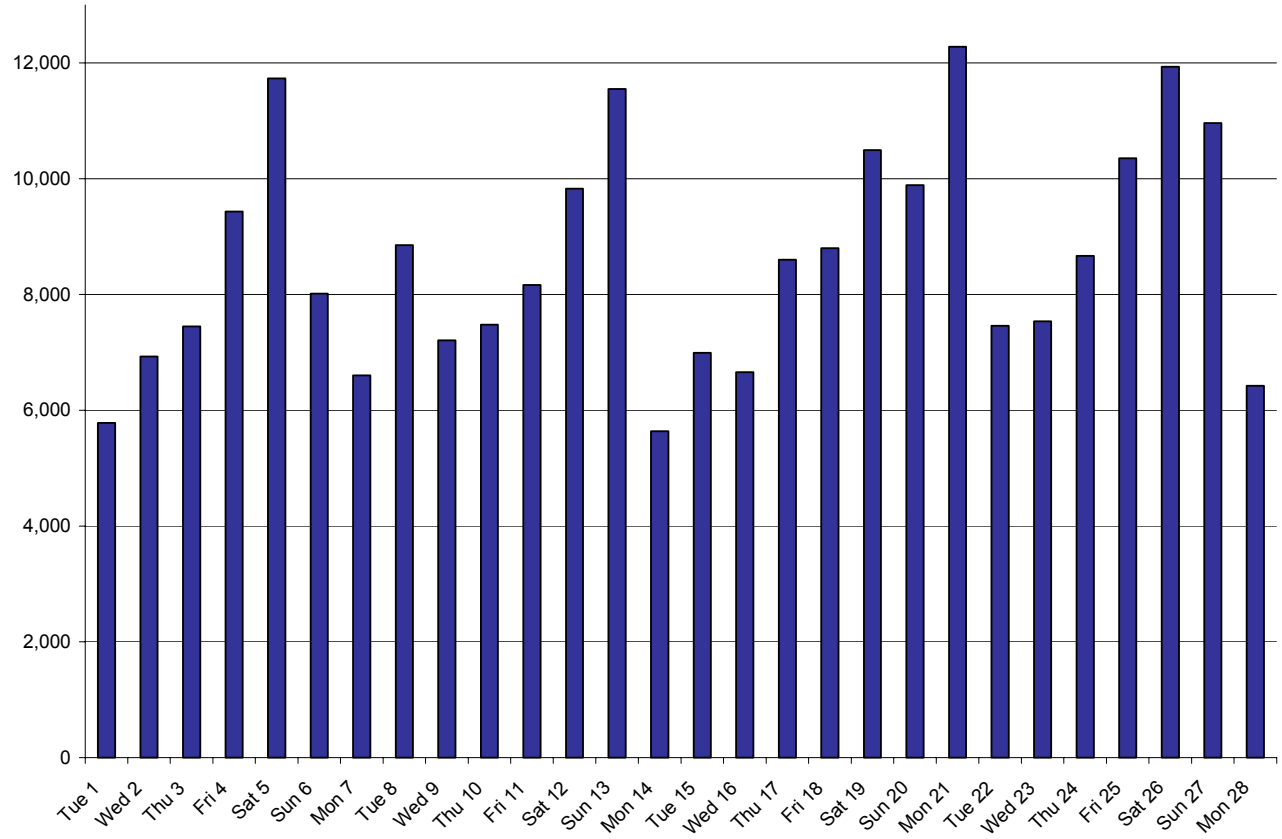
ranged between 1,096 and 1,248 for the years 1993-2003. The average 30th highest hour for these years was 1,180 vehicles/hour. Again, this information shows that even peak traffic conditions for Little Cottonwood Canyon have remained fairly consistent over the past decade.

2005 Traffic Volumes

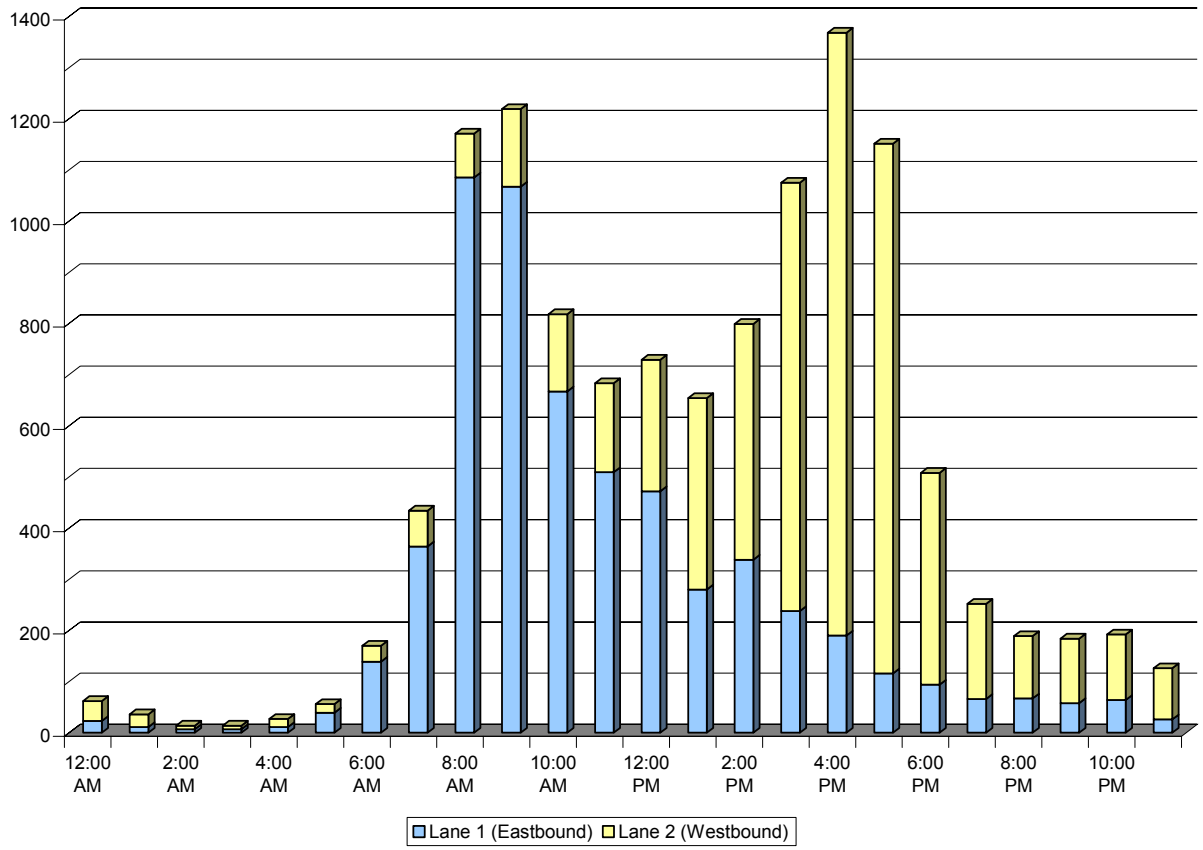
The past winter, 2004-2005, presented excellent ski conditions and as such traffic volumes during peak conditions were slightly higher than previous years. Figure 2-19 displays daily traffic volumes during the peak month of February 2005.

Figure 2-19: Daily Traffic Volumes February 2005



As shown in Figure 2-19, peak weekend traffic conditions ranged between 9,000 and 12,300, with President's Day (Monday the 21st) generating the most traffic. The highest non-holiday traffic day was Saturday the 26th. Figure 2-20 displays traffic volumes by hour and by direction for this peak day traffic condition.

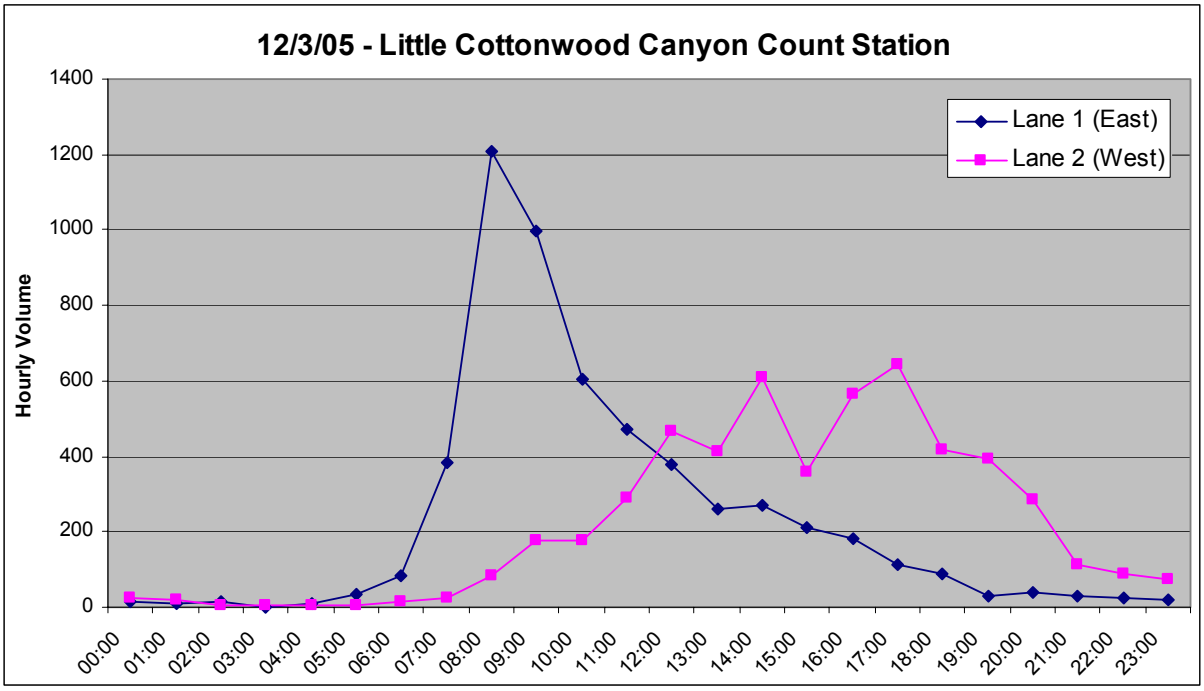
Figure 2-20: Hourly Traffic Volumes by Direction, Saturday February 26, 2005



As shown in Figure 2-20, on peak days, traffic is heaviest in the eastbound direction during the morning hours as people arrive at the ski resorts. The heavy morning traffic is mirrored in the westbound direction during the evening as people depart from the ski resorts. The highest traffic volume by direction is the westbound traffic volume at 4:00 p.m. (almost 1,200 vehicles). This hour also represents the highest combined total for both directions (almost 1,400 vehicles).

Project team members observed traffic and roadway conditions on Saturday, December 3rd, 2005, when a winter storm impeded traffic flow leaving the resorts in the afternoon. In these conditions, travel time from the upper Alta parking lots to the mouth of Little Cottonwood Canyon was roughly four hours. This was due primarily to whiteout weather conditions, slick roads, and a large number of vehicles attempting to enter the traffic stream from the four Snowbird access points. Figure 2-21 illustrates directional traffic volumes by hour for Saturday, December 3rd. As the table shows, the westbound traffic volumes exiting the canyon that day never exceeded 650 vehicles per hour. In contrast, on the peak day discussed above (February 26, 2005) westbound traffic volumes were roughly 1,100 vehicles per hour. While daily traffic volumes on February 26th were approximately 10% higher than on December 3rd, this still does not account for the dramatic drop in hourly volumes. The situation on December 3rd clearly illustrates the avalanche risk to vehicles: many people were trapped on the road, physically unable to escape, while the avalanche danger continued to increase.

Figure 2-21: Inclement Weather Hourly Traffic Volumes



2005 Operating Conditions

During non-peak and dry roadway conditions, vehicles can travel the speed limit for most of the corridor. The only obstructions to traffic during these conditions are hindrances by slow moving vehicles in the non-passing section and speed reductions for tight curves. Figure 2-22 and Figure 2-23 display typical eastbound and westbound travel speed conditions during free-flow traffic conditions. This data was collected on Friday, October 21, 2005 (10:30 – 11:00 a.m.) by a GPS unit in a free flowing vehicle. The GPS unit recorded speed and position information in one-second intervals.

Interestingly, the GPS data shows a marginally faster average speed traveling eastbound (39.6 mph, uphill) than westbound (39.2 mph, downhill). On the surface, this seems to counter common sense: vehicles would presumably travel faster downhill, due to the force of gravity. However, on further inspection, the data revealed several “choke points” where downhill (and, to a lesser degree, uphill) speeds dropped considerably. These choke points correspond to sharp curves in SR-210’s horizontal alignment, causing drivers to slow suddenly to avoid losing control on the curves. These locations were on either side of the Lisa Falls/Salt Lake Twins avalanche path, and at the eastern end of the Tanners avalanche path.

A small difference in eastbound and westbound speeds is not necessarily significant in free flow, dry pavement conditions. However, on days with inclement weather and high traffic volumes, the choke points discussed above could contribute to accidents, which in turn could cause traffic to slow or stop in high avalanche risk areas. Travel times and speeds will also be collected during the upcoming 2005-2006 peak winter conditions. The information from these runs will be compared to the free flow conditions, to evaluate the effects high traffic volumes and winter conditions might have on overall traffic operations and public safety.

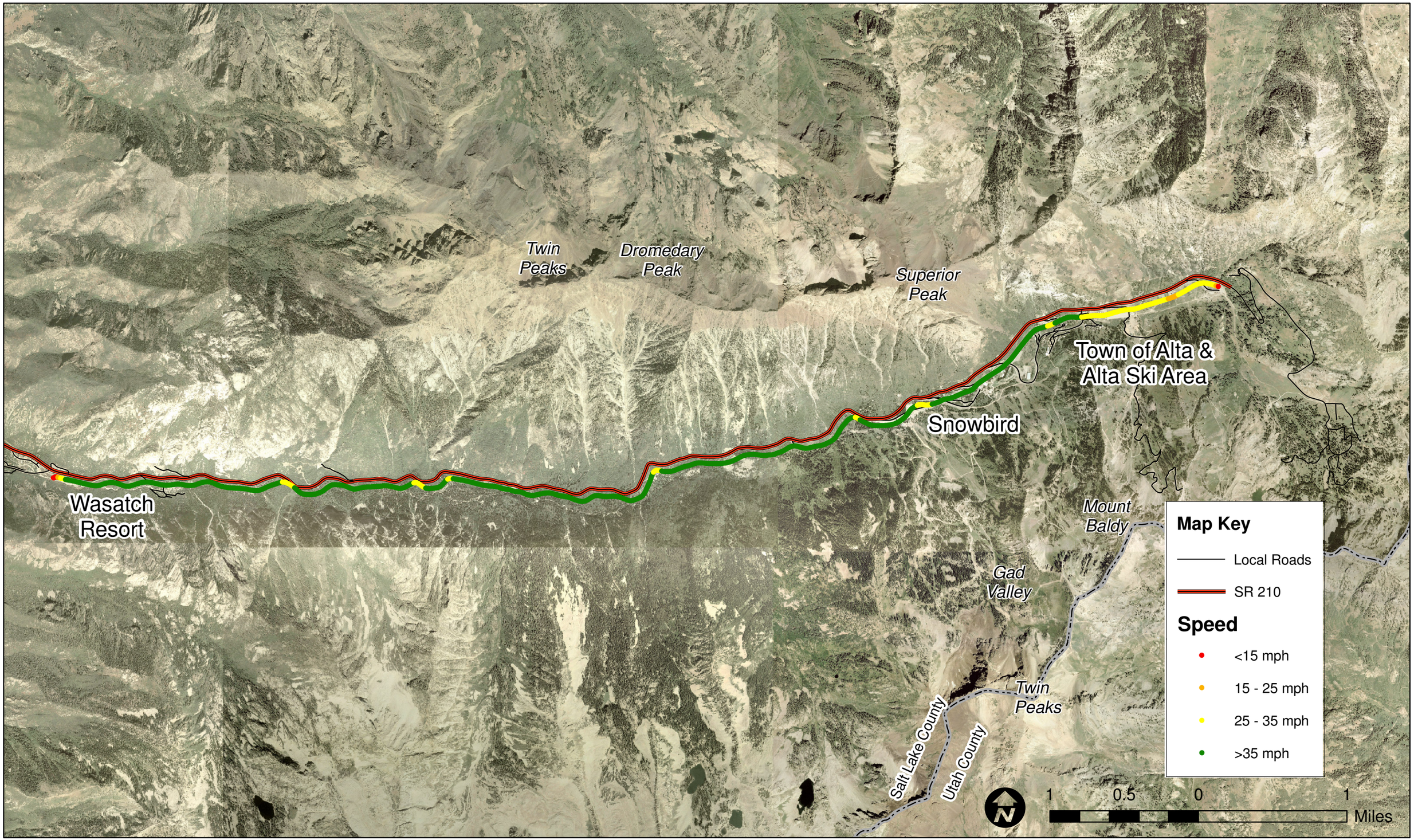


Figure 2-22: Free Flow Corridor Eastbound Travel Speeds

Sources: Utah State Automated Geographic Resource Center (County Boundary Line, Aerial Photo), Town of Alta (Roads) Note: The data presented is subject to error.

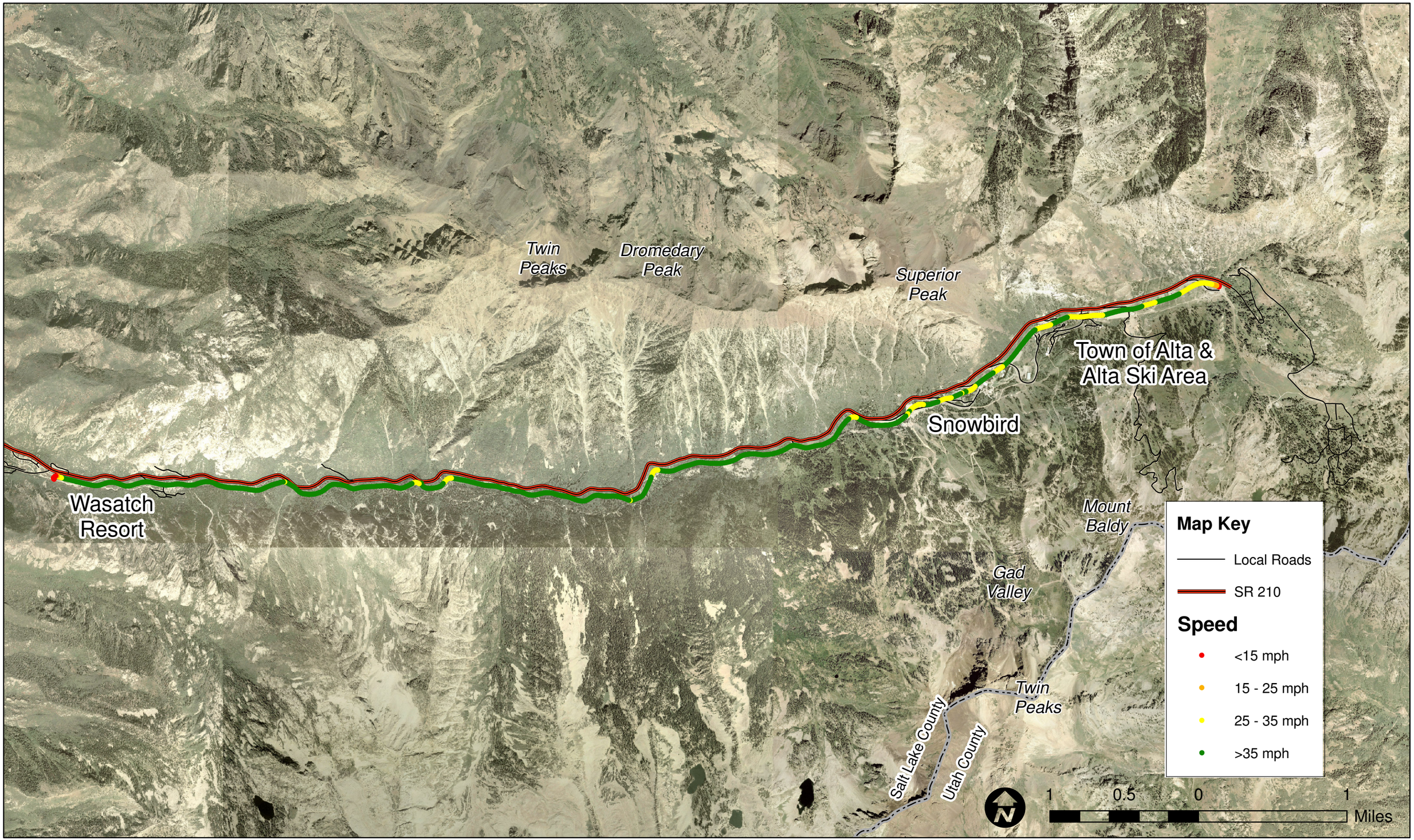


Figure 2-23: Free Flow Corridor Westbound Travel Speeds

Sources: Utah State Automated Geographic Resource Center (County Boundary Line, Aerial Photo), Town of Alta (Roads) Note: The data presented is subject to error.

Crash Data

The general safety of a given roadway is usually classified according to Crash Rates and Severity Rates. These rates provide an overall indication of safety because their results depend on the total number of accidents on a given roadway, the length of the roadway, and the average annual daily traffic on the roadway. In addition to the above, severity rates are also weighted according to the typical accident severity. UDOT ranks accident severity on a scale of 1-5, with 5 being the most severe (fatalities) and one being the least severe (property damage only). The average rates are determined by UDOT. UDOT tracks accident and severity rates for state routes, according to their traffic volumes and location. The average information is then compared to a specific roadway to determine if the given rates are high are low.

Crash data for the year 1994 – 2003 were obtained from UDOT. This report focuses on recent accident trends (2002-2003); however additional accident data is provided in the appendix. Table 2-14 displays the average accident rate and severity rates compared to UDOT expected rates:

Table 2-14: Actual Vs. Expected Rates

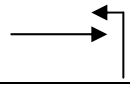
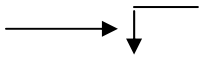
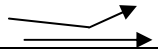
	SR-210 Rates		*Expected Rates**	
	Accident	*Severity*	*Accident*	*Severity*
Average 02-03	2.42	1.62	2.22	1.60
*UDOT CARS – Expected Value Report 6/21/2004				

As shown in Table 2-14, the actual accident and severity rates for SR 201 are slightly higher than UDOT's expected rates for similar facilities. This higher rate indicates potential safety deficiencies exist along the corridor.

Between 1994 and 2003 Little Cottonwood Canyon experienced nine fatal accidents resulting in sixteen total fatalities. Of these nine accidents only three occurred during the winter months (October – April), and only one fatal accident occurred during snowy conditions. Five of the fatal accidents were single vehicle accidents, resulting from speeding, driving left of center, or other driver errors. Thus, weather conditions have not played a significant role in increasing fatal accidents along the corridor in recent years, but rather driver errors (such as speeding) and impediments (such as alcohol) were the prime contributing factors. See Figure 2-24 – 27 for an illustration of SR-210 accidents by canyon section and type.

To further confirm this conclusion, the next most severe accident rating, Severity 4 – broken bones or bleeding wounds, was analyzed for the years 2002-2003. A total of eighteen of these accidents occurred between 2002 and 2003. A summary of these accidents is provided in Table 2-15.

Table 2-15: Severe Accidents, 2002 - 2003

Type of Accident	*Number of Occurrences*	*Most common contributing circumstance*	*Picture*	*Most common pavement conditions*
Single Vehicle	10	Speeding, defective brakes, and other improper driving	None	Dry
Right-angle – one straight one turning left	3	Crossing at intersection against signal		Dry
Vehicle turning left collides with opposing vehicle	2	Crossing at intersection against signal		Dry
Head on collision	1	Drove left of center		Dry
Side-swipe same direction	1	Hitching on vehicle		Dry
One moving one parked	1	Speed too fast	None	Snowy

Source: UDOT accident records for SR 201

As shown in Table 2-15, most of the severe accidents between 2002-2003 occurred during dry pavement conditions and resulted from improper driving behavior. Table 2-16 shows the most frequent accident types and causes for all accidents between 2002 and 2003.

Table 2-16: Description of Accident Statistics 2002 - 2003

Query	*Most Frequent Accident Type*	*Most Frequent Contributing Circumstances*	*Second Most Frequent contributing Circumstance*	*Number of Accidents by Pavement Conditions*
Result	Single vehicle collision	Speed too fast for conditions	Improper lookout	Dry = 221 Wet = 28 Snowy = 41 Icy = 33 None Given = 4
Possible remediation	NA	Traffic Calming/ improved enforcement	Improve site distance at problem locations	For snowy and icy conditions provide better enforcement on vehicle restrictions

Source: UDOT accident records for SR 201