

Another Successful Pi Day!!

By: Heather Manzo



Thank you all for joining us for our 7th Annual Pi Day! This was a record year and we are already planning on next year's Pi Day festivities. The food was wonderful and the company was out of this world! We had overwhelming participation with 54 pies along with many additional snacks. One hundred eighty-two NDOT employees stopped by to share in this event and to get a bite of pie. Due to the overwhelming participation in the raffle, the number of prizes was increased from two to five gift cards to various places including Starbucks, Olive Garden, Applebee's, IHOP and one which may be redeemed at one of several restaurant locations. Congratulations to our winners: Julie Maxey, Shelly Madalinski, Matt Nussbaumer, Brian Kramer and Judy Price!

In This Issue:

Page 1
Pi Day

Page 2
Research Projects
Helping to Restore
Lake Tahoe

Page 5
Product Evaluation
Updates

Page 6
Fun Facts
Library Corner



Special thanks go out to Paula Morton and Nancy Carnahan, Lucy Koury, Manju Kumar, Chris Akinola, Heather Manzo and our new Librarian Mitch Ison for helping make this event a hit!



Research Projects Helping to Restore Lake Tahoe

By: Tyler Thew, Senior Hydraulic Engineer
Nevada Department of Transportation

Tyler Thew, Matt Nussbaumer, and Andy Knust in the Hydraulic Section are collaboratively working on developing innovative, practical, and cost effective methods to implement NDOT's Lake Tahoe program. With the help of Manju Kumar in the Research Section, this team put forward two problem statements for consideration for the annual program development process for Federal Fiscal Year 2013. Their problem statements were among the sixty-four received and reviewed by the Research Advisory Committee (RAC). Based on the potential for implementation, their ideas were among the top 15 for which full proposals were requested, and ultimately ranking high among the top eleven for which full proposals were approved by the Research Management Committee (RMC).

Background

In 1970, the clarity of Lake Tahoe was so good that you could see 97 feet below the water surface. There has been a long-term trend of decline in visibility and today you can only see approximately 70 feet below the water surface. Fine sediment particles (FSP) and nutrients (phosphorus and nitrogen) have been identified as the primary pollutants affecting clarity. Nutrients control the distance that light is able to penetrate into the water column. However, the light scattering effect of FSP less than sixteen micrometers in diameter ($<16 \mu\text{m}$) was determined to exhibit a greater influence on clarity.

Regulations recently enacted by the Environmental Protection Agency (EPA) require NDOT to reduce the amount of fine sediment that is discharged from the highways within the Lake Tahoe basin. The goal of the regulations is to return Lake Tahoe to its historic clarity of 97 feet. Fine sediment is approximately the size of a blood cell and very difficult to remove from highway runoff. NDOT's previous sediment control efforts were not focused on these very small particles and new and innovative multi-disciplinary approaches are needed to meet the federal requirements.



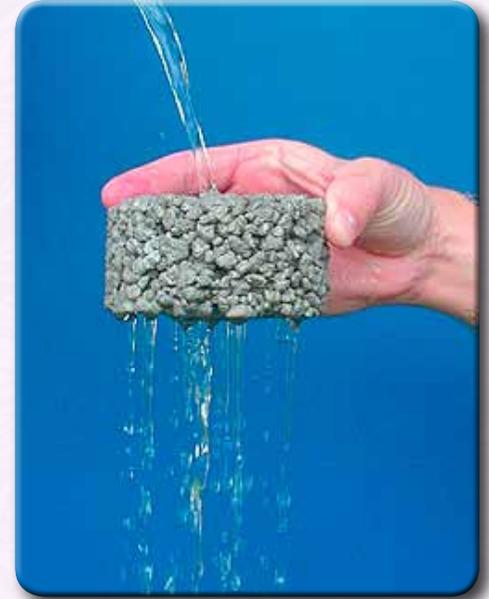
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Pervious Concrete Research Project

Pervious concrete has been used by other jurisdictions on projects in the Lake Tahoe basin and the team wanted to see if NDOT could use pervious concrete in shoulder areas to reduce the need for expensive treatment systems. The most effective method of reducing fine sediment particles is through infiltration. Pervious concrete increases the amount of rain and snow that is infiltrated within the right of way and reduces the amount of water carrying fine sediment to the Lake. Pervious concrete also will help to distribute infiltration throughout the right of way which is more consistent with the natural process that was present prior to construction of the highway. Downstream of the pervious concrete the volume of runoff will be decreased thereby reducing the water's ability to cause erosion and generate fine sediment.

The team was concerned about the durability of the pervious concrete in the presence of snow plows and that the application of road sand could plug the system. The team worked with Darin Tedford and Kelly Yokotake in the Materials Section to come up with a research project to assess the functionality, cost effectiveness, durability and long-term maintenance needs of the pervious concrete installations at two test sections in Lake Tahoe. The project will also assess new testing methods that can be used for quality control during and after placement of the pervious concrete.

The research is currently underway and is being conducted by a partnership between the Western Transportation Institute (WTI), Nichols Consulting Engineers (NCE), and Venner Consulting. WTI is part of the College of Engineering at Montana State University (MSU).



Cut Slope Sediment Loss Project

In order to meet EPA requirements NDOT is required to estimate fine sediment particles (FSP) generated from right-of-way by considering various factors such as road shoulder conditions, road abrasive application practices, and pollutant recovery activities. Currently accepted methods of estimating cut and fill slope FSP do not sufficiently account for riprap slope protection and were not developed with specific focus on the types of slopes encountered within the Lake Tahoe Basin.

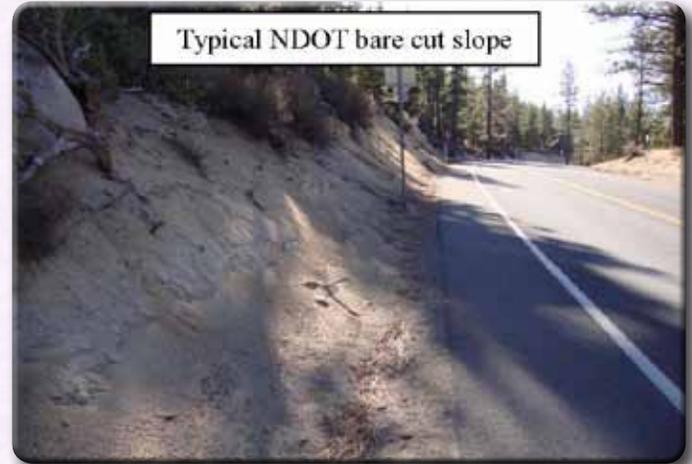
NDOT has historically used the "Revised Universal Soil Loss Equation" (RUSLE) to estimate the sediment generated from the slopes. EPA has proposed using the "Road Cut and Fill Slope Sediment Loading Assessment Tool" (RCAT) for estimating sediment instead of RUSLE. RCAT is a new methodology that has not been field verified on NDOT cut/fill slopes and in many cases the estimated sediment load generated is much smaller than estimates using other methods. If RCAT underestimates the sediment generated from NDOT cut/fill slopes then NDOT will receive a much smaller credit from EPA for millions of dollars of cut slope stabilization that NDOT has constructed.

The Hydraulics section developed a research project that will compare RCAT, RUSLE and other soil loss methods in order to determine the most appropriate method for determining the fine sediment generated from highway cut/fill slopes. The project will also provide recommendations for modifications to these methods to make them more appropriate for use in the Lake Tahoe basin and to identify what percentage of the sediment generated is "fine sediment."

The research is underway and is being conducted by a partnership between the University of Nevada, Reno and Atkins, a consulting engineering firm.

Congratulations to Tyler and his team (Matt Nussbaumer and Andy Knust) on this accomplishment. Please be encouraged to share an idea or problem that may make a good problem statement. You can contact our research coordinator, Manju Kumar at (775) 888-7803. He always accepts problem statements.

For the most recently concluded solicitation cycle, for FFY 2014 seventy-seven problem statements were received and are being reviewed by the Research Advisory Committee (RAC). Thank you to all who participated in the annual Research, Development, and Technology Transfer (RD&T) program development process.



Blinded By the Sun? Let Your Steering Wheel Guide You! By: Folmer Eelke, Department of Computer Science and Engineering, University of Nevada, Reno.

Glare caused by sunlight or headlights is a significant cause of vehicle accidents, especially in winter, due to a lower elevation of the sun and the presence of snow and ice, there is a significant increase in traffic accidents due to glare. As a person ages, the ability to focus and recover from glare continues to diminish and as a result nearly 40% of drivers involved in accidents due to glare are older than 45 years. Though glare can occur in various contexts, one of the more dangerous situations is when a driver is steering through a curve, as there is a greater risk of getting blinded due to the significant change in direction.

In recent years, there has been increasing interest in improving automotive safety using haptic interfaces. For example, lane-keeping or lane-changing systems are already commercially available where haptic cues warn the driver of impending danger, for instance, a vehicle in the blind spot. Haptic feedback has some desirable properties over other modalities in that it is private and does not distract any passengers. Haptic feedback provided through the steering wheel allows for robust and efficient communication of rich tactile information as a driver is always holding it.

Existing haptic automotive interfaces, such as those used in navigation systems, have only explored the use of haptic feedback to indicate to the driver when to steer and in which direction, but not how far to steer, as the driver typically performs this task by looking at the curvature of the road. If a driver is temporarily blinded through glare, such haptic cues do not contain enough information to safely steer a vehicle through a curve.

Graduate student Burkay Sucu and Dr. Eelke Folmer from the Department of Computer Science and Engineering at the University of Nevada, Reno have developed and evaluated a novel haptic interface, which relies on an intelligent vehicle positioning system to indicate when, in which direction, and how far to steer to facilitate steering without any visual feedback. A steering wheel was developed with two embedded vibrotactors. Haptic feedback provision is inspired by how rumble strips work, which provides tactile feedback to a driver when they drift from their lane.

Steering cues are provided through a vibrotactor integrated in the left and right of the steering wheel. Drivers steer away



from a cue felt in either hand, in order to find a dead-band window that indicates the target orientation of the wheel, which is dynamically adjusted as the car drives through the curve. User studies with this interface were conducted using a simulator where we evaluated steering through various types of curves. Because simulating blindness due to glare is subject to many variables, we evaluated steering with and without visual feedback as to identify an upper and lower bound on the performance of our interface. Our interface allows for blind steering for curves up to 45 degrees (less than a drivers lane keeping ability is significantly improved when used in conjunction with visual feedback.



Nevada LTAP By: Meg Ragonese

It was previously known as the T² Center. Now, NDOT is helping provide road expertise and knowledge with the new Local Technical Assistance Program (LTAP).

LTAP puts transportation knowledge at the fingertips of NDOT and local agency transportation staff with annual classes, on-site transportation training, webinars, a training video library, technical assistance and more. It is part of a national network of similar programs ensuring engineers and technicians are prepared with the technical knowledge to meet future street and highway needs. Federal and State funds administered through the NDOT Research section support LTAP.

In the twenty-plus year history of the program, nearly 1,500 transportation staff yearly have attended informative workshops; and many more have benefitted from on-site training, newsletters and other customized resources.

Truckee Meadows Community College (TMCC) has signed the contract to conduct the trainings for FFY 2013. For class notifications and newsletter updates, please contact the Nevada LTAP Center Team:

Program Director: **Jim Nichols** • Phone: (775) 829 – 9022 • Email: jnichols@tmcc.edu
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NDOT Product Evaluation Coordination Program By: Heather Manzo

Nevada will have an opportunity to participate in the National Transportation Product Evaluation Program (NTPEP) 2013 Annual Meeting April 21-24 in Pittsburg, PA. This is a great opportunity to share product evaluation information on a national level! If you have any items you would like discussed at the annual meeting, please email Heather Manzo, the Product Evaluation Coordinator, at hmanzo@dot.state.nv.us with your comments by April 8, 2013.

The Arizona Department of Transportation is hosting a Southwestern States Product Evaluation Program Peer Exchange panel May 7-10, 2013 in Phoenix, AZ. We are looking for ideas and information on what NDOT feels are the top products used in highway/road construction which could be part of a collaborative effort with other states. Please submit your ideas to be incorporated in this peer exchange effort to the Heather, by April 29.

Mark your calendars! The next Product Evaluation Committee meeting is scheduled for June 11, 2013.

Library Corner

By: Ken Chambers

Our New Librarian

We in Research are excited to announce the recruitment of our new librarian, Mitch Ison, who will be starting April 1. Mitch joins us from Nevada State Library and Archives with many years of experience, and has worked extensively with previous NDOT librarians. Please stop by to welcome Mitch to his new position.

Lynda.com Online Training Library

Lynda.com is an online learning company that helps anyone learn software, creative, and business skills to achieve their personal and professional goals. Take a look at the course selection here: <http://www.lynda.com/allcourses>.

Logins will be available for a 14 day check-out available on a first-come first-served basis. Renewals are available as long as no requests are pending for access. To access this database, please email a request to ndotlibrary@dot.state.nv.us

ASTM DOT Web Portal

The ASTM DOT Web Portal can be accessed from any desktop on the NDOT network (verified by IP address) from this web address: <http://nvdot.cyberregs.com/>. ASTM International, formerly known as the American Society for Testing and Materials (ASTM), is a globally recognized leader in the development and delivery of international voluntary consensus standards.

ASCE Journal Publications Electronic Access

After giving NDOT Library your input, Research decided to try online access for all ASCE (American Society of Civil Engineers) Publications. This library of journals is accessible at each of your workstations authenticated by an IP Address (NDOT employees only). This means that by accessing this web address: <http://www.ascelibrary.org/>, you will have access to approximately 73,000 papers.

If you have questions, are in need of assistance, or have special circumstances that surround your request please email ndotlibrary@dot.state.nv.us.

Nevada Fun Fact

By: Chris Akinola

There is only one summit in Nevada to have four consecutive numbers for its elevation. Geiger Summit in Storey County sits at an elevation of 6,789 feet.

Hoover Dam, the largest single public works project in the history of the United States, contains 3.25 million cubic yards of concrete, enough to pave a two-lane highway from San Francisco to New York.



The NDOT Research Section administers the NDOT's research, development and technology transfer program and serves as the "clearing-house" for product evaluations.

Research and Technology Review is published quarterly by the NDOT Research Section. Its purpose is to provide the latest information on the NDOT research activities including product information and other pertinent research topics.

If you have comments or need additional information regarding any of the topics discussed in this issue, please contact the Research Section. Edited by: Christianah Akinola

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