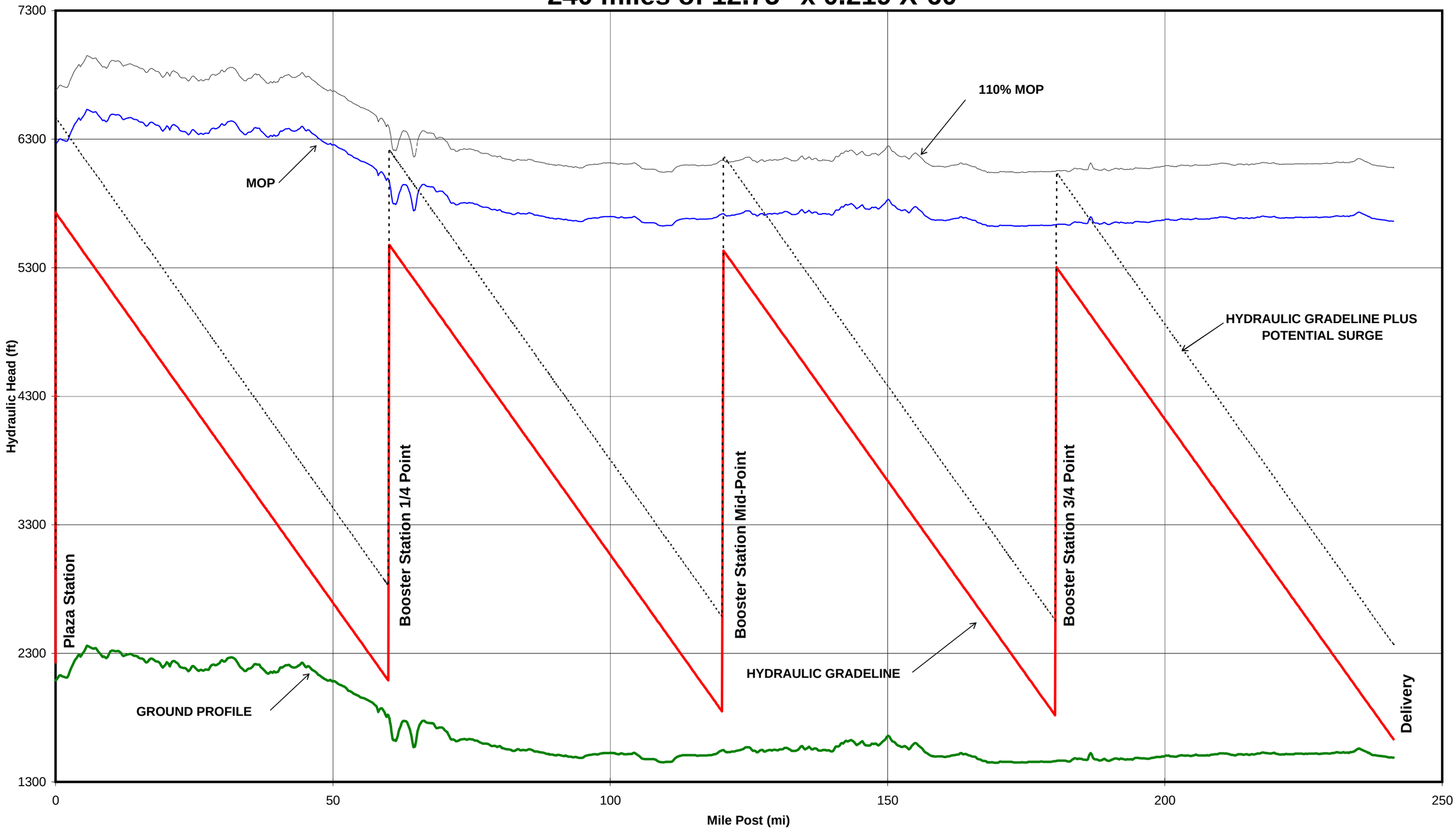
DESCRIPTION	DECLINE/INFL.	$/BBL	BPD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTALS
LOAN BALANCE				$243,649	$237,373	$230,690	$223,572	$215,991	$207,918	$199,320	$190,163	$180,411	$170,025	$158,964	$147,184	$134,639	$121,277	$107,048	$91,893	$75,754	$58,565	$40,259	$20,763	$3,055,458
PRINCIPAL PAYMENT				$6,276	$6,683	$7,118	$7,580	$8,073	$8,598	$9,157	$9,752	$10,386	$11,061	$11,780	$12,546	$13,361	$14,230	$15,155	$16,140	$17,189	$18,306	$19,496	$20,763	$243,649
INTEREST PAYMENT				$15,837	$15,429	$14,995	$14,532	$14,039	$13,515	$12,956	$12,361	$11,727	$11,052	$10,333	$9,567	$8,752	$7,883	$6,958	$5,973	$4,924	$3,807	$2,617	$1,350	$198,605
ANNUAL Q (BBLS)			95,000	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	34,675	381,425
TARIFF $/BBL		$2.918		$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	$2.92	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
ANNUAL Q (BBLS)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TARIFF $/BBL		$0.000		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
GROSS REVENUE				$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$2,023,633
LESS:																								
FIXED OPERATING EXPENSE	3.00%	$2,464		$2,464	$2,538	$2,614	$2,692	$2,773	$2,856	$2,942	$3,030	$3,121	$3,215	$3,311	$3,411	$3,513	$3,618	$3,727	$3,839	$3,954	$4,073	$4,195	$4,321	$66,209
YRLY MAINTENANCE EXP.	3.00%			$0	$0	$0	$0	$603	$0	$0	$2,448	$2,448	$2,072	$2,448	$1,632	$0	$0	$784	$0	$0	$0	$0	$0	$12,435
POWER & PENT.EXP.	3.00%	$4,177		$4,177	$4,303	$4,432	$4,565	$4,701	$4,843	$4,988	$5,137	$5,292	$5,450	$5,614	$5,782	$5,956	$6,134	$6,318	$6,508	$6,703	$6,904	$7,111	$7,325	$112,243
LIABILITY INS	3.00%	$560		$560	$576	$594	$612	$630	$649	$668	$688	$709	$730	$752	$775	$798	$822	$847	$872	$898	$925	$953	$981	$15,039
INTEREST EXPENSE				$15,837	$15,429	$14,995	$14,532	$14,039	$13,515	$12,956	$12,361	$11,727	$11,052	$10,333	$9,567	$8,752	$7,883	$6,958	$5,973	$4,924	$3,807	$2,617	$1,350	$198,605
AD VALOREM TAX @	5.00%			$11,573	$10,416	$9,374	$8,436	$7,592	$6,833	$6,114	$5,396	$5,059	$5,059	$5,059	$5,059	$5,059	$5,059	$5,059	$5,059	$5,059	$5,059	$5,059	$5,059	$126,444
15YR MACRS DEPRECIATION				$12,182	$23,147	$20,832	$18,761	$16,885	$15,179	$14,375	$14,375	$14,400	$14,375	$14,400	$14,375	$14,400	$14,375	$14,400	$7,188	$0	$0	$0	$0	$243,649
TAX LOSS CARRY FORWARD				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET TAXABLE INCOME				$54,388	$44,773	$48,341	$51,584	$53,958	$57,307	$59,138	$57,746	$58,426	$59,228	$59,265	$60,581	$62,705	$63,290	$63,089	$71,743	$79,643	$80,414	$81,247	$82,146	$1,249,009
35% FEDERAL TAX + 6.75% STATE TAX	41.75%			$22,707	$18,693	$20,182	$21,536	$22,527	$23,926	$24,690	$24,109	$24,393	$24,728	$24,743	$25,292	$26,179	$26,423	$26,340	$29,953	$33,251	$33,573	$33,920	$34,296	$521,461
NET INCOME AFTER TAX				$31,681	$26,080	$28,159	$30,047	$31,430	$33,381	$34,448	$33,637	$34,033	$34,500	$34,522	$35,288	$36,525	$36,866	$36,749	$41,790	$46,392	$46,841	$47,326	$47,850	$727,548
GROSS REVENUE				$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$101,182	$2,023,633
LESS: PRINCIPAL & INTEREST				$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$22,113	$442,253
OPERATING EXP.				$7,201	$7,417	$7,639	$7,869	$8,708	$8,348	$8,598	$11,304	$11,570	$11,468	$12,125	$11,600	$10,267	$10,575	$11,676	$11,219	$11,555	$11,902	$12,259	$12,627	$205,926
TAXES (INCOME + AD VALOREM)				$34,280	$29,109	$29,557	$29,972	$30,119	$30,759	$30,804	$29,505	$29,452	$29,787	$29,802	$30,351	$31,238	$31,482	$31,399	$35,012	$38,310	$38,632	$38,980	$39,355	$647,906
ANNUAL CASH FLOW			-243,649	$37,587	$42,543	$41,872	$41,227	$40,241	$39,962	$39,666	$38,260	$38,047	$37,814	$37,141	$37,117	$37,563	$37,011	$35,994	$32,838	$29,203	$28,535	$27,830	$27,087	$727,538
CUMULATIVE CASH FLOW				$37,587	$80,130	$122,002	$163,229	$203,470	$243,432	$283,098	$321,358	$359,405	$397,219	$434,360	$471,477	$509,040	$546,051	$582,045	$614,883	$644,086	$672,621	$700,451	$727,538	

Note 1: The Ad Valorem tax is calculated as 5% from the State of North Dakota

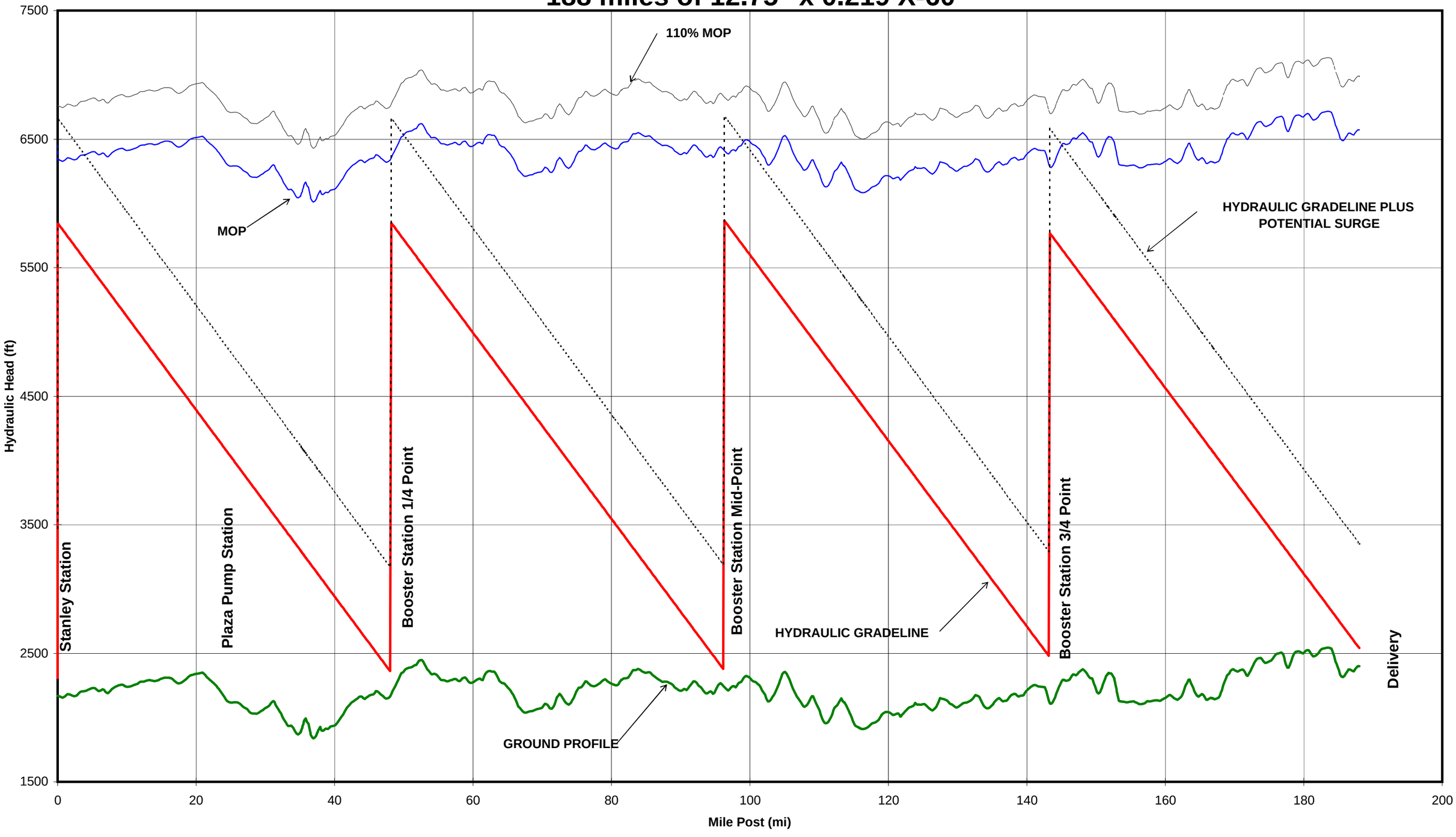
Note 2: ILI tools runs every 5 years are calculated as a portion of the Yearly Maintenance Expense.

Note 3: In-Service tank inspections in years 5 and 15 and Out of Service tank inspections in years 8-12 are calculated as a portion of the Yearly Maintenance Expense.

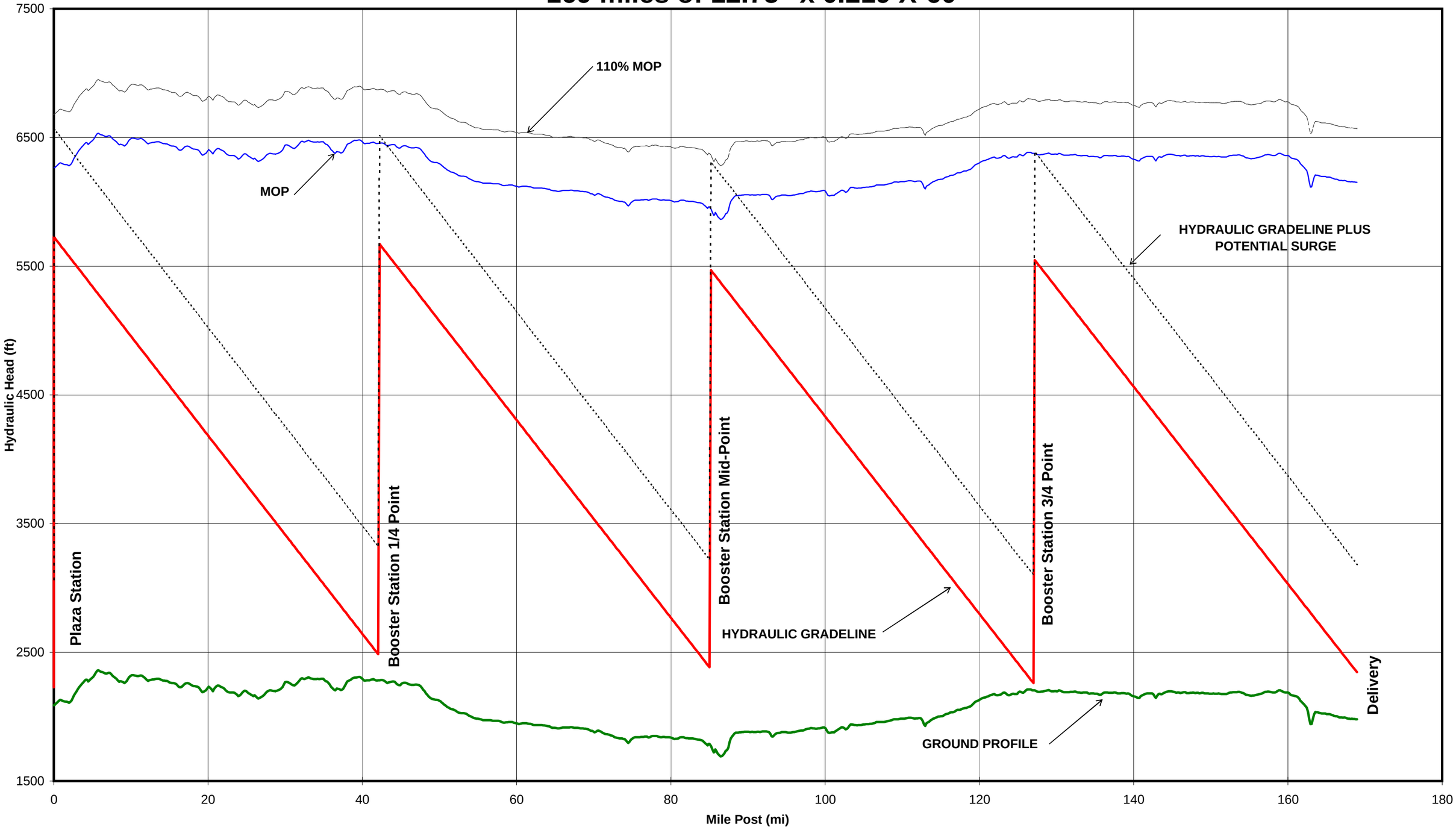
East 12" Ultimate - Plaza to Niagara PS - 86.6MBPD - Sweet Crude (2.8cs)
240 miles of 12.75" x 0.219 X-60



West 12" Ultimate - Stanley to Fallon (XL) Pipeline - 95.2MBPD - Sweet Crude (2.8cs)
188 miles of 12.75" x 0.219 X-60



North 12" Ultimate - Plaza to Whitewood PS - 98.5MBPD - Sweet Crude (2.8cs)
169 miles of 12.75" x 0.219 X-60



APPENDIX I

Independent Operator Case

Appendix I

Independent Operator

Independent Operator Case

Cost Increase Summary

Operating Cost Increase

Operation of the 12" System North Route at a flowrate of 55MBPD by an independent operator would have increased yearly operating cost as follows:

	Cost Increase per Year
Salary and Benefits for 6 additional employees, including President, Electrical Controls Technicians, Line Riders, and Pipeline Controllers	$ 856,500
Company Vehicles and Communications for additional employees	$ 110,600
Office Space for additional Employees	$ 46,300
Total Operating Cost Increase – Independent Operator	**$ 1,013,400**

Capital Cost Increase

Construction of the 12" System North Route at a flowrate of 55MBPD by an independent operator would have increased capital cost as follows:

	Increased Capital Cost
Additional SCADA licenses, hardware, and training	$ 390,000
Total Capital Cost Increase – Independent Operator	**$ 390,000**

Accounting for the above costs, a tariff of $4.30 would be required to reach a rate of return of 15%.