



# T<sup>2</sup> ROADS ON THE RANGE

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2017, Issue 1

## *From the Desk of the Director*

As the winter season gets closer, our training program at the WYT2/LTAP center is going in full swing. We have three events that are scheduled in November and December and I am hoping that you and your staff will take advantage of these programs. In addition, we will be providing OSHA training in the spring as well as our Annual Safety Congress in April.

In the summer, we provided the counties with information about crash data and roadways eligible for the statewide sign program. As a result, seven counties decided to participate in the program and we have already summarized all the requests and passed them to WYDOT. It is anticipated that WYDOT will ship all the requested signs, posts, as well as hardware to the counties sometime in the spring. Counties are requested to install the signs as soon as possible and let us know when the installations are done so that we can do the inspection and close the books on this important project.

As far as the Wyoming Rural Road Safety Program (WRRSP), the next round of funding will be in 2018. The applications will be accepted starting August 1, 2018 and will be due no later than September 15, 2018. The T2/LTAP will help with the applications by helping you conduct the Level I field evaluation as well as performing the benefit cost analysis. Early in the summer of 2018, we will provide all counties with updated crash data. We need to know if you are interested in securing funding for safety projects as soon as you can so that your applications can be submitted on time. Late applications will be accepted and they would be postponed to the following year. This safety funding is available for counties interested in implementing the WRRSP. The WRRSP funds 90.49% of the project cost up to a maximum of \$100,000 of federal funds and will require a 9.51% local match.

Please call us if you have any questions about our training/technical assistant program.

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## 22nd Annual Transportation and Safety Congress

The WYT2/LTAP Center did a change in this year's annual transportation and safety congress. We changed it from two and a half days to a single day. The center believes this worked very well. If you should have any comments on the change we would surely like to hear about them.

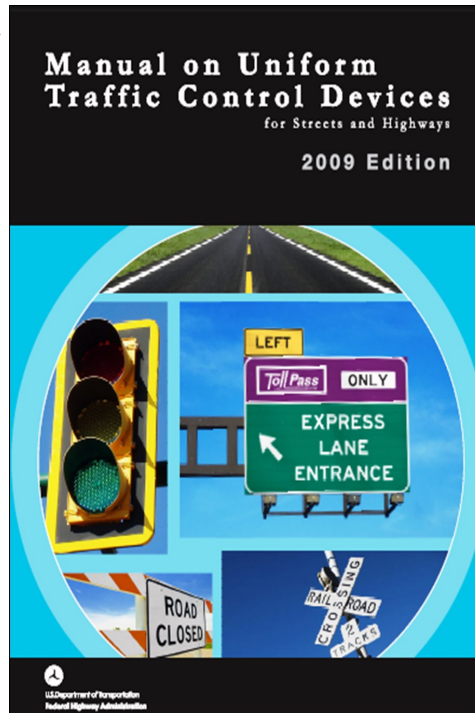
The one day workshop had three different tracks you could attend, Local Project Administration Certification (LPA) track, a Transportation track, and a Work Zone/ATSSA Flagger Certification workshop.

The one day Safety Congress started with breakfast and registration at 7:30 am and then the three tracks started at 8:00 am. The LPA workshop covered various topics which is to ensure a sub-recipient agency has the fundamental understanding of the requirements in existing state and federal Highway Administration rules and to certify that a member of the staff attended and LPA workshop and passed an exam.

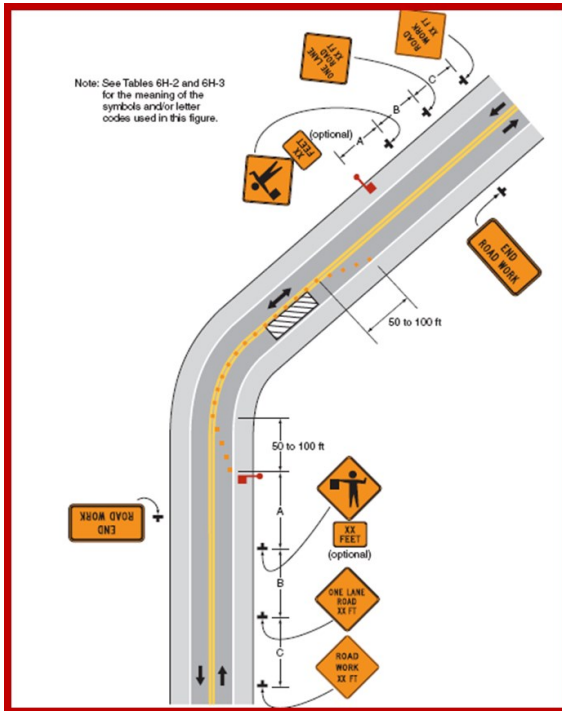
The 22nd transportation track started with opening remarks and introductions by Khaled Ksaibati, Director of the WYT2/LTAP Center. Next was Ken Muller WACERS president, talked next about the Wyoming Association of County Engineer and Road Superintendents (WACERS). He emphasized that WACERS is always trying to get more involvement from all the counties. Curtis Clabaugh, State Photogrammetry & Surveys Engineer gave a presentation on Drones In Transportation Program. Dave Pendleton, Fremont County Engineer gave a presentation on Gravel Road Gradations and Additives. Kelly McCollam, DMC Wear Parts LLC, talked on A Better Grader Blade by BluSteel BX System. Tim Miller and Dennis Dirks with CONTEHDH Engineer Solutions talked about Metal Culvert/Structural Plate Longevity and Installation Best Practices. Matt Carlson, State Highway Safety Engineer, talked about Low Costs Safety Improvements. Next was Khaled talking about The Pavement Management Systems the WYT2/LTAP Center has been working on. Last to present was Mark LaBelle, Asphalt Systems, Inc. on New Technologies in Pavement Preservation.

The WYT2/LTAP Center presented a workshop on work zone safety/temporary traffic control and American Traffic Services Association (ATSSA) Flagging Certification. The curriculum is a two part workshop, which is completed by attending a morning session and an afternoon session. The first session is work zone safety and traffic control while the second session is ATSSA Flagger Certification. The purpose of flagging certification and temporary traffic control, as well as the principles for their use, is to promote highway safety and efficiency by providing for the orderly movement of all road users on streets and all public roads throughout the nation.

The first session of the workshop covers the elements of work zones/temporary traffic control; component parts of a temporary traffic control zone, set up, maintenance, types, and take down.



This session of the workshop was held in the morning. It helps you improve your understanding of work zone operations, associated risks and how to make work zones safe. It also covers the Manual on Uniform Traffic Control Devices (MUTCD) to select an appropriate layout, along with the procedures that should be followed to make sure the work zone is safe.



The second session of the workshop was the ATSSA Flagging Certification Course. It is specifically for those who will be flaggers. Those who assume the duties of flagger must understand their role in the work zone and know how to perform their job safely and effectively. The course described why proper flagger operations are important, the abilities of a good flagger, how to use standard references as they pertain to flagger control, the proper flagging signals and procedures, and the different flagging practices for various typical situations. This workshop also covers the MUTCD. To become certified as an ATSSA flagger, you need to attend both sessions of the workshops, pass a 25 question flagger EXAM, pass a demonstration test, and comply with all requirements of the ATSSA flagger program. Wyoming flagging certification is valid for three years

All three tracks attended lunch where the Roads Scholars and Master Roads Scholars were presented, see article below.

- Bart Evans, safety analyst

## Master Road Scholars

Being recognized as a Roads Scholar requires the successful completion of at least twelve (12) Wyoming Technology Transfer Center workshops. Of these, one must be the Annual Transportation and Safety Congress and one must be Work Zone Traffic Control.

Recognition as a Master Roads Scholar requires the successful completion of at least twenty (20) Wyoming Technology Transfer Center workshops, with the same two required workshops as for Roads Scholar recognition.

Pictured right is the Roads Scholars Class of 2017





## ***Monetization of Dust Impacts***

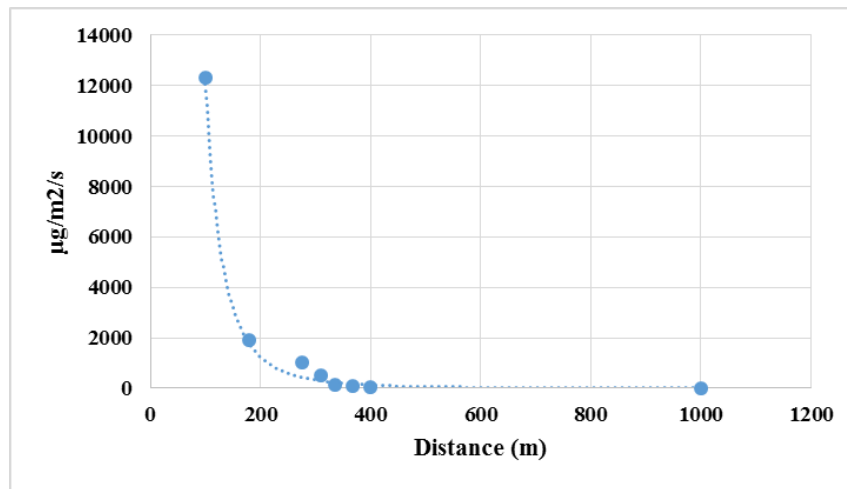
Local agencies in Wyoming own a large inventory of unpaved roads (approximately 13,000 centerline miles) that formulate 90% of the local roads network in the state. The amount of dust generated from these roads is considered a major flaw of maintaining an asset of unpaved roads. Dust is generated from unpaved roads due to the interaction of the moving vehicle and its operational characteristics, road surface, and weather conditions. Currently, the state of Wyoming is experiencing an increase in industrial and mineral activities. As a result, many of the state's local roads (paved and unpaved) are carrying an additional heavy truck traffic due to the high drilling activities in the rural areas. The excess truck traffic is highly increasing the amount of generated dust and impacting the structural capacity of these roads. According to the Wyoming Technology Transfer Center (WYT<sup>2</sup>/LTAP), the reported particulate Matter (PM) emissions due to traffic on unpaved roads is significant in most of the counties in the state. This creates a persistent need to upgrade some of these unpaved roads to paved ones. However, the uncertainty of estimating future traffic needs and the arising limitations in capital improvement funds leave these roads without any realistic paving plans. The impact of industrial/mineral activities is temporary and limited to the drilling duration most of the time. Therefore, local agencies in Wyoming depend mainly on Congestion Mitigation and Air Quality Improvement (CMAQ) program funds to manage their asset of unpaved roads. The utilization of CMAQ funds is intended to reduce the generated dust from unpaved roads, in addition to improve their structural performance. This can be achieved by applying chemical dust suppressants on regular basis. Incorporating the environmental impacts of unpaved roads dust on local economy can highly improve the planning and the decision making process in selecting roads for chemical treatment. The emitted dust from unpaved roads has profound environmental impacts on human health, vegetation, and livestock.



***Impact of Dust on Crops, Human and Livestock***

A recent study conducted by Wyoming Technology Transfer center utilized the already established knowledge to estimate the environmental damage costs (dollars per mile) due to the emitted dust from unpaved roads. These estimates include the monetary values of human health benefits, change in crops yield, and change in livestock production. Using a population factor combined with the contribution of unpaved roads in the total PM emissions, results from EPA RIA study were modified accordingly. Using a population factor combined with the contribution of unpaved roads in the total PM emissions, results from EPA RIA study were modified accordingly. The modified EPA RIA benefits reflected the potential effects of unpaved roads dust on human health in Wyoming.

In addition, exposure-response curves related to photosynthesis processes were used to quantify the effect of dust on agriculture. The quantification of damages in agriculture was performed in the means of reductions in the annual yield of crops. The affected area of crops was identified after running the AERMOD dispersion model via the Dustran software. The modeling results showed that effects of unpaved roads dust can reach up to 300m downwind the road. The deposition upwind the road was not significant and mostly on the road itself. This could be attributed to the strong winds upstate. Using the Dustran software improved the estimation process by incorporating the prevailing weather conditions in Wyoming, in addition to the different terrain characteristics. Loss due to respiratory diseases was considered a surrogate measure to quantify the effects of dust on livestock. However, loss in cattle and calves was considered only. These animals are most likely to be kept outside for grazing. Thus, they are more prone to unpaved roads dust.



### ***Average Total Deposition of PM10 from Unpaved Road Using Dustran***

The estimation results showed that the monetary value of the environmental costs due to unpaved roads dust in Wyoming were very high and worth \$ 32 million/year. This value is equal to 0.08% of the total Gross Domestic Product (GDP) and 4.7% of the gross value added by the agriculture sector in the state. In addition, these impacts represents 0.1% of the total personal income in the state. Most of these damages were related to changes in crops yield (61%) and human health benefits (38%). Unpaved roads dust seemed to have a minor effect on livestock production. The monetized value of dust effect on livestock was only \$345,145/year.

### ***Environmental Damage Costs per Mile***

Environmental Impact	Estimated Damage Cost (\$/mile/year)
Human Health	912
Change in Crops Yield	1,490
Change in Livestock Production	26
Total	2,429

Cont'd from p. 4

A life cycle-cost comparison in Johnson County, showed that maintaining unpaved roads with chemical suppressants is 48% cheaper than maintaining similar roads with traditional methods. This comparison showed the importance of incorporating the environmental impacts in the decision making process.

### ***Life Cycle Cost Comparison (Okok, et al., 2017)***

Cost Type	Untreated Unpaved roads (\$/Mile)	Chemically treated Unpaved Roads (\$/ Mile)
Cost (\$/Mile)*	8,962	9,400
Human Health Benefits (\$/Mile)*	1,824	
Change in Crops Yield Value (\$/Mile)*	2,980	
Change in Animals production Value (\$/Mile)*	52	
Total Environmental Costs (\$/Mile)	\$ 4,856	-
Total (\$/Mile):	\$ 13,818	\$ 9,330
* Over 2 years; All values are in 2016 dollars		

This study was supported with funds from WYDOT and FHWA. The full report on this study can be obtained by contacting the WYT2/LTAP center directly.

## ***Gravel Roads Workshop***

The Wyoming T2/LTAP hosted two one day workshops on gravel roads in Cody and Gillette the first week of June.

The workshop objective was to give novice and experienced employee's practical methods and techniques for constructing and maintaining gravel roads. Each attendee received the Gravel Roads, Maintenance and Design Manual. This manual was funded by the Federal Highway Administration and produced cooperatively by several states. It covers the most current developments on unpaved roads.

The course covered drainage, materials, proper blading techniques, motor grader operations, and stabilization and dust control in a classroom setting followed by field training. This training is a combination of the newest innovations gathered from several states.

Former Montana LTAP Director Steve Jenkins, P.E., was the instructor for both workshops. He has a Master's degree in Geotechnical Engineering. His work experience includes roadway design, transportation planning, materials, research and hydraulics for the Utah Department of Transportation. For the past thirty years, Steve taught Gravel Roads in many western states and has extensive involvement with local and tribal governments. He also continues to collect interesting photos.

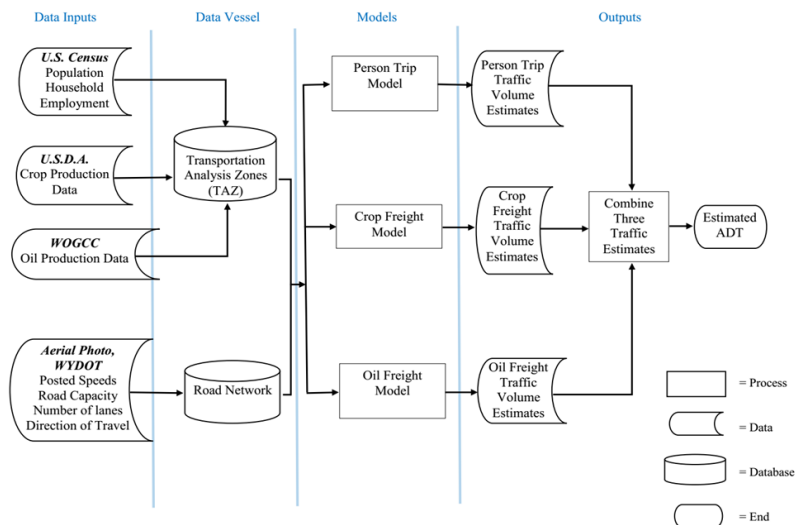
# Traffic Estimation for Low-Volume Roads

Traffic volume data is an important resource for many different transportation applications. Some of these applications include safety analysis, traffic impact analysis, land use planning, environmental analyses, and project planning. In order to facilitate these applications, extensive traffic counts are needed to quantify traffic volumes. Unfortunately, in Wyoming, resource limitations restrict the use of these traffic counts to a small percentage of Wyoming roads. To sate both our resource limitations and need for reliable traffic data, a well-developed method for traffic volume estimation was developed.

A method of traffic volume estimation was recently tested in Wyoming. This model, the travel demand model, or TDM, was developed specifically for estimating traffic volumes on low-volume roads in Wyoming. The entire study is made up of two phases. In the first phase, the TDM was developed and tested in four counties. The model was then compared with other prediction models to recommend its adoption for statewide implementation.

The model implementation required several data inputs. The output results were in the form of geographic data indicating the various roads and their traffic volumes . These results are available

on the WYT2/LTAP website under the Pavement and Traffic Volumes tab. There you will find an interactive map of the state and traffic estimations and data for the entire state.



Why is this information important to our state? The influx of the oil and gas industry in some rural areas of Wyoming has created the need to determine the traffic impact of the changing land uses on the low-volume rural roads. To satisfy this need, an earlier phase of this study was carried out to develop a linear regression model and a logistic regression model for estimating traffic volumes using land use, road characteristics, demographic, and socioeconomic variables as predictors. The resulting model was validated to have an accuracy rate ranging from 79 to 88 percent.

TDM models require a lot of data inputs and filters to generate accurate outputs. The figure above roughly outlines how raw inputs are sorted and estimated for low-volume roads in Wyoming. Detailed information about this model can be found in, "DATA DICTIONARY Wyoming Low-Volume Roads Traffic Volume Estimation (phase II)" by Dick Apronti, and Khaled Ksaibati. This dictionary is available on the WYT2/LTAP website as well as other resources.

The Wyoming Technology Transfer Center, WYT2/LTAP, has many resources available to road and bridge departments around the state through our loan program. These resources include retro-reflectometers, dust monitors and traffic counters, and are available for rental throughout the year.

All of these tools can be used to improve upon existing data that has been collected and help update the traffic estimation information that is available online.

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## Upcoming Workshops

### 23rd Annual Safety Congress

- Casper - April 11, 2018

### Concrete Workshop

- Thermopolis - December 5, 2017
- Douglas - December 6, 2017

### Local Project Administration Certification

- Casper - November 8, 2017

### Selecting and Applying Asphalt

- Kemmerer - November 14, 2017
- Douglas - November 16, 2017

### OSHA 10 Safety / Preventing Runovers and Backovers

- Casper - February 12-13, 2018

### WMTC Concrete Certification

- January 8-10, 2018
- March 12-14, 2018
- May 16-18, 2018

### WMTC Aggregate Certification

- December 11-13, 2017
- January 17-19, 2018
- May 14-16, 2018

### WMTC Asphalt Certification

- December 13-15, 2017
- January 10-12, 2018
- May 9-11, 2018