NM 68, Riverside Drive
City of Española, New Mexico
ITS Project
Final Evaluation Report

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By:

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I. Executive Summary

The project herein, is for the deployment of a traffic management system on New Mexico 68, Riverside Drive, in the City of Española. This project improved traffic flow through this rural community and increased safety along the principal arterial. The project limits are US 84/285 on the south, and Valley Dr. on the north.

The project need was initially identified by severe congestion along Riverside Drive that has gradually increased over the past 10 years. The situation initiated a study to relieve traffic congestion on NM 68 through the City of Española. The study was based on existing traffic reports that indicated that a traffic management system could cost-effectively reduce congestion and provide traffic benefits to the corridor and the community.

This ITS deployment of a traffic management system has mitigated the immediate need for a relief route. In addition, the system has reduced the rate of overall crashes, travel time delays and variability, and increase freeway and arterial throughput. Furthermore, it has had a positive impact lessening vehicle emissions and energy consumption, with great benefits for local drivers and those passing through the corridor to a destination outside the immediate area.

II. Background

NM 68 is the main access to the City of Española and to the north central area of New Mexico. This route provides access to Taos, the Rio Grand gorge, and the mountain recreational communities of Angel Fire, Eagles Nest and Red River. NM 68 is heavily traveled by commuters on weekdays destined for Los Alamos National Laboratory and Santa Fe, and recreational users on weekends.

Riverside Drive (NM 68) is a rural principal arterial in a growing rural community. The roadway has four lanes with median turn lanes and continuous two-way left turn lanes. Roadside development includes commercial, residential, and industrial land uses. The corridor currently has eight signalized intersections within 2 miles, and signal spacing varies from 400 ft. to 3000 ft. The varied spacing makes time based coordination difficult, and a more traffic responsive system was required. The corridor average weekday traffic ranges from 20,000 vehicles per day (vpd) to 31,400 vpd with an increase of over 20% on the weekends due to a large recreational traffic volume passing through the community.

Before the improvements, during AM peak hours the traffic operations along the corridor were acceptable, but during PM peak hours and on weekends, approaches fail in two of the intersections. Observation studies indicated that substantial queues lead to frequent

cycle failure at the Fairview Drive intersection. Also, failures occur at La Joya Street, NM 76, Valley Drive, and US 84/285, as result of the Fairview Drive intersection.

III. Project Description

This project deployed a new traffic management system on eight signalized intersections on NM 68 in the City of Española, New Mexico. The field system consists of new traffic signal controllers and cabinets, new video detection equipment, the installation of signals interconnected between intersections, traffic management system hardware and software, and system integration. In addition, the use of video detection at each intersection will provide information for emergency service providers where incidents occur near the intersections.

Fiber optic was installed between three of the signalized intersections (Fairview, Lowdermilk, and Valley). Because environmental issues that prohibit sub-surface installations without exhaustive environmental investigations and remediation (Superfund Site), the remaining five signalized intersections are integrated through a wireless communication system. The full system connects to a traffic operation center (TOC) located at the New Mexico Department of Transportation (NMDOT) General Office in Santa Fe. An intermediate operations center is in the City of Española, which provides communication to local and state police, and emergency services offices in Española.

The project system requirements are for the initial eight signalized intersections, with the ability to expand to at least 30 more intersections in the future. This system has the capacity of analyzing real time traffic information and being responsive to changes in traffic flow during peak and non-peak hours. In addition, the system is responsive to emergency vehicles with the ability to quickly transition if a primary timing plan is interrupted.

IV. Conformance with National and/or Regional Architecture

A project level ITS Architecture was developed, using a systems engineering analysis, and the project was design in accordance with the project level ITS Architecture. This project level architecture is tied to the Santa Fe Architecture since the Santa Fe metropolitan planning organization (MPO) planning area also included portion of the Rio Arriba County.

V. Project Evaluation

The evaluation strategy set the following goals that were achieved:
- **Safety** – Reduction in the rate of overall crashes (fatal, injury, and [PDO] property damage only)
- **Mobility** – Reduction in travel time delays and variability
- **Efficiency** – Increase freeway and arterial throughput
- **Emissions** – Decrease in vehicle emissions and energy consumption

- **Customer Satisfaction –** Benefits for local drivers and those passing through the corridor to a destination outside the immediate area

This new traffic management system has improved the level of service (LOS) from a LOS F to a LOS A due to the improvements. Prior to the improvements, the eight signalized intersections operated independently, whereas following the improvements they are interconnected and coordinated. The system has received a positive feedback from the City of Española. It also has been low-maintenance and as of September 2008 has operated without interruption.

VI. Collected Data

Refer to the tables on page 6 through 8.

VII. Project Challenges

Most of the challenges that the project faced were developing a communications system that would accommodate the National Transportation Communications for ITS Protocol (NTCIP)-compliant traffic signal central system ("ICONS"), data collection and management (DCMS), video detection system and the pan tilt zoom (PTZ) video camera systems.

Since most of the City of Española is categorized as a Superfund site, the project was not able to do subsurface work. Only three of the eight signalized intersections (Fairview, Lowdermilk, and Valley) are connected using fiber optics. The remaining five signalized intersections operate independently through a wireless communication system. At the moment there were no other options but to explore the wireless systems available. Several site surveys were conducted to determine what wireless communication system installation would work best.

Prior to the Espanola Project, NMDOT had successfully used wireless technology on closed loop systems to communicate from the master controller to the intersection traffic signal controllers. NMDOT have used a standard telephone service to communicate to the master controller remotely from the traffic operations center located in Santa Fe. Wireless technology had never been used to communicate with an NTCIP-compliant central system (ICONS), video detection, DCMS or PTZ video cameras in the field or remotely. NMDOT staff realized that we could not communicate to all devices by use of a standard telephone service and needed to look at other options. A digital microwave system was recently installed by General Services Division (GSD) for the State Police and NMDOT Project Office to use for communications and to access the Internet. NMDOT was granted permission by GSD to use the digital microwave system as a backhaul into the network. NMDOT pays a monthly fee to GSD for this access. During the set up phase, NMDOT project staff had to determine how much bandwidth was necessary for all devices. NMDOT project staff also had to develop an Internet protocol (IP) scheme. As of September 2008, the communications system and all devices installed have required minimal maintenance.

VIII. Project Costs

The initial bid was $809,009.00. The cost of the entire project without gross receipt tax (GRT) was $802,120.16. The cost of the project with gross receipt tax was $862,279.18. Gross receipt tax is a tax collected from the seller of goods and services, rather than the consumer.

IX. Conclusions

This traffic management system has mitigated the immediate need for a relief route. In addition, the system has reduced the rate of overall crashes, travel time delays and variability, and increase freeway and arterial throughput. Using traffic data from the NMDOT's *Traffic Safety Bureau 2006 Report*, there was a considerable reduction in total crashes (fatal, injury, and PDO) between 2004 and 2006. In 2006 there was a decrease of up to 27.5% total of crashes compared with the previous years.   This wireless communication system has allowed the City of Española, not to disturb the subsurface due to the presence of both soil and groundwater contamination.

Although environmental factors affected the project implementations, the new traffic management system improved the level of service (LOS) from a LOS F to a LOS A, which corresponds roughly to a reduction in delay of 87.5%. The system has had a positive impact, lessening vehicle emissions and energy consumption, with great benefits for local drivers and those passing through the corridor to a destination outside the immediate area.

New Mexico Department of Transportation

Peak Hour Volume Report

Location: Riverside Dr. @ Fairview Dr.

E - W Street: Fairview Dr.
N - S Street: Riverside Dr.
Run Date: 08/12/2008 9.21 AM
Date Range: 08/08/2008   - 08/08/2008

Begin Time - End Time	Eastbound Fairview Dr.			Northbound Riverside Dr.			Southbound Riverside Dr.			Westbound Fairview Dr.		
	L	R	T	L	R	T	L	R	T	L	R	T
07:00 AM - 07:15 AM	21	19	7	22	7	0	75	0	71	15	11	10
07:15 AM - 07:30 AM	18	27	10	20	11	8	93	0	90	14	4	10
07:30 AM - 07:45 AM	29	29	8	29	10	1	101	1	81	16	7	15
07:45 AM - 08:00 AM	47	36	23	44	9	34	91	0	79	24	18	47
08:00 AM - 08:15 AM	32	38	18	32	11	42	75	0	63	24	18	31
08:15 AM - 08:30 AM	48	41	16	40	19	18	74	0	57	27	21	32
08:30 AM - 08:45 AM	46	38	16	41	17	15	72	3	48	23	20	29
08:45 AM - 09:00 AM	56	43	25	49	14	28	83	1	62	30	24	32
09:00 AM - 09:15 AM	60	57	19	48	10	31	90	0	73	36	20	17
09:15 AM - 09:30 AM	43	44	20	36	28	37	98	1	68	32	29	20
09:30 AM - 09:45 AM	61	49	23	41	20	49	91	0	60	34	27	29
09:45 AM - 10:00 AM	70	53	22	44	24	39	105	0	85	31	20	33
AM Peak Hour Volume	234	203	84	169	82	156	384	1	286	133	96	99
% of Total Traffic	12.14 %	10.53 %	4.36 %	8.77 %	4.26 %	8.1 %	19.93 %	0.05 %	14.84 %	6.9 %	4.98 %	5.14 %
% Direction			27.04 %			21.12 %			34.82 %			17.02 %
AM Peak Hour Factor			0.9			0.93			0.88			0.91

Table 1 Peak Hour AM

New Mexico Department of Transportation

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Location: Riverside Dr. @ Fairview Dr.

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Run Date: 08/12/2008 9.21 AM
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Begin Time - End Time	Eastbound Fairview Dr.			Northbound Riverside Dr.			Southbound Riverside Dr.			Westbound Fairview Dr.		
	L	R	T	L	R	T	L	R	T	L	R	T
03:00 PM - 03:15 PM	93	65	36	50	28	68	107	1	86	47	36	41
03:15 PM - 03:30 PM	88	53	38	38	42	61	119	2	97	44	24	34
03:30 PM - 03:45 PM	67	59	44	45	28	67	96	1	78	38	31	45
03:45 PM - 04:00 PM	98	62	38	59	35	55	112	0	93	53	31	46
04:00 PM - 04:15 PM	84	45	34	39	42	70	117	0	72	41	27	33
04:15 PM - 04:30 PM	87	60	46	45	34	76	134	0	97	45	31	40
04:30 PM - 04:45 PM	94	63	52	35	28	70	123	0	103	40	32	36
04:45 PM - 05:00 PM	70	48	36	58	40	65	133	0	111	39	32	31
05:00 PM - 05:15 PM	101	65	55	51	80	13	110	0	91	42	25	33
05:15 PM - 05:30 PM	74	31	36	47	117	44	102	0	89	53	26	39
05:30 PM - 05:45 PM	53	48	30	59	142	63	124	0	96	26	38	26
05:45 PM - 06:00 PM	75	42	28	60	56	58	106	0	85	44	21	36
PM Peak Hour Volume	352	236	189	189	182	224	500	0	402	166	120	140
% of Total Traffic	13.04 %	8.74 %	7.0 %	7.0 %	6.74 %	8.3 %	18.52 %	0.0 %	14.89 %	6.15 %	4.44 %	5.19 %
% Direction			28.78 %			22.04 %			33.41 %			15.78 %
PM Peak Hour Factor			0.88			0.91			0.92			0.92

Table 2 Peak Hour PM

Time Slot From To	Detector Description	Class A	Class B	Class C	Class D	Class E	Total
00:00 - 01:00	NB Riverside Dr. @ Stanley Griegos LT	130	0	3	0	0	133
	NB Riverside Dr. @ Stanley Griegos Thru 1	164	0	3	0	0	167
	NB Riverside Dr. @ Stanley Griegos Thru 2	443	6	5	0	0	454
	Sub Totals:	737	6	11	0	0	754
01:00 - 02:00	NB Riverside Dr. @ Stanley Griegos LT	72	2	3	0	0	77
	NB Riverside Dr. @ Stanley Griegos Thru 1	74	2	0	0	0	76
	NB Riverside Dr. @ Stanley Griegos Thru 2	253	3	4	0	0	260
	Sub Totals:	399	7	7	0	0	413
02:00 - 03:00	NB Riverside Dr. @ Stanley Griegos LT	72	3	1	0	0	76
	NB Riverside Dr. @ Stanley Griegos Thru 1	53	0	0	0	0	53
	NB Riverside Dr. @ Stanley Griegos Thru 2	185	1	2	0	0	188
	Sub Totals:	310	4	3	0	0	317
03:00 - 04:00	NB Riverside Dr. @ Stanley Griegos LT	59	1	3	0	0	63
	NB Riverside Dr. @ Stanley Griegos Thru 1	29	1	2	0	0	32
	NB Riverside Dr. @ Stanley Griegos Thru 2	120	2	4	0	0	126
	Sub Totals:	208	4	9	0	0	221
04:00 - 05:00	NB Riverside Dr. @ Stanley Griegos LT	92	3	5	0	0	100
	NB Riverside Dr. @ Stanley Griegos Thru 1	46	1	4	0	0	51
	NB Riverside Dr. @ Stanley Griegos Thru 2	151	0	1	0	0	152
	Sub Totals:	289	4	10	0	0	303
05:00 - 06:00	NB Riverside Dr. @ Stanley Griegos LT	225	1	3	0	0	229
	NB Riverside Dr. @ Stanley Griegos Thru 1	103	2	1	0	0	106
	NB Riverside Dr. @ Stanley Griegos Thru 2	256	3	6	0	0	265
	Sub Totals:	584	6	10	0	0	600
06:00 - 07:00	NB Riverside Dr. @ Stanley Griegos LT	564	16	3	0	0	583
	NB Riverside Dr. @ Stanley Griegos Thru 1	423	15	25	0	0	463
	NB Riverside Dr. @ Stanley Griegos Thru 2	714	31	12	0	0	757
	Sub Totals:	1701	62	40	0	0	1803
07:00 - 08:00	NB Riverside Dr. @ Stanley Griegos LT	555	28	5	0	0	588
	NB Riverside Dr. @ Stanley Griegos Thru 1	1332	66	43	0	0	1441
	NB Riverside Dr. @ Stanley Griegos Thru 2	1404	39	21	0	0	1464
	Sub Totals:	3291	133	69	0	0	3493
08:00 - 09:00	NB Riverside Dr. @ Stanley Griegos LT	492	26	3	0	0	521
	NB Riverside Dr. @ Stanley Griegos Thru 1	1419	96	47	0	0	1562
	NB Riverside Dr. @ Stanley Griegos Thru 2	1914	45	20	0	0	1979
	Sub Totals:	3825	167	70	0	0	4062
09:00 - 10:00	NB Riverside Dr. @ Stanley Griegos LT	405	12	0	0	0	417
	NB Riverside Dr. @ Stanley Griegos Thru 1	1697	123	47	0	0	1867
	NB Riverside Dr. @ Stanley Griegos Thru 2	2420	47	18	0	0	2485
	Sub Totals:	4522	182	65	0	0	4769
10:00 - 11:00	NB Riverside Dr. @ Stanley Griegos LT	358	10	4	0	0	372
	NB Riverside Dr. @ Stanley Griegos Thru 1	1814	121	50	0	0	1985
	NB Riverside Dr. @ Stanley Griegos Thru 2	2499	53	28	0	0	2580
	Sub Totals:	4671	184	82	0	0	4937
11:00 - 12:00	NB Riverside Dr. @ Stanley Griegos LT	341	6	0	0	0	347
	NB Riverside Dr. @ Stanley Griegos Thru 1	1965	72	48	0	0	2085
	NB Riverside Dr. @ Stanley Griegos Thru 2	2762	48	11	0	0	2821
	Sub Totals:	5068	126	59	0	0	5253
12:00 - 13:00	NB Riverside Dr. @ Stanley Griegos LT	300	10	1	0	0	311
	NB Riverside Dr. @ Stanley Griegos Thru 1	2003	98	47	0	0	2148
	NB Riverside Dr. @ Stanley Griegos Thru 2	2473	50	9	0	0	2532
	Sub Totals:	4776	158	57	0	0	4991
13:00 - 14:00	NB Riverside Dr. @ Stanley Griegos LT	338	4	4	0	0	346
	NB Riverside Dr. @ Stanley Griegos Thru 1	2195	86	36	0	0	2317

Table 3 Vehicle Classification Within Group

Time Slot From To	Detector Description	Class A	Class B	Class C	Class D	Class E	Total
13:00 - 14:00	NB Riverside Dr. @ Stanley Griegos Thru 2	2624	71	22	0	0	2717
	Sub Totals:	5157	161	62	0	0	5380
14:00 - 15:00	NB Riverside Dr. @ Stanley Griegos LT	321	14	0	0	0	335
	NB Riverside Dr. @ Stanley Griegos Thru 1	2133	69	40	0	0	2242
	NB Riverside Dr. @ Stanley Griegos Thru 2	2724	59	18	0	0	2801
	Sub Totals:	5178	142	58	0	0	5378
15:00 - 16:00	NB Riverside Dr. @ Stanley Griegos LT	269	8	1	0	0	278
	NB Riverside Dr. @ Stanley Griegos Thru 1	2468	85	31	0	0	2584
	NB Riverside Dr. @ Stanley Griegos Thru 2	3085	40	22	0	0	3147
	Sub Totals:	5822	133	54	0	0	6009
16:00 - 17:00	NB Riverside Dr. @ Stanley Griegos LT	257	6	2	0	0	265
	NB Riverside Dr. @ Stanley Griegos Thru 1	2920	64	24	0	0	3008
	NB Riverside Dr. @ Stanley Griegos Thru 2	3370	47	13	0	0	3430
	Sub Totals:	6547	117	39	0	0	6703
17:00 - 18:00	NB Riverside Dr. @ Stanley Griegos LT	261	8	1	0	0	270
	NB Riverside Dr. @ Stanley Griegos Thru 1	3303	61	33	0	0	3397
	NB Riverside Dr. @ Stanley Griegos Thru 2	3794	41	16	0	0	3851
	Sub Totals:	7358	110	50	0	0	7518
18:00 - 19:00	NB Riverside Dr. @ Stanley Griegos LT	358	9	3	0	0	370
	NB Riverside Dr. @ Stanley Griegos Thru 1	2618	55	25	0	0	2698
	NB Riverside Dr. @ Stanley Griegos Thru 2	2765	27	7	0	0	2799
	Sub Totals:	5741	91	35	0	0	5867
19:00 - 20:00	NB Riverside Dr. @ Stanley Griegos LT	370	9	3	0	0	382
	NB Riverside Dr. @ Stanley Griegos Thru 1	1747	36	14	0	0	1797
	NB Riverside Dr. @ Stanley Griegos Thru 2	2154	17	17	0	0	2188
	Sub Totals:	4271	62	34	0	0	4367
20:00 - 21:00	NB Riverside Dr. @ Stanley Griegos LT	389	2	1	0	0	392
	NB Riverside Dr. @ Stanley Griegos Thru 1	1276	25	8	0	0	1309
	NB Riverside Dr. @ Stanley Griegos Thru 2	1730	25	18	0	0	1773
	Sub Totals:	3395	52	27	0	0	3474
21:00 - 22:00	NB Riverside Dr. @ Stanley Griegos LT	318	1	7	0	0	326
	NB Riverside Dr. @ Stanley Griegos Thru 1	844	8	8	0	0	860
	NB Riverside Dr. @ Stanley Griegos Thru 2	1396	12	19	0	0	1427
	Sub Totals:	2558	21	34	0	0	2613
22:00 - 23:00	NB Riverside Dr. @ Stanley Griegos LT	286	3	7	0	0	296
	NB Riverside Dr. @ Stanley Griegos Thru 1	461	2	6	0	0	469
	NB Riverside Dr. @ Stanley Griegos Thru 2	936	4	10	0	0	950
	Sub Totals:	1683	9	23	0	0	1715
23:00 - 00:00	NB Riverside Dr. @ Stanley Griegos LT	183	1	5	0	0	189
	NB Riverside Dr. @ Stanley Griegos Thru 1	287	2	0	0	0	289
	NB Riverside Dr. @ Stanley Griegos Thru 2	617	5	8	0	0	630
	Sub Totals:	1087	8	13	0	0	1108
	Totals:	**79178**	**1949**	**921**	**0**	**0**	**82048**

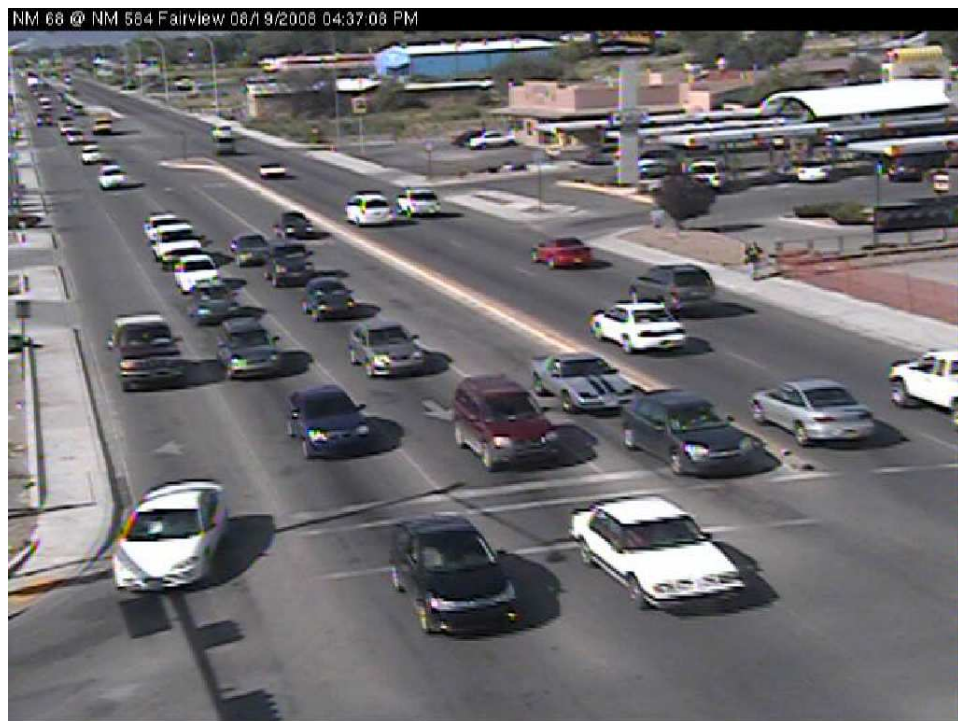**Table 4 Vehicle Classification Within Group Cont.**

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Source: Google Maps, licensed to the New Mexico Department of Transportation

Image 1: Aerial of Española
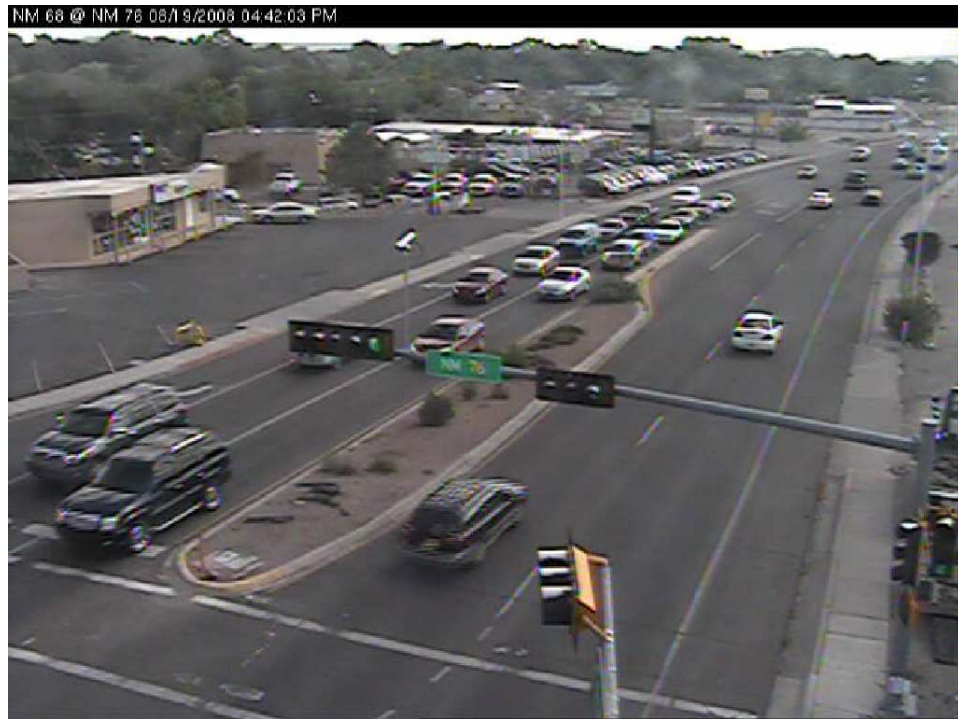
Source: City Española, New Mexico Advanced Traffic Management System

Image 2: NM 68 @ NM 76 NB

Source: City Española, New Mexico Advanced Traffic Management System

Image 3: NM 68 @ NM 584 Fairview Ln. SB

Source: City Española, New Mexico Advanced Traffic Management System

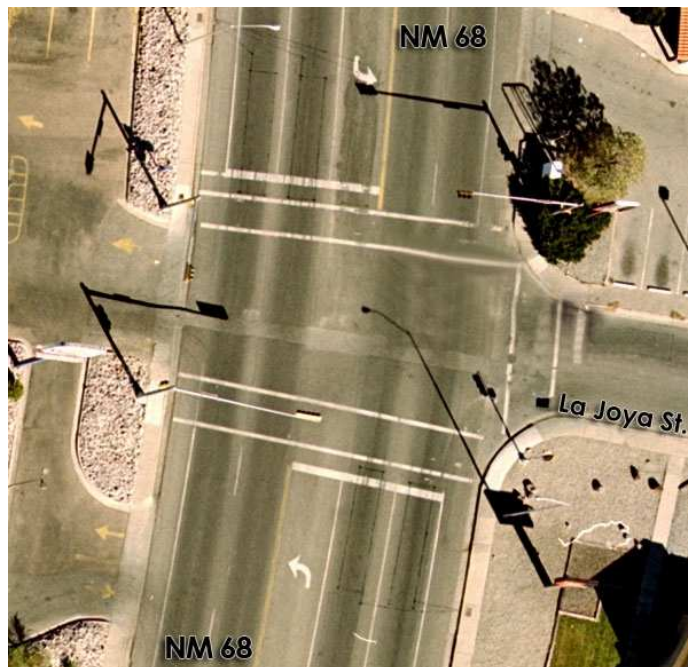**Image 4: NM 64 @ NM 84 Stanley Griego Bridge SB**

Source: New Mexico Department of Transportation, Survey and Lands Engineering

Image 5: Aerial NM 68 @ Fairview Ln.

Source: City Española, New Mexico Advanced Traffic Management System

Image 6: Aerial NM 68 @ Stanley Griego

Source: City Española, New Mexico Advanced Traffic Management System

Image 7: NM 68 @ La Joya St.