ACCOMPLISHMENTS & EFFICIENCIES

– INTERNAL DOCUMENT –

Utah Department of Transportation

Fiscal Year 2009

Prepared by the UDOT Research Division

February 2010
Introduction

The Strategic Goals of the Utah Department of Transportation (UDOT) are described in what is known as our “Final Four”. Meeting these goals is a very demanding task in a state that is growing dramatically and with a limited tax base.

Final Four:

1. Take Care of What We Have
2. Make the System Work Better
3. Improve Safety
4. Increase Capacity

Significant progress has been made in each of these areas during fiscal year 2009. The major accomplishments of UDOT are described in the following pages of this Internal Document. Several of these initiatives were presented in oral presentations by UDOT leaders to the Utah State Legislature in January 2010.

UDOT Use:

The efficiencies and accomplishments documented in this Internal Document will be reviewed for the following purposes:

- Develop performance measures
- Implementation initiatives
- Media Marketing topics
- Newsletter articles
- TIG submittals
- TRB papers
- WASHTO-X sessions
- Library sessions
List of Groups and Divisions that Submitted Initiatives:

The following list consists of regions, groups, divisions, and sections that submitted accomplishments and efficiencies for fiscal year 2009 to the Research Division. Their submittals are presented in this Internal Document in the order shown below.

- Region 1
- Region 2
- Region 3
- Region 4
- Project Development
  - Construction
  - Consultant Services
  - Engineering Technology Systems
  - Hydraulics
  - Pre-Construction
  - Project Management
  - Research
  - Right of Way
- Systems Planning & Programming
  - Asset Management
  - Planning
- Operations
  - Aeronautics
  - Equipment
  - Maintenance
  - Motor Carrier
  - Traffic and Safety
  - Traffic Management
Region 1

Efficiencies and Accomplishments 2009

MATERIALS

UDOT’s First Warm Mix Asphalt Project
Strategic Goal: Preservation, Operation
Savings: Economically viable option without any cost adjustment to the project
Efficiency: Reduced energy required to produce and place asphalt mixes

Escalating energy costs in recent years have spurred renewed interest in reducing energy required to produce and deliver products, including roadway materials. Warm Mix Asphalt (WMA), is one of the emerging technologies that has successfully demonstrated the ability to reduce energy in the production of asphalt pavements. WMA methods reduce energy required to produce and place asphalt pavement while dropping emissions at the batch plant and at the site. This is accomplished with chemical additives and/or asphalt foaming processes that reduce the viscosity and enhance distribution of the binder.

Demonstration and test projects have been built around the country over the past four or five years with some success, mostly with neat binders and on low volume roadways. Granite Construction Company (Granite) tested WMA technology with some of their commercial mix on some Utah city streets in 2008 and 2009, and UDOT and Granite began to discuss implementation of the technology with UDOT’s Superpave+ specifications and modified binders for state highways.

When Granite was the successful bidder on a major rehabilitation project in Ogden, on SR-204 (Wall Avenue), UDOT decided the time was right to try WMA on a UDOT project. Even though this was a fast-tracked project funded by the American Recovery and Reinvestment Act, the project partnership committed to doing this right by doing the following:

- A proven mix design was selected for warm mix modification.
- Granite selected Astec’s Double Barrel Green® technology that foams the asphalt using a manifold of nozzles that inject water into the warm binder, foaming the asphalt without chemical additives.
- UDOT’s standard specifications were used, and concerns about early rutting resistance with WMA were investigated and dismissed, as the produced mix very successfully passed UDOT’s Hamburg Wheel Tracker test for rutting and
moisture susceptibility.

- An extensive mix design review and in-project test run were used to verify the ability of the mix to meet all UDOT requirements. The mix design verification was performed on mix produced from the nearby hot plant, eliminating difficulties and producing a sufficiently similar mix in the laboratory.

Granite and Garco Laboratories worked closely with Region One Materials Division, the UDOT Wellsville Construction Crew, and UDOT Central Materials Division to successfully implement UDOT’s first WMA project ever. Some highlights of the project’s success are given below:

- The material produced met all of UDOT’s standard performance specification requirements and used a UDOT PG 64-34 binder. This is significant because other projects involved modifying lab procedures to mitigate warm mix effects prior to testing.
- The production temperatures were reduced by 50 °F.
- There was a marked absence of smoke and observed emissions as the WMA was delivered to the project and compacted.
- The ability to compact the WMA was discovered to be enhanced when compared to the similar HMA mix despite the reduction in temperature.
- Though some of the economic benefits of lower production temperatures might be mitigated by slightly slower production rates, WMA was demonstrated to be an economically viable option and was delivered without any cost adjustment to the project.

WMA was used to pave the west side of this north-south route, and HMA was used to pave the east side. This will facilitate performance comparison over time.

This technology has the potential to not only reduce environmental impact from emissions, but may improve the pavement performance through decreased aging of the binder and better compaction. There are even possibilities for stretching the construction season and reducing overall project durations by enhancing compaction in cooler environments.

Following is additional information on the project:

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>F-0204(9)1, SR-204; Wall Ave, SR-26 to 32nd Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Section:</td>
<td>Rotomill 7”, 6” HMA/WMA, 1” Bonded Wearing Course</td>
</tr>
<tr>
<td>Notice to Proceed:</td>
<td>8/12/2009</td>
</tr>
<tr>
<td>Contract Time:</td>
<td>30 calendar days</td>
</tr>
<tr>
<td>WMA Used:</td>
<td>5,600 tons (approximate)</td>
</tr>
<tr>
<td>HMA Used:</td>
<td>5,100 tons (approximate)</td>
</tr>
<tr>
<td>Binder:</td>
<td>PG 64-34 UT</td>
</tr>
<tr>
<td>RAP (HMA&amp;WMA):</td>
<td>15%</td>
</tr>
<tr>
<td>Gyratory Specification:</td>
<td>N_{ini} 8, N_{des} 100, N_{final} 160</td>
</tr>
<tr>
<td>2008 AADT:</td>
<td>15,595</td>
</tr>
<tr>
<td>Classification:</td>
<td>Urban Arterial</td>
</tr>
</tbody>
</table>
**Precast Concrete Pavements for Slab Repair**

Strategic Goal: Preservation, Operation  
Savings: Unmeasured user cost savings  
Efficiency: Improved replacement slab quality; reduced impacts to highway users

Driven by a determination to limit impacts to the public, UDOT Region One implemented a new solution to Portland cement concrete pavement rehabilitation on I-15: precast slab replacements. This was the first full-scale precast pavement project for UDOT, and was an outstanding success.

A rehabilitation project on I-15 in Layton and Clearfield was intended to provide partial depth repairs and full-depth slab replacements to an aging pavement. This three-lane concrete section has an average annual daily traffic of 100,000 vehicles and provides connectivity for Salt Lake City commuters, Hill Air Force Base, and interstate travelers.

Region One project managers were determined to limit impact to highway users, and decided to allow two-lane closures only in a five hour window on weeknights. Closures necessary for full-depth repair were also restricted on weekends. It became clear that traditional methods and standard specifications for cast-in-place concrete were inadequate to meet these requirements and provide a quality repair.

Precast slab repair was evaluated for the project and has the following benefits:

- A carefully controlled environment in the precast yard can result in stronger, more uniform, and less permeable pavement slabs with a long life expectancy.
- Replacement slabs are delivered to the project full-strength.
- Risk associated with variable strength gain on cast-in-place concrete is eliminated.
- Dowel bar grouting, slab stabilization, profile grinding, and joint work can happen in subsequent shifts. Grade-supported slabs can be opened to traffic before these items are complete.

Building upon UDOT’s prior experience in 2006 with a small-scale intermittent precast slab replacement, and increasing experience with similar processes on the east coast, the project was modified during advertisement to provide a precast repair within the very tight traffic maintenance restrictions.

B. Jackson Construction Company was the successful bidder and submitted the Fort Miller Super-Slab System® for approval in accordance with the contract specification that allowed alternative proprietary systems under certain conditions. The installed slabs were installed on a carefully graded base, and then grouted to add additional stability and to eliminate any voids.
Dowel bars and tie bars were included to connect the slabs to each other and to the existing pavement.

After an initial learning process, B. Jackson Construction Company was able to install as many as 15 slabs per shift with a single crew. The new slabs generally rode noticeably smoother than the existing pavement even before the specified profile grind occurred at these locations.

This first attempt in Region One with precast slab repair was remarkably successful. As the project neared completion, area residents were still asking what all the barrels on the shoulders were for, and when the project would begin. The repairs are smooth, and are expected to outlast the surrounding pavement.

Following is additional information on the project:
Project Name: IM-15-7(221)332. I-15; Layton to 200 South (Clearfield)
Notice to Proceed: 3/31/2009
Precast Paving Slabs Placed: 3,728 square yards, (466 panels)
Prime Contractor: B. Jackson Construction
Precast Supplier: Mountain West Precast
Precast System Designer: Fort Miller Precast
Region 2
Efficiencies and Accomplishments 2009

TRAFFIC OPERATIONS

Installation of Centerline Rumble Strips, Shoulder Rumble Strips, and Enhanced Shoulder Striping
Strategic Goal: Safety
Savings: Potential reduction in fatal crashes
Efficiency: Improved safety features for users of rural two lane highways

In FY2009 Region Two embarked on an aggressive program to install centerline rumble strips, shoulder rumble strips, and enhanced shoulder striping on rural two lane highways in the region. During FY2009 Region Two installed 26 miles of centerline rumble strips, 24.4 miles of shoulder rumble strips, and 66.1 miles of enhanced shoulder striping.

The enhancements were made on the following roadways:

<table>
<thead>
<tr>
<th>Route</th>
<th>Pavement Type</th>
<th>Centerline Rumble Strip Quantity (ft)</th>
<th>Shoulder Rumble Strip Quantity (ft)</th>
<th>Total Rumble Strip Quantity (ft)</th>
<th>6” Shoulder Stripe Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR-111</td>
<td>Asphalt</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>37,088</td>
</tr>
<tr>
<td>SR-138</td>
<td>Asphalt</td>
<td>70,213</td>
<td>128,769</td>
<td>198,982</td>
<td>177,313</td>
</tr>
<tr>
<td>SR-32</td>
<td>Asphalt</td>
<td>37,852</td>
<td>0</td>
<td>37,852</td>
<td>75,705</td>
</tr>
<tr>
<td>SR-35</td>
<td>Asphalt</td>
<td>29,452</td>
<td>0</td>
<td>29,452</td>
<td>58,904</td>
</tr>
</tbody>
</table>

Nationally, rural highways account for approximately 40 percent of all motor vehicle travel but 60 percent of all fatal crashes. Region Two chose to try and address this statistic with targeted improvements to local concerns.

A recent study of rural roadways in California, Colorado, Delaware, Maryland, Minnesota, Oregon, and Washington, by the Insurance Institute for Highway Safety showed that the installation of centerline rumble strips reduced motor vehicle crashes at treated sites by 14 percent; injury crashes were reduced by an estimated 15 percent. Head-on and opposing-direction sideswipe crashes — the primary target of centerline rumble strips — were reduced by an estimated 21 percent, while head-on and opposing-direction sideswipe crashes involving injuries were reduced by an estimated 25 percent (Richard Retting, Insurance Institute for Highway Safety, http://cms.transportation.org/sites/scote/docs/CLRS_Summary.pdf).
MAINTENANCE/CONSTRUCTION

Portable Gravel Screens
Strategic Goal: Preservation
Savings: $137,250 from reuse of rockfall material in Parley’s Canyon for one summer
Efficiency: Reuse of rockfall material

Every year many tons of rock material fall off the slopes along canyon roads and need to be cleaned out of cut ditches to allow for proper drainage. In the past the material has been disposed of or stored on State property. Rather than letting this material go to waste, Region Two purchased gravel screens to process the material for use in shouldering or repairing erosion.

Last summer 5,500 tons of rock material were removed from Parley’s Canyon. It was processed into the following items with approximate savings as shown:

- 3,000 tons of roadbase that would not have to be purchased elsewhere, saving $22,350
- 1,500 tons of 4-6” rock, saving $140,400
- 1,000 tons of landscape rock, saving $60,000
- Total Value of Material Produced = $222,750.

The cost of producing the material is described as follows:

- Cost of screens = $9,500
- Labor and equipment for processing = $76,000
- Total Cost to Produce Material $85,500.

This represents an approximate net Total Savings of $137,250 for reuse of the rock material from Parley’s Canyon.
MATERIALS

Recycling Worn Out Concrete Pavement On Site Into New Roadway Base
Strategic Goal: Preservation, Operation, Safety
Savings: $1.4 million savings versus off-hauling old concrete and bringing in new base material
Efficiency: Elimination of approximately 5,300 truck trips; reduced project carbon emissions

Traditionally concrete pavement that needs to be rebuilt is broken up and hauled off site for either recycling or fill material. An available alternative is to crush worn out existing concrete pavement and incorporate it into new roadway base on site.

The SR-201 project from Bangerter Highway to 5600 West had approximately 80,000 tons of concrete pavement that needed to be removed prior to being replaced with new pavement. Rather than hauling this concrete off site, about 90% was processed on site and incorporated into the base material below the new concrete pavement.

The project was procured using UDOT’s low bid process. Cost savings to the taxpayer by recycling the existing concrete pavement on site was about $1.4M. This savings is reflected in the price of the winning contractor’s bid. Roadway base materials normally hauled into a project were reduced greatly. Approximately 5,300 truck trips were eliminated by recycling the concrete pavement on site.

Other benefits of this process are as follows:

- Carbon emissions were also greatly reduced due to reduced truck hauling.
- Reduced potential of construction accidents by reducing on site construction traffic.
- Reduced noise surrounding the project during construction.
- Fewer calls to UDOT Public Relations due to fewer trucks on the roadway.
- Reduced dust and roadway tracking of mud during construction.

Links to UDOT’s Final Four are reflected in this project. For preservation, fewer trucks means less wear and tear on our surrounding roadways. Operation is improved since truck traffic is reduced by not putting haul trucks on the public roadway during a year-long project, thus allowing traffic to flow unimpeded by merging haul trucks. Safety is improved by having fewer trucks on the roadway and reducing possible broken windshields and auto/truck accidents.
Region 3

Efficiencies and Accomplishments 2009

1-TAKE CARE OF WHAT WE HAVE-

Saratoga Springs Satellite Shed
Savings: Reduced snowplow response time
Efficiency: Provide better driving conditions for roadway users

In order to better address the growing needs along SR-68 and SR-73 West of Utah Lake a horse arena on ground purchased by the Mountain View Corridor Project was purchased and converted into a satellite shed. Three snowplows will be stationed there providing immediate service to the Saratoga Springs, Eagle Mountain, and West Lehi areas.

Bonded Wearing Course
Savings: Delayed reconstruction costs
Efficiency: Extend the life of the pavement and improve the driving surface

Multiple bonded wearing course projects were completed on I-15 through Utah County. They involved milling off the old open graded surface course and replacing it with a bonded wearing course. Bonded Wearing Course is a preventative maintenance treatment with the following benefits: improved skid resistance, reduced traffic noise, improved pavement condition rating and ride quality, spray reduction, and reduced impact of reflection cracking.

ARRA Program
Savings: Delayed reconstruction costs
Efficiency: Extend the life of pavements and bridges; support the Utah economy through jobs

This past March-May, Region Three advertised 21 ARRA projects worth $49,000,000. The majority of these projects and funds were dedicated to pavement and bridge preservation. This effort will help greatly “Take Care of What We Have” in Region Three.

Statewide, UDOT advertised 77 ARRA projects worth over $146.8 million from March through June 2009.

2-MAKE THE SYSTEM WORK BETTER-

Implementation of the Permit Office Access Review Team
Savings: Reduced permit review time
Efficiency: Easier tracking of permit applications

This is a prime example of how we made the system work better for us as well as the public, local jurisdictions, and developers. Prior to implementing formalizing the Team, each member
would review access applications separately, beginning with the Traffic Engineer, then the Right-of-Way Engineer, then the Design Squad Leader, and back to the Right-of-Way Coordinator (also known as the Permits Office). This process could take up to 45 days for each submission of documents attached to the application. If revisions were needed, the applicant had to make the revisions and resubmit, and the process would start over. At times this process was frustrating to the applicants because of the time it took for the applications to “make the rounds” before final approval, and was challenging for the staff in the office to keep track of where all the reviews were at any given time.

To address both issues we decided to change the process by formalizing the Team and adding one member to the Team. Besides the Traffic Engineer, Right-of-Way Engineer, Design Squad Leader, and Right-of-Way Coordinator, the Program Manager was added to the Team. This person provides an additional perspective on what is best for the Department, the applicant, and the public. The Team meets one day a week for two hours to review and discuss each application that has come in during the previous week, and to meet personally with applicants if either party needs to have a face-to-face meeting. The Team makes a decision on the application during the meeting unless further discussion, review, or revisions to the application documents are necessary. This has greatly reduced the review time and made it easier to track the applications because the staff that issues the permits is in the office where the meetings take place and can hear and take notes on what is discussed during the meeting.

All parties involved with this process are very happy the changes were made; the Team because they don’t have to deal with all the reviews during the week, the Permits office staff because they are more organized, and the public/applicants because our review turn-around time is much less.

**Provo Canyon ATMS**  
**Savings:** Reduced snowplow response time  
**Efficiency:** Provide the driving public with delay notifications

This project involved placing fiber optic cable, cameras, variable message boards, and RWIS sites (automated weather stations) throughout Provo Canyon. The cameras and automated weather stations will be monitored by our traffic operations center 24 hours a day. This will help us improve our response times to these snowstorms as well as monitor the pavement temperatures to help us determine when additional salt is needed. The variable message boards will notify the public of delays in the canyon due to accidents, weather conditions, and avalanche work.

**Spanish Fork ATMS**  
**Savings:** Reduced time and resources to notify the public of incidents on US-6  
**Efficiency:** Inform the driving public with delay notifications and alternate routes

In an effort to “Make the System Work Better”, Region Three in partnership with the TOC constructed a new VMS sign on I-15 south of the US-6/I-15 Interchange informing the public of incidents on US-6. This VMS will allow the public to utilize I-15 as an alternate to US-6 saving valuable time and resources.
Vernal ATMS Interconnect
Savings: Travel time savings for roadway users
Efficiency: Reduction in traffic delay at intersections

Over the past few years, traffic on US-40 through Vernal has grown exponentially with the oil and gas development. This traffic generated the need to install traffic signals at many intersections. Each one of these new signals was developed as needed and were not coordinated. This ATMS project connected each of these signals, making our system work better.

3- IMPROVE SAFETY-

Installation of Cable Barrier on I-15
Savings: Relatively low cost to improve roadway safety
Efficiency: Reduced fatal crashes

It is becoming more well documented in the Traffic and Safety Division that cable barrier in the median of freeways is a relatively inexpensive treatment to significantly reduce or eliminate cross-over crashes with opposing traffic. In Region Three, where cable barrier was first installed in Utah, the number of cross-over crashes has been virtually eliminated where the cable barrier is in place. Because of its success, more is currently being installed in the Spanish Fork area. We are pleased to report that the total number of fatal crashes in Region Three has declined overall since 2003, and we believe a significant part of that decline is due to the presence of median cable barrier.

Center Line Rumble Strips
Savings: Relatively low cost to improve roadway safety
Efficiency: Reduced fatal crashes

Similarly to the median cable barrier, center line rumble strips are continuing to be a very inexpensive safety mechanism to reduce cross-over head-on crashes on roads without any kind of median. Many miles of shoulder and center line rumble strips have been installed on US-40 and more will be installed in the future on this and other rural high-speed roads. We also attribute the decline in fatal crashes on our roads to the presence of rumble strips because they alert drivers when they stray out of their lane.

US-40: West Roosevelt to Ioka Junction
Savings: Reduced travel delays for drivers
Efficiency: Safer access to local businesses by drivers

This project addressed safety concerns on US-40 between Ioka Junction and West Roosevelt. The project provided a new 14’ permissive median, standard 8’ shoulders, and addressed steep side slopes throughout the project limits. In addition, the high-angle skew at Ioka Junction (SR-87 and US-40) was realigned. Now complete, drivers can safely access local businesses between Ioka Junction and West Roosevelt.
**Bridge Replacement at MP 200 on US-6**
Savings: Reduced construction time due to ABC techniques  
Efficiency: Reduced roadway user costs and wildlife accident potential

Two new bridges were constructed utilizing the ABC technique that will provide much safer conditions than previously existed. One bridge replaced an existing structure, which had a poor rating from the structures division. The other provides for a wildlife underpass which will provide safe passage for animal movements keeping them separate from traffic on US-6.

**Guardrail on US-191**
Savings:  
Efficiency: Reduced potential for run-off-road accidents

Old substandard guardrail was replaced at various locations on US-191 (Indian Canyon). This protects the traffic from very steep drop offs.

**Runaway Truck Lanes**
Savings:  
Efficiency: Reduced potential for runaway truck accidents

Two emergency runaway truck ramps were installed on US-191 north of Vernal in locations where the road is very steep and contains very sharp curves. Historically there have been several significant accidents in this area because trucks lost control and crashed.

**4- INCREASE CAPACITY-**

**Access Utah County**
Savings: Reduced travel times for cross-county highway users  
Efficiency: Improve or add transportation corridors with a dedicated project management team

This is a dedicated project team that is handling six major construction projects in Utah County. The group has a dedicated project management team, right of way team and public involvement team. All of the projects are capacity projects and include S.R. 77, Pioneer Crossing, S.R. 92, Payson Bridge Decks, Geneva Road and the Vineyard Connector.

**Pleasant Grove Bridge State Street Bridge**
Savings: Reduced roadway user costs  
Efficiency: Reduced traffic delays

This project eliminates a bottleneck on State Street in Pleasant Grove where a seven lane road was reduced to two lanes to go under a railroad line. Working with Union Pacific we were able to drop the rail line to just below grade and build a seven lane bridge over the tracks. This will greatly improve the flow of traffic on this portion of State Street.
**US-40 Passing Lane Projects**
Savings: Reduced roadway user costs
Efficiency: Increased mobility on US-40

Three different projects on US-40 addressed congestion as a result of insufficient passing lanes. Additional passing lanes were constructed to increase capacity and improve the safety on US-40 between MP 139 and 141 and between MP 126.5 and 130. At the intersection of US-40 and SR-88, a westbound passing lane and turn lanes were provided, as well as the realignment of the intersection. The additional lanes provide motorists locations to safely pass slower vehicles which increases the mobility along US-40.
Region 4

Efficiencies and Accomplishments 2009

Snow Removal Material Application Rate
Strategic Goal: Preservation, Operation, Safety
Savings: Over $100,000 in one test area
Efficiency: Reduced salt and sand application while effectively melting snow

During snowplow operations, grit (sand) and salt are commonly spread on roadways to increase traction and melt snow and ice. These materials are commonly mixed together at 50% salt and 50% grit and then applied to the roadway with sanders on snowplows. An experiment was done that changed this mixture to 67% salt and 33% grit in a high elevation, high snow area. The melting action of the higher percentage of salt allowed the application rate to be decreased. This resulted in a load of salt/grit getting farther down the road while still effectively melting snow and providing traction. The end result was nearly 4,500 tons less material being applied to this road last winter as compared to past winters. This equates to a savings of over $100,000 in this location last winter.

Plow mounted sanders have controls that can control the application rates of salt/grit that hit the road. If more material is applied to the road than is needed to provide adequate traction and snow melting, it is essentially wasted. These sanders can be calibrated to optimize the amount of material that is applied to the road. This results in applying just the right amount of material to be effective and not too much that it is wasted. When properly calibrated, sanders are applying less material and it appears to operators that there is not enough material being applied to the road. Sophisticated controls were installed on snowplow sanders and then calibrated to apply the optimum amount of salt and grit to the roadway. A concerted training effort took place last winter, training our operators to trust the new equipment and the optimized application rates. It was not easy, but operators did not apply more material by overriding the sander controls, thus saving tax dollars by not over applying snow fighting materials.

SR-143 MP 16 – 27 Parowan Canyon Snow Removal
Strategic Goal: Preservation, Operation, Safety
Savings: $78,500 in snow removal costs over the previous year
Efficiency: Reduced snow removal effort while meeting the needs of stakeholders

The area of SR-143 from mile post 16 – 27 from Brian Head to the Mammoth Creek Road is very difficult to maintain during winter conditions. The high elevation and frequent high winds make the snow removal task daunting.

The district has been maintaining this section of roadway on a 24 hour basis for many years to provide the best service possible for the communities of Brian Head and Panguitch. The task of snow removal is exceedingly difficult due to the high elevation, the depth of snowfall and the geographic area that is conducive to extremely high winds in the range of 60-90 mph. The
roadway can close at any time when these conditions exist which make it very dangerous for users and UDOT workers alike.

Last season, UDOT representatives met with Brian Head officials, Iron County Commissioners, Brian Head Ski Resort representatives, Senator Dennis Stowell, National Park and US Forest Service officials to determine the best and most cost effective strategy to manage the roadway in winter. It was determined that it was in the best interest of the communities and the National Monument to keep the roadway open in winter as much as possible. Travelers from Arizona and other areas to the south use this access to Brian Head, the Dixie National Forest and Cedar Breaks National Monument for winter recreation and sightseeing opportunities.

It was determined to change the level of effort for snow removal to Daylight Plowing Only with no parking allowed in this section. This provides for immediate closure opportunities when necessary without stranding anyone in the area. Additional efforts were made to allow access to the winter ranger station in the monument and snowmobile parking areas near Brian Head.

For the previous 4 years, costs for snow removal in this section have been very high which have caused the station to overrun the snow budget every year. For FY 08, the snow removal costs for this area were $136,642.56. FY 09 costs for this same section were $58,114.19, or a savings of $78,528.37. The snowfall and conditions for the last 2 years has been almost identical. This is money that can be used for other maintenance activities and pavement preservation.

Stakeholders have met again this year to review the efforts from last year. We will focus on the same removal efforts, but with enhanced parking areas and opportunities for recreation and sightseeing in the area. These changes have made the department much more efficient in this area, while still providing excellent service to the public.

Re-opening of SR-14 after Rockfall at MP 7
Strategic Goal: Preservation
Savings: Over $66,000
Efficiency: Used in-house crew and equipment to address rockfall and repair roadway

In early December 2008, a massive rockfall occurred in Cedar Canyon on SR-14. The fall occurred in the early evening. Utah Highway Patrol dispatch notified Brandon McKinlay, station 4540 shed foreman, that there had been a report of rocks on the road. As this is a common occurrence in the canyon, Brandon investigated. The “rocks on the road” turned out to be a massive rock fall from approximately 700 feet above the roadway. A large portion of the limestone ledge above the roadway broke loose and covered approximately 900 feet of roadway with rocks, dirt and debris anywhere from 3 to 20 feet deep with approximately 10,000 Cu. Yds. of material. Some of the rocks on the roadway were near house size and approximately 30-40 tons.

SR-14 is a main link from I-15 to US-89, which carries commuter and business traffic across a 10,000 ft. elevation alpine mountain. It links the communities of Cedar City, Kanab, Hatch and Duck Creek Village. It is also a main link to Cedar Breaks National Monument, Zion National Park and Bryce Canyon National Park. Detour time to various locations serviced by SR-14 varies
from 1 hour to 4 hours. Upon discovering the magnitude of the incident, Brandon contacted Jim McConnell, Cedar District Engineer. Jim and Ray Bentley, Cedar District Maintenance Engineer, went directly to the site to determine the extent of damage. The large amount of material left above the roadway on the steep slope above was of considerable concern. The area was walked to determine if any vehicles were involved in the incident, which proved to be negative. Keith Brown with UDOT central Geotechnical was called and he immediately arranged for a rockfall expert to visit the site. It was determined the following day that the material above was stable and wouldn’t continue to fall.

Brandon, Jim and Ray discussed the situation with Nathan Lee, Region 4 Director. It was determined that the cost to have a contractor remove the material and reopen the roadway would be approximately $100,000 to $150,000. Brandon felt that he and his crew could safely remove the material and reopen the road at a much lower cost. A track-hoe was rented to help with rock removal from the slope in addition to UDOT owned equipment. An airtrack drill and operator was rented to drill the large rocks for blasting. Completion of the removal, installation of precast barrier and reopening of the roadway was completed 6 days after notification of the incident. Total cost for removal, safety barrier and repaving was $33,775.40.
Safety Improvements to US-6 Between Spanish Fork and Price
Strategic Goal: Operation, Safety
Savings: Reduced user costs from reduced accident delays
Efficiency: Decreased accident frequency and fatalities

UDOT has made improvements to US-6 between Spanish Fork and Price with sections being widened to four lanes, construction of passing lanes, and installation of rumble strips. These improvements have shown a decrease in accident frequency and fatalities. The accident data for US-6 between Spanish Fork and Price are shown below.

US-6 Crash Statistics – Spanish Fork to Price

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 3 (26 miles)</td>
<td>10</td>
<td>2</td>
<td>14</td>
<td>3</td>
<td>16</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Region 4 (37.5 miles)</td>
<td>18</td>
<td>4</td>
<td>13</td>
<td>6</td>
<td>19</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>6</td>
<td>27</td>
<td>9</td>
<td>35</td>
<td>5</td>
<td>41</td>
</tr>
</tbody>
</table>

Rumble Strips
Strategic Goal: Operation, Safety
Savings: Relatively low cost to improve roadway safety
Efficiency: Reduced potential for accidents

UDOT has been diligent over the last few years in installing rumble strips on all interstate routes within Region 4. This has resulted in 100% of our Interstates having shoulder rumble strips. We have focused our recent efforts on installing rumble strips on our two-lane Rural Highways. The installation of rumble strips on both shoulders as well as centerline provides immediate feedback to drivers who are drowsy or impaired that drift outside the travel lane. The installation of these rumble strips provide a high benefit to cost ratio and are an effective tool in reducing accidents.

In 2009, Region 4 installed 156 miles of rumble strips, including 114 shoulder miles and 42 miles of centerline. This is an overall rumble strip increase of 84% from 2008. The rumble strips installed in 2009 represent 49% of all rumble strips in the region, with 45% of shoulders and 64% of centerline rumble strips installed in 2009.
Project Development

Efficiencies and Accomplishments 2009

CONSTRUCTION

 Consolidated Advertising of Projects in the Newspapers
Strategic Goal: Operation
Savings: $30,000 in one year in advertising costs
Efficiency: Multiple projects advertised in one large advertisement

The advertising section has reduced the costs of printed advertising in the newspapers by consolidating all of the projects that are advertising into one large advertisement rather than advertising each individual project. The add lists all of the projects advertising and refers the reader to the UDOT website where they can get the project specific information and direction on how to bid the projects. This has saved about $30,000 dollars this year.

Adobe Connect for Meetings
Strategic Goal: Operation
Savings: $26,800 estimated annual savings for Region 4
Efficiency: Attend meetings via the Internet to avoid travel time and costs

This past year Construction has started using the Adobe Connect program for our CET, CEMT, and DE meetings and webinars. This allows attendees from the Regions and Consultant offices to attend the meeting via their computers without leaving their offices. This reduces travel, time away from the office, per diem and hotel costs. These meetings are recorded and put on the UDOT website so they can be watched at a later date without any additional resources.

One example of the benefits of this tool is given below. If there are five engineers from Region 4 attending one of these meetings via the web, this would save the following:

- Travel Costs: $320 for vehicle expense
- Labor Costs: $1,200 for travel time only
- Per Diem Costs: $160
- Total Cost = $1,680 per meeting
- Hotels were not included in the estimate since they are not always used
- CEMT: 6 meetings per year
- CET: 4 meetings per year
- DE: 6 meetings per year
- Total savings for 16 meetings just from Region 4: $26,880 per year
CONSULTANT SERVICES

Contract Management System
Strategic Goal: Operation
Savings: Over 5,400 man-hours saved from 2007 to 2009
Efficiency: Reduced time required for contract administrators

The Contract Management System (CMS) is a module of the Electronic Program Management System (ePM) for the tracking and maintaining of engineering services contracts for the Utah Department of Transportation (UDOT). CMS has been in place since March of 2007 and has greatly reduced the man-hours it requires of Contract Administrators in Consultant Services to administrate and write engineering services contracts. As an example, it used to take Contract Administrators approximately three hours to draft each contract or modification by using MS Word templates, Excel spreadsheets, and an Access database of contacts for consultants. It would require the repetitive entry of the same contract-specific information. This process for drafting contracts now takes a few minutes. There have been over 1,800 contract related transactions within CMS since March of 2007. This translates to approximately 5,400 man-hour savings. This is just the savings for a small portion of the contracting process that is easily identifiable.

The tracking of contract requests allows UDOT Project Managers to view the status of pending contracts and modifications without contacting Consultant Services. This provides a high level of customer service.

Other features that CMS provides for the Consultant Services Division are maintenance of the prequalified pool of consultants, contract history, consultant financial information, Federal-aid agreements between the Local Governments and UDOT, and identifying statistical trends.

ENGINEERING TECHNOLOGY SYSTEMS

Performance Management Reporting System
Strategic Goal: Operation
Savings: Potential time and cost savings
Efficiency: Streamlined preparation and conducting of project delivery meetings

The UDOT Performance Management Reporting System (PMRS) comprises two dashboards, the Executive Dashboard and the Region Level Dashboard, and their subordinate detail reports. A dashboard is a set of graphical reports displayed together. The PMRS dashboards allow managers at all levels to gain immediate knowledge of the state of the UDOT program of projects, and to apply this knowledge to improve management of projects, to address problems, and to communicate more effectively with stakeholders. In this way the Reporting System contributes to Make the System Work Better.

The goal of the Executive Dashboard project was to provide executive management and the Region Program Managers with an easy way to prepare for and conduct the quarterly Region
Project Delivery Update (RPDU) meetings. Prior to development of the dashboard, data for the meetings had to be compiled by manipulating ePM pre-programmed reports into lists and graphs in Excel spreadsheets. Not only was this process time- and labor-intensive, but the results were of necessity out of date because of the length of lead time required. If more detail was needed, more research and analysis were necessary. The dashboard can return up-to-date information in the meeting itself, at any desired level of detail.

The Executive Dashboard is grouped into sections by the four key project drivers: Scope, Schedule, Budget, and Quality. Within the sections the measures are viewed as either “state of measure,” which is a view of the current program where issues can be identified and corrected, or “trend,” which is a historical view of project delivery performance. A set of measures is provided under each driver for both the Preconstruction and Construction phases of project delivery.

A key feature of the system is its ability to provide ever finer levels of detail. Selecting a Region, a Project Manager, or a Resident Engineer narrows the report accordingly. Each of the dashboard gauges provides a breakout of detail by Region as well as statewide by the condition being measured. For example, if a Program Manager needs to see if projects are being advertised on schedule, the Preconstruction Schedule gauge shows how many are late, how many are approaching their committed date, and how many have dates further in the future. Clicking on the gauge legend displays four more gauges, one for each Region, and a list of projects. Clicking on a red needle on one of the Region gauges displays a list of late projects for that Region. The Program Manager sees only the information that is needed at the time, in a concise and flexible format.

The dashboards save time in both preparation for and conduct of the RPDU meetings, which was their original purpose. In addition, executive management and Region Program Managers monitor the dashboards daily to maintain a current overview of the state of their performance, allowing early intervention where necessary and providing a higher level of performance and efficiency overall.

An example view of the Executive Dashboard is shown below.
Document Management System for CADD Projects (ProjectWise)
Strategic Goal: Operation
Savings: Potential time and cost savings
Efficiency: Improved collaboration and management of project documents

The Department has implemented a document management system for the CADD movement being used for the design of transportation projects. The product chosen for this function is ProjectWise from Bentley Systems, Inc., who also provides our CADD applications MicroStation and InRoads. ProjectWise provides a feature-rich platform for collaboration among all contributors to the development of projects in CADD and eliminates potential duplication of files, since all files in all projects are controlled under one source and all contributors, including consultants, can access that source.

Key advantages of ProjectWise:

- A major advantage with any document-management facility is collaboration, and ProjectWise provides this for the Department very well and to a level never-before attainable.
• ProjectWise is “CADD-Aware” in that it recognizes content of CADD files and can be used for such things as populating the title blocks on sheet files with project-specific information, thus leading to consistency from sheet-to-sheet in a project.
• A single point of storage and access exists for all project-related files.
• Projects and files can be developed within a prescribed and organized work flow that will carry a project through development and through to advertisement, award and construction.
• All projects and files can be accessed from all workgroup locations within the Department, including the Complex, all Regional offices, Construction field offices, the TOC and special offices such as Access Utah, I-15 Core, etc.
• External consultants can gain access to the projects and files via the Internet.
• Documents can be assigned attributes by which they can be searched at any time, for any reason.
• Access and permissions for projects and files can be controlled by appropriate project stakeholders, managers, etc.
• When a user is operating on any file, that file is locked such that nobody else may modify it during that time.
• Certain key project documents can flow into the Electronic Plan Room (EPR), which is a key component to offering projects to be advertised for bidding by contractors.

Key points as to how ProjectWise improves the overall efficiency as compared to before document management was implemented:

• Before ProjectWise, to facilitate collaboration, many files were copied and worked on by several people in different disciplines and locations, and it was difficult to track who was working on which file(s), and which was the most current version. ProjectWise eliminates this problem through the very nature of a document management system wherein each file must be “checked out” to a single user to be worked on, and while that document is checked out, no other users may access it for editing, but may still access it in read-only mode.
• Before ProjectWise it was difficult, if not impossible, to achieve intra-departmental access to projects and files, since all project data was stored on local servers in each workgroup location, such as the Complex and Regional offices, and access to these files from any other location was difficult to achieve and maintain. ProjectWise solves this by offering a single point of access for all projects and files.
• Before ProjectWise it was virtually impossible for external consultants to gain access to our projects and files. ProjectWise solves this by offering access to UDOT projects and files to external consultants via the Internet.
• Before ProjectWise it was a difficult proposition to collect and post key project documents into the Electronic Plan Room (EPR) for advertising and bidding by contractors. ProjectWise greatly improves this step while still allowing the Construction Advertising group control over when a project can be officially advertised.
HYDRAULICS

Evaluating Fish Passage in New and Rehabilitated Culverts
Strategic Goal: Preservation
Savings: $35,000 per culvert and a reduction in traffic delays
Efficiency: Culvert liners eliminate costly excavation and replacement

UDOT-sponsored research studies have given UDOT unique tools which now allow Department designers and others to reliably evaluate fish passage in both new and rehabilitated culverts. Excavating and replacing old culverts disrupts traffic and requires costly pavement repairs. The deeper a culvert is buried beneath the road, the more expensive excavation can become but ensuring fish passage through these culverts is also a critical goal of the Department. Recognizing this challenge, UDOT, in cooperation with BYU and USU, has developed 1st Stage protocols for validating fish passage in candidate culverts for liner restoration. These protocols allow UDOT engineers to rapidly identify culverts which can be restored using liners without blocking fish passage. Rehabilitation using liners means traffic delays are minimal or eliminated entirely. Expensive pavement and subsurface materials are no longer impacted when culverts are rehabilitated rather than replaced, while preserving and expanding our natural heritage.

UDOT has published these initial screening protocols in a research report. These new resources enable maintenance forces to rehabilitate culverts without the danger of blocking fish passage.
PRE-CONSTRUCTION

Value Engineering Program Awards
Strategic Goal: Operation, Capacity
Savings: $17,400,000 estimated savings on the I-15 at 11400 South Interchange project
Efficiency: Reduced project costs through application of value engineering recommendations

UDOT received the AASHTO National Value Engineering Award for Improved Performance and an Honorable Mention for a Preconstruction project over $75 million. To recognize outstanding VE achievements and to promote awareness of the importance of VE, the AASHTO Value Engineering Technical Committee has established national awards to be given to transportation agencies. These awards are presented on a biennial basis to agencies that have shown special achievement in providing added value in process improvement, project delivery, construction, or design.

UDOT received the AASHTO VE Improved Process award for the SR-26, Riverdale Road, I-15 to Washington Boulevard project. This project team sped up construction time considerably by applying Value Engineering recommendations from the study. They were able to increase capacity on Riverdale Road and make the system work better while reducing roadway user costs.

UDOT also received the AASHTO VE Honorable Mention for Preconstruction projects over $75 million. The I-15 at 11400 South Interchange project provides an additional east-west arterial roadway, about 6 miles in length, from Bangerter Highway in South Jordan to State Street in Sandy, both principal north-south arterial highways. A new interchange is proposed where 11400 South crosses under I-15 just west of State Street. The VE team generated 33 ideas with 14 ideas selected for inclusion in the RFP for this design-build project for a total estimated savings of $17,414,000 (7.1 percent of project cost).

PROJECT MANAGEMENT

Project Management Meeting Trip Reduction Initiative - Adobe Connect Pro Meeting Implementation (PDConnect Meeting)
Strategic Goal: Operation
Savings: $234,000 estimated annually; $60,000 actual savings for six PDConnect Meetings
Efficiency: Reduced travel for training and meetings

The implementation of Adobe Connect Pro over the past year has been extremely successful. Many UDOT groups have used this product to more efficiently communicate with their customers. More people are able to participate in training and coordination with much less time consumption.

The “PDConnect” meeting is an exemplary use of this technology. The purpose for these meetings is to relay
current project delivery information, training, and news to the project delivery teams. On average, about 60 people have participated in each of the six regularly scheduled monthly meetings. These efficient meetings last about 45 minutes, and participants can easily attend from their desk computers or adjacent conference room. No travel time is required. Without this technology, many people would not be able to attend these meetings, and the result would be less informed project delivery teams. Mistakes due to delays and unshared information by these teams could cost a significant amount of money. The direct cost savings for the six PDConnect meetings alone is approximately $60,000.

**RESEARCH**

**Infrasound Avalanche Monitoring System Research Evaluation**

*Strategic Goal: Preservation, Operation, Safety*

*Savings: Potential for reduced avalanche control costs*

*Efficiency: Improved avalanche monitoring and control to lessen impacts to roadway users*

Little Cottonwood Canyon Road, or SR-210, connects the Salt Lake Valley with the Town of Alta, Alta Ski Lifts, and Snowbird Ski Resort at the top of Little Cottonwood Canyon. The road is the only method of access for the communities, resorts, trailheads, and private properties along the canyon’s length. SR-210 is threatened by 35 major avalanche paths; all but three of these paths originate on the southerly facing slopes on the north side of the canyon. The White Pine, White Pine Chutes, and Little Pine avalanche paths are some of the most active paths in Little Cottonwood Canyon. The steepness and confined nature of these paths allows even small to medium sized avalanches to reach the road. These paths frequently respond first in natural avalanche cycles triggered by heavy precipitation.

Currently, avalanche control is accomplished through road closure and artillery control, occasionally supplemented by helicopter control. UDOT has a seasonal staff of four full-time avalanche forecasters stationed in the canyon, who coordinate closely with snow safety departments at the local ski areas. The Little Cottonwood Canyon forecasters have some of the most technologically advanced equipment available, but they still face problems in the canyons. For instance, in inclement weather or low visibility, they cannot determine visually whether avalanche activity is occurring naturally or whether control efforts have been successful. Furthermore, visual confirmation can mean placing UDOT staff in danger of avalanche activity. Unlike avalanche control operators at the ski resorts, the Little Cottonwood Canyon forecasters cannot use ski lifts to access the avalanche starting zones and determine if control efforts have been successful. To combat this problem, UDOT installed an Infrasonic Avalanche Detection system in 2006 to monitor three locations in Little Cottonwood Canyon: White Pine, White Pine Chutes, and Little Pine. The Infrasonic provides remote sensing of avalanche activity to allow Little Cottonwood Canyon forecasters to monitor avalanche risks when visibility is poor. Prior to installation, the Little Cottonwood Canyon forecasters hoped that the Infrasonic would provide early warning of natural avalanche cycles and confirm avalanche control efforts.

The purpose of the completed research evaluation was to address questions relating to the Infrasonic’s ability to provide reliable early warning of natural avalanche cycles and confirm
control operations, as well as to reduce costs for UDOT, ways to improve the Infrasonic system, and whether an expanded Infrasonic system would benefit UDOT or other state DOTs? Several methods were used to ascertain this information, including interviewing key staff members, obtaining data outputs from the Infrasonic system, obtaining notes from the forecasters’ logs, and reviewing comparable remote monitoring technologies.

The analysis showed that the Infrasonic did provide early warning of natural avalanche cycles. It also showed that the Infrasonic confirms the success (or failure) of avalanche control operations. In the past, unless avalanche control operations triggered slides that reached the road, the Little Cottonwood Canyon forecasters generally could not confirm whether control efforts were successful, particularly if visibility was poor. The Infrasonic allows the forecasters to know, in real time, whether the ammunition hit the target; whether the ammunition detonated; and whether the detonation triggered an avalanche.

The Infrasonic likely reduces costs, though this may not be quantifiable yet. First, the Infrasonic improves public safety by providing better information for road closure decisions. Second, the Infrasonic improves safety for UDOT avalanche control staff. In the past, if the avalanche forecasting team was not able to verify whether control operations in White Pine or Little Pine had been successful, their choices were either to assume the risk or send someone out to verify efforts in the field. Both of these benefits can be considered in terms of the cost of human lives, whether they represent members of the public or UDOT staff: either way, improved safety reduces these intangible costs. Third, the Infrasonic can potentially reduce the duration of road closures, which represents an economic benefit to the ski resorts in Little Cottonwood Canyon. Fourth, the improved efficiency of avalanche control operations in Little Cottonwood Canyon can reduce staffing costs. Shorter road closures requires less time from both UDOT staff and the Salt Lake County Sheriff, which assists in canyon sweeping efforts and controlling traffic at the base of the canyon.

UDOT staff unanimously agreed that the system’s usefulness justified its expansion. In Little Cottonwood Canyon, several locations were identified for system expansion: above the Town of Alta, Snowbird Village, between Little Pine and Snowbird Entry 4, or Slide Canyon in Provo Canyon. However, there are some limitations to the Infrasonic. These include UDOT’s limited legal ability to manipulate the software codes; communication glitches; and a limited potential for transferability of the system to new locations and new user groups.
RIGHT OF WAY

Decentralization of the No ROW Certification
Strategic Goal: Operation
Savings: Time savings
Efficiency: Reduced time required prior to project advertising

One of the major innovations implemented this past year is the decentralization of the No ROW certification. Previously, all ROW certifications had to be sent to the ROW Director for review and approval. Now, the region director may review and approve the No ROW certification, saving up to two weeks time to advertise for construction.
Systems Planning & Programming

Efficiencies and Accomplishments 2009

ASSET MANAGEMENT

Pavement Condition Data Collection
Strategic Goal: Preservation
Savings: Reduced staff time for collecting pavement condition data
Efficiency: Improved ability to model pavement condition and recommend future projects

The Asset Management Division contracted with a vendor to collect our pavement condition data and road view images. This effort enabled us to combine the pavement condition data collection with the roadway image data collection, and provide a web based application for access to all the data. Because of the vendor’s specialized equipment, they were able to collect pavement images and road view images, as well as measure surface cracking, surface roughness, wheel path rutting, and then provide an integrated dataset for all of the collected data.
The integrated data set can be accessed through the internet using our vendor’s VisiWeb application and also through a desk top application, which our pavement management practitioners can use for a more detailed look at the condition data.

This effort had two effects on the Asset Management Division. First, it allowed the Division to reduce our staff by one FTE through a retirement and it also freed up almost one FTE within our pavement data collection unit to concentrate on other tasks that we were behind on. Second, it has allowed us the luxury of collecting pavement condition data that we have not been able to collect in years past. This additional data will enhance our ability to model pavement condition, recommend future projects and forecast future budget needs.

**PLANNING**

**Statewide Travel Demand Model**
Strategic Goal: Operation, Safety, Capacity  
Savings: Potential time and cost savings in allocating capacity project funds  
Efficiency: Earlier decision-making for capacity projects

The Planning Division developed a predictive traffic model that helps us ‘Make the System Work Better’ by having the ability to evaluate all of the state routes as a system, rather than as a single roadway or corridor, today and into the future. This model allows analysts and decision-makers insight into the current and future needs and to have a sense of when those capacity improvements are needed. To ‘Increase Capacity’ of our system, this model can identify statewide capacity needs and provide the necessary information to assist in defining the increased capacity need. The travel model provides data that can identify current and future congested areas and the required ‘Increased Capacity’ necessary to ‘Improve Safety’. The efficiency in this statement is that the model can help us with decisions earlier in time to reduce fatalities, add lanes and maintain mobility closer to an optimal level that is linked to available funding sources. These efficiencies offer the opportunity to strategically allocate resources to projects now and plan for additional resources into the future.

**Geographic Information System (GIS)**
Strategic Goal: Operation, Safety, Capacity  
Savings: Reduced staff time required for researching databases  
Efficiency: Improved ability to address planning-phase issues at a system level

The Planning Division developed a GIS system that contains information from UDOT, resource agencies and other sources. The GIS system allows for a broad range of information to be analyzed and reported which can help ‘Make the System Work Better’ by allowing complex issues to be understood and acted upon. This GIS System can help Planning be more efficient by addressing a variety of issues in the planning phase and at a system level. The system can also assist Planning with the ability to analyze safety, congestion, environmental and other factors together, resulting in the ability to reduce fatalities and increase capacity.
The basis of the GIS system is to help Planning be more efficient through capturing, storing, analyzing and displaying data. This increased efficiency and capability allows Planning to evaluate many different pieces of information and determine and retain that information in a reusable and efficient manner. Planning efficiencies continue to increase over time as the GIS system is used and more information and study of the data becomes available and is used in the decision making process. These efficiencies result in less time needed by Planning staff to research and find information.
Operations

Efficiencies and Accomplishments 2009

AERONAUTICS

Decommissioning of the Logan VOR Air Navigation Facility
Strategic Goal: Operation
Savings: $12,000+ per year in technical maintenance cost, plus monthly electric cost
Efficiency: Reduced maintenance required

Performance Audit
Strategic Goal: Preservation, Operation
Savings: Over $75,000 total annual savings
Efficiency: Reduced staffing required

Dye Management Group, Inc. was contracted by UDOT to conduct an independent analysis of the business and management practices regarding airplane operations of the Division of Aeronautics and Dept. of Public Safety. The Dept. of Public Safety sold their twin-engine Beech Baron, and the pilot who retired was not replaced. Savings to DPS include elimination of an FTE, aircraft maintenance and insurance. The Aircraft Maintenance Supervisor for the Division of Aeronautics retired before the end of FY09. One of the two remaining mechanics was promoted to Maintenance Supervisor, and an FTE for Aircraft Mechanic remains vacant. Total annual compensation savings for the Division of Aeronautics exceeds $75,000.

Coordination with Airport Sponsors for Maintenance Projects
Strategic Goal: Preservation, Operation
Savings: Approximately $100,000 for one year
Efficiency: Lower engineering and bidding fees and lower materials cost

The Division of Aeronautics successfully coordinated with several airport sponsors to combine small airport maintenance projects with local non-airport projects. The Division saved approx $100,000 last year from lower engineering and bidding fees, and lower materials cost (economy of scale).

Dutch John Airport Runway and Apron Reconstruction Project
Strategic Goal: Preservation, Operation
Savings: Over $300,000
Efficiency: Reduced construction time by using full depth reclamation for the base course

The Dutch John airport runway and apron reconstruction project included full depth reclamation of material for the base course, greatly reducing the time needed for construction and closing the airport. This process was also considered by the county to be more environmentally friendly or "green". The Division saved over $300,000 on this project.
EQUIPMENT

1. Fuel Efficiency Goals-
Strategic Goal: Preservation, Operation
Savings: Reduced fuel costs
Efficiencies:

1.1. UDOT has purchased a dedicated CNG street sweeper.
1.2. UDOT is in the process of retrofitting 2 light-duty pickup trucks with CNG.
1.3. UDOT has also purchased 4 more hybrid vehicles to bring the total up to 16.
1.4. UDOT has implemented an idle reduction program to monitor our idle time, as of this last year we reduced our idle time by 3.5%.
1.5. UDOT has downsized 4 vehicles from a ½ ton to mini-pickups, 2 vehicles from a ¾ ton to a ½ ton pickup and 4 trucks from a 1 ton to a ¾ ton pickup.

2. Cost Saving Goal-
Strategic Goal: Preservation
Savings: Reduced upfront vehicle costs
Efficiency:

2.1. UDOT has continued the lease and the buy-back program to save mechanic time and also down time. As of this year we have 17 leased backhoes, 6 buy-back loaders and 32 leased tractors.

3. Exploring New and Better Technologies-
Strategic Goal: Preservation, Operation
Savings: Reduced equipment usage costs
Efficiencies:

3.1. TowPlow and muni-body- We purchased 2 TowPlows and 2 municipal bodies to go with them to increase snow plow efficiency.
3.2. Preco GPS system- We have installed ten GPS units in our dump trucks to monitor blade wear and material usage.
3.3. Light-duty GPS- We have installed 22 GPS units in our light vehicles to monitor driver behavior and fuel consumption.
3.4. 1st Response Unit- We have purchased 2 more 1st response units which give us the capability to have a directional chute as well as mix salt water with the salt to make slurry to put down on the road. This should help the materials effectiveness.
3.5. Performance Chips- We have installed performance chips on 16 light-duty pickup trucks to improve power and increase fuel economy.
3.6. Epoke Spreader- We are going to test an Epoke sander for better spreading results. This is similar technology to the 1st response.
3.7. Rock Bed- We are buying a rock bed so that when we haul rock loads it will not destroy the side of the dump body.
4. **Radio Conversions**
   Strategic Goal: Preservation
   Savings: Retain current FCC radio licenses
   Efficiency:

   4.1 UDOT has been tasked with changing out all of the 150 Mhz radios to comply with the new FCC mandate of narrow banding. This goal is 50% complete and the remainder will be finished in this fiscal year.

**MAINTENANCE**

**Using TowPlow for Multi-Lane Snow Clearing**
Strategic Goal: Preservation, Operation, Safety
Savings: $25,000 this year due to better plowing efficiency
Efficiency: Overall plowing efficiency increased 25% on routes where TowPlow was used

A high capacity side-swing plow unit was deployed in Region 2 during the late winter of 2008-2009. The unit consists of a 24-foot snow plow mounted to a dual swivel axle frame that swings to the right behind a full size snow plow truck. The additional snow plow gives an additional 12 to 14 feet lane clearance per pass. The TowPlow unit is equipped with its own spreader and prewetting tank.

One TowPlow was deployed in Region 2 last year. A second unit will be delivered in mid-November for use in Region 1. The TowPlow adds 70 to 100% additional plowing capacity to the truck it is mounted on, depending on the original snowplow blade configuration of the plow truck. A single operator operates both TowPlow and traditional plows mounted on the truck. Since the TowPlow adds considerable weight to the truck, fuel consumption is increased by about 10%. Maximum safe plowing speed is reduced to 35 MPH for the truck/TowPlow combination.

The wider swath enabled UDOT crews to clear I-80 Parley’s Summit travel lanes with two trucks rather than the three plow trucks normally used. Overall plowing efficiency on the routes where the TowPlow were used increased 25%, with no reduction in service levels.

An unexpected result of using the TowPlow was the ability to clean turn pockets and bus loading zones on city streets in Park City with a single pass. We received “kudos” from appreciative transit users in Park City for our clever innovation.

The second TowPlow will be used on I-15 and SR-67 in South Davis County. The added capacity should partially offset plowing recent lane gain projects in that area. While the TowPlow worked well in mountainous interstate conditions, we anticipate even more savings.
Numerically Controlled Plasma Plate Cutter
Strategic Goal: Preservation, Operation
Savings: About $10,000 in direct savings this year
Efficiency: Reduced fabrication time of snow plow mount parts

UDOT custom fabricates snowplow mounting brackets for each new snow plow truck. In the past these parts were hand cut using traditional methods. Using the plasma plate cutter fabrication time for complex plow mount parts has been reduced by 40%. The most significant savings however is a 70% reduction in plate scrap. The new cutter is much more accurate and precise in creating replicate parts.

(1) Complex steel parts cut from ¾” steel plate in fifteen minutes; (2) Plow mounts awaiting painting

Fabrication and assembly of plow mounts was completed prior to delivery of the cab and chassis. In the past hand cutting and fitting usually was still going on after the truck order was received.
Purchase of a new plasma plate cutter was partially funded as a Maintenance Methods demonstration project in 2008 to speed up delivery of snow plow equipped trucks to the UDOT fleet.

Overall, fabrication time has been reduced, steel scrap has been substantially reduced, and repair part fabrication has been standardized. Overall, the fabrication shop has realized about $10,000 in direct savings during FY2009 resulting from the using a state-of-the-art numerically controlled plasma plate cutter. Truck delivery to field units was accelerated in FY2009 in that units were delivered 10 to 14 days faster than previous years. John Walker, Fabrication Shop Manager, attributes most of this time to reduced cutting and fitting of plow mounts in his operation.

**Remote Road Condition Viewing Using Off-the-Shelf Technology**

Strategic Goal: Preservation, Operation
Savings: $23,000 in actual savings for eight sites this year
Efficiency: Avoided sending observer and truck to site when not needed, and received advance warning of poor road conditions

Initially five remote cameras were installed as proof-of-concept for possible UDOT utilization. Station Supervisors dispatched snowplows based on observing actual road conditions rather than guessing what was happening at remote areas and on mountain passes. The test was so successful that a total of nine sites were installed. Remote feed was provided to TOC operations room with no technical difficulty. Putting the streaming feed on TOC channels allowed UHP troopers to watch road sites to get pre-arrival estimates of crash severity. TOC staff reported watching traffic behavior under poor road conditions.
The project was so successful that the TOC commissioned construction of trailer-mounted temporary viewing cameras to monitor traffic flow in bridge construction zones in Utah County. An additional eight sites are being installed this season with full TOC integration. An additional low-cost feature this season will be an infrared lamp and camera to allow dark night viewing without installing a new luminaire. The infrared light will be turned on for sixty seconds at a predetermined pavement location. Only UDOT staff with appropriate passwords can operate the infrared spotlight and camera.

Viewing availability was over 99.9% during the winter 2008-2009 season. Costs have been contained under budget as a result of the innovative contracting used for the initial developmental work.

**MOTOR CARRIER**

**Improvements in Crash Data Analysis and Processing**

Strategic Goal: Operation, Safety  
Savings: Reduced analysis and reporting time  
Efficiency: Enhanced ability to analyze commercial vehicle crash data and do federal reporting

In collaboration with the UDOT Traffic and Safety Division, the Motor Carrier Division (MCD) worked to establish a commercial vehicle module within the Safety Management System (SMS). This system enabled the MCD to improve their ability to analyze commercial vehicle crash data and enhanced reporting to the Federal Motor Carrier Safety Administration (FMCSA).

For the past several years, the MCD has been challenged with uploading commercial crashes because an electronic submittal method of reporting has been broken and it has been difficult to gain accident reports, especially in an electronic format from all law enforcement agencies throughout the state. This rendered the MCD unable to report crashes for a significant portion of the primary routes for 2006, 2007 and 2008. This challenge created difficulties for the MCD in that they were unable to effectively establish strategies to reduce commercial vehicle related crashes. In addition, the inability to upload crash data to the FMCSA disqualified the MCD from several federal grant or safety funding opportunities.

The completion of the SMS system has rectified this challenge. The commercial module of SMS has provided for electronic accidents report forms to upload automatically. Once these accidents are reviewed and verified SMS will upload them to the FMCSA. For those agencies not using an electronic accident report, the MCD manually enters commercial crash data, which creates an electronic record and then is uploaded to the FMCSA. The MCD has entered, verified and uploaded all commercial crash reports for 2006, 2007 and 2008. This accomplishment has improved the ability to analyze and attack causes for commercial vehicle related crashes. It has also enabled us to pursue federal funding sources, which can be utilized to combat commercial crash causations.
**Increased Commercial Vehicle Inspections**

Strategic Goal: Safety  
Savings: Potential for reduced accidents and accident-response related costs  
Efficiency: Automated credentialing system allows for more commercial vehicle inspections

In Fiscal Year 2008, the MCD launched an automated oversize, overweight and credentialing system. This system has proven to be very successful. Our records through Fiscal 2009 reflect that more than 70 percent of the total permits sold last year have been self-issued by the customer. This process has enabled the MCD to reallocate several work assignments and personnel, which allowed for more focus on commercial vehicle and driver inspection. In conjunction with the Utah Highway Patrol, Commercial Vehicle Bureau, the MCD inspected vehicles and drivers than ever in their history. The following chart reflects that in Fiscal Year 2009 the MCD and their UHP partners achieved more than 40,000 total inspections.
TRAFFIC AND SAFETY

Reduced Fatalities (‘Zero Fatalities’ Strategy)
Strategic Goal: Safety
Savings: Reduced traffic fatalities
Efficiency: Reduced traffic fatalities by 8% in the last year

The primary goal of Zero Fatalities is to help people understand that the top contributors to fatalities are: driving drowsy, distracted, aggressive, impaired, and unbuckled. These are all driver behaviors. By avoiding these five behaviors, we can make dramatic reductions in traffic fatalities, moving closer to the statewide goal of Zero Fatalities.

Zero Fatalities is Utah’s ultimate traffic safety goal. As a result of this unified strategy, all other traffic safety campaigns and programs in the state fall under the Zero Fatalities program. They carry the Zero Fatalities logo in their advertising and educational outreach materials and they cross-promote each other. This approach helps raise awareness of Utah’s unified focus on traffic safety. It also shows how efficiently the state shares resources, coordinates together and works with the various state agencies. Each organization follows the mission of Utah’s Comprehensive Safety Plan and has adopted the goal of Zero Fatalities.

Campaigns under the Zero Fatalities umbrella:
- Boost 'Til 8 – Booster Seat Usage - Utah Safe Kids Coalition
- Truck Smart – Commercial Motor Vehicle Safety - UDOT Motor Carrier Division
- Click It Or Ticket – Seat Belt Usage - Utah Highway Safety Office
- Sleep Smart. Drive Smart. – Drowsy Driving - Utah Highway Safety Office
- Spot The Tot – Child Safety - Primary Children’s Medical Center
- Heads Up – Pedestrian Safety - Utah Highway Safety Office
- Buckle Tough – Rural Seat Belt Usage - Utah Department of Health
- Never Leave Your Child Alone – Child Safety - Primary Children’s Medical Center
- Drive to Stay Alive – Commercial Motor Vehicles - UDOT Motor Carrier Division
- Alive at 25 – Teen Driving – Utah Safety Council

Based on annual research conducted by Dan Jones and Associates on behalf of Zero Fatalities, the survey results have shown that more than 50 percent of the adult population in Utah is aware of the Zero Fatalities program thanks to the outreach activities.

Since 2000, traffic fatalities have been reduced by 26 percent. Compared to the previous year, traffic fatalities were reduced by 8 percent, from 299 to 276 as shown in the graph below.
Reduced Teen Driving Fatalities ("Don't Drive Stupid" Campaign)
Strategic Goal: Safety
Savings: Reduced teen fatalities
Efficiency: Reduced teen fatalities by 42% in the first year of campaign

UDOT crash statistics show that teenage drivers represent eight percent of the licensed drivers in Utah, yet they were involved in more than one-quarter (26 percent) of all motor vehicle crashes. To combat the growing concern over teen crashes, more than a dozen organizations across Utah have combined efforts to create a Teen Driving Task Force. The group agreed to follow the mission of Utah’s Comprehensive Safety Plan and adopt the goal of Zero Fatalities. With an edgy look and in a language teens understand, the Don't Drive Stupid brand has become the message from teens, to teens. They have embraced and adopted the message, making it an easy-to-use catchphrase they can throw at their friends.

Utah’s Teen Driving Task Force is comprised of representatives from the following organizations:
- Utah Department of Transportation
- Utah Department of Public Safety
- Utah Department of Health
- Utah Highway Patrol
- Utah Driver License Division
- Utah Highway Safety Office
- Utah Department of Education
- Utah Department of Health
- Primary Children’s Medical Center
- Salt Lake Valley Health Department
- Central Utah Public Health Department
- Emergency Medical Services for Children
- Utah PTA.

After the first year, fatalities among 16-19 year olds dropped 42 percent.

Here are a few things that the Teen Driving Task Force has been able to accomplish:
- Give presentations in dozens of high school driver ed. and health classes across the state
- Hold high school assemblies with parents of teen fatalities
- Conduct educational outreach activities during high school lunch breaks
- Give numerous presentations at community/county safety fairs.

As part of the campaign, a Teen Memoriam Yearbook entitled “Sixteen Reasons Why Zero is the Only Acceptable Number” was published and distributed to the public. This memoriam shares the stories of 16 teens who lost their lives on Utah's roads in 2007. The parents of these teens agreed to share their stories in hopes of reminding people of the responsibility we bear when we get behind the wheel of a vehicle. The yearbook earned the Silver Award in the National Health Information Awards, Government division, Injury Prevention, Booklet category. An excerpt from the yearbook is shown in the figure at right.
Traffic and Safety continues to implement new strategies to reduce the delivery time of signal projects. This effort focuses on four main areas:

- Utilizing State Forces
- Using on-call Consultant Engineering contracts
- Procurement contracts for Construction firms
- Typical Design-Bid-Build projects.

During the past year State Forces were used primarily to handle left-turn phasing upgrades at existing signalized intersections. When appropriate we also utilized the option to change order this type of work into existing construction projects.

By using on-call contracts with consultant engineering firms, the design time of signal projects has been shortened. These on-call contracts are used on less complex signal projects, typically not involving utilities or right-of-way issues. With most projects, the signal project design is complete in one month as compared to three months typically.

New signal construction is done exclusively by private contractors with procurement contracts and the normal advertisement process. More than half of the new signal projects this year have been successfully constructed by procurement contract. The cost to construct using procurement contracts is approximately two-thirds the cost of a typical advertised project. The benefits include timeliness and cost savings. The overall savings is due to reduced overhead on the part of the contractor and UDOT.

The biggest benefit to UDOT is the timeliness. The typical signal constructed by procurement is fully operational within 1 month after the design is complete. Constructing a similar advertised project takes at least 6 months. Using on-call engineering consultant contracts has reduced the average design time from two months to one month.

By using these methods – one month on-call design/one month procurement contract construction, the public can have a fully operational signal project in two months as compared to minimum eight months with a design-bid-build process.
TRAFFIC MANAGEMENT

New CommuterLink Web Site
Strategic Goal: Operation
Savings: Potential roadway user cost savings
Efficiency: Improved public access to real-time roadway traffic and condition information

In November of 2008, the Traffic Management Division launched a completely new version of the CommuterLink web site. The web site has a number of innovative features, including:

- An easily navigated map that can be panned and zoomed.
- A table showing real-time travel times on I-15, I-80, SR-201, I-215, and the Legacy Parkway. Travel times on I-15 include both the general purpose lanes and the Express Lane.
- A summary of traffic incidents, color-coded by severity as shown in the figure below.

![CommuterLink Map](image)

- A summary of all UDOT construction projects, including a color-coded measure of their traffic impact, in a list that can be sorted by location or traffic impact severity.
- Weather forecasts for cities in Utah.
- Additional links, including a link to report traffic signal problems, and links to neighboring state web sites.
- Additional traffic camera locations, including US-6 and the Legacy Parkway.

In FY 2009, the website recorded 2,616,400 user sessions and 802,999,200 hits.
Mobile CommuterLink Web Site  
Strategic Goal: Operation  
Savings: Potential roadway user cost savings  
Efficiency: Improved public access to real-time roadway traffic and condition information  

In conjunction with the new CommuterLink web site, the Traffic Management Division also implemented a mobile web site designed specifically for web-enabled mobile phones and PDA’s. When the CommuterLink web site server detects that is being accessed by a mobile device, it automatically redirects the user to another server. The mobile web site server then provides a simplified version of the CommuterLink web site that has text and graphics that are compatible with that particular hand-held device. The mobile CommuterLink web site provides a summary of traffic incidents, traffic camera views, and the text of current variable message signs displays. An image of the mobile interface is shown in the figure below.

LED Retrofits of Electronic Variable Message Signs  
Strategic Goal: Preservation, Operation, Safety  
Savings: Estimated $131,000 per year in reduced electrical costs  
Efficiency: Brighter and more energy efficient LED displays  

The Traffic Management Division has completed the retrofit of 47 freeway variable message signs with new light-emitting diode or LED displays. This project has been underway for three years and was completed in FY 2009. The LED displays replace the older system of incandescent bulbs with mechanical shutters. The retrofits were accomplished by installing new LED light source panels into the existing sign housing.

The new LED displays are brighter and easier to read, and can be more easily dimmed at night and brightened during the day. The LED’s also provide the following benefits:

- With no moving mechanical parts, the LED signs are more trouble-free, resulting in more reliable performance and less maintenance.
• The LED’s have a longer expected life in comparison to incandescent light sources.
• LED’s are more energy efficient than incandescent light sources. The savings in electrical costs for the 47 signs that were retrofit is estimated at $131,000 per year.

An example photograph of a retrofitted sign is shown below.

Expansion of Travel Time Messaging
Strategic Goal: Operation
Savings: Potential roadway user cost savings
Efficiency: Improved software for display of real-time travel times

The Traffic Management Division developed improved software that more easily permits the calculation and display of real-time travel times on UDOT’s variable message signs. Travel times are calculated by using average speed data collected by “traffic monitoring stations” that are typically located one-half mile apart on the freeway system in the Wasatch Front area. The software calculates the average speed of all vehicles on a section of highway, and then uses that estimate to determine average travel time between points.

The improved travel time processes were put into effect at the time of the opening of the Legacy Parkway in September 2008 in order to give motorists guidance about the use of the Legacy Parkway as an alternative to I-15. The photograph at right shows a sample message displayed on a variable message sign on northbound I-215.

In addition to the signs in the vicinity of the Legacy Parkway, travel time messages were also implemented on approximately 30 additional signs on I-15, I-80, I-215, and SR 201.
**Electronic Technician Training Program**
Strategic Goal: Preservation, Operation
Savings: Potential reduction in traffic signal maintenance costs
Efficiency: Potential reduction in traffic signal problems by having well trained technicians

In FY 2009, the Traffic Management Division completed the first full year of a training program for Electronic Technical Specialists. UDOT has about 40 Electronic Technical Specialists throughout the department. The technicians maintain and operate the 1,100 traffic signals that UDOT owns across the state. Crews of technicians also maintain freeway lighting, ramp meters, electronic signs, fiber-optic cable, traffic monitoring cameras, traffic speed and volume sensors, and road weather information systems.

Because technology is always changing rapidly in the electronics field, the Traffic Management Division established this program to help technicians remain current with the latest technology. Courses were taught by in-house UDOT personnel, consultants, and equipment manufacturers.