



**RESEARCH  
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*Innovation Frontline*

Applied Research and  
Innovation Branch (ARIB)

**Post-Flood Peak Discharge and Stage Documentation Project**



CDOT Research Staff have assisted work crews in determining the best management of flooded areas by researching flood conditions, as at this location in Denver, Colorado.

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Director**

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*Message from*  
**Director Amanullah Mommandi**

*The Applied Research and Innovation Branch is excited to present our first Research Newsletter.*

This Newsletter will be an excellent tool to start communicating with our internal and external customers and FHWA and CDOT Stakeholders. In addition to this newsletter, research staff communicate through meetings, conferences and presentations with our stakeholders.

The following are the different program areas of the Applied Research and Innovation Branch Program:

- Environment and Water Quality
- Structures, Hydraulic and Geotechnical

- Safety, Operations and Planning
- Pavement and Materials
- Local Technical Assistance Program (LTAP) and Library Services
- Field Services

The Research Branch receives and screens approximately 50 research problem statements / ideas every year, and completes an average of 20 research projects yearly. Please don't hesitate in sharing your own innovative ideas with us! Even if you're not sure about your idea, it could be well worth it in the eyes of experts. The research staff will engage assistance from our



**Amanullah Mommandi, M.S., P.E.**  
*Director, Applied Research and Innovation Branch*

own staff of experts as well as from a number of universities and private consulting firms. Funding for the Research Branch is provided through the Division of Transportation Development, which devotes 25 percent of its annual budget to our program. For FY2016, the Research Branch received a total of \$3,177,773.

We support **CDOT's mission** to provide the best multi-modal transportation system for Colorado that most effectively and safely moves people, goods and information. Our applied research goes a long way in helping CDOT achieve its mission because we systematically study phenomena related to specific, known needs to develop practical applications that answer questions and solve problems. Additionally, current CDOT management is emphasizing a three-pronged approach to becoming **the best DOT in the country**. The three peaks involve:

- Our People
- Leading Edge Technology
- Healthy Multi-Modal System

We appreciate your time in reading our newsletter and look forward to receiving your ideas on how to enhance it. Once again, I would like to thank CDOT staff for taking extra time from their regular work participating on the research panels, oversight teams, final presentations, and reviewing the draft reports.

Sincerely, Amanullah Mommandi, M.S., P.E.

[www.codot.gov/programs/research](http://www.codot.gov/programs/research)

CDOT Research Staff, L-R: David Weld, David Reeves, Gabriela Vidal, and Aziz Khan doing paleoflood research along Kiowa Creek.



## Meet Our Staff

- Amanullah Mommandi, *Director*
- Aziz Khan
- David Reeves
- Skip Outcalt
- Bryan Roeder
- David Weld
- Gabriela Vidal, *Contractor*
- Richard Griffin, *Contractor*

### **AMANULLAH MOMMANDI, Director**

*Applied Research and Innovation Branch*

M.S., Civil Engineering, Colorado State University, Fort Collins  
B.S., Civil Engineering, Kabul University

Prior to coming to CDOT, Mr. Mommandi had over 15 years of work experience with the Federal Government and private consultants in the area of management, water resources and hydraulics. Mr. Mommandi has served more than 30 years as a CDOT hydraulic engineer, Hydraulic Program Manager and currently as the Director of the Applied Research and Innovation Branch. As the ARIB director, his focus is on ways CDOT can quickly and effectively implement the findings and recommendations of applied research.

Mr. Mommandi represents CDOT at the national research efforts with the Strategic Highway Research Program (SHRP), National Cooperative of Highway Research Programs (NCHRP) and Transportation Research Board (TRB), AASHTO Research Advisory Committee (RAC) and chairs the CDOT RIC meeting. Mr. Mommandi appreciates the on-going support from CDOT staff, stakeholders, research branch staff, principal investigators, panel members and oversight team members as well as upper management and research and implementation council members. Mr. Mommandi enjoys teaching classes in the areas of water resources and hydraulics and specifically the Best Management Practices (BMP) class.

### **AZIZ KHAN, Deputy Director**

*ARIB Structures, Soils/Geotechnical, and Hydraulics Manager*

Ph.D., Civil (Geotechnical) Engineering, University of Colorado, Boulder  
M.S., Mining Engineering, University of Pittsburgh, Pennsylvania  
B.S., Mining Engineering, University of Peshawar

Dr. Khan has 25 years of civil and transportation engineering experience working on projects with major emphasis on planning, design and construction in the public and private sectors including state/government agencies, consulting firms, and academic institutions. He assists the Director of ARIB in the planning and management of the ARIB program and financial activities. Dr. Khan also represents CDOT at the national research efforts with Strategic Highway Research Program (SHRP), National Cooperative of Highway Research Programs (NCHRP), Transportation Research Board (TRB), AASHTO Research Advisory Committee (RAC) and in peer exchange meetings with other DOTs.

## ARIB Research Staff have had a Productive Year

**Accelerated Bridge Construction (ABC).** CDOT used ABC techniques on the FHWA-IBRD (Innovative Bridge Research and Development) project for the construction of Bridge N-16-Q on State Highway 69 over Turkey Creek, Huerfano County (CDOT Region 2). During the course of this innovative project, participants were able to develop a design methodology and related universal details. The project demonstrated faster pier erection by utilizing precast pier caps to eliminate concrete cure time from the critical path in the construction schedule. This methodology is easily applicable to the two column system at piers. The techniques developed resulted in overall construction cost savings and shorter construction time, both of which are beneficial to CDOT and result in higher road-user satisfaction.

### DAVID REEVES

*ARIB Safety, Operations and Planning Manager*  
Adv. Diploma of Technology in GIS, British Columbia Institute of Technology, Vancouver, Canada  
B.A.Sc., Civil Engineering with Honors, University of Waterloo, ON, Canada

**Thermal Mapping.** The Research team recently completed research involving thermally mapping several CDOT roads in Region 4 and along I-70. These thermal maps have proven useful in locating CDOT Road Weather Information Stations and gaps or overlaps in the system. They also reveal cold and warm spots that come in handy when snow plow trucks need to apply anti-icing treatments on the state's roadways. This helps CDOT use less material but with better effect.

### SKIP (WILLIAM) OUTCALT

*ARIB Research Fieldwork Coordinator*  
Engineering/Physical Sciences Technician III

**A Study of Bridge Deck Chlorides.** Concrete samples from bare concrete bridge decks - decks with no asphalt overlay - are sampled in half-inch depth increments. The ARIB arranges for traffic control and collects the samples. This study is performed by a CU professor and his students who analyze the samples to determine how deep chlorides have penetrated from winter ice control measures.

### BRYAN ROEDER

*ARIB Environmental and Water Quality Research Manager*  
M.S., Wildlife Science, New Mexico State University  
B.A., Biology, Colorado College

### Assessment of CDOT Revegetation Practices for

**Highway Construction Sites.** The revegetation of previously disturbed areas from highway construction activities is a critical component to overall site stormwater management strategy. Poor revegetation actions can lead to difficulty deactivating stormwater construction permits (SCPs). Excessive open permit periods due to

failed revegetation can result in higher non-project costs. This study evaluated the effectiveness of numerous CDOT revegetation practices. Over 30 conclusions and recommendations resulted to improve revegetation success, including topsoil salvage; soil amendments to improve nutrient-organic concentrations; and improved quality control by landscape architects during the revegetation process.

### DAVID WELD

*ARIB Research Support*  
With CDOT 21 years

**Logistics of Instrumentation.** The Research field support team is doing the modeling tests on a variety of bridge joints. Team members use tools such as scratch gauges, linear potentiometers and thermocouples to collect data used in CAD drawings, which helps CDOT understand load vs stress and load vs displacement.

### GABRIELA VIDAL

*ARIB Contracted Research Engineer*  
B.S., Civil Engineering, University of Colorado, Boulder

**Paleo Flood Studies.** CDOT and USGS staff worked with the Research Branch to collect field data from several paleo flood sites. The technical side and the benefit of these studies will be included in the next issue of this newsletter.

### RICH GRIFFIN

*ARIB Contracted Pavement & Materials Research Manager*  
Masters, Physics, University of Southern California  
B.Sc., Engineer Physics, Colorado School of Mines

**Asphalt Mix Durability and Performance.** In collaboration with the Branch's study panel, the Research team developed a scope of work for this research project. It will evaluate the impact of hot mix asphalt mix design changes that are being contemplated by the CDOT materials branch and paving industry.



CDOT Research Staff, L-R: Rich Griffin, Bryan Roeder, and Skip Outcalt inside the CDOT Research Library.

# ARIB is Proud to Complete Wildlife Escape Ramps Research Project

**Research Project**

## Monitoring Wildlife-Vehicle Collisions: Analysis and Cost-Benefit of Escape Ramps for Deer and Elk on U.S. Highway 550

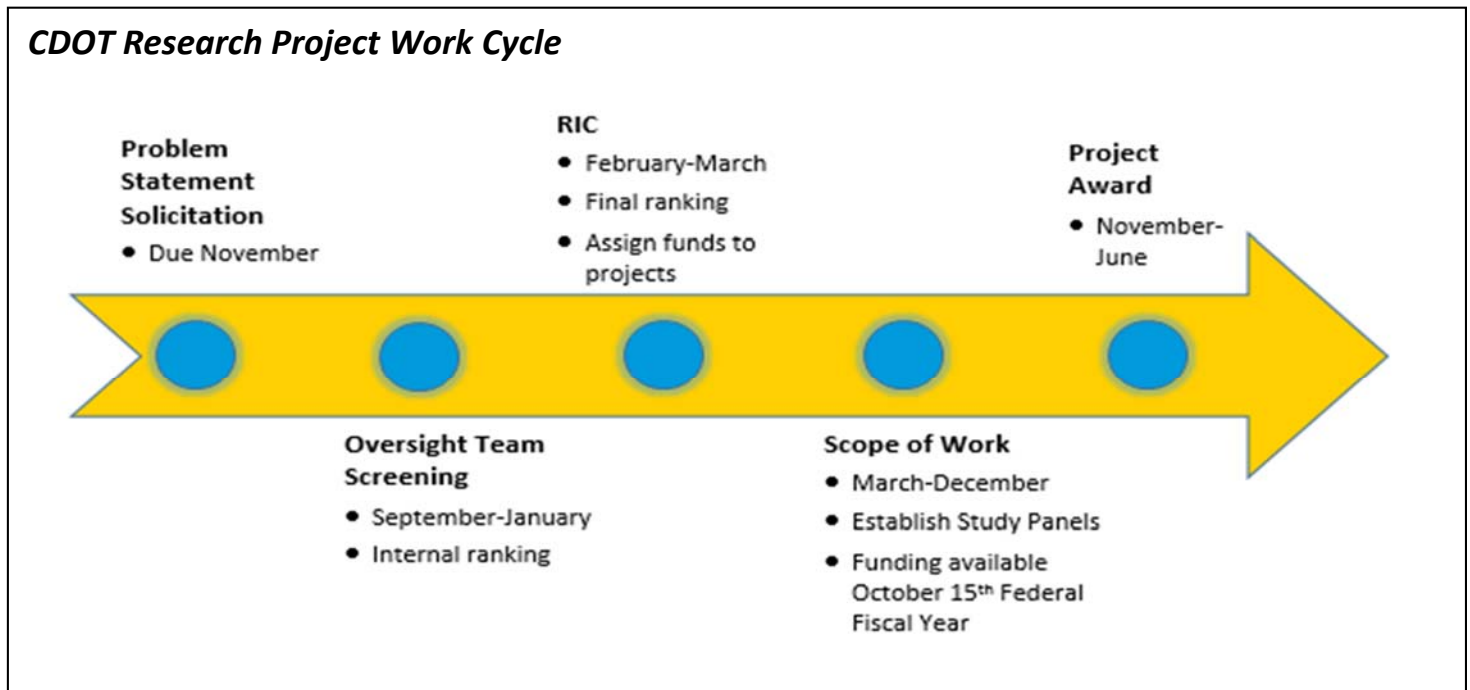
Wildlife fencing along highways can lower wildlife-vehicle collision (WVC) rates by safely excluding animals from the road right-of-way. Still, animals can breach fencing and end up trapped within the fencing along the highway right-of-way, exposing wildlife and motorists to the risk of collision. Wildlife escape ramps are designed to allow trapped animals safe passage out of the right-of-way. This study used motion-triggered cameras to evaluate the effectiveness of 11 escape ramps on U.S. Highway 550 near Ridgway, CO, and conducted a cost-benefit analysis. Escape ramps do reduce the number of WVC, and were used by mule deer, elk, bear, mountain lion, coyote, red fox, bobcat, raccoon, striped skunk, wild turkey,

rodents, raptors, and passerines. Mule deer visited escape ramps more than any other species. We documented a total of 1,333 successful mule deer escapes.

**Project Manager: Bryan Roeder**



Wildlife escape ramps, like the examples above, allow trapped animals safe passage out of the highway ROW.



The CDOT ARIB team encourages you to please submit your ideas for research to any ARIB staff member. Your idea could be well worth it in the eyes of our experts. For more program information, visit [www.codot.gov/programs/research](http://www.codot.gov/programs/research)

Sincerely, Amanullah Mommandi, Director

Editor in Chief: A. Mommandi  
 Contributors: A. Khan; D. Reeves; B. Roeder; S. Outcalt; D. Weld; G. Vidal; R. Griffin  
 Editorial Assistant: S. Dowling