

# MPC-423

January 1, 2013- December 31, 2013

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**Project Title:**

Impact of Energy Sector Growth on Perceived Transportation Safety in the Seventeen County Oil Region of Western North Dakota: A Longitudinal Analysis

**Key Terms:**

Bakken oil region, western North Dakota oil, driver perceptions, transportation safety, survey

**University:**

North Dakota State University

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**Research Needs:**

Western North Dakota is a rapidly evolving region in the United States. This evolution is especially prominent in a 17-county region where oil extraction methods have improved production economics. Road usage in this area has changed immensely due to the growing energy sector. Roads once used only for local access and agricultural purposes are now being used at high volumes to serve expanding oil and gas production. This has led to an increase in traffic volume, an increase in the number of overweight and oversized vehicles on the road, and a number of roads being in poor condition with others deteriorating rapidly. Poor road conditions, a growing population, greater vehicle miles traveled, and higher average annual daily traffic all are contributing factors that make the roads dangerous for users. Thus, there is a need to study not only how residents perceive road conditions, safety on roadways, and passenger vehicle-large truck interaction, but also to measure the success of safety campaigns, driver behavior on said roads, and the rates with which drivers avoid roadways impacted by oil development.

Present research with regard to the impacts oil development in western North Dakota has had on transportation is limited. Research concerning how the growing energy sector affects driver behaviors and attitudes is almost non-existent. The Upper Great Plains Transportation Institute (UGPTI) (2010) studied the conditions of paved and unpaved roads affected by oil development in western North Dakota, but the study did not address driver views or behaviors. A follow-up

study is forthcoming. In the same report, UGPTI (2010) analyzed truck traffic in 15 western North Dakota oil counties, but did not have an element containing responses from drivers in the region. Another UGPTI report (2012) addressed crash events in oil counties from 2007 to 2011, but obtained information from crash reports rather than from drivers directly.

At a broader scale, studies in other regions have addressed the changes oil development brings to communities. Prowse et al (2009) assert that oil development in Northern Canada has created noticeable changes to infrastructure and transportation, although the focus of the study addresses future responses due to climate change rather than a growing energy sector. Again, no attention is given directly to drivers. Laska et al (2005) reveal that increases in oil development in Coastal Louisiana threaten various transportation modes such as road networks, ports, and airports, though none of the analysis is based on direct responses from local transportation users. Affolter (1976) indicates that oil extraction in the North Sea has created more noise, safety hazards, increased traffic volumes, an altered landscape, construction camps, and changes to infrastructure in localized parts of the United Kingdom. These changes are similar to that which is being experienced in western North Dakota, though the focus of his research is on planning rather than driver indicators. Clearly, there is a knowledge gap in terms of how rapid development surrounding growing energy sectors impacts driver views and behaviors as reported by drivers.

Kubas and Vachal (2012) addressed this gap in a seminal study that analyzes how oil development changes driving conditions as perceived by drivers. The study utilized a survey questionnaire of a random sample of western North Dakotans to better understand the impacts said development has had on driver perceptions and behaviors. Because the region is dynamic, growing, and constantly changing, there is a need to continually monitor driver attitudes and behaviors. As such, the initial study by Kubas and Vachal should be viewed as a baseline to compare changes in driver perceptions over time. This proposed follow-up study will promote a better understanding of the long-term impacts rapid growth has on transportation safety perceptions.

### **Research Objectives:**

The following objectives will be highlighted in this study:

- To track safety perceptions of oil region drivers over time
  - Measure feelings of safety while driving
  - Use “braking suddenly” as a crash avoidance maneuver measure
- To discover trends in large truck/passenger vehicle interaction among oil county drivers
  - Measure frequency of large truck/passenger vehicle interaction
  - Measure feelings of safety passing/being passed by large trucks
  - Address tendency to drive out of the way to avoid large trucks
- To analyze changes in self-reported driver behaviors in oil region over time
  - Frequency of seat belt use
  - Propensity to speed
- To track exposure to safety messages among western North Dakota drivers
  - Familiarity with national, state, and local safety initiatives
- To understand safety priorities in the region as determined by drivers

- Ranking/Ordering of better signage, increased law enforcement presence, driver awareness, and large truck/passenger vehicle interaction
- To create longitudinal analysis of crash data in the 17 oil counties
  - Track fatalities caused by crashes
    - Per 100,000 population and per 100,000,000 VMT
  - Track injuries caused by crashes
    - Per 100,000 population and per 100,000,000 VMT
  - Track large truck crash trends
  - Track county-level crash data
- To provide transportation safety experts with appropriate data to create region-specific safety plans
- To disseminate annual findings with NDDOT, NDHP, local partners, and other strategic stakeholders in order to improve safety in the region
  - Via annual report
- To provide a case study for other communities experiencing rapid growth of the transportation issues most important to drivers

**Research Methods:**

The following methods will be used in this study:

- A mail survey will be used to collect oil traffic safety information. The state driver licensing division will take a proportionate stratified random sample of the 17-county oil region. The mail list will differ annually and will consist of approximately 2,700 driver addresses.
  - The survey is limited to a single page and consists of 18 questions, including demographic information. All responses are confidential and kept anonymous. The questions vary in terms of level of measurement: some are dichotomous, some are ordinal, some require ranking/ordering, and some are categorical. The survey has questions related to perceived safety, behavior, exposure, and priorities. See attachment for complete survey.
  - Valid surveys will be entered into a data base using SPSS and basic statistical analyses will be performed to measure trends in safety, behavior, exposure, and priorities. Analyses to be performed include Chi-Square testing, correlations, F-Tests, and descriptive statistics.
- Crash reports of rural road data will be queried using GIS analysis to track the total number of crashes, vehicles involved in each crash, large truck crash rates, and crash severity in the 17 oil counties.
  - Basic statistical analyses will be performed to measure trends in crash patterns, crash rates, large truck crash rates, and crash severity.
  - Analyses to be performed include Chi-Square testing, correlations, F-Tests, and descriptive statistics.
- Interviews and focus group discussions may also be conducted to gain insight during the project.

**Expected Outcomes:**

The primary outcome expected from this study is the advancement of knowledge in the field of transportation safety. Self-reported levels of safety, behavior, exposure, and priorities will be

useful for a diverse range of professionals and disciplines; practitioners in transportation safety, planning, community development, engineering, public health, economics, sociology, natural resources management, among others, can all benefit from the findings of this project. Moreover, this study will aid local officials in judging where to prioritize transportation issues in short-term and long-term planning by incorporating input from a broad range of stakeholders – in this case, users of the roadway – into their comprehensive plans. Additionally, this study will serve as a case study for other communities across the country to draw upon when addressing transportation safety needs in predominantly rural areas, agricultural communities, rapidly growing areas, and areas impacted by natural resource extraction.

**Relevance to Strategic Goals:**

The project contributes to the Safety and State of Good Repair strategic goals. The largest contribution of the project is in safety. The baseline established in the 2012 survey provides benchmarks to understand how the perceptions and decisions of drivers in the region change over time. The relationship between these benchmarks and safety indices such as crash incidence is important in decisions related to traffic safety programs and policies. The state of good repair is also addressed tangentially in driver behaviors and questions related to the driving decisions and perceptions of roadway operations, especially related to large truck interaction.

**Educational Benefits:**

Students will be involved throughout the study. A graduate student will work with local officials and topic experts to update the questionnaire to meet the needs of practitioners. An undergraduate student researcher will be involved with data entry, thus gaining both work experience and research exposure. A graduate research assistant will obtain crash reports, perform data analysis, and contribute to the final research reports.

In addition to student involvement, it is anticipated that the study will be presented at the Great Plains Sociological Association’s annual conference. There is a great likelihood that the project will be presented at other conferences as well.

**Work Plan:**

Milestone #	Milestone Event Description	Start Date	End Date	Criterion/Deliverable
1	Request IRB approval for human subjects study	Start Date	Month 1	Submit protocol of human subjects study for review by IRB at North Dakota State University
2	Conduct literature review	Start Date	Month 1	Completion of “Introduction,” “Needs Statement,” and “Project Background” sections of draft report
3	Meet with local topic experts to discuss survey content	Month 1	Month 2	Obtain personal communication with topic experts (members of NDDOT, ND Petroleum Association, ND Highway Patrol, ND Peace Officers Association, ND Association of Counties, ND Association of County Engineers, ND Oil & Gas

				Commission, and ProgressZone Officials) via letters, e-mail, interviews, and/or focus groups
4	Draft initial survey	Month 2	Month 3	Approve survey with topic experts. Make any necessary changes.
5	Administer final survey	Month 2	Month 3	Obtain mailing list and driver sample from state driver database. Coordinate survey to be printed with NDSU printing services. Verify “missing,” “flagged,” and “undeliverable” addresses.
6	First quarterly update	Month 3	Month 3	Submit quarterly update and progress report to appropriate agencies
7	Obtain crash data	Month 3	Month 4	Obtain rural driver crash reports for 17 county oil region. Create variables factoring for crash severity, multiple vehicle involvement, and large truck involvement. Based on annual changes in population, update crash rates per 100,000 population factoring for annual Census estimates. Use updated county-level VMT data to highlight crash rates per 100 million VMT.
8	Data entry	Month 4	Month 6	Respondents are open to return surveys for one month after survey administration. Begin the data entry process upon receiving valid surveys. At end of Month 6, a completed database will be available in SPSS for analysis.
9	Update draft report	Month 5	Month 6	Complete “Methods” and “Response” sections of draft report
10	Clean database	Month 6	Month 6	Review SPSS database for outliers, anomalies, incorrect data, and missing data. Update database accordingly and/or remove bad data as needed.
11	Second quarterly update	Month 6	Month 6	Submit quarterly update and progress report to appropriate agencies
12	Perform data analysis	Month 6	Month 7	Perform various statistical analyses such as Chi-Square tests, correlations, F-Tests, and descriptive statistics to address potential relationships in survey data. Perform various statistical analyses such as Chi-

				Square tests, correlations, F-Tests, and descriptive statistics in crash data. Compare and contrast findings to baseline (2012) data as needed.
13	Draft Research Report	Month 7	Month 8	Based on the results from data analysis phase, explain findings in research report. Complete “Results,” “Crash Data,” “Conclusion,” “Discussion,” and “Appendices” sections of research report. Compare and contrast findings to baseline (2012) data as needed.
14	Submit draft to topic experts for comment	Month 8	Month 9	Send electronic and/or hard copies of research report to experts in the field. Edit report as needed per recommendations from experts.
15	Third quarterly update	Month 9	Month 9	Submit quarterly update and progress report to appropriate agencies
16	Submit updated research report to peer reviewers	Month 9	Month 10	Send electronic and/or hard copies of updated research report to peer reviewers listed in this proposal. Edit report as needed per recommendations from peer reviewers.
17	Present findings at conference	Month 10	Month 10	Attend annual Great Plains Sociological Association conference to present findings of the research project. Network with fellow conferees for further presentation and/or dissemination of findings.
18	Publish final document	Month 11	Month 11	Publish final document with UGPTI as Department Publication. Make document accessible via UGPTI website and NDSU Library system.
19	Disseminate study with practitioners	Month 12	Month 12	Share findings and results with appropriate practitioners in 17 western North Dakota oil counties. Discuss possible strategies and uses of report to improve traffic and driver safety in region. Obtain preliminary changes to study and/or survey from practitioners for project in next year.
20	Annual update	Month 12	Month 12	Submit annual update and progress report to appropriate agencies.

**Project Cost:**

Total Project Costs: Total Direct costs of \$34,007

MPC Funds Requested: Year 1 Request \$26,000  
Matching Funds: Year 1 Match of \$8,007

**TRB Keywords:**

North Dakota Oil Region, Driver Survey, ProgressZone, Crash Data, Traffic Safety, Safety

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## APPENDIX: PREVIOUS SURVEY INSTRUMENT

### 2012 OIL COUNTY TRAFFIC SAFETY SURVEY

**Individual Responses  
Kept Confidential.**

1. How safe do you feel driving in your area compared to five years ago?  
 Much Safer    Somewhat Safer    Same    Less Safe    Much Less Safe
  2. Would you pay for a messaging system to alert drivers of heavy traffic or incidents to help drivers?    Yes    No
  3. Have you had to brake suddenly or swerve to avoid a crash in the past 3 months?    Yes    No
  4. Do you think more law enforcement visibility would reduce crashes?    Yes    No
  5. How often do you meet/pass large trucks while driving?  
 Daily    Few Times per Week    Few Times per Month    Less than Once per Month    Never
  6. How safe do you feel when...  
 passing large trucks?    Very Safe    Somewhat Safe    Neutral    Unsafe    Very Unsafe  
 being passed by large trucks?    Very Safe    Somewhat Safe    Neutral    Unsafe    Very Unsafe
  7. For a trip that typically takes you 20 minutes, how much longer would you drive to travel a route with...  
 fewer large oil trucks?    5 minutes    10 minutes    20+ minutes    I would not change my travel time  
 better signage and surface conditions?    5 minutes    10 minutes    20+ minutes    I would not change my travel time
  8. How often do you use your seat belt  
 while traveling in town?    Always    Nearly Always    Sometimes    Rarely    Never  
 when in a vehicle traveling over 30 mph?    Always    Nearly Always    Sometimes    Rarely    Never
  9. On a road with a speed limit of 65 mph, how often do you driver faster than 70 mph?  
 Always    Nearly Always    Sometimes    Rarely    Never
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10. The North Dakota Department of Transportation began a safety program called "Progress Zone" with industry partners. It uses advertisements and billboards to promote better driving. The ads are bright yellow and have short messages on them. Have you seen ads like this one?    Yes    No
11. Did you change your driving behavior after seeing "Progress Zone" ads?    Yes    No    Did Not See Ads
  12. Have you recently read, seen, or heard traffic safety ads relating to:  
 Passing with caution    Yes    No   If yes, where?    TV    Radio    Print    Billboard    Other  
 Slowing down    Yes    No   If yes, where?    TV    Radio    Print    Billboard    Other  
 Buckling up    Yes    No   If yes, where?    TV    Radio    Print    Billboard    Other  
 Sharing the road    Yes    No   If yes, where?    TV    Radio    Print    Billboard    Other
  13. How do you rank the following issues as priorities for traffic safety? (1=most important and 4 being least important).  

Rank

Signage related to Traffic Rules	_____
Law Enforcement Presence	_____
Driver Awareness	_____
Truck/Passenger Car Interaction	_____
  14. What type of road do you most often drive?    Interstate/Divided Highway    Two-Lane State Highways    Rural/Gravel
  15. How long have you lived at your current residence?   \_\_\_\_\_ Years
  16. Your age:    18-24    25-34    35-44    45-54    55-64    65-74    75 or Older
  17. Your Gender:    Male    Female
  18. Your Zip Code:   \_\_\_\_\_

include any comments on the back of the survey.

**Thank you for Participating!**