Additional Road Investments Needed to Support Oil and Gas Production and Distribution in North Dakota – Executive Summary

Study Objective: Oil production in North Dakota has more than doubled during the last 10 years. According to the Oil and Gas Division of the North Dakota Industrial Commission, approximately 3,300 wells were producing oil in the state prior to 2005. As of November 2010, that number had risen to 5,200. In addition, the number of producing wells is expected to increase substantially in the future.

The purpose of this study is to forecast road investment needs in oil and gas producing counties of North Dakota over the next 20 years in light of the expected growth. The objective is to quantify the additional investments necessary for efficient year-round transportation of oil while providing travelers with acceptable roadway service. The focus is on roads owned or maintained by local governments—e.g., counties and townships.

Analysis: Impacts and funding needs are analyzed for three types of roads: paved, graveled, and graded and drained. The analysis is based on three main data sources: (1) oil production forecasts, (2) traffic data, and (3) county road surveys. The forecasted output of wells is routed over the road network to pipelines using a detailed Geographic Information System model in which oil movements are represented as equivalent tractor-semitrailer trips that follow least-cost paths. The projected inputs of sand and water and outbound movements of salt water to disposal sites are similarly routed. These predicted inbound and outbound movements are accumulated for each impacted segment. Afterward, oil-related trips are combined with estimates of baseline (non-oil) traffic to estimate the total traffic load on each road. The county surveys provide detailed information about the condition of each impacted segment, as well as the typical thicknesses of surface and base layers. Movements of specialized equipment (such as workover rigs) are included in the analysis.

Improvements to each roadway type were estimated based upon existing condition, geometry and forecasted future traffic volumes. For paved roads, several types of potential road improvements are analyzed in this study, including reconstruction and structural overlays. A structural overlay is a cost-effective solution for pavements with substantial but lower increases in traffic. In addition to improving structural durability, reconstruction enables minor widening and shoulder improvements. In this study, oil-related impacts are estimated by comparing the selected improvement to the cost of a thin overlay, which should be sufficient for normal or baseline traffic. On unpaved roads, a number of improvement types are modeled: increased gravel application and blading frequency, dust suppressant, reconstruction to allow for 12-month operation, double chip seal improvements, and upgrading of graded and drained roads to gravel surfaces.

Summary of Results. Approximately 12,718 miles of impacted unpaved roads have been identified. The projected cost of oil-related traffic on these roads is $567 million over the next 20 years (from 2011 through 2030). When the unpaved and paved road costs are added together, the projected investment need for all roads amounts to $907 million, which is equal to an average annual need of $45.35 million over the 2011-2030 period. The costs are summarized by time period in Table S.1. In columns 5 and 6, two inflation scenarios are shown to illustrate the impacts of inflation on the total needs. In these scenarios, the impacts of inflation are not modeled until the 2014-2015 biennium. In addition, costs are presented by county for the next two biennia in Tables S.2-S.4. The numbers shown do not include overhead expenditures.

Table S.1 Summary of Projected Additional Funding Needs by Period (Millions of Dollars)

	Road Category			Inflation Scenarios	
Biennium	Unpaved	Paved	Total	3% Total	5% Total
2012-2013	$114.90	$118.20	$233.10	$233.10	$233.10
2014-2015	$114.90	$149.90	$264.80	$293.69	$314.20
2016-2017	$75.90	$17.00	$92.90	$109.31	$121.53
2018-2019	$36.90	$20.70	$57.60	$71.90	$83.08
2020-2021	$36.90	$10.60	$47.50	$62.91	$75.53
2022-2023	$49.10	$6.30	$55.40	$77.84	$97.12
2024-2025	$49.10	$4.70	$53.80	$80.19	$103.98
2026-2027	$37.50	$4.20	$41.70	$65.94	$88.86
2028-2029	$26.00	$4.20	$30.20	$50.66	$70.95
2030-2031	$26.00	$4.20	$30.20	$53.75	$78.22
Total	$567.00	$340.10	$907.10	$1,099.30	$1,266.57

Table S.2 Additional Paved Road Costs by County: 2012-2015 ($ 2010 Million)

County	2012-2013	2014-2015	2012-2013 Reconstruction	2014-2015 Reconstruction
Billings	$0.7	$1.8	$0.7	$1.7
Bottineau	$0.2	$2.5	$0.0	$1.3
Bowman	$0.1	$0.6	$0.0	$0.0
Burke	$0.1	$6.4	$0.0	$6.2
Divide	$3.3	$2.1	$3.2	$0.7
Dunn	$6.5	$15.6	$6.3	$14.1
Golden Valley	$0.9	$0.1	$0.8	$0.0
McHenry	$0.0	$0.0	$0.0	$0.0
McKenzie	$19.5	$33.6	$18.6	$30.7
McLean	$1.7	$10.5	$1.6	$9.8
Mercer	$0.0	$0.0	$0.0	$0.0
Mountrail	$40.9	$29.1	$40.4	$23.9
Renville	$15.8	$4.3	$15.6	$3.4
Slope	$0.0	$0.0	$0.0	$0.0
Stark	$7.3	$7.6	$6.9	$7.1
Ward	$2.8	$13.8	$2.4	$12.3
Williams	$18.4	$21.9	$17.5	$16.2
Total	$118.2	$149.9	$113.9	$127.4

Table S.3 Additional Unpaved Road Costs by County: 2012-2015 ($ 2010 Million)

County	2012-2013	2014-2015	2012-2013 Reconstruction	2014-2015 Reconstruction
Billings	$3.9	$3.9	$2.5	$2.5
Bottineau	$0.8	$0.8	$0.3	$0.3
Bowman	$0.5	$0.5	$0.3	$0.3
Burke	$3.2	$3.2	$1.8	$1.8
Divide	$9.4	$9.4	$6.0	$6.0
Dunn	$17.3	$17.3	$11.8	$11.8
Golden Valley	$4.3	$4.3	$2.9	$2.9
McHenry	$0.1	$0.1	$0.0	$0.0
McKenzie	$18.2	$18.2	$11.6	$11.6
McLean	$4.0	$4.0	$2.9	$2.9
Mercer	$0.2	$0.2	$0.1	$0.1
Mountrail	$15.9	$15.9	$10.1	$10.1
Renville	$1.9	$1.9	$1.1	$1.1
Slope	$0.6	$0.6	$0.5	$0.5
Stark	$8.1	$8.1	$5.7	$5.7
Ward	$6.2	$6.2	$5.0	$5.0
Williams	$20.2	$20.2	$13.6	$13.6
Total	$114.9	$114.9	$76.3	$76.3

Table S.4 Total Projected Additional Road Costs by County: 2012-2015 ($ 2010 Million)

County	2012-2013	2014-2015	2012-2013 Reconstruction	2014-2015 Reconstruction
Billings	$4.6	$5.6	$3.1	$4.2
Bottineau	$1.0	$3.3	$0.3	$1.6
Bowman	$0.6	$1.1	$0.3	$0.3
Burke	$3.4	$9.6	$1.8	$8.0
Divide	$12.8	$11.5	$9.3	$6.7
Dunn	$23.8	$32.9	$18.0	$25.9
Golden Valley	$5.2	$4.4	$3.7	$2.9
McHenry	$0.1	$0.1	$0.0	$0.0
McKenzie	$37.6	$51.8	$30.2	$42.4
McLean	$5.7	$14.6	$4.5	$12.7
Mercer	$0.2	$0.2	$0.1	$0.1
Mountrail	$56.8	$45.0	$50.5	$34.0
Renville	$17.7	$6.2	$16.7	$4.6
Slope	$0.6	$0.6	$0.5	$0.5
Stark	$15.4	$15.7	$12.6	$12.8
Ward	$9.0	$20.0	$7.4	$17.3
Williams	$38.6	$42.1	$31.1	$29.7
Total	$233.1	$264.8	$190.1	$203.7