

NM 314 / COURT HOUSE ROAD ROAD SAFETY AUDIT (RSA)



Final Report
May 2016

Prepared for:
The New Mexico
Department of Transportation



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Submitted by:



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Executive Summary

The following report is a summary of a Road Safety Audit (RSA) that was conducted on December 3rd and 4th 2014 for the signalized intersection of NM 314 and Court House Road in Los Lunas, NM. This report details the RSA scope, procedure, preliminary data analyses, field observations and conclusions and recommendations.

Conclusions and Recommendations

The conclusions and recommendations are summarized as follows:

Capacity Analysis (Tables 1 and 2)

- Analysis of existing conditions for both existing 2014 and projected 2035 traffic demands indicate that all study intersections (NM 314/Courthouse Road, NM 314/Colonial Ave, & Courthouse Road/Juan Perea Road) will operate at LOS C or better. Therefore capacity does not appear to be an issue within this study area.
- Queue analyses indicates that the calculated 95th Percentile queues do not appear to be long enough to have severe operational impacts.

Crash Analysis

- Generally, 2009 saw the greatest number of crashes with 9 of the study area wide 16 total.
- Crash occurrences at the NM 314/Courthouse appear to be trending down with 2009 having a high of 6 crashes and 2012 having a low of 0 crashes. This could be attributed to the introduction of the current southbound left-turn phase. However, additional data would be needed to accurately analyze the effect of the introduction of the current southbound left-turn phase.
- Same direction crashes accounted for the majority of crashes within the study area.
- Red light running accounted for a significant number of crashes.
- Southbound crashes accounted for 64% of the crashes at NM 314 and Courthouse Road
- There were no crashes where weather played a factor in the incident.
- A review of the current Highway Safety Manual and the Crash Modification Factor Clearinghouse website indicates the following mitigation measures and predicted crash reduction rates:
 - A reduction of the current intersection skew (Approximately 22 degrees) to 0 skew could reduce overall crashes by as much as 10%.
 - An added left-turn lane on one approach at a four leg signalized urban intersection can reduce injury crashes by 7%-11% and all high severity crashes by as much as 90%
 - An added left-turn lane on two approaches can reduce injury crashes by 14%-19% and all severity crashes by 9%-29%.
 - An added right-turn lane can reduce injury crashes by 5%-13% and all severity crashes by 2%-6%.
 - Providing intersection lighting can reduce night-time pedestrian crashes by 22%-62% and all traffic crashes by 28%-48%.

- The conversion of a stop-controlled intersection into a roundabout can reduce crashes of all types by 19% to 39%.
- No crash reduction factors were found for railroad treatments.

Kick Off Meeting

- A RSA kick-off meeting was held on December 4, 2014 at the Los Lunas Transportation Center, a summary of that meeting is provided on page 14.

Road Safety Audit Observations

- Striping on the westbound approach to NM 314/Courthouse Road was not clear. There were two stripe stop line locations presenting confusion as to where drivers are supposed to stop. Also, the parking restriction striping was not visible within the railroad crossing envelope.
- The existing right-turn restriction beacon is not visible to vehicles that have already arrived at the intersection. Additionally, there are no warning beacon and restrictions for permitted southbound left-turn traffic, which without prohibition allows permitted left-turning vehicles to be caught in the intersection during the dwell phase of a rail preemption event.
- There were several dangerous and illegal pedestrian crossings observed during train crossing events.
- The all-red phase for the westbound approach of the NM 314/Courthouse Road intersection was observed to be 1.5 seconds. This time is deficient to accommodate clearance of vehicles stopped at the advanced signal/rail stop line to proceed safely through the intersection.
- Existing pre-emption times were observed to be using only a 7 second track clearance time which is too short.
- Although the Courthouse Road rail crossing is not currently a quiet zone, it could become one in the future. The existing rail road crossing arms are not up to quiet zone standards.
- There is an existing approximate 22 degree skew in the westbound approach which can increase intersection crashes, and also reduces the effectiveness/efficiency of railroad crossing gates. It also significantly increases required arm lengths if upgrades are constructed.
- The railroad crossing currently does not provide a pre-signal operations that could be used to clear vehicles that have traversed the rail crossing but not the NM 314/Courthouse Road intersection during a rail crossing event.
- Truncated domes are not present for the pedestrian crossing at the Courthouse Road rail crossing. Also, the approach slopes should be checked for ADA compliance.
- The existing driveway to the Los Lunas Transportation Center is located between the railroad crossings and the westbound approach gate. This allows an unsafe maneuver circumventing the gates restriction of track crossings.
- It was observed that the southbound left-turn operates as a protected-permitted phase without an exclusive left-turn lane. This situation is unconventional and violates driver expectation.
- There are several closely spaced driveways on the west side of NM 314 in close proximity to the NM 314/Courthouse Road intersection. It was observed that these driveways did adversely impact signal operations due to left—turn queues encroaching into the intersection.
- Night observations indicated that intersection lighting was not operational.

- The stop sign at the raised crosswalk located between the Los Lunas Transportation Center and the parking lot is improperly placed relative to the stop line on the northbound approach on Juan Perea Road.

Short Term Mitigation

- Striping on the westbound approach of the NM 314/Courthouse Road should be refreshed and include the elimination of the intersection stop line closer to the signalized intersection, a “stop here on red” sign adjacent to the stop line located prior to the railroad crossing, and install striping/hatching that restricts vehicles from stopping from the rail/pre-signal stop line to the crosswalk on the westbound intersection approach. As part of the current resurfacing project on Courthouse Road, this mitigation has already been completed.
- The existing driveway to the temporary parking lot adjacent to the Los Lunas Transportation Center should be eliminated as soon as possible. It is understood that the temporary parking lot is to be converted to a pedestrian plaza and thus the driveway will be eliminated in June 2015. However, this driveway should be eliminated sooner if feasible and alternative access to the temporary parking area outside of the rail/intersection influence area could be implemented.
- Right-turn and left-turn restriction LED indications should be installed on the northbound and southbound approaches respectively. When a train event occurs these indications would activate for turn restrictions.
- Modified all-red timing should be calculated for the westbound approach per current NMDOT policy. It is estimated that the all-red time should be 8.5 seconds. Pedestrian walk times are recommended to be 7 seconds and the northbound flashing don’t walk phase should be 13.5 seconds. All phase calculations are shown in **Appendix D. All settings to preempted signals should be coordinated with both rail and signal personnel.**
- Required pre-emption times should be calculated based on TxDOT procedures found in the Railroad-Highway Crossing Handbook published by FHWA. Pre-emption time for existing conditions were calculated and provided in **Appendix D.** It was determined that preemption time should be 52 seconds (Includes 25 second ROW transfer, 24 second queue clearance and a 4 second buffer). Track clearance time requirements range from 28 to 36 seconds depending on consideration of design vehicle crossing gate interaction, which is optional. These numbers appear to be greater than what is provided. These calculations should be re-run if conditions change such as stop line locations, intersection geometry, and signalized intersection location. **All settings to preempted signals should be coordinated with both rail and signal personnel.**
- The at-grade pedestrian-rail crossings should be brought up to ADA standards. Specifically, tactile strips should be provided within 6 feet of the crossing area on both sides of the crossing. It is also recommended that approach slopes be measured and reviewed to ensure that these are reasonable for wheel chairs.
- The intersection lighting problem should be diagnosed and repaired so that the intersection is lit at night.

Long Term Mitigation

To remedy geometry issues such as skew removal on the westbound approach, four potential design alternative concepts were developed by the RSA group. Regardless of the alternative, all concepts discussed included the following long term mitigation:

- All options should include a pre-signal which should be coordinated with a pre-emption plan. A pre-signal will allow vehicles that have already cleared the railroad crossing during a train crossing event to clear the intersection without running a red light or parking in a dangerous area.
- All options should include upgrades to the railroad crossing, such as the addition of exit gates on both approaches to improve the safety of motor vehicles, bicycles, and pedestrians crossing the railroad tracks. A safety study will be initiated by Rio Metro in 2015 to identify minimum safety improvements for bicyclists and pedestrians at grade crossings located both inside and outside of quiet zones.
- A southbound left-turn and a northbound right-turn lane at the NM 314 signalized intersection was included for all options to remove turning demands from through traffic and reduce the risk of rear-end crashes. Additionally, the southbound left-turn lane would better accommodate driver expectation with the existing protect-permitted left-turn phase on the southbound approach. The additional lanes would also be in compliance with NMDOT SAMM.
- Aside from the No-Build alternative, which maintains the current Courthouse Road alignment, all concepts should remove the existing skew on the westbound approach to the NM 314 signalized intersection. Removal of the skew will reduce crash risks and provide better accommodation for requirements of quad gate systems and channelized approaches. However, skew could be somewhat mitigated for the No-Build Alternative if the westbound portion of the east leg was realigned, while the eastbound departure portion remains as is. This could provide an opportunity to provide a raised median for safer pedestrian crossings.
- All options should review access management within the signalized NM 314 intersection influence area. Combining of driveways and left-out restrictions should be considered for all alternatives.
- In the No-Build Alternative, the sidewalk on the south side of Court House Road could be moved further south to create a perpendicular crossing of the tracks with its own lights, gates and additional fencing to channel pedestrians away from Court House Road near the crossing. This would discourage improper and unsafe pedestrian crossings of the railroad tracks.

Alternative Intersection Concepts

For this RSA, four potential design alternatives were investigated and include the following:

- **Alternative 1 (Current Alignment)** – This alternative would maintain the existing Courthouse Road alignment and provide an additional southbound left-turn lane at NM 314, a pre-signal, and railroad crossing gate upgrades (See **Figure 18**). This alternative does not include a northbound right-turn lane due to space constraints and does not remedy the westbound skew. The main drawbacks of this alternative would be a very expensive pump station relocation that would be required due to the fact that all NM 314 widening for the added left-turn lane will occur on the

west side of NM 314 and westbound skew is maintained which is a challenge for quad gate construction.

Planning Level Cost - \$1.9 Million

- **Alternative 2 (North Shifted Alignment of Courthouse Road))** – This concept pushes the Courthouse Road alignment slightly to the north in order to remove westbound skew as it approaches NM 314 (See **Figure 20**). Again this alternative would include both a southbound left-turn lane, a northbound right-turn lane, a pre-signal, railroad crossing gate upgrades and the removal of intersection skew. The pump station relocation discussed in Alternative 1 could be avoided with this option as the widening of NM 314 is primarily north of the pump station.

Planning Level Cost - \$1.6 Million

- **Alternative 3a, 3b, or 3c (Extension of Juan Perea Road or Courthouse Road to Align with Colonial Avenue)** – This option would extend Juan Perea Road to NM 314 and align with Colonial Avenue where a signal would be constructed (See **Figures 22-24**). Sub-options for this alternative would include either a stop controlled T-intersection or a roundabout at the Courthouse Road/Juan Perea Road intersection or the realignment of Courthouse Road with Colonial Avenue with Juan Perea forming a T-intersection approach to Courthouse Road. This alternative would include an additional southbound left-turn and northbound right-turn lanes at NM 314, a pre-signal, railroad crossing gate upgrades, and the removal of intersection skew. Again, no pump station relocation would be needed. There are a few major challenges to this alternative that limit its feasibility including conflict with the under construction Los Lunas Transportation Center employee/overflow parking, difficulty providing access to an adjacent private residence, and existing on street parking on what would be the eastbound Colonial Avenue approach to the signalized intersection.

Planning Level Cost 3a - \$1.7Million

Planning Level Cost 3b - \$2.0 Million (Does Not Include Parking Lot Demolition)

Planning Level Cost 3c - \$2.2 Million (Includes the purchase of one property)

- **Alternative 4 (New Access Alignment South of the Transit Site)** – This alternative would create a new road immediately south of the Los Lunas Transportation Center intersecting with NM 314 and Juan Perea Road (See **Figure 25**). This alternative includes added southbound left-turn and northbound right-turn lanes at the signalized NM 314 intersection, a pre-signal, railroad crossing gate upgrades, and the removal of intersection skew. This option has a couple major challenges including a substantial private property take (1.6 Acres), and the reconstruction of the railrunner platform so that stopped trains do not have to remain parked at the proposed at-grade railroad crossing and significant rerouting of Courthouse Road access / traffic patterns.

Planning Level Cost - \$2.2 Million (Does not include ROW or Platform Rebuild)

Introduction

Road Safety Audits (RSA) are typically used by road agencies to identify and mitigate safety issues proactively. This in-turn assists the agency to utilize safety funding for projects that will mitigate all identified safety problems. NMDOT identified the intersection of NM 314 and Court House Road due to its close proximity to an at-grade rail crossing immediately to the east and the interaction of operations between the two intersections, especially when a rail crossing event occurs. The principal goal of the RSA is to determine safety deficiencies and hazards to public right-of-way (ROW) users at this study intersection and provide potential mitigation treatments for identified safety issues. An area map is provided as **Figure 1a** and a Location Map is provided as **Figure 1b**.

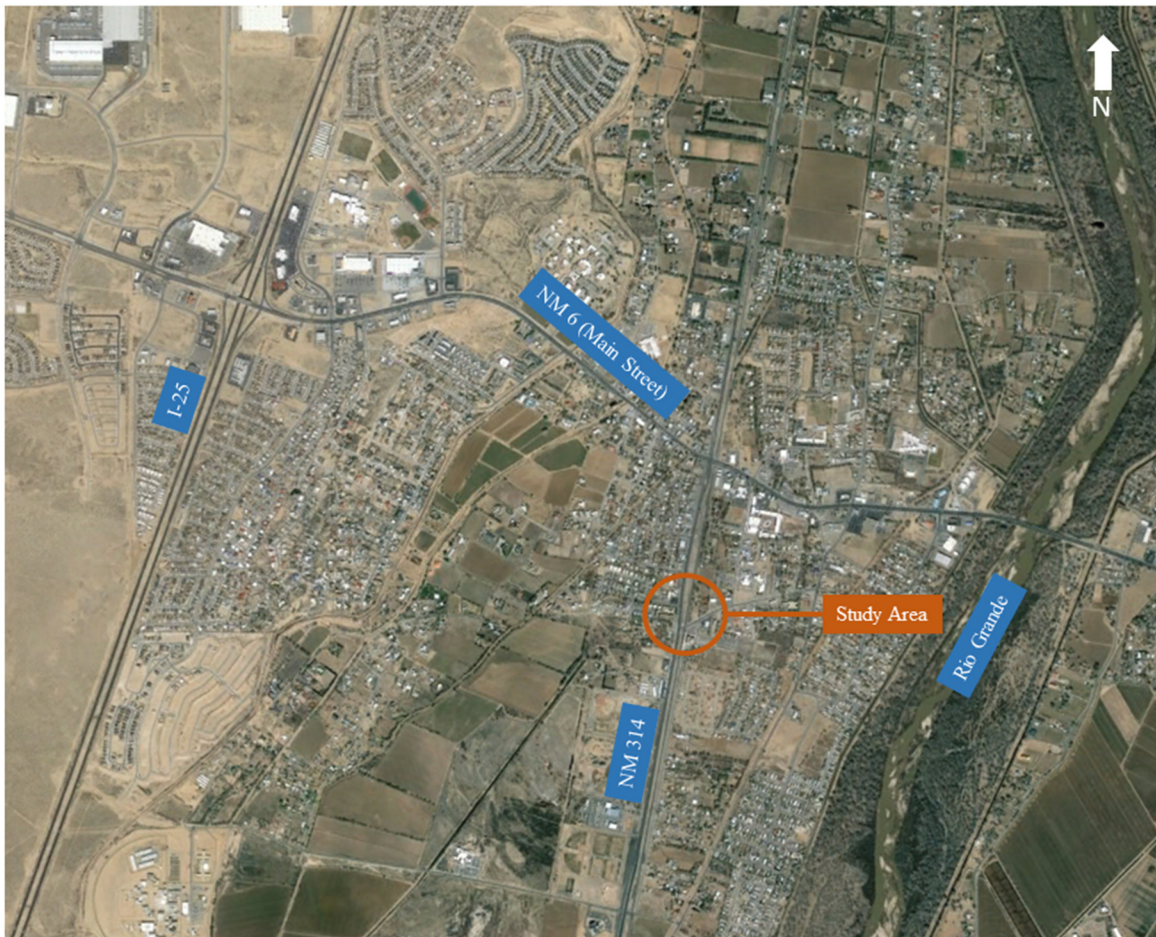


Figure 1a: Los Lunas, NM Area Map




 Study Intersection

Figure 1b: Study Intersection and Location Map

RSA Procedure

The RSA procedure is a 6 step process and is depicted in Figure 2.

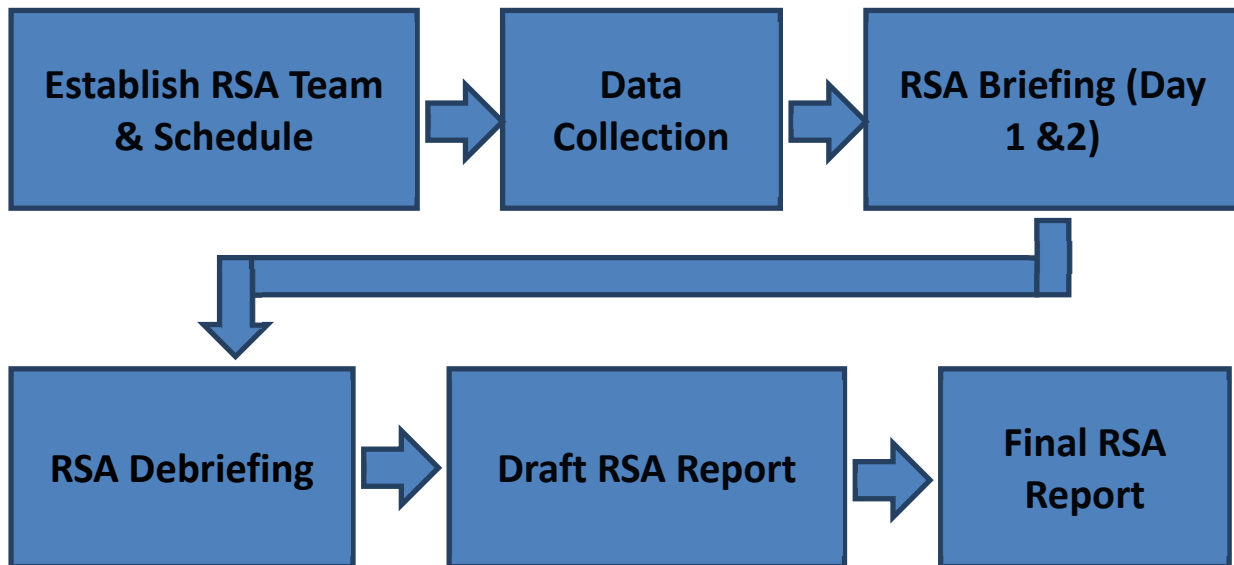


Figure 2: RSA Procedure

As indicated the first step in the process was to set the schedule and RSA team. The team included the following members:

- Afshin Jian, NMDOT State Traffic Engineer
- Steve Eagan, NMDOT – NMDOT Safety Project Engineer
- Gregory Clarke, NMDOT District 3
- Hooshang Tavanaiepour, NMDOT District 3
- Rais Rizvi, NMDOT District 3
- Priscilla Benavides, NMDOT District 3
- Clyde Archibeque, NMDOT Operations
- Bill Craven Rail Bureau Manager, NMDOT
- Scott Reif, HERZOG
- George Hicks, NMDOT Rail Bureau
- Robert Fine, NMDOT Rail Bureau
- Michael Jaramillo, Los Lunas Project Coordinator
- Rudy Archuleta, Los Lunas Public Works Director
- Patrick Byrd, (Lee Engineering)
- Paul Barricklow, Lee Engineering

The second step included the collection of turning movement and speed data, the review of crash data, and field visits with aerial photo reviews to get existing street and operation characteristics.

The actual audit was conducted December 3rd and 4th and included an initial briefing, field visits to all the study locations for the AM, PM, and Midday peak periods, a lighting and reflectivity survey and a final field debriefing of the survey team.

Existing Road Characteristics

Within the study area, NM 314 currently incorporates the following traffic operations and geometric characteristics:

- NM 314 is a primary urban arterial multi-lane highway incorporating two through lanes, a striped median, a bike lane on the southbound side of the road, a sidewalk on the west side, and a shoulder on the east side.
- Currently, the road is signed for 35 mph in both directions.
- Prevailing land use appears to be generally urban in nature with pockets of residential land use and occasional commercial business.

Court House Road within the study area currently incorporates the following traffic operations and geometric characteristics:

- Court House Road is a minor urban collector with one lane in each direction and a striped median.
- The speed limit is currently signed for 30 mph in both directions.
- Approximately 20 feet east of its intersection with NM 314 there is an at grade rail crossing.
- Transit bus traffic on this roadway is heavy due to the Los Lunas Transit Center located on the south side of Court House Road at its intersection with NM 314
- This road provides access to and from a regional transit station serving as a Railrunner station and a transit stop for Rio Metro.

The study intersection of NM 314 / Court House Road has the following traffic operations and geometric characteristics:

- There is a neighborhood street which forms the west leg of this intersection.
- The intersection is signalized.
- There are no dedicated left turn lanes for NM 314 at the intersection.
- The intersection contains sidewalks, cross walks, and ADA compliant pedestrian ramps.
- The Court House Road rail crossing is located 20 feet east of the intersection. The crossing has gates on the westbound approach and the eastbound approach. The westbound approach also uses an additional signal pole and mast-arm placed between the crossing and the intersection of Court House Road and NM 314. There is a stop line placed at the crossing gate on the westbound approach. There is also a second set of striped directional arrows and stop line placed between the crossing gate and the intersection of Court House Road and NM 314.
- There is a multi-use trail that ends at the north east corner of the intersection.

Planned Area Construction

There are several construction projects planned for the study area. These include:

- Extending the multi-use trail south of the NM 314 / Court House Road intersection.
- The addition of a southbound left turn lane at NM 314 and Court House Road.
- Conversion of temporary parking north of the Los Lunas Transportation Center to a pedestrian plaza.
- Construction of a new parking lot on the north side of Court House Road across from the Los Lunas Transportation Center.

These planned construction projects are shown in **Figure 3**.



Figure 3: Construction Area Map

The city of Los Lunas is planning to continue the multi-use trail that currently terminates at NM 314 and Court House Road. This trail will be placed in the vacant land between the railroad track and NM 314.

The NMDOT has determined that a left turn lane is necessary for the southbound movement at NM 314 and Court House Road. This would widen the intersection by 12 feet. The addition of this left turn lane is shown in **Figure 18** and is discussed in detail in Alternative 1.

There is an un-paved dirt lot used as temporary parking for the employees that work in the Los Lunas Transportation Center Building. This area is planned to be replaced with a pedestrian plaza. This plaza would eliminate the driveway currently used to enter the temporary parking lot. It should be noted that construction of this pedestrian plaza is scheduled to begin in June 2015. A drawing of the parking lot is shown below in **Figure 4**.



Figure 4: Pedestrian Plaza

The empty lot on the north side of Court House Road, across from the Los Lunas Transportation Center, is set to become an additional parking lot for the Los Lunas Transportation Center. This parking lot will add 24 parking spaces to the area. No additional driveways will be created. A drawing of the planned parking lot is shown in **Figure 5**.

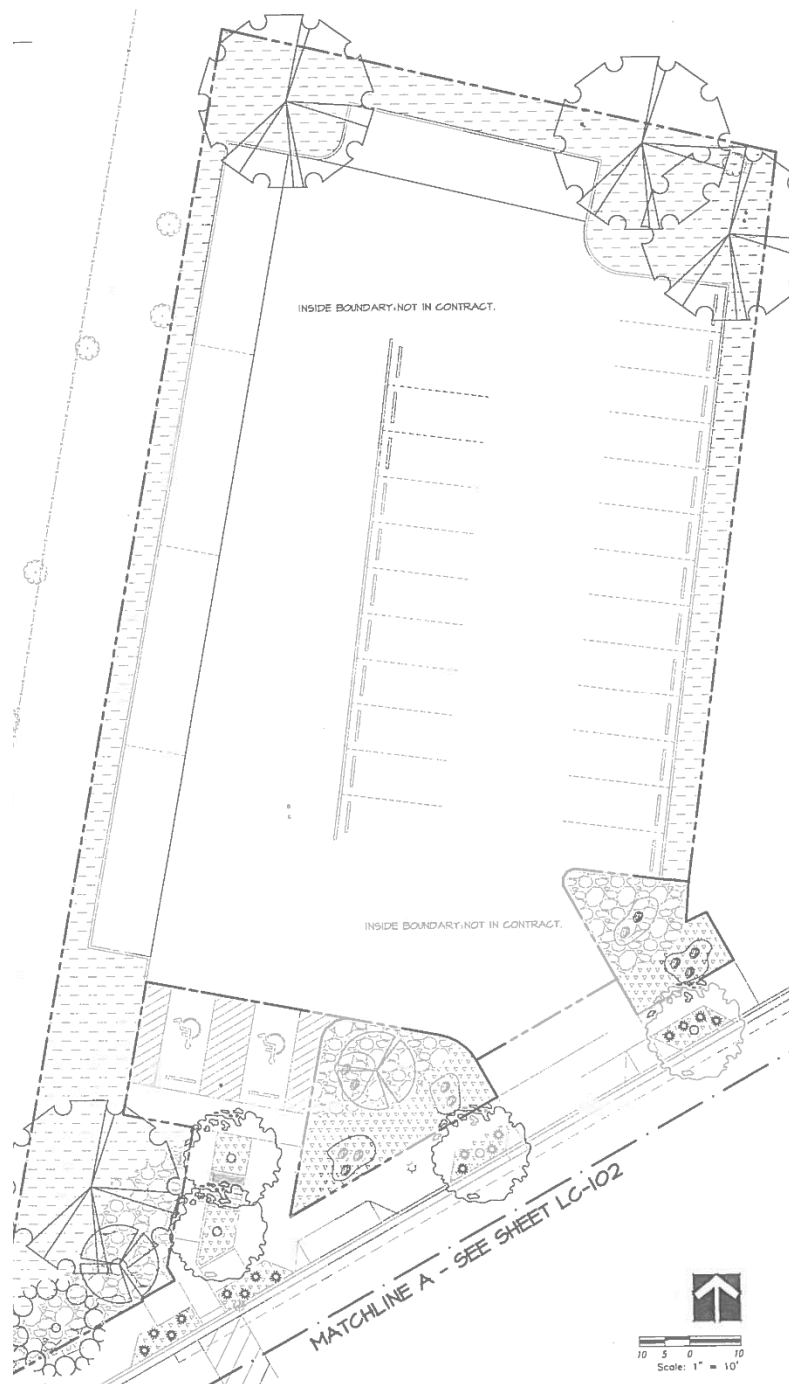


Figure 5: Additional Parking Lot

Existing Traffic Demand Characteristics

Turning movement counts were collected on November 6, 2014 for the intersections of NM 314 and Colonial Ave / NM 314 and Court House Road / Juan Perea Road, and on November 12, 2014 for the intersection of NM 314 and Court House Road. Train crossings were also collected and are presented with the resulting peak hour demands in **Figure 6**.

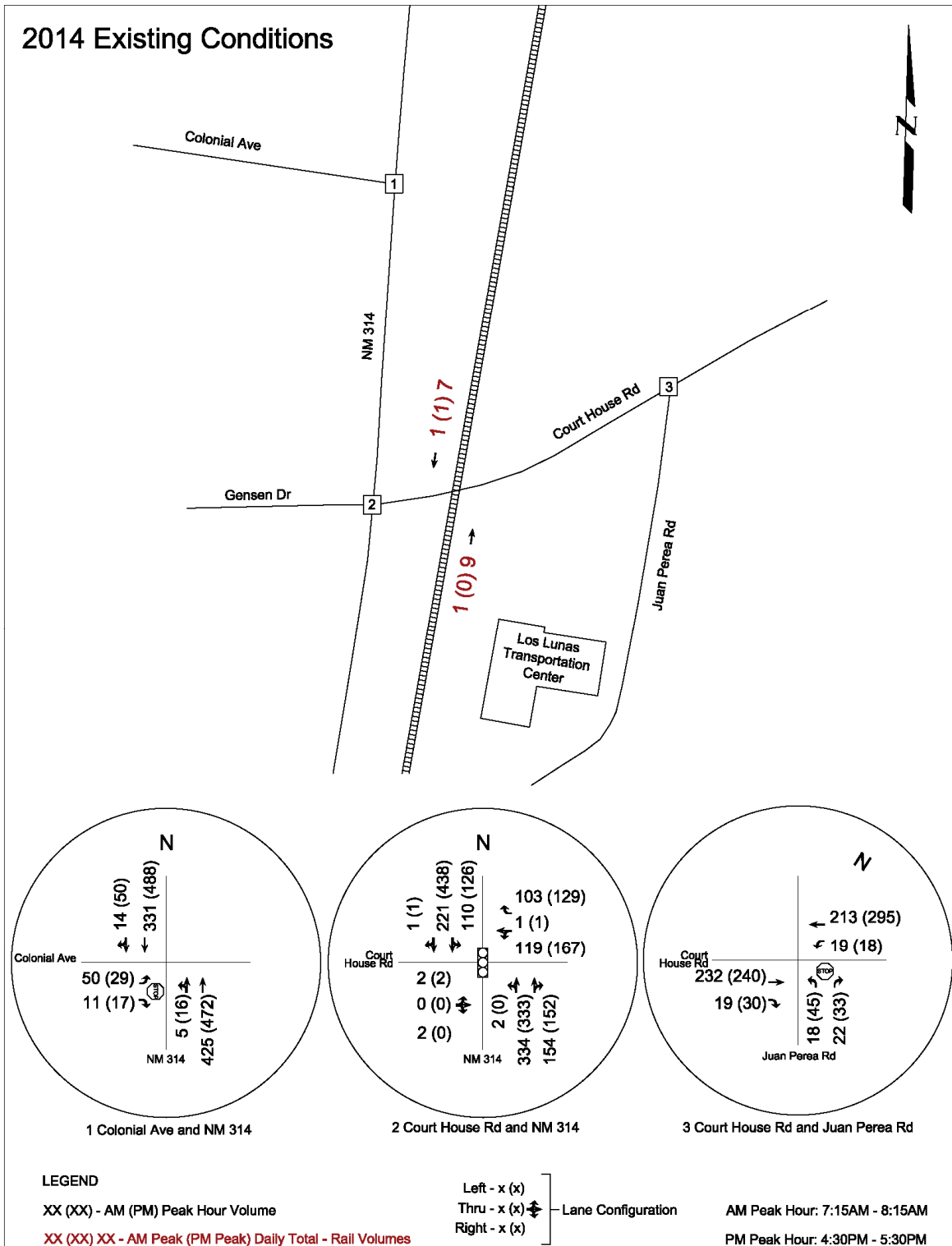


Figure 6 November 2014 Peak Hour Turning Movement Demands

Pneumatic traffic count tubes were also placed in advance of the westbound leg at the US 64/N 5031 intersection to collect daily traffic demands and speeds for weekday time periods. The following results were observed from the collected data:

- Turning movements at NM 314 / Court House Road are significantly greater in the PM peak hour than the AM peak.
- Peak hours were determined to occur at 7:15 to 8:15 in the AM, and 4:30 to 5:30 in the PM.
- The 85th percentile speed was found to be 42 MPH.

It should be noted that minor roadwork was being conducted along Court House Road west of the Los Lunas Transportation Center at the time of the data collection. This construction closed the existing two-way left-turn lane just east of the Juan Perea Road intersection.

Capacity Analysis and Queue Analysis

Capacity analysis of 2014 traffic demands and for 2035 traffic demands is summarized in **Table 1**. 95th percentile auxiliary lane queues are summarized in **Table 2**.

Table 1: Capacity Analysis Summary

Study Intersection	Scenario	Intersection LOS			
		AM		PM	
		Delay (s) ¹	LOS ²	Delay (s) ¹	LOS ²
NM 314 / Court House Road	Existing (2014)	13.1	B	12.9	B
	Future (2035)	11.7	B	12.0	B
NM 314 / Colonial Ave	Existing (2014)	14.0	B	16.1	C
	Future (2035)	25.1	D	14.6	B
Court House Road / Juan Perea Road	Existing (2014)	12.4	B	14.1	B
	Future (2035)	12.3	B	11.5	B

¹Average delay in seconds per vehicle.

²LOS stands for Level of Service.

As indicated, there does not appear to be any significant capacity constraints within the study area with all existing movements operating at an acceptable LOS C or greater for existing and 2035 projected demands.

Table 2: Queue Analysis Summary

Intersection	Year	Movement	95th Percentile Queue (feet)		Minimum Required Storage (feet)
			AM	PM	
NM 314 / Courthouse Road	Existing 2014	WB Right	35	39	50
	2035		39	42	50
	Existing 2014	WB Thru/Left	106	147	160
	2035		92	59	100
NM 314 / Colonial Avenue	Existing 2014	EB Left	10	10	-
	2035		22	8	-

As indicated above, the calculated 95th percentile queue demands at the NM 314/Courthouse Road was found to be 147feet. However, field observations indicated a queue length on the westbound approach to this intersection of 7 to 8 vehicles, which translates to approximately 140 to 160 feet. Queues of this magnitude easily encroach beyond the rail crossing if vehicles have chosen to stop at the stop line closer to the intersection rather than the appropriate stopping point prior to the rail gates and indications for the westbound approach.

Crash Analysis

In addition to intersection capacity and queue length, crash histories occurring from 2009 to 2012 for the study intersection were obtained and reviewed from the NMDOT data base. The provided raw crash data is provided in **Appendix B**.

Table 3 presents a summary of the crashes determined to have occurred within the study area from 2009 to 2012.

Table 3: Study Area Crash Characteristics (2009-2012)

		NM 314 & Courthouse Road	Courthouse & Juan Pera/Village Dr.	NM 314 & Colonial
Total Crashes		11	2	3
by Year	2009	6	1	2
	2010	4	1	0
	2011	1	0	1
	2012	0	0	0
by Crash Type	Angle	2	0	2
	Animal	1	0	0
	RailRoad Gate	1	0	0
	Sideswipe	0	2	0
	Same Direction-Both Left	1	0	0
	Same Direction-Both Straight	1	0	0
	Same Direction-One Stopped	3	0	0
	Same Direction-One Left Turn	1	0	0
	Rear End	0	0	1
	Backing Other	1	0	0
	% Same Direction	55%	0%	0%
	% Angle	18%	0%	67%
by Severity	PDO	10	2	3
	Injury	1	0	0
	Fatality	0	0	0
	% Injury	9%	0%	0%
by Cause	Red Light Running	3	0	0
	Driver Inattention	3	1	0
	Failure to Yield	1	0	1
	Following Too Close	3	0	1
	Failure to Stop	0	0	1
	Improper Turn	1	1	0
	% Driver Inattention	27%	50%	0%
	% Following Too Close	27%	0%	33%
by Direction	Northbound	2	0	1
	Eastbound	1	2	2
	Southbound	7	0	0
	Westbound	1	0	0
	% Northbound	18%	0%	33%
	% Eastbound	9%	100%	67%
	% Southbound	64%	0%	0%
	% Westbound	9%	0%	0%

- Generally, 2009 saw the greatest number of crashes with 9 of the 16 total.
- Crash occurrences at the NM 314/Courthouse Road intersection appear to be trending down with 2009 having a high of 6 crashes and 2012 having a low of 0 crashes. This could be attributed to the introduction of the current southbound left-turn phase. However, additional data would be needed to accurately analyze the effect of the introduction of the current southbound left-turn phase.
- Same direction crashes accounted for the majority of crashes within the study area.
- Red light running accounted for a significant number of crashes.
- Southbound crashes accounted for 64% of the crashes at NM 314 and Courthouse Road
- There were no crashes where weather played a factor in the incident.
- A review of the current Highway Safety Manual and the Crash Modification Factor Clearinghouse website indicates the following mitigation measures and predicted crash reduction rates:
 - A reduction of the current intersection skew (Approximately 22 degrees) to 0 skew could reduce overall crashes by as much as 10%.
 - An added left-turn lane on one approach at a four leg signalized urban intersection can reduce injury crashes by 7%-11% and all high severity crashes by as much as 90%
 - An added left-turn lane on two approaches can reduce injury crashes by 14%-19% and all Severity crashes by 9%-29%.
 - An added right-turn lane can reduce injury crashes by 5%-13% and all high severity crashes by 2%-6%.
 - Providing intersection lighting can reduce night-time pedestrian crashes by 22%-62% and all traffic crashes by 28%-48%.
 - The conversion of a stop-controlled intersection into a roundabout can reduce crashes of all types by 19% to 39%.
 - No crash reduction factors were found for railroad treatments.

Speed Characteristics

Speed data was collected in addition to daily traffic demands on NM 314. Speed data was compiled over a 24-hour period on November 12, 2014. Compiled speed data is provided in **Appendix A**, with the following observations:

- The 85th Percentile speed on westbound US 64 was observed to be 42 mph.
- Observed speeds above the speed limit appeared to occur southbound rather than northbound
- Over half of the observed speeds were greater than the current speed limit of 35 mph.

It is concluded from the data that while most vehicles were exceeding the speed limit, speeds are generally exceeding the speed limit by less than 10 mph. It should be noted that some of the lower speeds observed could be vehicles that had to stop at the red light at Courthouse Road and thus were not maintaining a free-flow speed

Rail Road Operations

The Los Lunas Rail Runner Station is located at the Los Lunas Transportation Center within the study area. This station services all Los Lunas Rail Runner passengers. The stop sees 7 northbound and southbound trips per weekday.

The Los Lunas Transportation Center also services 3 Rio Metro bus routes. These bus routes contribute 11 bus arrivals/departures per weekday.

Schedules for both transit services are provided in **Appendix E**.

Field Survey

The field survey was conducted by the RSA team on December 3rd and 4th with the following survey schedule:

Day 1 – December 3, 2014

- 12 – 1:30 pm – Mid-day field review
- 2 pm – RSA Meeting
- 3:15-5:30 pm – PM peak period field review
- 6:00-7:00 pm – Night-time field review

Day 2 – December 4, 2014

- 7:00-8:30 am – AM peak period field review
- 8:30 am – Potential Field Review Team Debriefing

Kick-off Meeting

Per the above schedule, a kick-off meeting was held to discuss background information regarding the study area. The following members of the RSA team were in attendance:

- Afshin Jian, NMDOT State Traffic Engineer
- Gregory Clarke, NMDOT District 3
- Hooshang Tavanaiepour, NMDOT District 3
- Rais Rizvi, NMDOT District 3
- Bill Craven, Rail Bureau Manager NMDOT
- Robert Fine, NMDOT Rail Bureau
- Rudy Archuleta, Los Lunas Public Works Director
- Michael Jaramillo, Los Lunas Project Coordinator
- Los Lunas Police Department
- Paul Barricklow, Lee Engineering
- Patrick Byrd, Lee Engineering

The meeting commenced with round-table introductions. The following is a bullet list summarizing the highlights of the meeting:

- Lee Engineering gave a prepared presentation giving background information on the study intersection including existing road conditions, crash history, traffic demand counts, speed data, and things to look for when surveying operations in the field.
- A southbound left turn bay at NM 314 and Court House Road is warranted as per the State Access Management Manual.
- A southbound left turn phase at NM 314 and Court House Road was added to the signal in 2010 to accommodate busses and in the hope that a left turn bay would be added in the future.
- Preemptive devices at the railroad crossing do operate according to MUTCD standards.
- The railroad crossing typically sees around 6 freight trains per day. These are spaced between commuter traffic. These trains travel at high speeds through the Court House Road railroad crossing.
- The Village of Los Lunas is considering implementing a quiet zone for the stretch of railroad along NM 314. Currently, under the Train Horn Rule (49 CFR Part 222), locomotive engineers are required to sound their train horns at least 15 seconds before reaching an at-grade crossing. Under a quiet zone, locomotive engineers are instructed to cease the sounding of train horns at grade crossings except in emergency situations.
- Quad railroad crossing gates can be closed up to 4-5 minutes at a time. This is the worst case scenario.
- A track clearance phase should be implemented for signal. This will allow vehicles near the railroad track to proceed away from the crossing before the approaching train arrives.
- The preemptive “No Right Turn When Flashing” beacon on northbound NM 314 does not, by itself, effectively warn vehicles that are close to the NM 314 and Court House Road intersection. An

additional warning beacon should be added placed at the signal in view of vehicles approaching in the right lane.

- An additional alternative is to re-locate the NM 314 signal and Court House Road slightly to the north along NM 314. This would allow more space for the additional of a channelized southbound left turn and a channelized northbound right turn. See **Figure 20**.
- An additional alternative is to re-locate the NM 314 / Court House Road signal to just south of the Los Lunas Transportation Center. This would allow more space for the additional of a channelized southbound left turn and a channelized northbound right turn. See **Figure 25**.

Upon completion of the kick-off meeting, the RSA team commenced the field survey. The following section summarizes and documents RSA field observations during AM, midday and PM peak periods and suggested mitigation.

Combined Summary of RSA Field Observations

Issue 1: Railroad Crossing Striping

Location: East leg of Court House Road at NM 314 / Court House Road



Figure 7a: Roadway Striping

Looking west on Court House Road at NM 314/Court House Road



Figure 7b: Stop lines

Looking west on Court House Road at NM 314/Court House Road

Description of the Safety Issue:

The existing roadway striping has worn out and is difficult to see. Many vehicles were observed stopping beyond the appropriate stop line on the East leg of Court House Road at NM 314 / Court House Road. This is likely due to the additional stop line and directional arrows placed beyond the desired stop location. Furthermore, there is no visible parking restricting within the railroad crossing envelope, which should be present to ensure motorists are not waiting at the red light within the railroad crossing.

Suggested Mitigation:

It is suggested that the roadway be re-striped and the additional stop line and directional arrows be removed. Currently, Molzen-Corbin is providing new striping designs as part of a Courthouse Road resurfacing project in process and will address these issues. Long term striping will depend on the mitigation that is recommended and constructed for this access. Alternative designs along with appropriate striping are discussed in the **Alternative Intersection Concepts** section of this report.

Issue 2: NM 314 Railroad Crossing Warning Beacons and Turn Restrictions

Location: NM 314 / Court House Road



Figure 8a: Existing Railroad Crossing Warning Beacon
Looking north on NM 314 south of NM 314/Court House Road

Description of the Safety Issue:

The warning beacons at NM 314 Court House Road do not operate effectively and are often not seen by motorists approaching the railroad crossing or are non-existent. Several vehicles were observed trying to make northbound right turns and southbound left turns at the NM 314 and Court House Road intersection with railroad crossing gates down and flashing warning lights operating. As a result, these motorists became stuck in close proximity of the active railroad crossing and for southbound left-turners, became a dangerous obstruction for through traffic on NM 314 that were still receiving green ball indications. For northbound motorists, the existing beacon was found to be effective when motorists were far enough away from the intersection to see the warning beacon when the train approached. However the beacon's location does not warn motorists that have traveled past the sign, attempting to make a right hand turn at the intersection, when a train triggers the crossing gates. The southbound-left turning movement at the intersection does not currently have any train warning beacons or turn restriction signage. Vehicles were observed making left hand turns from southbound

NM 314 while the train crossing gates were down. This caused a dangerous backup of vehicles at the crossing gate as shown in **Figure 8b**.



Figure 8b: Observed Vehicles Stopped within Intersection during Train Event
Looking West on Court House Road west of NM 314/Court House Road

Suggested Mitigation:

It is recommended that LED Black-out signs R3-1 and R3-2 be installed on the north-east mastarm and south-west mastarm of NM 314 / Court House Road, and that a protected left turn phase and left turn bay be installed for the southbound left movement. This would help prevent accidental turns at the NM 314/ Court House Road intersection when a train is approaching the crossing. **Figure 8c** and **Figure 8d** below show examples of the R3-1 and R3-2 LED black-out signs applied to the north-east mastarm and south-west mastarm of NM 314 and Court House Road.



Figure 8c: Railroad Crossing Warning Beacon Mitigation
Looking north on NM 314 south of NM 314/Court House Road



Figure 8d: Railroad Crossing Warning Beacon Mitigation
Looking south on NM 314 north of NM 314/Court House Road

Issue 3: Pedestrian Crossings

Location: Court House Road / NM 314 near the railroad crossing



Figure 9a: Unsafe Pedestrian Crossings

Looking west on Court House Road west of NM 314/Court House Road



Figure 9b: Unsafe Pedestrian Crossing

Looking west on Court House Road west of NM 314/Court House Road

Description of the Safety Issue:

During the field visits, it was observed that the close proximity of the railroad platform and multi-use trail to the roadway and railroad crossing encourages unsafe pedestrian crossings. Pedestrians were observed not crossing at the designated crosswalks and “jay-walking”.

Suggested Mitigation:

Pedestrian routes should be observed on Courthouse Roads to determine where pedestrians are walking to and from. Based on observations, a crosswalk master plan should be designed that will provide a balance between providing crossings where pedestrians are inclined to walk and where crosswalk locations are safe. Additionally, consideration should be given to providing gate restrictions to sidewalk crossings of the railroad facility when train crossings occur. Fencing and/or bollards could be incorporated into the transit station frontage to discourage pedestrians from crossing Courthouse Road at undesigned locations. Rio Metro has initiated a safety study to identify minimum safety improvements for bicyclists and pedestrians at railroad crossings located both inside and outside of quiet zones. This study will be conducted in 2015 and the results should be considered for the Court House Road railroad crossing.

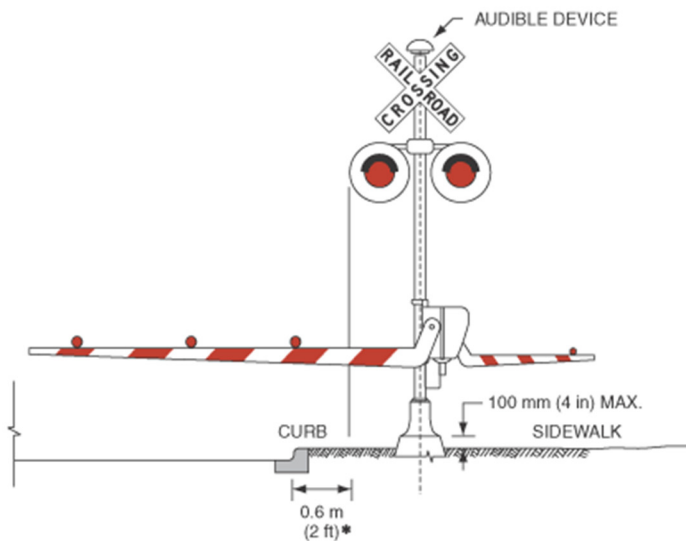


Figure 9c: FHWA Example of Crossing Arms for Pedestrian Facilities

Issue 4: Signal Timing

Location: Westbound Approach to NM 314 Court House Road Intersection

Description of the Safety Issue:

It was observed that all red times were too short and did not allow for vehicles stopped at the stop line located in advance of the railroad crossing to clear the intersection. Existing signal timing settings were attained from the NMDOT, and it was confirmed that the current all-red phase is 1.5 seconds for westbound movements, which is too short. Review of existing pedestrian times indicated that only 5 second walk times were in effect and the northbound pedestrian flashing don't walk time was a little short.

Suggested Mitigation:

Once stop line locations are determined, clearance widths should be measured to calculate new all-red clearance intervals per current NMDOT clearance interval policies. Under existing conditions, the required all red time would be 8.5 seconds for the westbound left turn movements, based on current NMDOT policy. It is recommended that walk times be increased to 7 seconds since pedestrian demands are well above the policy threshold of 10 pedestrian crossings in an hour and there were many school children observed using the crosswalks. The northbound pedestrian flashing don't walk should be 13.5 seconds based on a 3.5 feet per second walk speed.

Issue 5: Railroad Crossing Arms and Intersection Skew**Location:** Court House Road Railroad Crossing

Figure 10: Dual Crossing Arms at the Courthouse Road Railroad Crossing
Looking East at the NM 314/Courthouse Road Intersection

Description of the Safety Issue:

Currently the railroad crossing is operating with dual crossing arms. Additionally, the existing crossing arms effectiveness are limited by the skew on Courthouse Road as it crosses the rail facility. The skew combined with only dual arms provides opportunity for vehicles to skirt around them during a train crossing event.

Suggested Mitigation:

It is recommended that a quad gate system be constructed at the Courthouse Road railroad crossing. The quad gate system should provide crossing arms to restricted pedestrian crossings, as mentioned in **Issue 3**. If possible, the westbound approach leg should be realigned to remove the existing skew. Not only will this improve the constructability of a quad gate system, but also improve safety benefits at the NM 314 intersection as well. Medians should be constructed on the approach if single gates and/or the approach skew is retained.

Issue 6: Lack of Pre-signal Operations**Location:** Court House Road Railroad Crossing (Westbound)

Figure 11: Railroad Crossing Advanced Signal Indications (WB Courthouse Road)
Looking west on Court House Road at NM 314/Court House Road

Description of the Safety Issue:

Although, the westbound approach on Courthouse Road provides an additional advanced mast arm with signal indications, it is not currently operating as a pre-signal. With no pre-signal vehicles traversing the railroad crossing during a train call could be caught between running a red light and parking in a dangerous location. Additionally, existing pre-emption times like track clearance times (7seconds) seemed short.

Suggested Mitigation:

It is recommended that the crossing incorporate a pre-signal with signal pre-emption. A pre-signal would provide a green clear-out phase for far side westbound indications so that vehicles are not stuck on the tracks nor are they running a red light. Additionally, the far side signal indications should be

properly louvered to avoid confusion between conflicting signal indication from the pre-signal. An analysis of the louvers should be conducted to verify effectiveness. Based on ultimate geometry, a pre-emption plan must be formulated in conjunction with pre-signal timing for proper and safe operations. A sample calculation based on existing geometry is provided in **Appendix D**. Based on existing conditions the required maximum pre-emption time is 53 seconds with queue clearance times at 24 seconds, right-of-way transfer times at 25 seconds and a 4 second separation time. A minimum track clearance time of 28 seconds if vehicle-gate intersection is not accounted for or 36 second track clearance if this intersection is included. Train pre-emption times should be re-calculated depending on the final railroad crossing and signalized intersection geometry ultimately chosen.

Issue 7: ADA Issues at Railroad Crossing

Location: Court House Road Railroad Crossing



Figure 12: ADA Access Issues
Looking east on Court House Road at NM 314/Court House Road

Description of the Safety Issue:

It was also observed that the crossing does not meet ADA standards for railroad crossings. According to ADA requirement the circulation path should include accessible entrance and accessible route but at the rail crossing the entrance was not accessible for person with disabilities.

Suggested Mitigation:

It is recommended that the crossing be brought up to ADA/FHWA standards. The detectable warning surface shall be located so that the edge nearest the rail crossing is 1.8 m (6 ft.) minimum and 4.6 m (15 ft.) maximum from the centerline of the nearest rail. The rows of truncated domes in a detectable warning surface shall be aligned to be parallel with the direction of wheelchair travel. Also, the slope should be checked to ensure it is not too steep for wheel chairs.

Issue 8: Driveway to Temporary Parking Lot within Railroad Crossing

Location: Court House Road Railroad Crossing



Figure 13: Driveway to Los Lunas Transportation Center
Looking east on Court House Road at NM 314/Court House Road

Description of Safety Issue:

There is a driveway located along the south side of Court House Road at the Railroad Crossing. It is being used as an entrance to a dirt parking lot for the Los Lunas Transit Center. The driveway currently sits between the railroad crossing arms. It was observed that vehicles leaving the parking lot and turning west on Court House Road often stopped on the tracks while waiting to pass through the signal at Court House Road and NM 314.

Suggested Mitigation:

It is recommended that the driveway be removed completely or relocated to the east side of the parking lot along Juan Perea Road. It should be noted that this parking lot will be converted to a pedestrian plaza in June 2015 and the need for this access will be unneeded.

Issue 9: Protected-Permitted Phasing without Exclusive Turn Lane

Location: SB Approach NM 314/Court House Road



Figure 14: SB Protected-Permitted Phasing on NM 314 at Courthouse Road
Looking south on NM 314 at Court House Road

Description of the Safety Issue:

The southbound left-turn movement currently operates with a protected-permitted left-turn phase. However, there is no exclusive left-turn lane for this protected phase. While not expressly restricted by the 2009 MUTCD, protected-permitted phasing without an exclusive left-turn lane is unconventional and may violate driver expectation. Additionally, crash research indicates that rear end crash risks are significantly increased with shared left-turn/through lane operations. Although observed crash data actually indicates a steady reduction in crashes with the introduction of the protected-permitted phasing with zero crashes in 2012.

Suggested Mitigation:

Based on driver expectation and NMDOT (State Access Management Manual), an exclusive left-turn lane is recommended for the east and west legs of the NM 314/Courthouse Road intersection. The preferable length for the left-turn lanes would at least be 230 feet in length to cover deceleration requirements at 35 mph as per SAMM.

Issue 10: Closely Spaced Driveways

Location: Intersection of Court House Road and NM 314



Figure 15: Apartment Complex Drive near the NM 314/Courthouse Road Intersection
Looking south on NM 314 at Court House Road

Description of the Safety Issue:

There are several closely spaced driveways on the west side of NM 314 within the project area, which are currently not in compliance with NMDOT SAMM. There was an observed northbound left-turn queue accessing the above driveway that spilled backwards through the NM 314/ Courthouse Road Intersection, which can increase the risks of crashes. As mentioned previously, a shared left-turn through movement also increases the risk for rear-end crashes. The above driveway is only 100 feet from the NM 314/Courthouse Road intersection. There is another driveway less than 70 feet away to the north and Colonial Avenue is 200 feet to the north. All driveways are full movement access.

Suggested Mitigation:

Based on NMDOT SAMM, these driveways should either be combined and/or limited to right-in right-out access. Final access management would depend on the design alternative that is chosen to upgrade the railroad crossing and the NM 314 / Courthouse Road intersection and public input.

Issue 11: Intersection Lighting**Location:** Intersection of Court House Road and NM 314

Figure 16: Street Lighting at NM 314 / Court House
Looking west on NM 314 at Court House Road / NM 314

Description of the Safety Issue:

It was observed during the PM peak of the RSA field visit, the intersection lighting at the NM 314/Courthouse Road intersection was not functioning.

Suggested Mitigation:

Intersection lighting issues should be diagnosed and repaired.

Issue 12: Stop Sign and Stop line Location**Location: Raised Crosswalk on the East Side of the Transportation Center**

Figure 17: Stop Sign and Stop line Location
Looking east on Juan Perea Road / Transit Center Parking Lot

Description of the Safety Issue:

The northbound stop line location on Juan Perea Road relative to the stop sign is confusing. Stop signs should be placed near the stop line.

Suggested Mitigation:

Either an additional stop sign should be added to the stop line south of the raised crosswalk, or the stop line at the crosswalk should be removed and the stop sign relocated to the southernmost stop line.

Other Observations and Issues

As night-time survey was conducted to observed striping and signing reflectivity and visibility. All signs had adequate reflectivity and visibility. Striping at times was hard to see, but this could have been due to wet pavement at the time of observations, which can reduce striping reflectivity.

Alternative Intersection Concepts

Alternative 1 Keep Current NM 314/Courthouse Road Intersection Location

Alternative 1 adds a left turn lane to the southbound approach of intersection of NM 314 and Court House Road. This alternative would maintain the current intersection location, but would upgrade railroad crossing gates to quad gates, incorporate a pre-signal, and LED turn restriction displays for both the northbound and southbound directions. Due to the skew that would remain on Courthouse Road, a raised median and channelization of the westbound approach would be required in case this crossing is ever to become a quiet zone. **Figure 18** shows a conceptual drawing of Alternative 1. **Figure 19** shows the geometry of Alternative 1 and the turning movements.

A capacity analysis was performed for the proposed alternative. A summary of all capacity analyses can be found in **Table 4**. As indicated it is expected that the intersection will operate at an acceptable LOS.

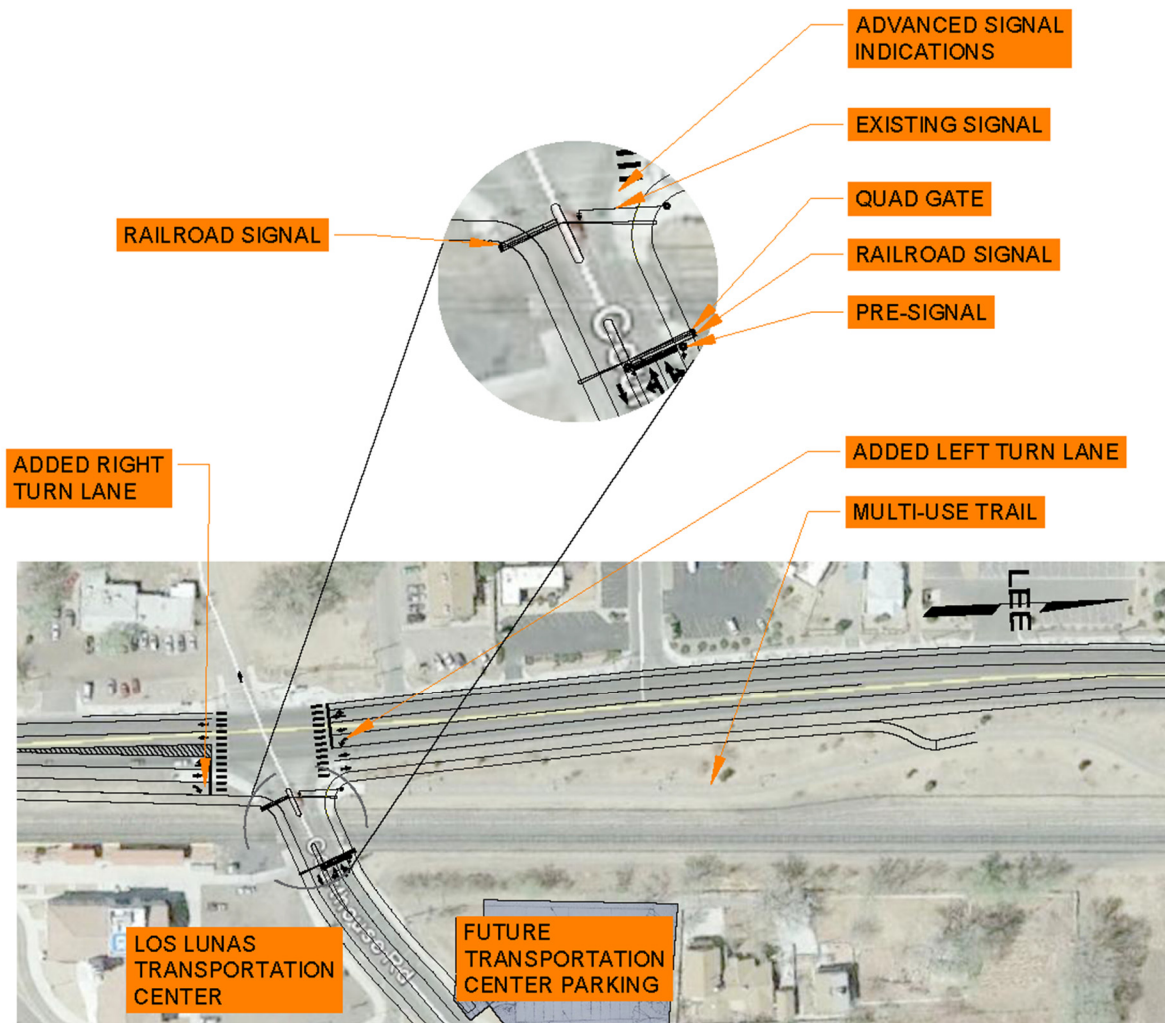


Figure 18: Alternative 1 Conceptual Drawing

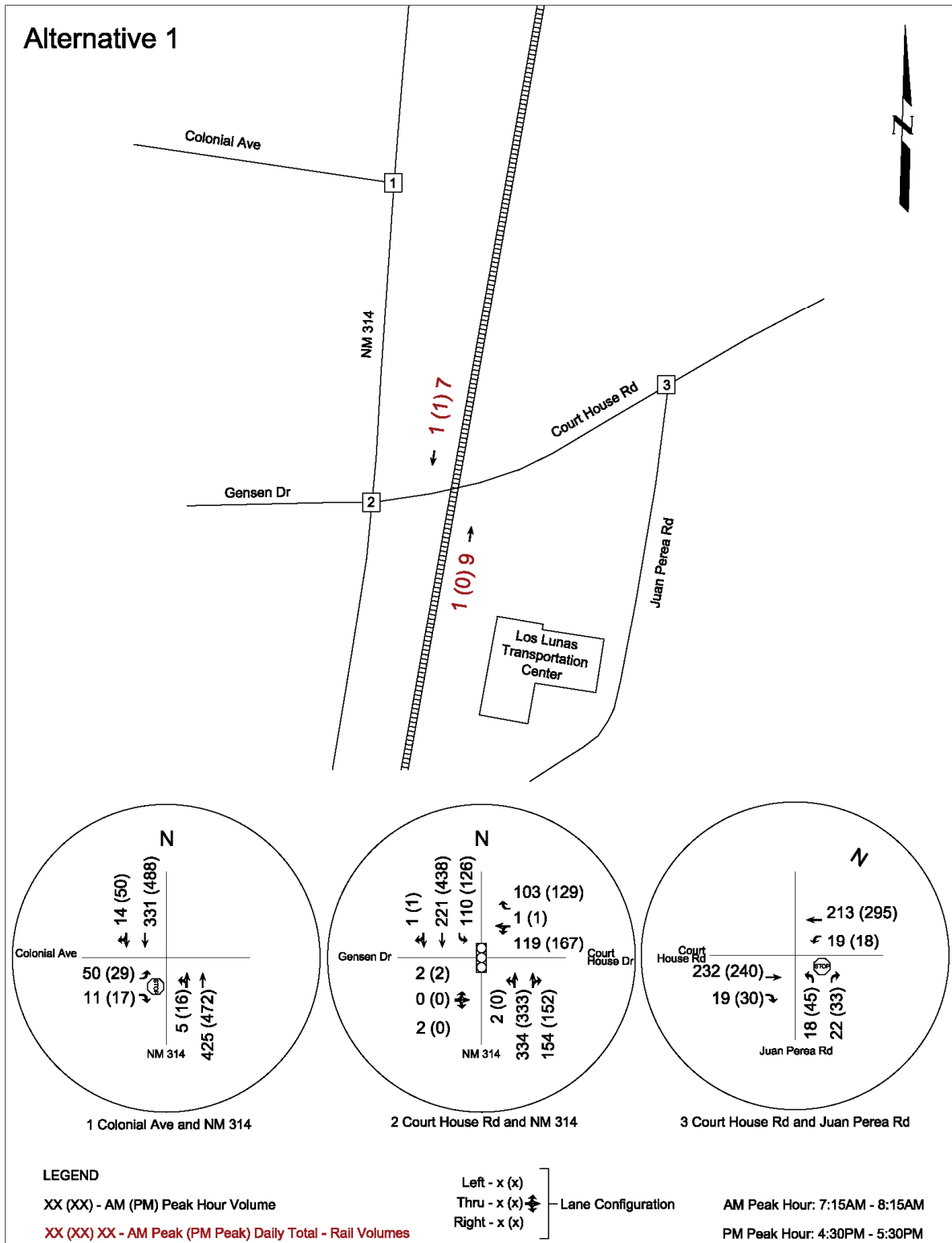


Figure 19: Alternative 1 TMC

This alternative has the following pros and cons associated:

Pros

- This alternative would require the least amount of public right-of-way acquisition.

Cons

- The widening associated with the added left-turn lane will encroach on railroad ROW if widened to the east thus pushing multi-use trail and vehicular facilities closer to the train tracks.
- An expensive pump station relocation would be required if all widening is done to the west.
- Alternative 1 does not address the skew on the westbound approach, which presents challenges to provide proper quad-gating and is inherently less safe at vehicular intersections.

Considerations

- As mentioned, there is a potential that, in the future, this location could become a quiet zone. Therefore, quiet zone requirements would need to be met; a median plus widening on the westbound approach to the NM 314/Courthouse Road intersection to prevent the ability for vehicles to sneak around crossing arms.
- Raised medians should be considered for east and west approaches to the NM 314/Courthouse Road intersection. Existing driveways to the restaurant on the southwest corner, the apartment complex and law offices on the northwest corner should be at least limited to right-in/right-out due to their close proximity to the signalized intersection and the fact that minor street left-turn movements tend to be at much greater risk for severe crashes.
- A separate pedestrian crossing could be provided south of the NM 314/Courthouse Road intersection and sidewalk on Courthouse Road and fronting the Los Lunas Transportation Center would be removed. This would separate pedestrian traffic from the vehicular rail crossing and potentially discourage illegal and unsafe pedestrian crossing traversing the railroad tracks. To increase the effectiveness of this option, fencing and/or bollards would be needed to limit direct access to Courthouse Road and the railroad tracks from the transit center.
- A road diet on NM 314, reducing the cross-section from 4 to 3 lanes, could reduce the right-of-way impacts when adding auxiliary lanes at the Courthouse Road intersection. Road diets have been considered an effective safety measure by FHWA. However, further study of the entire NM 314 corridor would be required to determine the viability and desirability prior to implementing such a measure.

The estimated cost for Alternative 1 is **\$1.9 Million**.

Alternative 2 Realignment of Court House Road Just North of Existing

Alternative2 re-aligns the intersection of NM 314 / Court House Road so that the east leg of the intersection becomes the driveway of the nearby apartments on NM 314. **Figure 20** shows a conceptual drawing of Alternative 2. Re assigned turning movements for Alternative 2 are shown in **Figure 21**. A capacity analysis was performed for the proposed alternative. A summary of all capacity analyses can be found in **Table 4**.

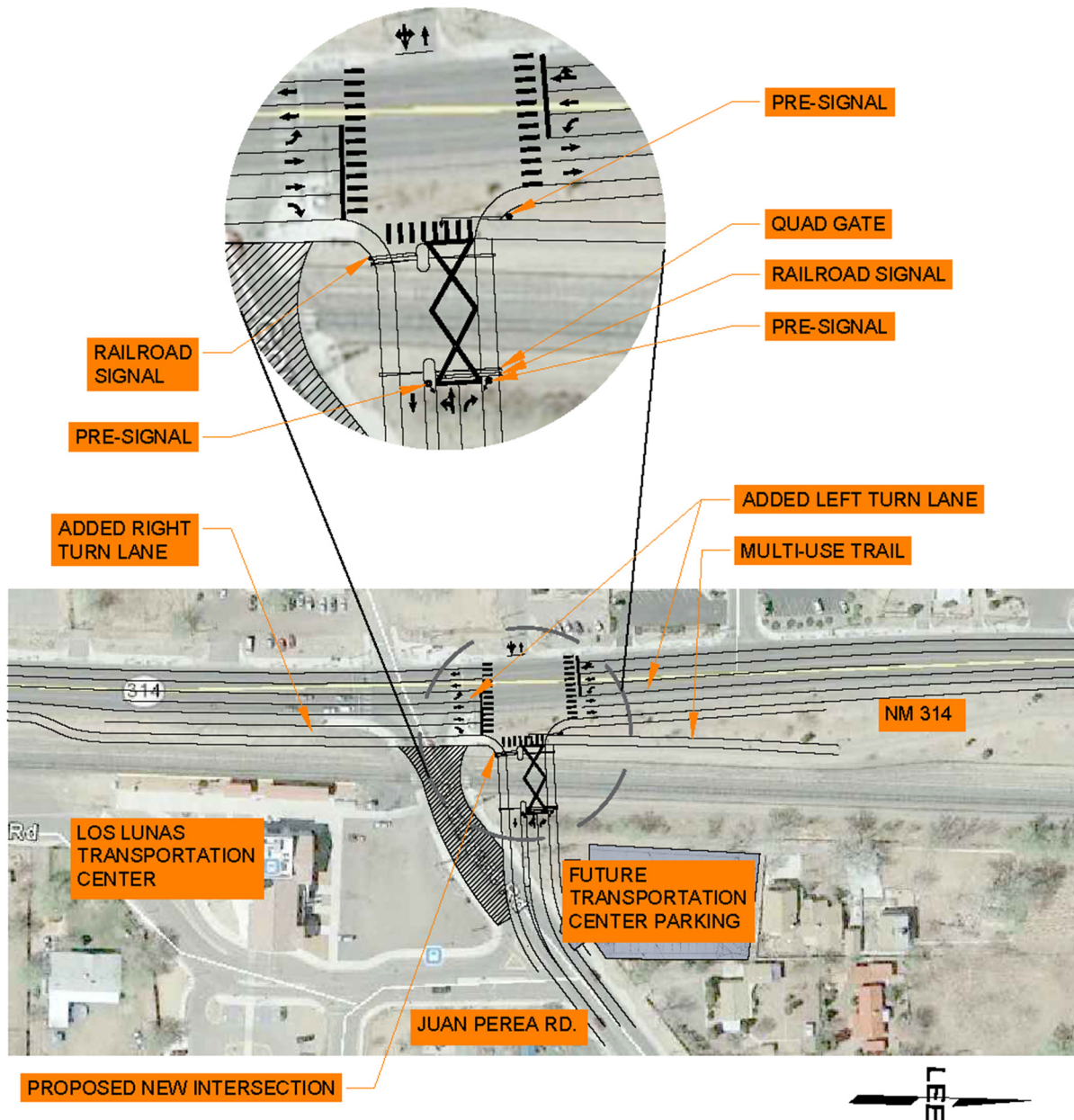


Figure 20: Alternative 2 Conceptual Drawing

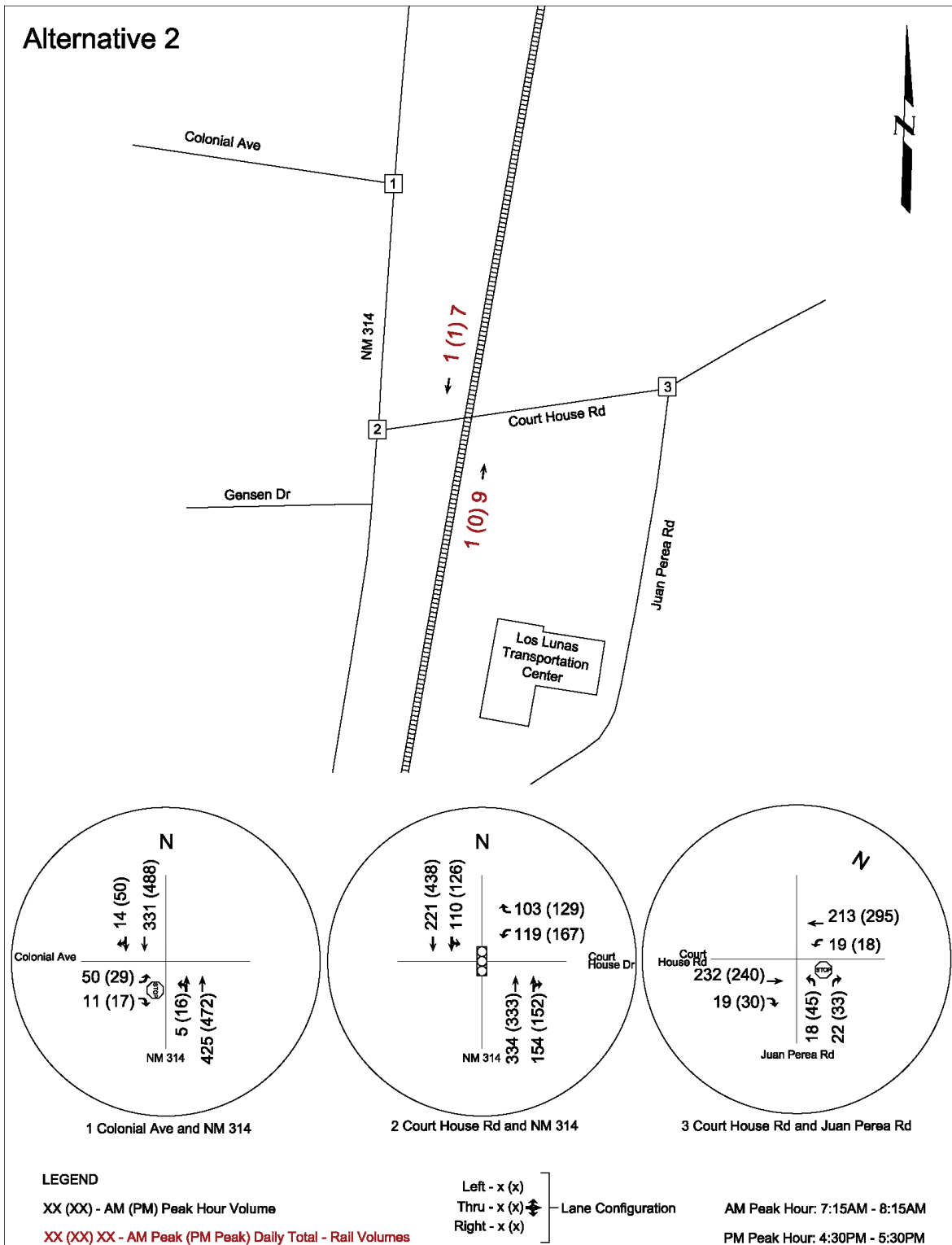


Figure 21: Alternative 2 TMC

Pros

- This alternative would potentially avoid the expensive relocation of the pump station located on the northwest corner of the existing signalized intersection.
- Realignment of the westbound leg allows the elimination of the skewed approach thus providing better safety and accommodation of quad gates.
- Relative to Alternatives 3 and 4, very little ROW acquisition would be required.
- Unlike Alternative 1, this alternative will still provide access for the private residence to the north of Courthouse Road.

Cons

- Realignment options are limited due to the need to minimize impacting the future Transportation Center parking lot proposed on the north side of Courthouse Road.
- The private drive to the apartment complex would likely either align or fall within the proposed new NM 314 signalized intersection.

Considerations

- Depending on where the private access to the apartment complex to west falls, it is likely that this driveway would at the very least be limited to right-in/right-out or even closed. It should be noted that apartment residents can access NM 314 either from Gensen Dr or Colonial Ave. If this driveway is closed left-out access from Gensen Dr may need to be maintained.
- Raised medians should be considered for east and west approaches to the NM 314/Courthouse Road intersection. Therefore, due to close proximity, the existing driveways to the adjacent law offices and Colonial Avenue should become right-in/right-out only. Vehicles exiting these driveways and wanting to head north could do a U-turn maneuver at the proposed intersection or they could access Gensen Drive via side street connections.

The estimated cost for Alternative 2 is **\$1.6 Million**

Alternative 3a, 3b and 3c Extension of Juan Perea Road (or Courthouse) to Align with Colonial Avenue

Alternative 3 proposes to extend Juan Perea through Courthouse Road extending to the northwest and forming a new signalized intersection with NM 314 aligning with Colonial Avenue. The intersection of Juan Perea Road / Court House Road will become a stop controlled T-intersection (Alternative 3a) or a Roundabout (Alternative 3b) and the existing Courthouse alignment west of this intersection would be abandoned. Similar to Alternative 1, the railroad crossing controls would be upgraded to a quad gate system with a pre-signal and incorporate left and right-turn restriction LED indications. Alternatively, Courthouse Road could be realigned directly into Colonial Avenue (Alternative 3c). Again the intersection of Juan Perea Road and Court House Road would again form a T-intersection, except the stop controlled approach would be on Juan Perea Road rather than Courthouse Road. **Figure 22, 23, 24** depicts the geometry of Alternative 3a, 3b, and 3c respectively. Re-assigned turning movements for both Alternative 3a and 3b are shown in **Figure 25** and a capacity analysis was performed for the these alternatives. A summary of all capacity analyses can be found in **Table 4**. It should be noted that Alternative 3c was considered and added after the initial completion of this report and therefore analyses are not included in **Table 4**. However, the intersections of NM 314/Courthouse Road-Colonial Avenue would operate at similar LOS to Alternatives 3a and 3b. Operations at the Courthouse Road/Juan Perea Road intersection would actually improve due to the fact that turning demands would be reduced by keeping Courthouse Road the main approaches rather than the minor one.

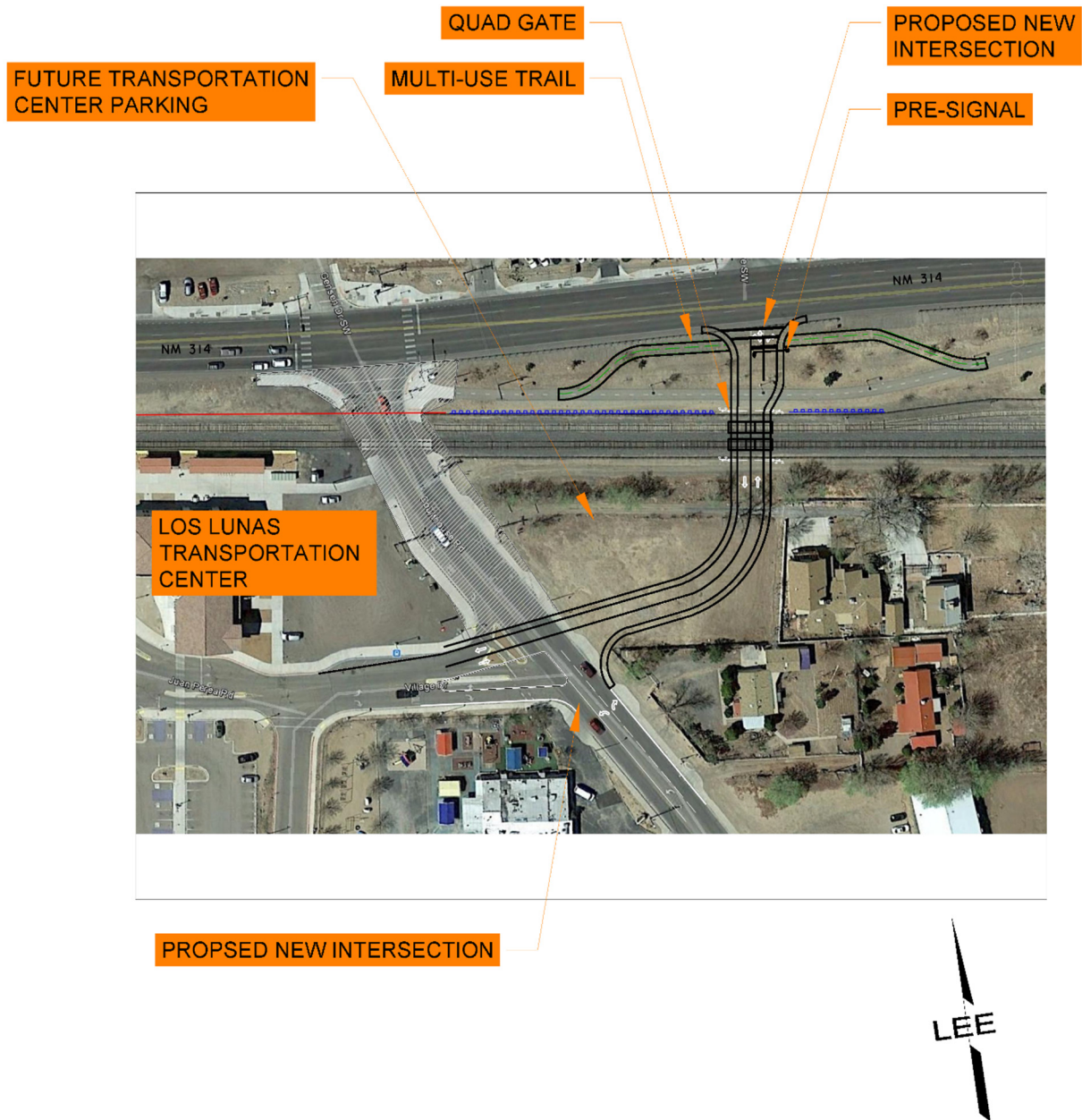


Figure 22: Alternative 3a Conceptual Drawing

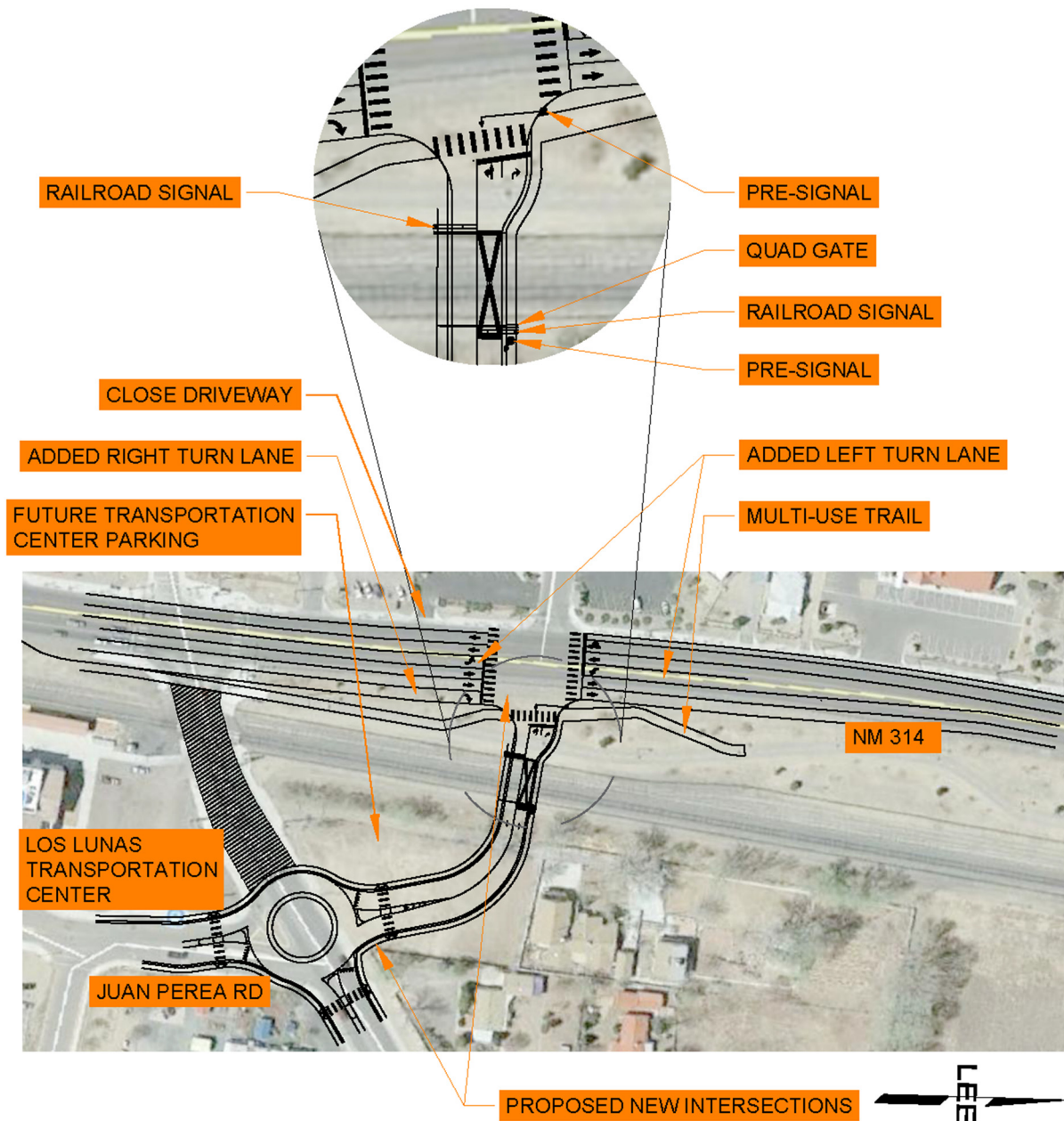
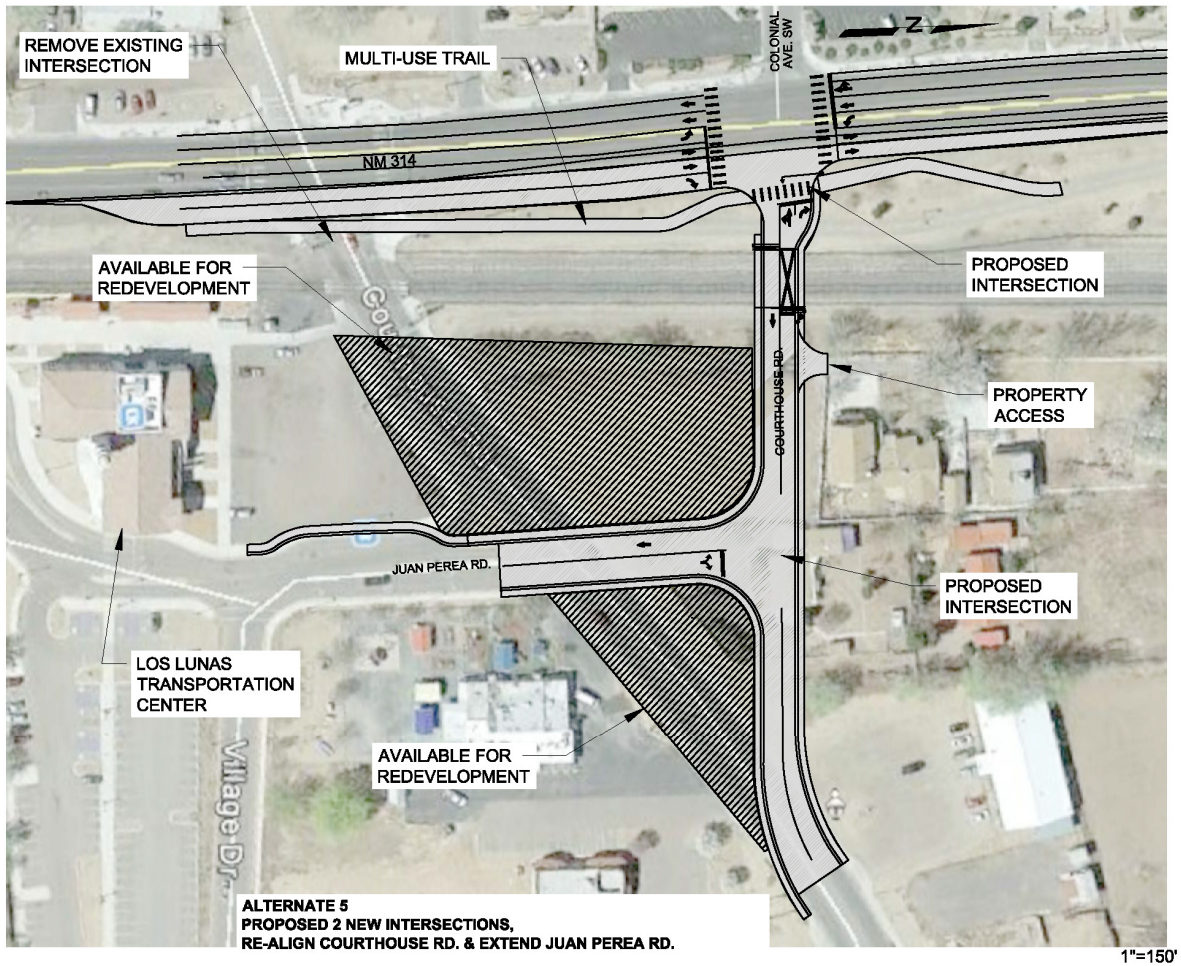


Figure 23: Alternative 3b Conceptual Drawing

Figure 24: Alternative 3c Conceptual Drawing



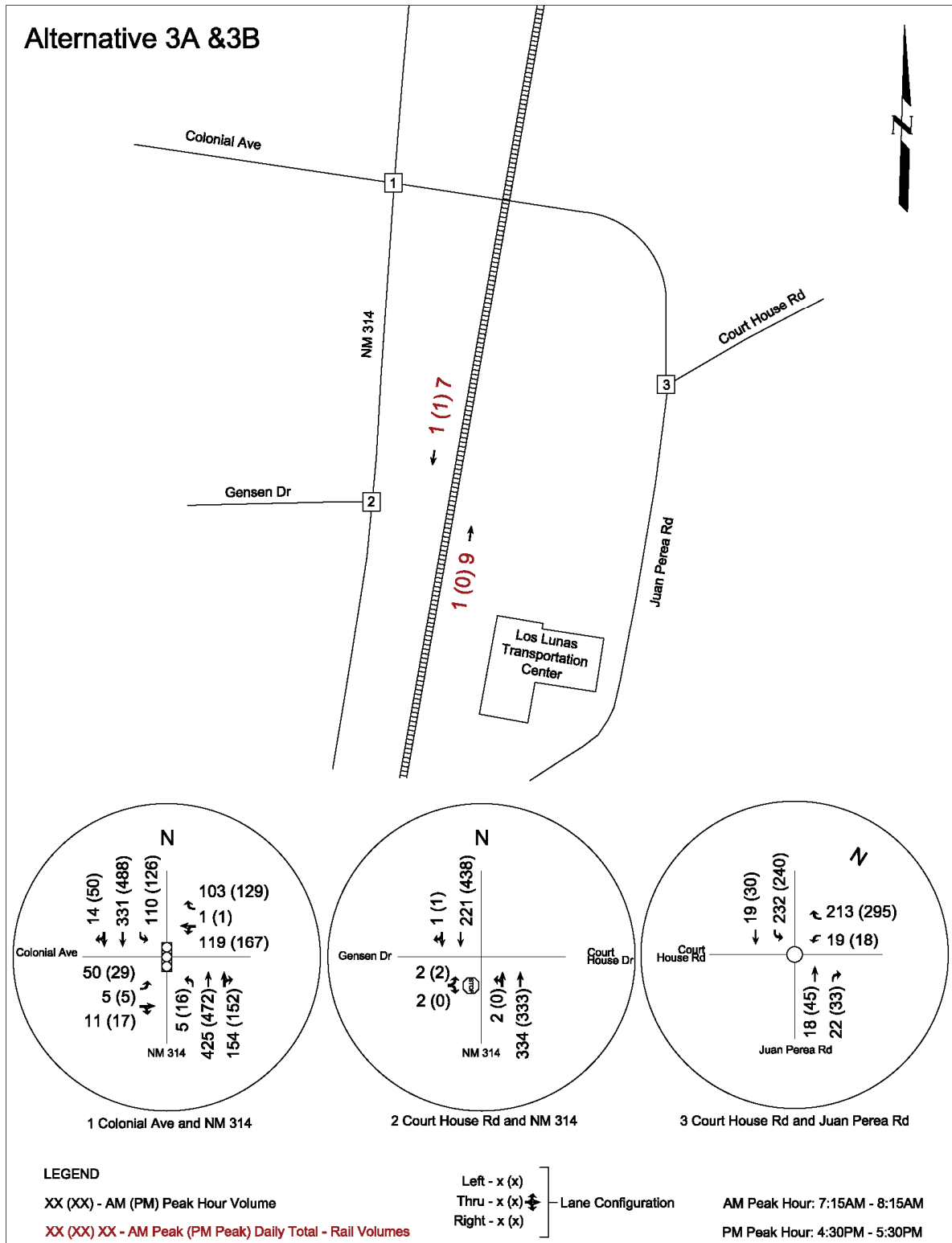


Figure 25: Alternative 3A & 3B TMC

This alternative has the following pros and cons associated:

Pros

- This alternative would mitigate the intersection skew thus providing better opportunities for providing the quad gate system and reduces crash risks at the signalized intersection with NM 314.
- The signalized intersection footprint at NM 314 does not encroach on railroad right-of-way.
- The multi-use trail crosswalk is now placed at a much greater distance from the railroad crossing reducing the occurrence of railroad-pedestrian interactions.
- This alternative avoids an expensive relocation of the existing pump station located at the northwest corner of the NM 314/Courthouse Road intersection.
- Alternative 3c offers better visibility of both the NM 314 intersection as well as the railroad crossing compared to Alternatives 3a and 3b.
- Alternative 3c provides accommodates more natural turning movement demands by making Juan Perea Road the minor street approach compared to Alternatives 3a and 3b, which make Courthouse Road the minor street

Cons

- The proposed widening would encroach on the already designed transit station employee parking lot planned for the lot immediately north of the transit station, but would also provide additional space where Court House Road is proposed to be removed.
- It would be a challenge to provide safe access for the private home that would be located at the northeast corner of the NM 314/Juan Perea-Colonial Avenue intersection.
- There is existing on-street perpendicular parking on the Colonial Avenue approach that should be eliminated for safety reasons due to potential backing out maneuvers. However, there are no evident alternative locations for this parking without condemning the property.
- With the railroad crossing further away from the proposed NM 314 signalized intersection, the pre-emption time length requirements will increase due to greater track and queue clearance distances.
- Alternative 3c would require that a private residence be acquired.

Considerations

- There are several driveways accessing the Colonial Avenue approach within 50 feet of the proposed signal, which should be eliminated due to potential conflicts with safe signal operation.
- Raised medians should be considered for east and west approaches to the NM 314/Colonial Avenue intersection. Therefore, due to close proximity, the existing driveways to the adjacent law offices and the apartment complex on the west side of NM 314 should become right-

in/right-out only. Vehicles exiting the apartment complex wanting to route north can access either Gensen Drive or Colonial Avenue could complete a left-turn maneuver.

- All of these alternatives will require coordination with the proposed parking lot that the transit center is in the process of planning and designing.

The estimated cost for Alternative 3a is **\$1.7 Million**; Alternative 3b is **\$2.0 Million**; Alternative 3c is **\$2.2 Million**. It should be noted that the cost estimate for Alternative 3c does not include the acquisition of the property needed to construct this option.

Alternative 4 New Access Alignment South of the Transit Site

Alternative 4 proposes a new alignment approximately 300 feet south of the existing NM 314/Courthouse Road intersection which would create a new signalized intersection at NM 314 and extend to Juan Perea Road. The new intersection at Juan Perea Road could either be a stop controlled T-intersection or a roundabout. The existing signalized Courthouse Road intersection with NM 314 would be eliminated and the Courthouse Road alignment between NM 314 and Juan Perea Road would provide local access to the future transit station parking lot and one private residence. **Figure 26** shows a conceptual drawing of Alternative 4 with roundabout control applied at the new Juan Perea Road intersection. Re-assigned turning movements for Alternative 3 are shown in **Figure 27**. A capacity analysis was performed for the proposed alternative. A summary of all capacity analyses can be found in **Table 4**.

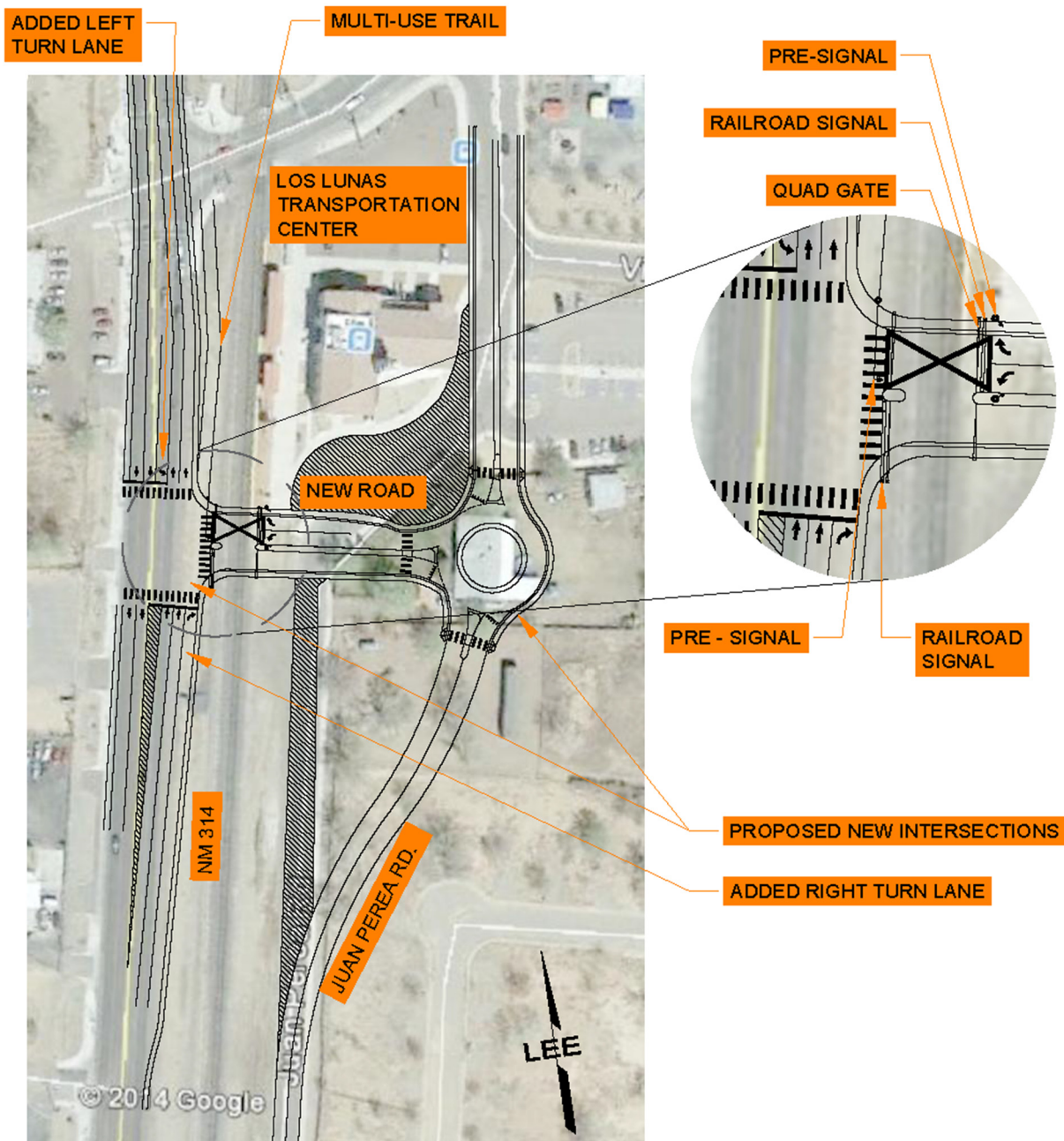


Figure 26: Alternative 4 Conceptual Drawing

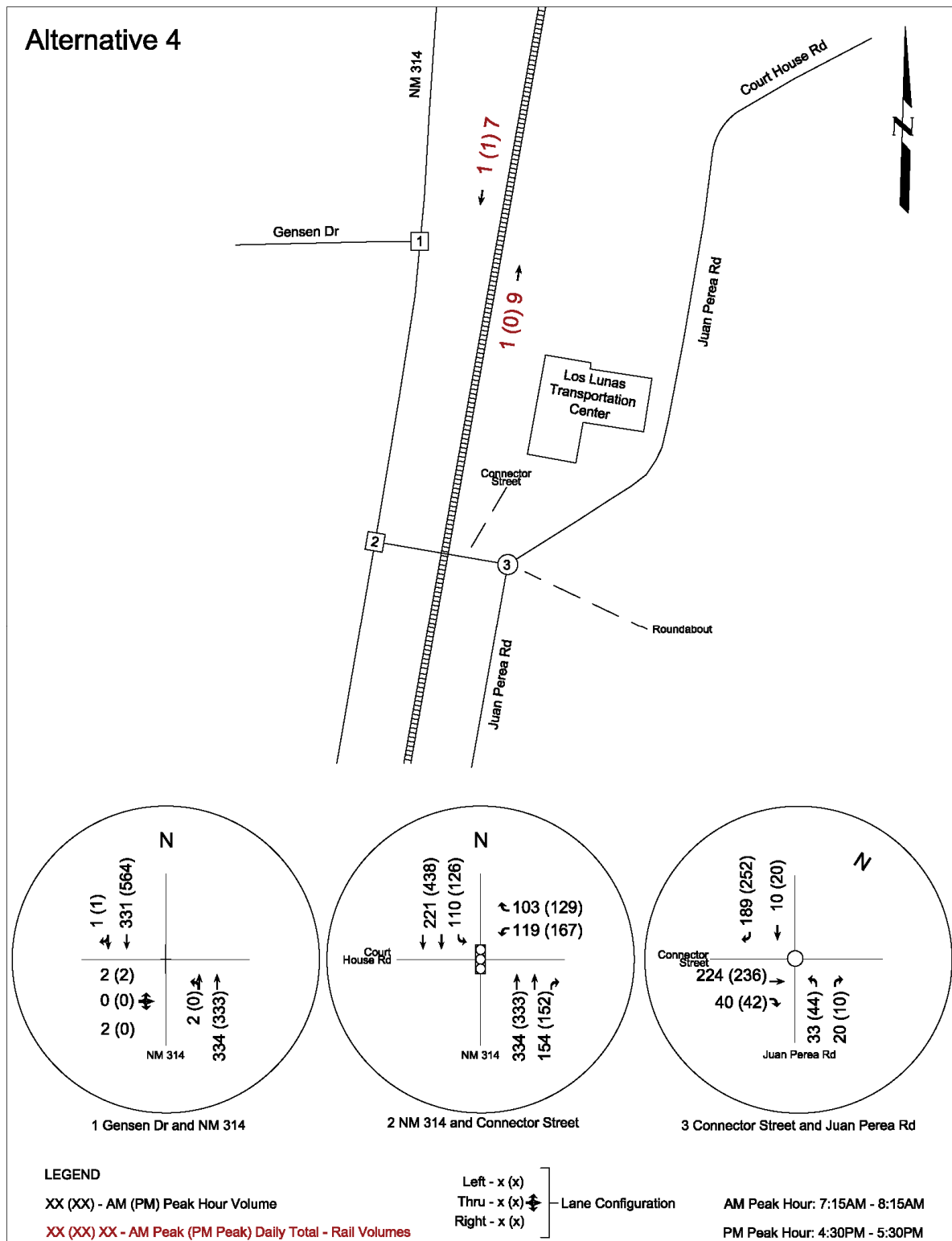


Figure 27: Alternative 4 TMC

Alternative 4 has the following pros and cons associated:

Pros

- This alternative would mitigate the intersection skew thus providing better opportunities for providing the quad gate system and reduces crash risks at the signalized intersection with NM 314.
- This alternative avoids an expensive relocation of the existing pump station located at the northwest corner of the NM 314/Courthouse Road intersection.

Cons

- The proposed realignment of Juan Perea Road could require up to 1.7 Acres of adjacent property take to accommodate the new Juan Perea Road intersection.
- The location of the new alignment may require the reconstruction of the Railrunner platform to ensure that a stopped northbound train does not encroach into the proposed at-grade crossing.
- Due to the close proximity of the at-grade rail crossing and roundabout, the existing transit drop-off area would have to be relocated toward the north side of the transit station.
- There are several private driveways located on the west side of NM 314, which complicate a proposed new intersection on the south side of the transportation center and cannot be easily relocated.

Considerations

- There private driveway located on the west side of the proposed intersection would ideally be combined with the adjacent restaurant driveway located to the north.
- Raised medians should be considered for east and west approaches to the proposed signalized intersection. Therefore, due to close proximity, several existing driveways on the west side of NM 314 should become right-in/right-out only. Vehicles wanting access to the north on the north side of the intersection can simply do a U-turn at the proposed signalized intersections. Vehicles wanting to head north and using these driveways on the south side of the intersection would have to find a U-turn opportunity, which may not be easy as the road section is a four-lane undivided road.
- The new Juan Perea roundabout should be placed far enough such that queues stopped at the at-grade crossing minimally impact the roundabout operation.

The estimated cost for Alternative 4 is **\$2.2 Million. This cost does not include ROW acquisition nor rail platform reconstruction.**

Capacity Analysis for Alternative Intersection Concepts

Capacity analyses for existing traffic demands were conducted for impacted intersections under all proposed design alternatives. Anticipated delay and LOS at impacted intersections are summarized in **Table 4**.

Table 4: Capacity Analysis Summary

Study Intersection	Design Alternative	Intersection LOS			
		AM		PM	
		Delay ¹	LOS ²	Delay ¹	LOS ²
NM 314 and Court House Road	1.0	22.4	C	21.0	C
	2.0	19.5	B	18.6	B
	3A ³ and 3B ³	10.3	B	14.1	B
NM 314 and Colonial Avenue	3A and 3B	21.6	C	22.2	C
Court House Road and Juan Perea Road	Alternative 3A ³	14	B	14.9	B
	Alternative 3B	5.5	A	6.1	A
NM 314 and Connector Street	Alternative 4	22.7	C	22.6	C
Juan Perea and Connector Street	Alternative 4	7.5	A	8.5	A

¹Average delay in seconds per vehicle.

²LOS stands for Level of Service.

³Delay and LOS for highest delay movement is reported for unsignalized intersections.

In general, capacity does not appear to be an issue under any of the scenarios as all study intersections under all design alternatives are expected to operate a LOS C or better and all movements are expected to operate below capacity for existing demands. As previously mentioned, 2035 model demands indicate very little expected traffic demand growth in this area, therefore operations would be expected to be similar under 2035 demands.

Additionally, 95th percentile queue demands were reported for auxiliary turn lanes under each proposed design alternative. Anticipated 95th percentile queue lengths and recommended minimum storage lengths are summarized in **Table 5**.

Table 5: Queue Analysis Summary

Intersection	Design Alternative	Movement	95th Percentile Queue (ft)		Minimum Required Storage (feet)
			AM	PM	
NM 314 / Courthouse Road	1	SB Left	61	69	80
		WB Right	47	45	50
	2	SB Left	61	69	80
		NB Right	51	51	60
		WB Right	35	43	50
		WB Left	100	136	150
NM 314 / Colonial Avenue	3A and 3B	WB Right	31	41	40
	3A and 3B	SB Left	57	65	80
NM 314 / Connector Street	4	SB Left	126	142	150

Project Deliverable Presentation and Final Comments

Lee Engineering conducted a final webinar with the RSA team on January 20, 2015 3:00 PM – 5:00 PM. The purpose of the webinar was to summarize the procedures, assumptions, findings and recommendations of the draft RSA report.

Attendees:

- Afshin Jian, NMDOT State Traffic Engineer
- Rais Rivi, NMDOT District 3
- Bill Craven, Rail Bureau Manager
- Abiel Carillo, Molzen-Corbin
- Michael Jaramillo, Los Lunas Project Coordinator
- Nancy Perrea, NMDOT, District 3 Traffic Engineer

The following is a summary of the discussion that occurred during the presentation and comments received.

- A current Rio Metro on-call project is scoped to do the following:
 - Research and compose pedestrian and bicycle crossing standards at rail facilities.
 - Identify needs at existing rail crossings based on standards.
 - Prioritize crossings for improvements.
- A quiet zone requirement is not a safety upgrade to the current railroad crossing gates.
- The pedestrian plaza that is to be constructed in June 2015 north of the Los Lunas Transit Center is to provide railroad maintenance access on the south side of the transit center, decorative fencing along Court House Rd to discourage jay-walking, and improved signing and striping on the west side of the transit center. This pedestrian plaza will also remove the driveway located within the railroad crossing.
- Drivers have complained about confusion between the pre-signals and the indications at the NM 314 Intersection. The existing pre-signal mast arm should be relocated and reviewed for lower effectiveness.
- Two other possible mitigation options include:
 - Providing a median refuge with the existing Court House Rd alignment design alternative.
 - Provide a separate pedestrian crossing of the tracks south of Court House Rd with fencing or bollards restricting access to Court House Rd.
- Bill Craven from the NMODT Railroad Bureau suggested that a road diet could be a potential mitigation on NM 314 that would reduce ROW impacts and that further study of such an alternative could be studied in the future.

For Conclusions, Recommendations and Costs, please see the Executive Summary of this report.