

Variable Speed Limits I-80 in Parley's Canyon



Speed Limit Legalities

Utah Code

Title 41, Chapter 6a Section 602

“The Department of Transportation shall determine the reasonable and safe speed limit for each highway or section of highway under its jurisdiction”

Speed Legalities

Utah Code

Title 41, Chapter 6a Section 602

“The Department of Transportation may establish different speed limits... based on:

(a)time of day

(b)highway construction

(c)type of vehicle

(d)weather conditions

Setting Speed Limits

UDOT establishes speed limits based on:

- Roadway design speed
- Prevailing vehicle speeds
- Accident history
- Highway traffic and roadside conditions
- Other highway safety factors.

Prevailing vehicle speeds are one of the biggest considerations.

Its all relative

If we don't allow highly capable vehicles to go faster than the 85th percentile speed in good weather,

Why would we do the same in bad weather?

The Variable Speed Limit Idea

Northern Utah – several years ago

- UHP proposes a variable speed limit in Sardine Canyon between Brigham City and Logan
- UDOT does our research and agree that it's a good idea.

UDOT Goes for it

UDOT's Decision: Install VSL on I-80 in Parley's Canyon. Existing infrastructure allowing cost reduction is an important factor.



Construction

A brand new system needs:

- Hardware
- Software
- Testing

Any system needs

- Power
- Communications



System Details

The I-80 Parley's VSL system consists of:

- 15 Signs
- Arranged in 4 zones
- 2 zones westbound
- 2 zones eastbound
- Upper and lower canyon zones

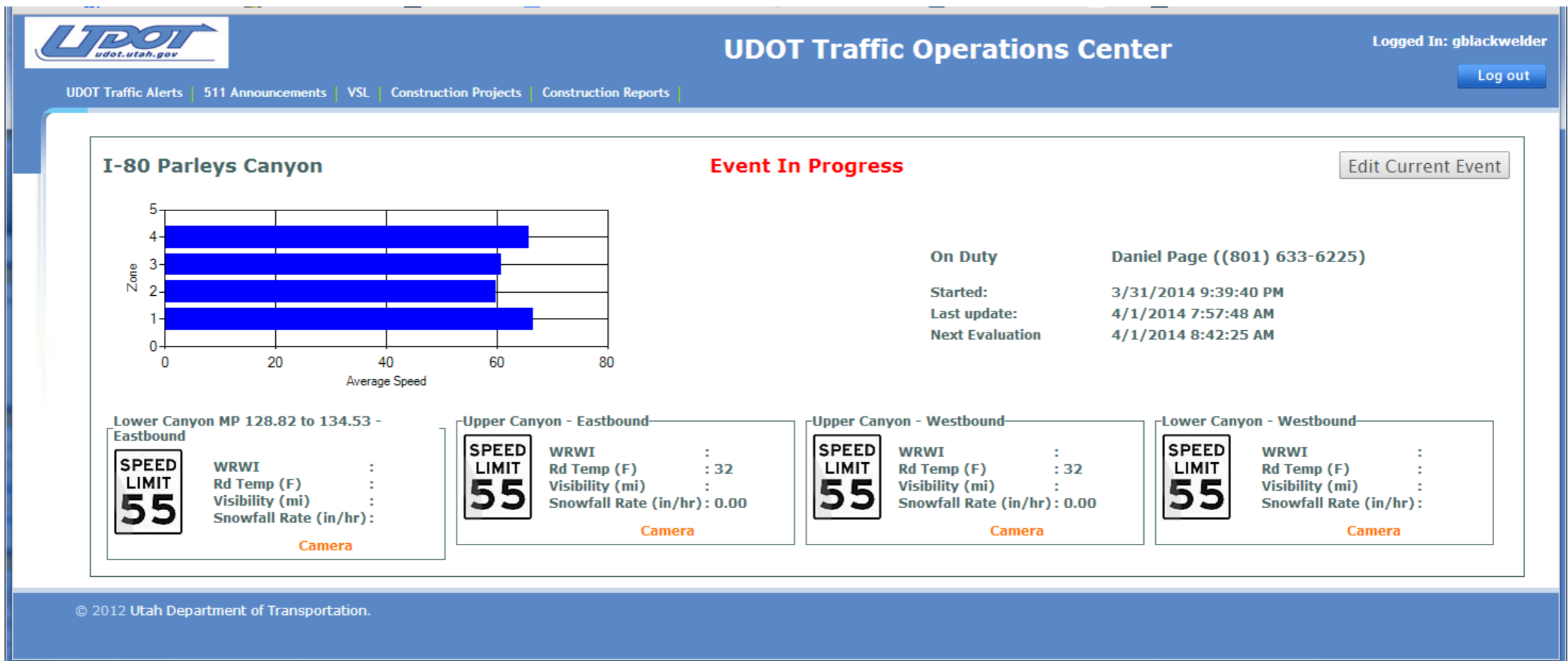


Project Details

- Cost of just over \$700,000
 - Roughly \$40,000 per sign
 - Actual sign costs are a fraction of the total
 - a good portion of that went into getting the power and communications to the signs
 - Solar and cell vs. hardline power and communications was a big decision
- Project Challenges
 - Dependent on several road projects – benefits because of same contractor
 - Discovery of bad conduit at the mouth of the canyon

Software

UDOT developed a custom interface for our sign control software



Software Process

The software creates a record of speed limit decisions in a weather event.

An event is triggered when it is requested by UDOT or UHP staff.

The screenshot displays the UDOT Traffic Operations Center interface. At the top, the UDOT logo and website URL (udot.utah.gov) are on the left, and the title "UDOT Traffic Operations Center" is in the center. On the right, it shows "Logged In: gblackwelder" and a "Log out" button. Below the header, a navigation bar contains links for "UDOT Traffic Alerts", "511 Announcements", "VSL", "Construction Projects", and "Construction Reports".


The main content area is titled "I-80 Parleys Canyon" and shows a "No Events" status. It displays data for four segments: "Lower Canyon MP 128.82 to 134.53 - Eastbound", "Upper Canyon - Eastbound", "Upper Canyon - Westbound", and "Lower Canyon - Westbound". Each segment shows a "SPEED LIMIT 65" sign, a "Camera" icon, and a table of weather-related data: WRWI, Rd Temp (F), Visibility (mi), and Snowfall Rate (in/hr). The "Upper Canyon" segments show a temperature of 49°F and a snowfall rate of 0.00 in/hr. The "Lower Canyon" segments show empty fields for these values. A "Create New Event" button is located in the top right of the main content area.

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Starting the Process

When an event is requested, the TOC operators contact an engineer who will run the event.



 **UDOT Traffic Operations Center**

UDOT Traffic Alerts | 511 Announcements | VSL | Construction Projects | Construction Reports

Operations | Weather | Engineers

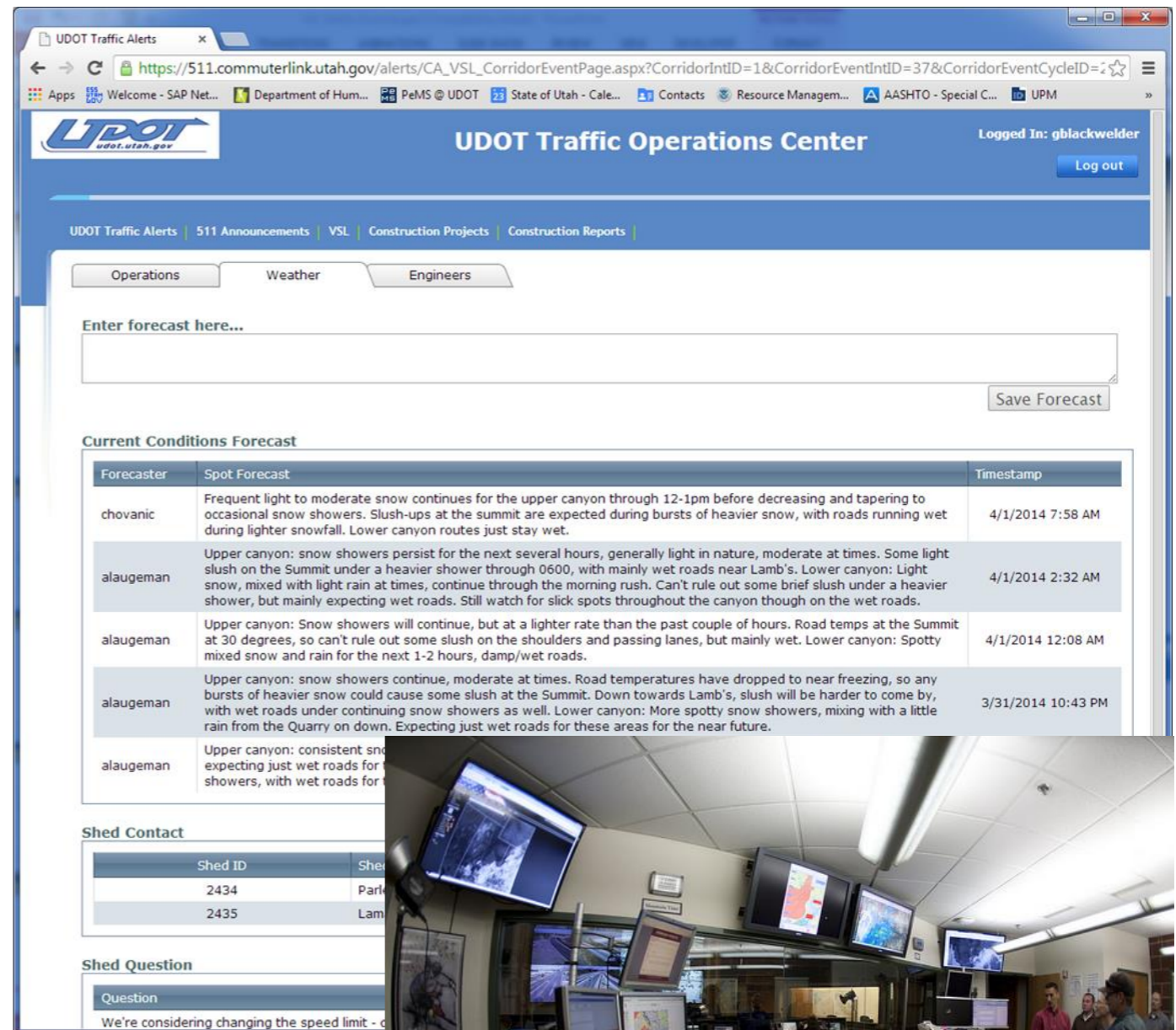
Name	Schedule Summary	Priority	Contact Number	Called	Answered	Assigned
Daniel Page		1	(801) 633-6225	<button>Click when called</button>	<button>Click on answer</button>	3/31/2014 9:42 PM
Marjorie Rasmussen		2	(801) 910-2160	<button>Click when called</button>	<button>Click on answer</button>	<button>Click to assign</button>
Nathan Lee		3	(801) 975-4844	<button>Click when called</button>	<button>Click on answer</button>	<button>Click to assign</button>
Bryan Adams		4	(801) 965-4111	<button>Click when called</button>	<button>Click on answer</button>	<button>Click to assign</button>
Glenn Blackwelder	Not available Wednesdays 7 a.m. to 9:30 a.m.	5	(801) 518-4180	<button>Click when called</button>	<button>Click on answer</button>	<button>Click to assign</button>
Rob Clayton		6	(801) 514-9780	<button>Click when called</button>	<button>Click on answer</button>	<button>Click to assign</button>
John Haigwood		7	(801) 573-7619	<button>Click when called</button>	<button>Click on answer</button>	<button>Click to assign</button>
Robert Hull		8	(801) 965-4273	<button>Click when called</button>	<button>Click on answer</button>	<button>Click to assign</button>

Time	UserName	Notes
3/31/2014 9:45 PM	tbullough	Requested from trooper 497 - roads getting wet from summit to mp 135 Weather desk stated snow was unlikely to end soon ATMS map linklayer showed speeds of 50 mph Contacted Danny Page, next eval at 22:15, speeds reduced to 55 mph in the canyon

Enter notes here...

Gathering Information

At the start of the event, the weather group at the TOC does a short-term forecast, and freshens it at 1-3 hour intervals.



The screenshot displays the UDOT Traffic Operations Center (TOC) website. The page includes a navigation bar with links to UDOT Traffic Alerts, 511 Announcements, VSL, Construction Projects, and Construction Reports. A forecast table is visible, detailing current conditions and forecasts for various road segments. Below the table, there is a 'Shed Contact' section and a 'Shed Question' section.


Forecaster	Spot Forecast	Timestamp
chovanic	Frequent light to moderate snow continues for the upper canyon through 12-1pm before decreasing and tapering to occasional snow showers. Slush-ups at the summit are expected during bursts of heavier snow, with roads running wet during lighter snowfall. Lower canyon routes just stay wet.	4/1/2014 7:58 AM
alaugeman	Upper canyon: snow showers persist for the next several hours, generally light in nature, moderate at times. Some light slush on the Summit under a heavier shower through 0600, with mainly wet roads near Lamb's. Lower canyon: Light snow, mixed with light rain at times, continue through the morning rush. Can't rule out some brief slush under a heavier shower, but mainly expecting wet roads. Still watch for slick spots throughout the canyon though on the wet roads.	4/1/2014 2:32 AM
alaugeman	Upper canyon: Snow showers will continue, but at a lighter rate than the past couple of hours. Road temps at the Summit at 30 degrees, so can't rule out some slush on the shoulders and passing lanes, but mainly wet. Lower canyon: Spotty mixed snow and rain for the next 1-2 hours, damp/wet roads.	4/1/2014 12:08 AM
alaugeman	Upper canyon: snow showers continue, moderate at times. Road temperatures have dropped to near freezing, so any bursts of heavier snow could cause some slush at the Summit. Down towards Lamb's, slush will be harder to come by, with wet roads under continuing snow showers as well. Lower canyon: More spotty snow showers, mixing with a little rain from the Quarry on down. Expecting just wet roads for these areas for the near future.	3/31/2014 10:43 PM
alaugeman	Upper canyon: consistent snow showers, with wet roads for the near future.	

Shed Contact

Shed ID	Shed Name
2434	Parke
2435	Lamb

Shed Question

Question: We're considering changing the speed limit - c

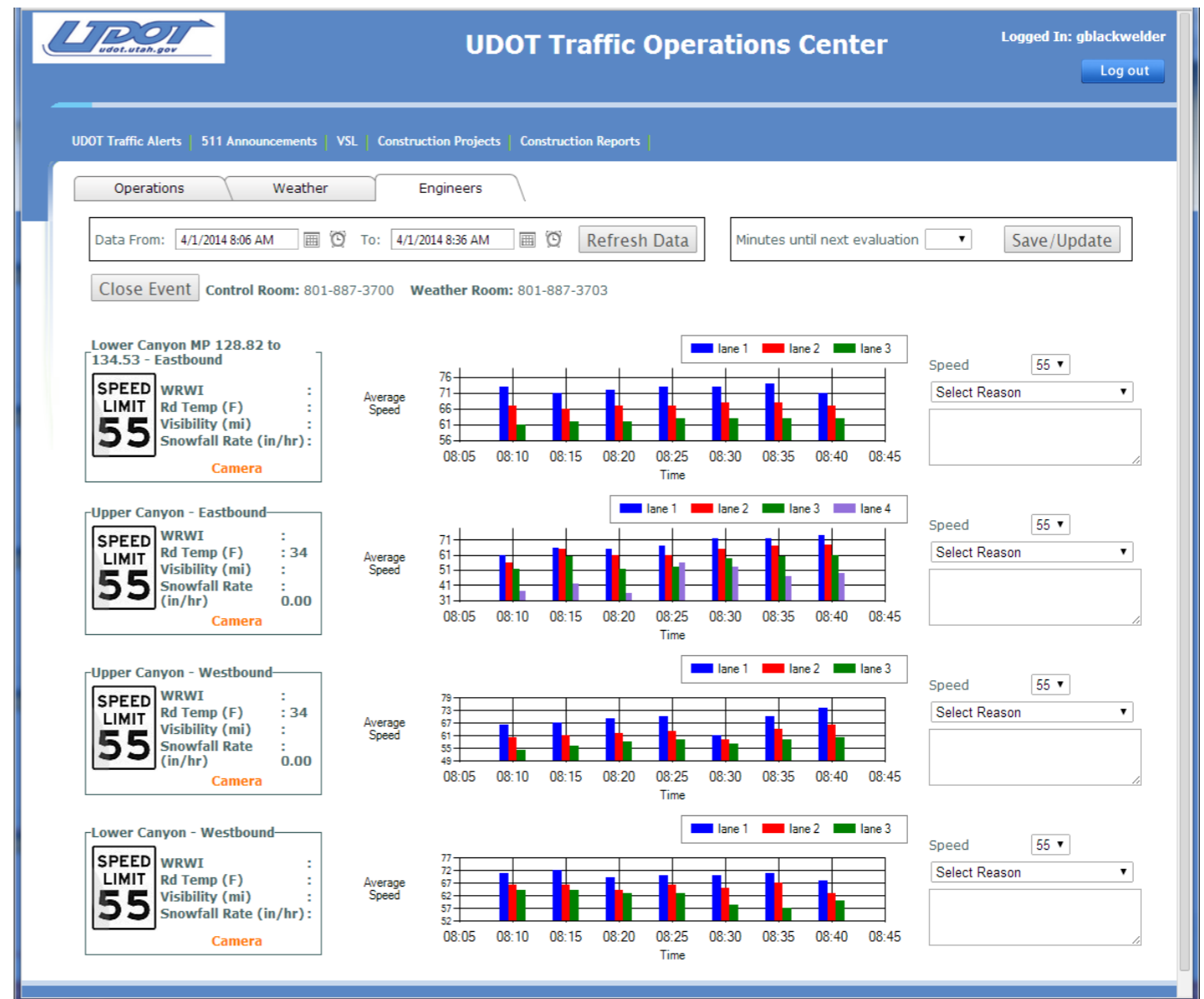


The photo shows the interior of the UDOT Traffic Operations Center. It features multiple computer monitors displaying traffic data and maps, with several staff members working at the consoles.

Setting the Speed Limit

The traffic engineer reviews the weather forecast, notes from the operators and then goes to this page

The graphs show speeds on I-80. Lane 1 is approximately the 85th percentile speed.



The Speed Decision

Factors in Speed Choice

- 85th Percentile Speed
- Expected weather trend (better, worse or the same)
- Shed Feedback (will road be clear soon?)
- Chain Restrictions
- End result – an engineering study

Implementing the Limit

Steps to Finalize Speed Limit

- Engineer enters selected speed and reason
- Signs change
- Automatic email to UDOT and UHP
- The TOC operators notify dispatch (start of event only)
- TOC operators post on overhead VMS



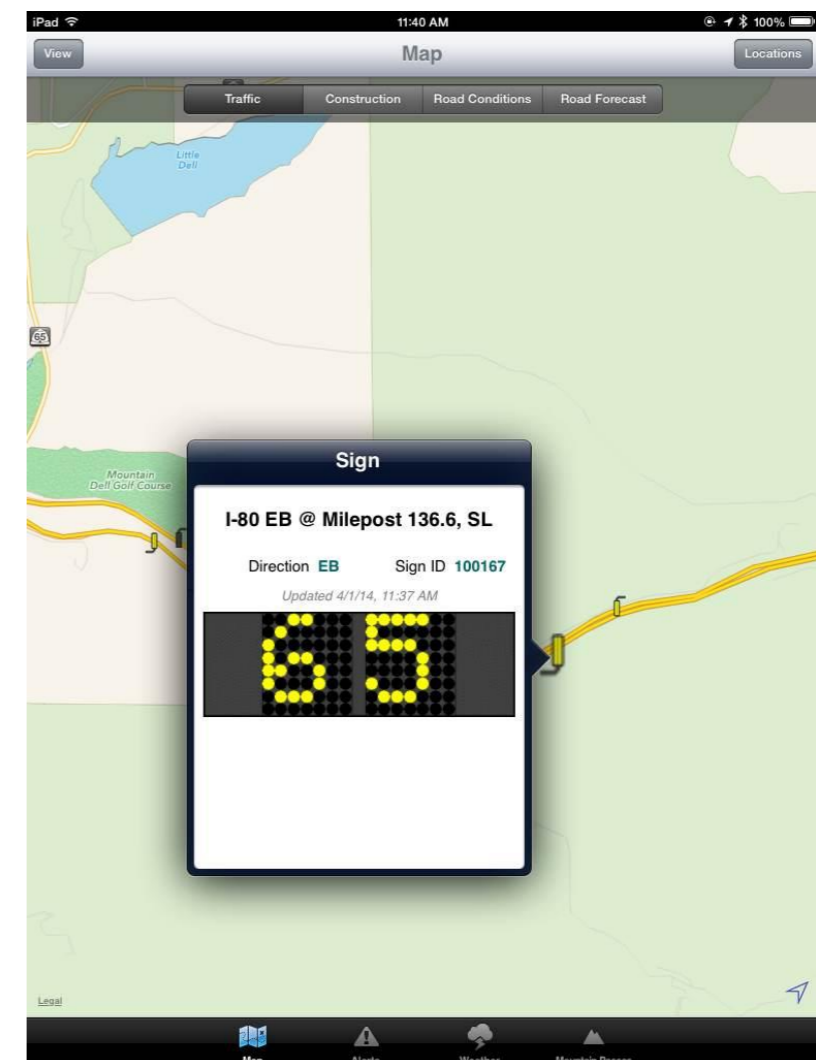
Photo: Chris Siavrakas

End of the Event

A VSL event ends when the speed returns to free-flow (above 65 mph in left lane) and there is no further weather expected.



Photo: UDOT



Results

Operational Stats

- First event on January 6, 2014
- 340 events through June 20, 2017
 - Some small number are test events
 - We do run for heavy rain in the summer.
- During those events, engineers evaluated and set speed limits over 1500 times

Reactions

Anecdotal Evidence

- We've received positive public and agency feedback
- The main complaint has been the brightness (or lack thereof) of the signs. This is being addressed.
- Speeds posted feel reasonable – with the exception of when we have changing conditions in the zone.



Operational Changes

- We've missed a few opportunities to lower the speed limit – we've asked our TOC operators, UHP and weather staff to be more aggressive on starting events
- The resources required to run are significantly more than anticipated. It takes about one full time equivalent to maintain and operate the syste.

Future of VSL

Here are a few of the locations VSL has been suggested:

- Sardine Canyon (the original idea)
- Provo Canyon (has infrastructure)
- I-15 in southern Utah (highest points on I-15)
- Salt Creek Canyon (near Nephi)



Future of VSL

- We will not build where the problems are localized (not corridor-wide)
- We will not build another system until we can automate operation – and we are studying automation
- We think the systems are more useful when they have a large speed range – we're looking forward to the first in an 80 mph zone.

Now is a good time for questions

