



# *T<sup>2</sup> Roads on the Range*

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## **Mitigating the Impact of Oil and Gas Traffic on Southeastern Wyoming County Roads**

The oil and gas industry has been doing business in Wyoming for over 100 years while making significant contributions to the State's economy. According to the Petroleum Association of Wyoming, in 2010 Wyoming ranked 7th in the nation in crude oil production and 2nd in natural gas production. During the same year, the petroleum industry employed approximately 21,000 people with a payroll of over \$1.1 billion, and oil and gas production contributed \$1.9 billion to state and local governments as taxes and royalties. It is essential that the State of Wyoming continues to work closely with the petroleum industry to insure the adequacy of the transportation infrastructure. Such cooperation will be beneficial to the Wyoming economy, the driving public, and the oil and gas industry.

With the development of the Bakken shale in North Dakota, currently one of the nation's predominant oil and gas fields, the energy industry has looked at the Niobrara shale in southeastern Wyoming and neighboring states as another potential, major petroleum source. Though the Niobrara has not yet been developed to the degree that the Bakken has in North Dakota, there is the potential for southeastern Wyoming to experience additional, substantial increases in drilling traffic. Other county roads in Wyoming are already carrying heavy oil and gas traffic, such as the one shown. In anticipation of this possible impact to southeast Wyoming's road networks, the state legislature

has funded a study by the Wyoming T<sup>2</sup>/LTAP Center documenting the current conditions of county roads in Converse, Goshen, Laramie and Platte Counties.



Phase I of this project, completed in 2011, laid out the plans for this effort. Phase II was carried out in the spring and summer of 2012, and the final report is nearly complete. It consists of documenting the current condition of all the roads and cattle guards in the four counties. These counties' maintenance records were assembled, compiled and analyzed. Oil and gas well sites and water haul sites were obtained and located with a geographic information system (GIS). Traffic counts were conducted on county roads identified by the counties as receiving or likely to receive increases in traffic due to oil and gas extraction activities. A proposed Phase III will

continue these monitoring efforts, tracking the condition of the counties' roads and cattle guards, perhaps as oil and gas activities greatly increase the traffic they must carry.

Along with the primary assessment of the counties' roads and cattle guards, several other related efforts were conducted. Brief assessments of crash records and bridge inspection results were performed as possible starting points for more detailed monitoring and evaluation. The WY T<sup>2</sup>/LTAP Center evaluated Wyoming county permitting processes and developed standard permits. Available resources of the four counties were assessed, and their abilities to adjust to increases in traffic were evaluated. All these efforts were conducted to assist the counties in preparation for possible increases in traffic regardless of the traffic's source.



The goals of these efforts are twofold. First, the current condition of the counties' road networks is documented so any future damage can be quantified. Second, the counties are being provided the tools needed to monitor their own networks so they can manage their road networks more efficiently.

### **Evaluating the Counties' Roads**

There are four fundamental elements affecting the performance and cost of paved and unpaved roads. One of these, weather, we cannot control or influence, nor can we bill Mother Nature if she washes out a road, so it is not analyzed. (We may, however, be able to get emergency relief funding if we have documented the road's prior

condition.) The three elements under our control and influence are: (1) traffic; (2) maintenance and construction and their costs; and (3) road and bridge conditions. Analyzing the interaction of these three elements is the objective of this project.

The WY T<sup>2</sup>/LTAP Center gathered data from a variety of sources including the four counties' road and bridge departments, Pathway Services, the Wyoming Oil and Gas Conservation Commission (WOGCC), the State Engineer's Office and WYDOT. The Center also performed field data collection as necessary.

A critical element of rating the counties' paved and unpaved roads was dividing them into discrete segments. They were generally split where maintenance or construction practices change, where there is a significant change in materials or geometry, or where there is a substantial change in traffic volume or type. These segments, ranging from a tenth of a mile up to as long as ten miles and typically several miles long, are the smallest road units analyzed.

### ***Traffic: Oil and Gas Trip Generation***

A common practice of traffic engineers is using site-specific activities to predict traffic. For example, a retail store will allocate so many parking spaces per square foot of store space. The concept of using data about trip generators – primarily oil and gas wells in this instance – is applied to this project. The number of oil and gas wells and water haul sites near each road segment, along with traffic volumes measured on the roads, is used to generate an 'impact priority' for roads identified by the counties as being impacted by oil and gas activities. This 'impact priority' is used to provide a simple assessment of the degree of oil and gas impacts on individual county road segments.

### ***Conditions: Data Collection***

The Center analyzed the videos provided by Pathway Services, the contractor which performs automated data collection for WYDOT. Analyses of these videos generated pavement condition

indexes (PCI) and present serviceability indexes (PSI) for the four counties’ paved roads. Pathway’s automated data collection van also provided international roughness index (IRI) and rut depth data.

The Center’s staff collected field data for cattle guards and unpaved roads. This data collection was standardized by three guides developed by the Center. The ‘Ride Quality Rating Guide’ evaluates the road’s surface quality as perceived by the general public and is available on the Center’s website under Special Projects, Gravel Roads Management. The “Gravel Roads Rating Standards” is used to rate specific distresses and drainage.

The ‘Cattleguards Ratings Standards’ is used to rate the condition of cattle guards’ grates, bases, approaches and wings. All three of these guides include verbal descriptions of the various ratings along with numerous photographs that illustrate the condition ratings.

**Cost: Maintenance Records**

Electronic maintenance data were collected from each of the four counties’ records. The extent of these records varied from nearly a year up to about seven years. Each county collects and uses the data differently. They vary in their accuracy, their completeness, and in the items, tasks, activities and projects to which costs are assigned. In spite of these difficulties, an attempt was made to assess and evaluate each county’s expenditures.

**Analyzing the Counties’ Roads**

Each of the four counties road networks are unique, both in the makeup of their infrastructure and in the traffic they carry. Each county has its own historical construction and maintenance practices, material availabilities, and funding levels. While describing the entire results of this extensive study is not possible in this article, a few interesting observations are described:

County road networks change quickly, particularly those that serve the transient and sporadic oil and gas extraction industry. The bridge shown below was used by data collectors in June 2012, but not in August 2012 for obvious reasons. Such changes are easy to track. Tracking the rapidly changing traffic associated with oil and gas drilling is far more difficult in early stages. Information from the WOGCC was instrumental in providing current locations of oil and gas wells.



The change in this bridge over the North Platte River in western Converse County was obvious; tracking oil and gas impacts is more difficult.

The costs of improvements to impacted paved roads were estimated. As shown in the table below, a total of \$157 million of improvements were identified, though since the data collection was

**Prioritized Paved Road Recommended Improvement Costs**

Impact Priority	Impact		Estimated Cost
	Number	Segments Miles	
1	3	18.9	\$9,454,250
2	2	14.2	\$7,260,000
3	5	31.9	\$18,448,500
4	4	15.6	\$7,732,250
5	5	34.0	\$40,788,000
6	25	103.2	\$61,616,700
Subtotal	44	217.7	\$145,299,700
Completed Projects	2	16.3	\$12,018,750
Other Segments	22	28.0	NA
<b>TOTAL</b>	<b>68</b>	<b>261.9</b>	<b>\$157,318,450</b>

performed, \$12 million of these improvements have been performed, leaving \$145 million of improvements on the roads identified by the four counties as impacted paved roads. The top priority is the 18.9 miles of impact priority Level 1, with an estimated cost of \$9.5 million.

Additional costs due to oil and gas impacts on unpaved county roads were generated by examining the counties' maintenance records and the costs of recommended improvements on the unpaved roads. The net documented cost to the counties of oil and gas impacts on their unpaved roads is estimated to be \$1.26 million. The full impact of energy activities on unpaved roads including culverts, bridges, and the safety of local roads will require additional condition data which will be collected in Phase III.

### **Summary**

This study has documented the current conditions of Converse, Goshen, Laramie and Platte Counties' roads. Using information on the counties' costs, on the roads' conditions, and on the traffic they

carry, evaluations of the four counties' road networks were performed, and the total costs needed to get the counties networks into adequate condition were estimated. A baseline condition of the counties networks has been established so any future impacts and damage to the counties' roads can be documented.

The mitigation strategies developed in this study will both help the four counties plan for and adjust to any major increases in traffic on their roads and bridges, and they will serve as models for other counties in their efforts to document, maintain and improve the conditions of their county road networks. The findings of this study will be presented to the Wyoming Legislature, WCCA, WYDOT and WACERS in the near future. The recommendations of this study will help in supporting the effort for providing adequate transportation infrastructure for both the driving public and the energy industry.

For more information feel free to contact Dr. Ksaibati at the WY T<sup>2</sup>/LTAP Center.

## **S-A-L-T-E-D Advice for Storage**

**S**afety means good visibility for operators, warning signs at entrance and security fencing.

**A**ccessibility means easy access for equipment and delivery trucks, space big enough for front-end loaders to maneuver, room for a 20-ft. extension of the pad in front of storage buildings, and doors large enough to accommodate equipment.

**L**egality means complying with local zoning ordinances and any required discharge permits.

**T**idiness means keeping buildings well maintained, good housekeeping around the storage site and screening the storage site with fencing or plants.

**E**conomic means permanent covered storage and locating the storage site to avoid long distance hauling.

**D**rainage means good drainage away from the stockpile, sloping bituminous pads (1/4 inch per foot downward from the center), continuing run-off, installing retention curbs if necessary and disposing of salt brine in conformance with applicable federal and state regulations and local ordinances.

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# MAP-21, Risk Management and You

by Joe Dailey, Wyoming FHWA Division Administrator

The recently passed transportation authorizing legislation: Moving Ahead for Progress in the 21st Century Act (MAP-21) contains a requirement that states must develop a risk-based, performance-based asset management plan for preserving and improving the condition of the NHS.

## Risk Management

The international standard ISO 31000<sup>i</sup> defines risk as “the effects of uncertainty on objectives.” In its broadest terms, risk is anything which could be an obstacle to achieving goals and objectives. I’ve heard this translated into a simple question: “what is it that is keeping you up at night?” Risk Management is the process of identifying and mitigating risks so that an organization can achieve its objectives. Given these definitions, consciously or not we all have been using risk management on a continuous basis throughout our personal and professional lives. However, research has found that few organizations have formal approaches or comprehensive tools to identify or mitigate risks at agency, program, or project levels.

The management of a transportation network of any kind is dependent on good risk management for success. Transportation organizations set strategic objectives (i.e., the reliable and efficient movement of people and goods), but success is uncertain. There are numerous factors both internal and external that could prevent the achievement of these objectives. MAP-21 encourages transportation organizations to set performance measures and develop asset management systems to optimize their investment decisions. Again, multiple factors can impact the organization’s achievement of its performance and asset condition goals. Risk is a natural part of transportation – a common trait of highly successful transportation

agencies is that they have developed formal risk management strategies, methods and tools. The Federal Highway Administration (FHWA) has recognized the implicit role of risk management in Transportation, the diagram below is taken from a recently published document: Risk-Based Transportation Asset Management: Evaluating Threats, Capitalizing on Opportunities.<sup>ii</sup>



Risk management is not limited to asset management; another natural outcome of risk management is to allocate resources to those activities that are critical to the successful achievement of an organization’s goals. For example my office conducts annual risk assessments for the Federal-aid Highway Program going back many years, these risk assessments are used to develop our internal work plan. Like everyone else we have too few resources to address all of the numerous requirements levied on us by law, regulation and guidance, so we use our risk assessment and resulting mitigation strategies to ensure that we can assist WYDOT and local agencies in delivery of the Federal-aid Highway Program and successfully achieve our agencies goals.

The 2012 Summer Olympics and Risk Management:<sup>iii</sup> The recent successful London Olympics was made possible in part by proactive use of Risk Management. In 2006 the organizers identified risk management as a critical function in the delivery of all the facilities needed for the Olympics. Given the number of simultaneous projects cross-coordination was a real challenge, so they set up three main stages of risk management:

- Identifying and managing all areas of risk and how they applied to the more than 2,500 individuals working on facilities (projects) at any given time.
- Assessing the impact of those risks (enterprise-wide) — and not just the impact on one project. For example, one risk was where it took extra effort to get the Olympic torches placed in the right location. That might mean the need for two extra cranes on site, but the ripple effect is that it took those cranes away from other projects that were using them. This could in turn cause those projects to be delayed.
- Having an aggressive plan to control the risks by being scientific rather than reactive. They laid out careful mitigation plans and actions and assigned authority and accountability in advance. So well before they laid their first foundation or their first beam, they had the risks identified, the mechanisms to assess losses, and possible risk-control actions in place.

At that point, they looked at all the costs and the schedules and ran a simulation to identify the probability that a certain risk would occur. If a certain risk had a high cost or a high time delay and an 80% likelihood that it would happen, they made sure they mitigated the problem before it occurred. For instance, possibility of a labor strike was identified as a top risk, so the organizers identified the labor agreements would need to be negotiated (and their potential risk to the enterprise) during the time frame running up to the Olympics.

As you can see Risk Management is a tool used by successful infrastructure project managers worldwide, over the next year we will be working with the LTAP to develop risk management training and tools that local transportation professionals can use to assess and mitigate risk as part their operations.

- i. International Organization for Standardization (ISO) (2009). ISO 31000 Risk Management – Principles and Guidelines, Geneva, Switzerland.
- ii. Risk-Based Transportation Asset Management: Evaluating Threats, Capitalizing on Opportunities. Report 1 Overview of Risk Management, June 2012, FHWA-HIF-12-035. <http://www.fhwa.dot.gov/asset/pubs/hif12035.pdf>
- iii. [http://www3.cfo.com/article/2012/9/risk-management\\_london-olympics-risk-management-chris-bell-active-risk](http://www3.cfo.com/article/2012/9/risk-management_london-olympics-risk-management-chris-bell-active-risk)

## New DVDs Available to Check Out

- Choosing Sustainable Materials (PA7325)
- Critical Thinking: Analyzing (PA7323)
- How to Read & Understand Research (PA7326)
- Green Careers: Transportation (PA7322)
- Social & Ethical Issues in Design & Technology (PA7324)
- Science of Structures (DC7331)
- Ethics & Professionalism (DC7330)
- Field Guide to Testing Deicing Chemicals (M7369)

## Ten Commandments for Snow Fighters

**1** Thou shalt present thyself to thy job physically and mentally fit and properly clothed for any emergency in order to withstand the rigors of thy task.

**2** Thou shalt never enter thy cab without inspecting thy lights, windshield wipers, defrosters, flares and other safety equipment.

**3** Thou shalt know thy spreading and plowing routes, as well as the performance of thy spinner and the life of thy plow blade.

**4** Thou shalt faithfully remain alert in order to avoid guardrails, headers, stalled cars, manhole covers, railroad tracks and mailboxes. Otherwise thee may smite thy windshield with thy head.

**5** Thou shalt contain thy temper even though cars and trucks pass thee on both sides and tailgate thee too close for comfort. Anger only multiplies thy prospects of coming to grief by accident.

**6** Thou shalt use thy radio as briefly as possible. Remember thy fellow workers may need to communicate in an emergency.

**7** Thou shalt interrupt the flow of power to thy spreader before attempting to free any foreign objects or blockages if thee treasure thy fingers.

**8** Thou shalt render thy truck and spreader out of gear and stoutly set thy brakes before dismounting from thy cab.

**9** Thou shalt govern thy speed according to conditions, else thee may wind up with thy truck upside down.

**10** Thou shalt mind thy manners on the roadway, clearly signal thy intentions, and remember that it is more blessed to give than to receive.

\* Both articles on this page were reprinted from the Colorado LTAP Winter 2006 newsletter.

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## Safe Driving Habits for Plow Truck Drivers

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- Always inspect your vehicle before leaving the shop
- Don't tailgate
- Watch your speed
- Be rested and alert
- No drugs or alcohol should be used prior to driving
- Watch out for the other motorists
- Always stay in control of your vehicle; watch for spots that could cause blade to "hang up"
- Be alert during white-out conditions
- Check your equipment frequently
- Be courteous; don't throw snow on cars or pedestrians!

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### Upcoming Events

**Pavement Preservation**  
**Feb 12 - Riverton**  
**Feb 13 - Douglas**

**LPA Certification**  
**April 9 - Casper**

**Safety Congress**  
**April 10 & 11 - Casper**  
**Parkway Plaza Hotel**

### Wyoming T<sup>2</sup>/LTAP Staff:

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*The national Local Technical Assistance Program mission is to foster a safe, efficient, and environmentally sound surface transportation system by improving skills and increasing knowledge of the transportation workforce and decision makers.*

