

# LEVEL 'A' PLANNED COMMUNITY TECHNICAL REPORT

FOR

# SANTOLINA LEVEL 'A' MASTER PLAN

# TRANSPORTATION MASTER PLAN

AUGUST 26, 2013

Prepared For:

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TECHNICAL REPORT

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TRANSPORTATION MASTER PLAN

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COUNTY OF BERNALILLO, NEW MEXICO

AUGUST 26, 2013

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## I. TRANSPORTATION ANALYSIS

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### A. INTRODUCTION

The Santolina Master Plan area is approximately 13,700 acres in west Bernalillo County shown in Figure 1. Transportation access to and from Santolina is critical to the success of the community. As shown in the Master Plan, Santolina is served by a roadway network made up of Atrisco Vista, Dennis Chavez, 118<sup>th</sup> Street, Central Avenue, and Shelly Drive, as well as Interstate 40 from the Atrisco Vista/West Central interchange.

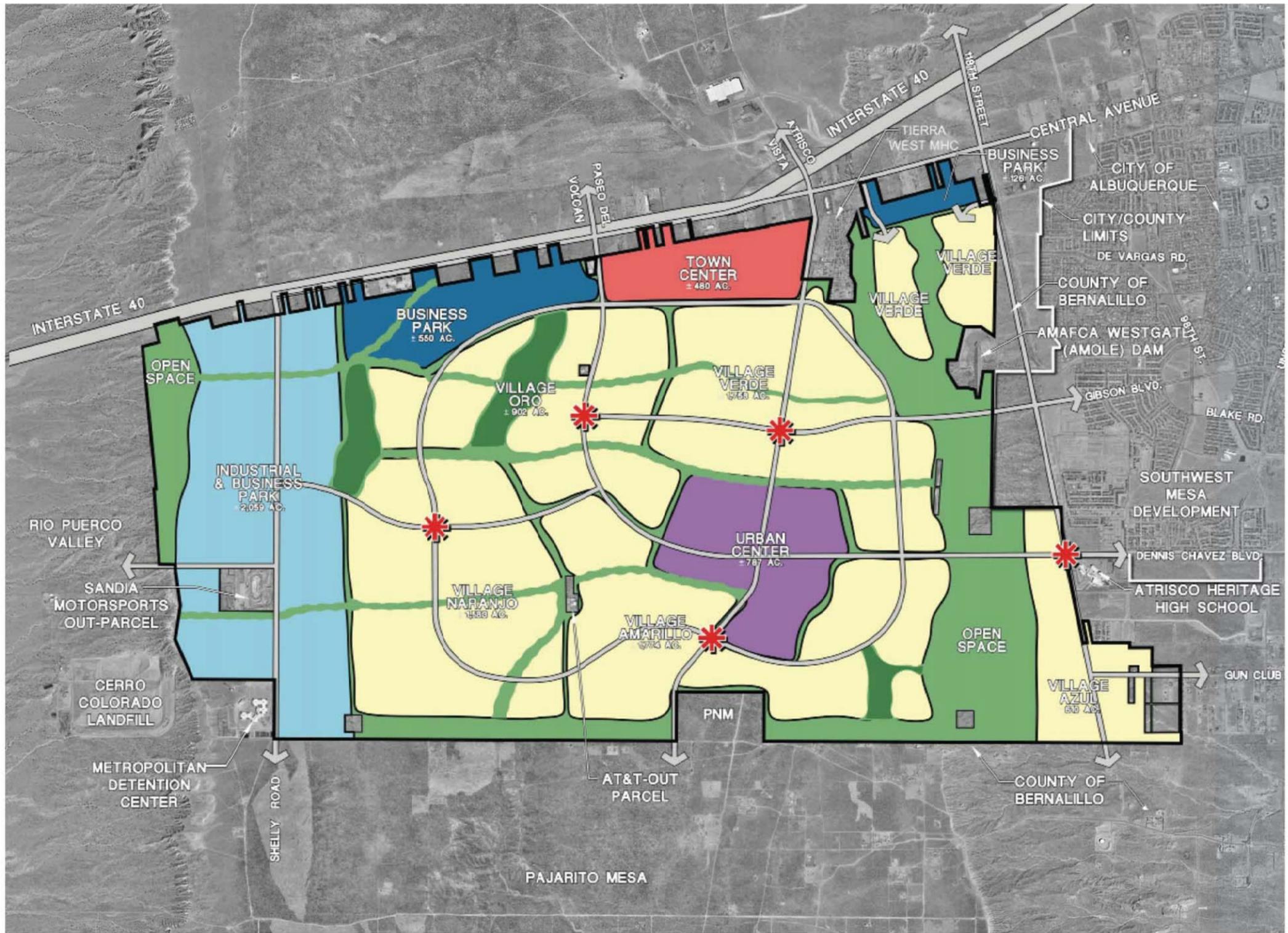
The 2035 Metropolitan Transportation Plan (MTP) anticipates several projects that will improve access to Santolina, to be discussed later, and shown in Figure 5. The MTP has projects to widen Dennis Chavez Boulevard east of Atrisco Vista, widen Atrisco Vista north of Interstate 40, and construct Paseo del Volcan north of Interstate 40. In addition, future interchanges with Interstate 40 are identified at 118<sup>th</sup> Street and Paseo del Volcan. All of these planned improvements will serve to improve access to Santolina.

Transportation infrastructure will be phased as needed to serve the development, as substantiated by future Level B and Level C traffic impact analyses.

### B. MAJOR STREET SYSTEM AND RELATED COMPONENTS

Santolina will benefit from its proximity to a relatively extensive transportation network of existing streets and roadways. These will be extended through the community as needed to serve development, and will be designed to be multi-modal, with adequate room for trails, bicycle, and transit. The roadway corridors shown in the Master Plan are principal arterials with 4-6 lanes. A network of collector and local streets will be developed in the next phase of planning, with the Level B plans for each subarea. In addition to the next level of roadways, there will also be an overall network of pedestrian and bicycle trails within Santolina which will connect to the larger, regional existing and planned roadway, bicycle, and trail facilities.

As stated in the Level A Master Plan, a goal for the transportation plan is the development of a circulation and transportation system which promotes connections to and from existing and planned freeway interchanges, arterials and collector streets; allows for transit connections throughout the community; that creates links between activity centers and Villages; and provides opportunities for alternative modes of transportation for the community through an extensive network of trails and bikeways. Walkability and transit opportunities are highly valued traits of new communities, and they are prevalent at Santolina.



**SANTOLINA LEVEL A  
MASTER PLAN  
FIGURE 1**



## 1. FUNCTIONAL CLASSIFICATION AND ROADWAY HIERARCHY

As mentioned, all the roadways shown in the Master Plan are principal arterials. Dennis Chavez Boulevard, Atrisco Vista Boulevard and the future Paseo del Volcan are principal arterials, however, these and all other arterial roadways will generally adhere to the intersection and driveway spacing as identified in the NMDOT's State Access Management Manual (SAMM).

Internal circulation will be focused on a radial loop road through the Villages, with minor arterials and collectors branching off from the loop road to create an internal grid structure within the Villages. This arrangement provides multiple, parallel routes, providing opportunities to disperse traffic.

As the subareas are evaluated in the Level B plan submittals in the future, minor arterials, collectors and local streets will be identified.

## 2. EXTERNAL CONNECTIONS/GATEWAYS

As shown in the Master Plan, primary access to the site will be via:

- Dennis Chavez Boulevard,
- a Gibson Boulevard extension from 118<sup>th</sup> Street,
- Central Avenue/I-40 Frontage Road,
- Shelly Drive,
- the Interstate 40 interchange with Atrisco Vista, and
- the future Paseo del Volcan.

All these roadways are expected to carry significant traffic volumes, particularly post-2035, as the interstate and escarpment limit the opportunities for access to the site. As will be discussed later, opportunities for an extension of Gun Club or Grant Road, or grade separated overpasses across I-40 or a Shelly Drive interchange, could be used to improve connectivity and reduce congestion on entry roadways after 2035. Future Level B studies will define, and evaluate the need for these connections in more detail.

Prior to the construction of the future Paseo del Volcan interchange, access to Paseo del Volcan in Santolina will be via Central Avenue/I-40 Frontage Road.

Besides its role as a critical primary access carrying a significant amount of traffic volume, the Gibson Road extension up the escarpment is considered necessary to demonstrate to the Federal Highway Administration (FHWA) that the local roadway network is fully developed to the maximum extent possible, and alternatives to using the Interstate system for local trips are available. This will be crucial in the FHWA review of future 118<sup>th</sup> Street and Paseo del Volcan

Interchange Access Change Requests (required to gain federal approval for new interchanges on the interstate system). Given its alignment through the escarpment, this extension will follow natural contours and be designed to minimize impacts to the Ceja.

Other key roadways near Santolina include 118<sup>th</sup> Street and Atrisco Vista.

### 3. ACCESS MANAGEMENT

Access within Santolina will generally follow the intersection and driveway spacing criteria identified in the NMDOT SAMM. As none of the roadways will be posted above 50 MPH, this will result in a minimum signalized intersection spacing of 2,640 feet, or one-half mile, for principal arterials, and 1,760 feet for minor arterials. At a minimum, full access unsignalized intersection spacing is 1,320 feet, or one-quarter mile, for principal arterials, and 660 feet for minor arterials. Full access driveways have the same minimum spacing as full access unsignalized intersections. Partial access driveway spacing, such as left-in/right-in/right-out driveways, will range from 450 feet for principal arterials, to 275 – 400 feet for minor arterials, depending on the posted speed limit.

Figure 2 shows the potential signalized intersection locations based on the SAMM intersection spacing criteria for the Full Build scenario, which is anticipated to occur 40-50 years in the future. The 2035 Projected Development (Phase 1) roadway network and potential signalized intersections are shown in Figure 3. The graphics also show potential unsignalized intersection locations near the Village Centers. These are for illustrative purposes, and actual locations will depend on land use, final roadway alignments, and other factors, however the stated access management policy will be to follow the NMDOT SAMM to the greatest extent possible. Any deviations will require County approval.

### 4. TYPICAL SECTIONS

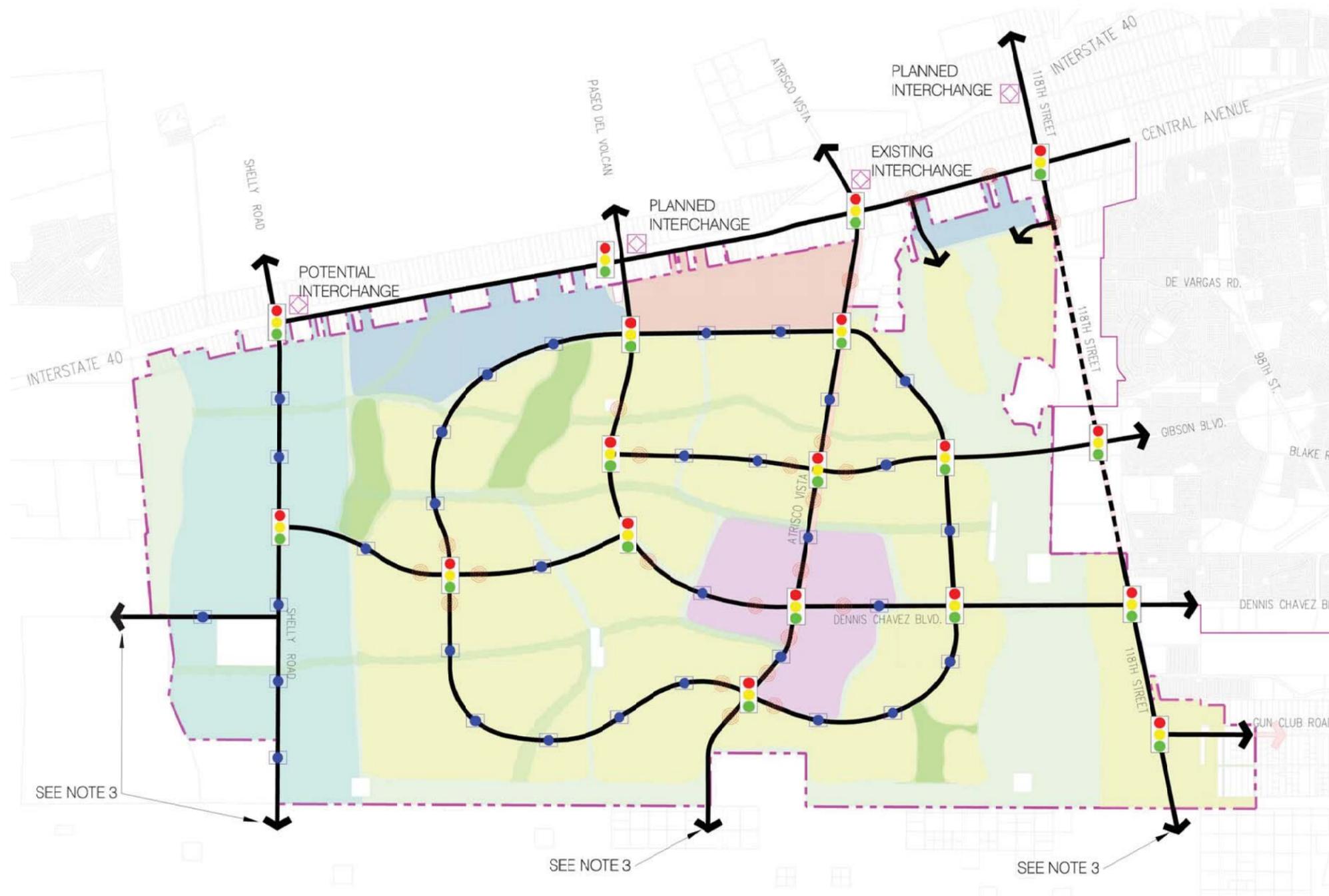
The proposed principal arterial typical sections are included in the following figures. The three sections shown include a proposed 6-lane principal arterial with a separate, dedicated bus lane for regional connections, a 6-lane principal arterial without dedicated transit, and a 4-lane principal arterial. Right-of-way widths range from 186-feet to 136-feet.

All three typical sections have on-street provisions for bicycle lanes and sidewalks or multi-use trails and have landscape buffers.

These typical sections will provide Santolina with a robust set of principal roadways and bicycle and pedestrian facilities resulting in local and regional wide access to alternate travel modes.

# ROADWAY FUNCTIONAL CLASS & ACCESS MANAGEMENT MASTER PLAN

## FIGURE 2

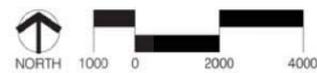


**NOTES:**

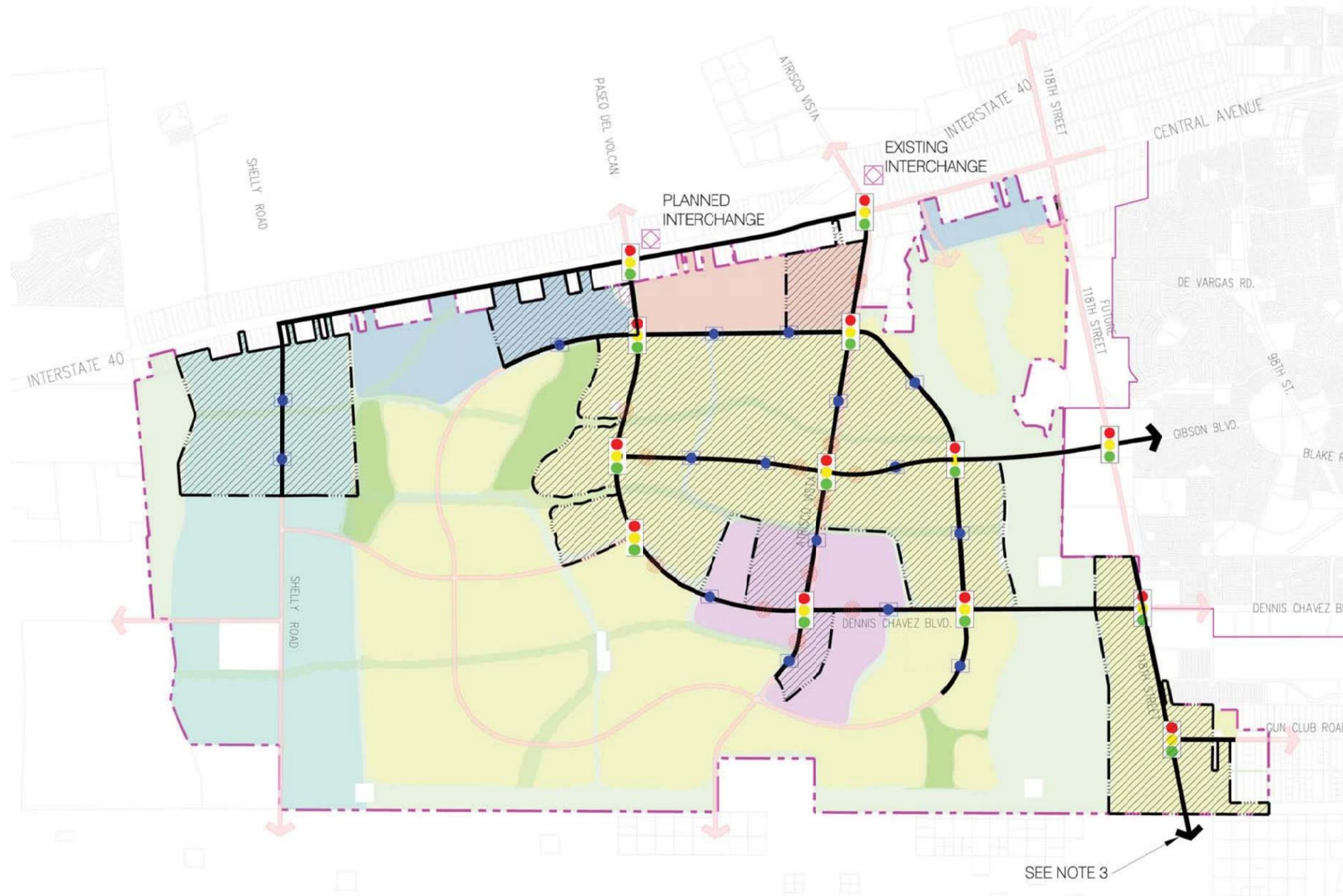
1. TRAFFIC SIGNAL AND INTERSECTION SPACING GENERALLY CONFIRMS WITH NMDOT STATE ACCESS MANAGEMENT (SAM) MANUAL FOR URBAN PRINCIPAL AND MINOR ARTERIALS.
2. ROADWAY FUNCTIONAL CLASS AND ACCESS MANAGEMENT PLAN ARE APPROXIMATE AND ILLUSTRATIVE, SUBJECT TO CHANGE.
3. FUTURE ROADWAY EXTENSIONS AND INFRASTRUCTURE OUTSIDE SANTOLINA ARE BY OTHERS (AS REQUIRED BY DEVELOPMENT PATTERNS).

**LEGEND**

	MAJOR SIGNALIZED INTERSECTION		PRINCIPAL ARTERIAL
	POTENTIAL FUTURE SIGNALIZED INTERSECTION		OFFSITE IMPROVEMENTS (BY OTHERS)
	POTENTIAL UNSIGNALIZED INTERSECTION		
	EXISTING INTERCHANGE OR PLANNED INTERCHANGE		



# ROADWAY FUNCTIONAL CLASS & ACCESS MANAGEMENT 2035 PROJECTED DEVELOPMENT (PHASE 1) MASTER PLAN FIGURE 3



**NOTES:**

1. TRAFFIC SIGNAL AND INTERSECTION SPACING GENERALLY CONFIRMS WITH NMDOT STATE ACCESS MANAGEMENT (SAM) MANUAL FOR URBAN PRINCIPAL AND MINOR ARTERIALS.
2. ROADWAY FUNCTIONAL CLASS AND ACCESS MANAGEMENT PLAN ARE APPROXIMATE AND ILLUSTRATIVE, SUBJECT TO CHANGE.
3. FUTURE ROADWAY EXTENSIONS AND INFRASTRUCTURE OUTSIDE SANTOLINA ARE BY OTHERS (AS REQUIRED BY DEVELOPMENT PATTERNS).

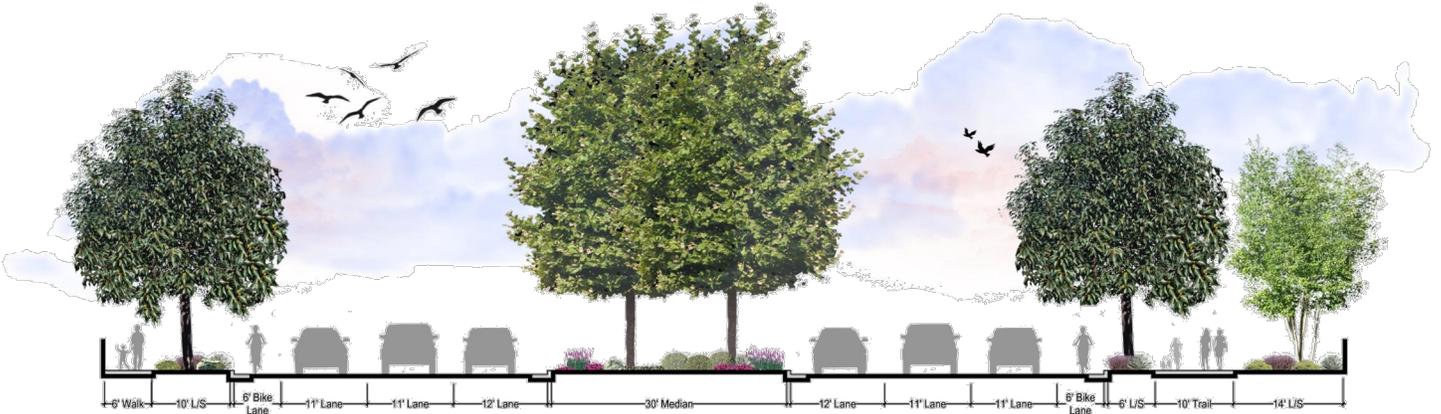
**LEGEND**

<ul style="list-style-type: none"> <li> MAJOR SIGNALIZED INTERSECTION</li> <li> POTENTIAL FUTURE SIGNALIZED INTERSECTION</li> <li> POTENTIAL UNSIGNALIZED INTERSECTION</li> <li> EXISTING INTERCHANGE OR PLANNED INTERCHANGE</li> </ul>	<ul style="list-style-type: none"> <li> PRINCIPAL ARTERIAL</li> <li> 2035 PROJECT PHASE 1 AREA</li> </ul>
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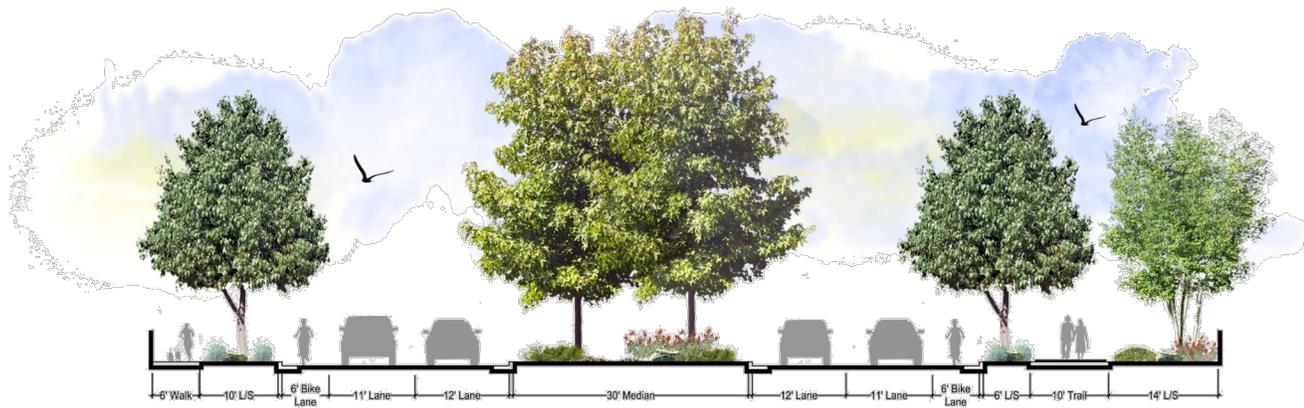




PRINCIPAL ARTERIAL  
w/TRANSIT  
(186' R.O.W.)



PRINCIPAL ARTERIAL  
(158' R.O.W.)



MINOR ARTERIAL  
(136' R.O.W.)

FIGURE 4 - TYPICAL SECTIONS



Photo credit: Complete Streets

### C. STRATEGIES FOR STREET CONSTRUCTION AND DEDICATION

The initial two lanes of permanent roadways, intersections and other elements to serve the development will be constructed by the planned community developer, per the Planned Community Criteria and Development Agreement. Subsequent stage construction of additional lanes, based on actual demand and short term projections of demand, will be eligible for consideration of local government capital programming, as stated in the Planned Community Criteria.

Right-of-way dedication will occur after the Level B studies establish the location of roadways for the Level B project area.

### D. ANALYSIS OF INTERNAL NETWORK PERFORMANCE

This section will discuss the approach and results for evaluating the operation of the internal roadway network.

#### 1. STUDY APPROACH AND METHODS

A detailed description and report on the study approach and methods is included in Appendix T-1, Travel Demand Modeling Procedures and Databases. In general, the typical procedures used by the MRCOG in developing socioeconomic and roadway forecasts were followed. Coordination with MRCOG and Bernalillo County Planning and Transportation Staff

was performed to ensure Staff concurrence of the approach and methods. The NMDOT was also included in the coordination so as to accurately appropriately address NMDOT jurisdictional concerns and future planning activities.

The number of dwelling units was determined from the Comprehensive Plan Designated Area Standards. The population forecasts were derived from the 2010 Census Bernalillo County average household size. Employment area estimates were derived by applying typical floor-to-area (FAR) ratios to anticipated areas considered appropriate for development, and the desired development activity. Job numbers were determined using typical employee per square-foot estimates for each proposed zoning/development district. Development by 2035 was forecast using realistic assumptions of land use absorption and market forecasts.

For the 2035 Projected Development (Phase 1) analysis, regional control totals on population and employment were held constant in order to maintain consistency with adopted forecasts and policy. This means the amount of regional population and number of jobs in the Santolina 2035 analysis is the same as that used in the 2035 MTP analysis. This provides a direct comparison between the base case of the 2035 MTP and the proposed Santolina Level A Master Plan analysis.

For the 2035 full build analysis, Santolina was estimated to contain its maximum expected level of development, with the balance of the Albuquerque Metropolitan Planning Area (AMPA) held at forecast 2035 level of development. This was done as there is no accepted or adopted socioeconomic or roadway network established past 2035.

## 2. 2035 MTP BASE MODEL DISCUSSION

The MRCOG 2035 MTP was developed using population and employment forecasts for the AMPA by the University of New Mexico's Bureau of Business and Economic Research (BBER). These region-wide estimates were refined by the MRCOG, and growth was assigned to specific areas using information collected by MRCOG from approved Master Plans, discussions with local government Staff, local planners and developers, and from information derived from the MRCOG Land Use Allocation Model (LAM). The LAM model uses proximity to existing infrastructure as one feature in identifying future areas for development.

The 2035 MTP also uses a regional travel demand model, which utilizes the socioeconomic forecasts discussed above (population and employment), combined with a future roadway network, to forecast 2035 traffic volumes on the major roadways in the AMPA. This future roadway network is financially constrained, meaning the anticipated funding for the future roadway network is limited to estimates of the future funding available at the federal, state, and

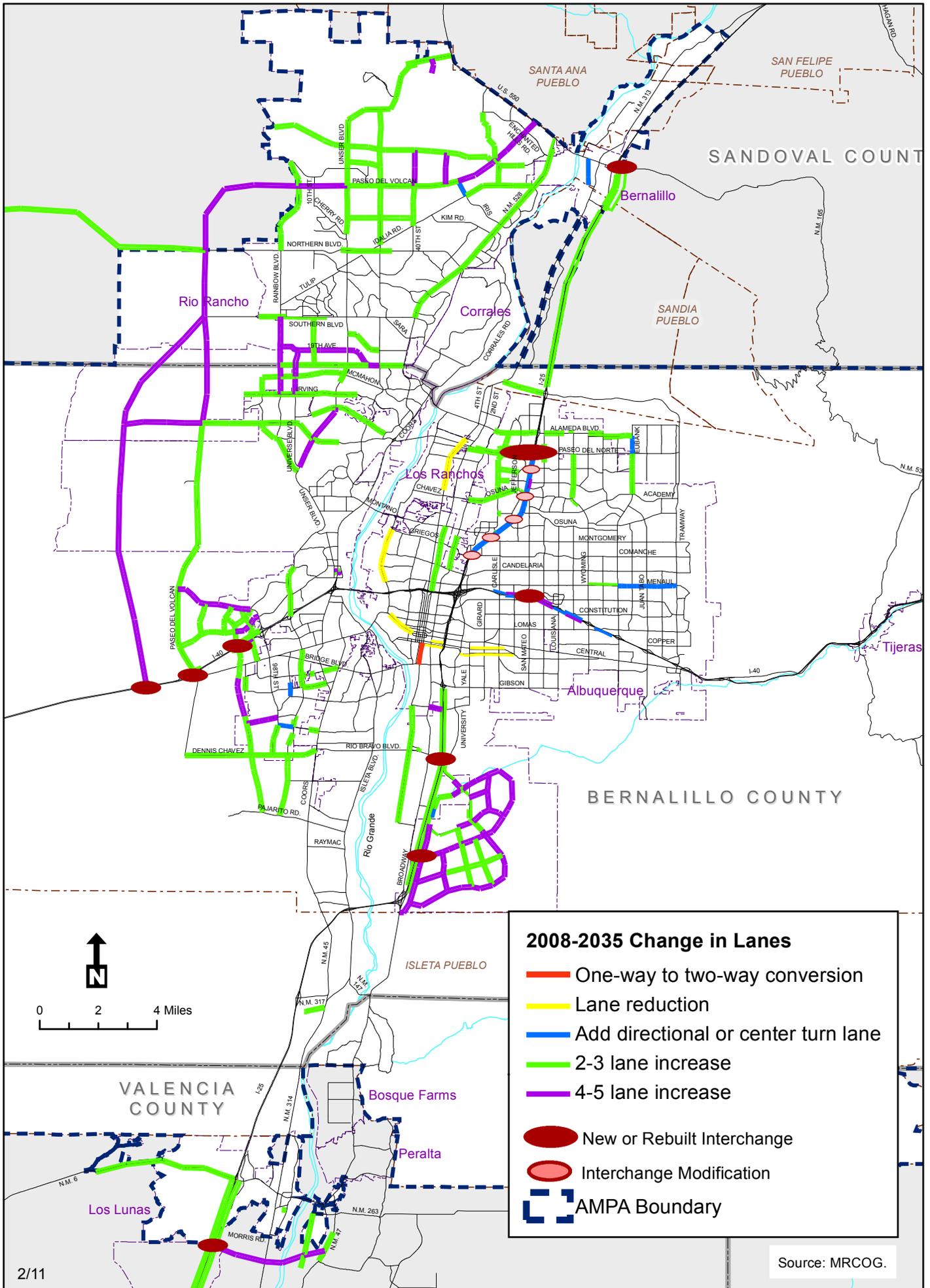


FIGURE 5 - 2035 MTP ROADWAY NETWORK EXPANSION PROJECTS

local levels. Figure 5 shows the map (Map 3-4) from the 2035 MTP identifying the types and locations of roadway network expansion projects for the AMPA. The 2035 MTP identifies almost \$6 billion of transportation projects by 2035, with over \$3 billion of publicly financed roadway capacity projects, with an additional \$800 million identified for private sources.

a) *Roadway Network In Santolina*

As can be seen from Figure 5, there are no future roadway expansion projects shown within the boundary of the Santolina Master Plan, other than widening of 118<sup>th</sup> Street and Dennis Chavez Boulevard, and interchanges with I-40 at Paseo del Volcan and 118<sup>th</sup> Street.

This lack of a planned future roadway network is the result of a lack of a Master Plan for the area. This Level A Master Plan will identify the roadway network that will be used in the development of future MTP's.

As stated above in Section I.C, Strategies for Street Construction and Dedication, the initial two lanes of permanent roadways, intersections and other elements to serve the development will be constructed by the planned community developer, with future roadway improvements constructed per the Planned Community Criteria and Development Agreement.

b) *Socioeconomic Forecast*

The population forecast for the AMPA developed by the UNM BBER and MRCOG shows a large increase in population by 2035. The forecast has a 74% increase over 2008, from a population of 766,553 in 2008 to 1,331,139 in 2035. These projections are being reevaluated based on recent trends and are expected to go down in the upcoming 2040 forecasts, however the trend is the same, with increased population but at a slightly lower rate. The MRCOG 2035 MTP additional population forecast will result in 100,000 acres of undeveloped land being converted to residential, commercial and governmental/municipal uses. This additional area is approximately 10% of the land area of the Albuquerque Metropolitan Planning Area. Figure 6 shows Map 2-3 from the 2035 MTP, which identifies the existing and forecast developed land area in the AMPA.

Due to existing constraints on development, existing zoning and land use plans, as well as land availability and costs for infrastructure, the bulk of these new residents, almost 80%, are anticipated to live west of the Rio Grande River. Constraints leading to development west of the river include tribal, federal and state lands; open space, the river, and other geographical limits such as the escarpments. Fractured land ownership patterns lead to difficult land consolidation and master planning efforts. There are limited areas in the region than can accommodate new

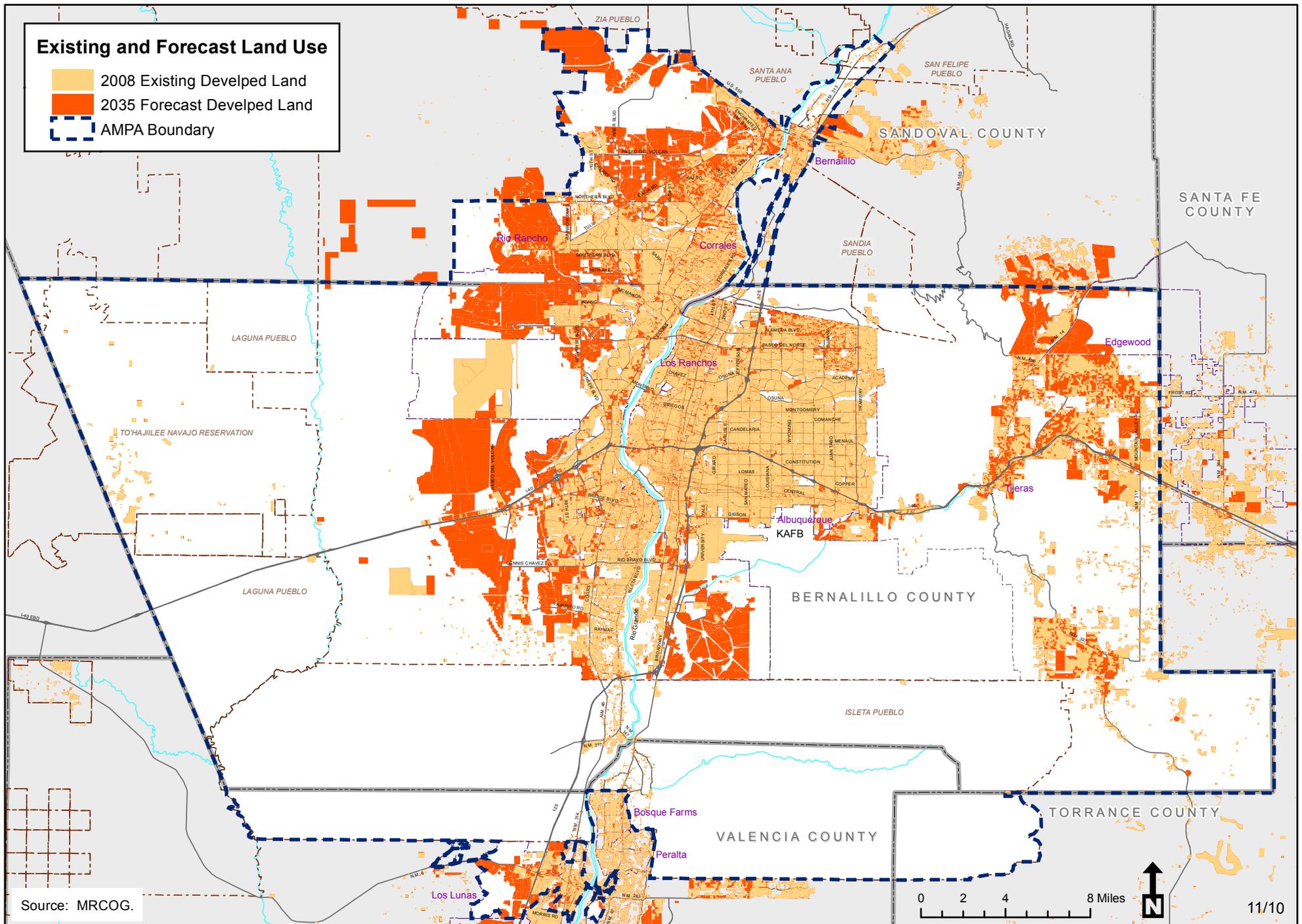


FIGURE 6 - EXISTING AND FORECAST DEVELOPED LAND AREA

Growth before development occurs in the undeveloped master plans areas, such as Santolina, unless existing neighborhoods within the AMPA accept a substantial increase in their current density, and; this interest has not been expressed to date. The 2035 MTP forecast already assumes substantial growth in Mesa del Sol and Volcano Heights.

Figure 7 shows Map 2-4 from the 2035 MTP, showing the locations of projected population and employment growth. The map clearly shows large increases are forecasted for the periphery of the metro area and west of the Rio Grande River, including Santolina. Again the population growth forecast is located in these areas as the existing land use and zoning of the balance of the metro area does not allow the absorption of the forecast population increase.

The large increase in population forecast for the AMPA by BBER led MRCOG to assign population and employment to land area without Master Plans, such as Santolina, and former Westland lands west of Atrisco Vista Boulevard, outside of the boundary of the Westland North Master Plan.

Figure 7 also shows the large increase in employment forecast for the region, almost 190,000 jobs, an approximately 50% increase over 2008. However, this job growth does not keep up with the increase in population, which is forecast to increase 74%. This is partly due to the large baby boomer generation growing older. In 2008 approximately 11% of the AMPA population was over 65, and in 2035 it is projected that almost 20% of the population will be over age 65.

The employment projections show over half of the new jobs (99,000) are anticipated to be created west of the river. However due to the population increase, the jobs/housing balance will actually decline on the west side, from 0.63 jobs per household west of the river in 2008, to 0.56 in 2035. The jobs/housing balance will also reduce on the east side of the river, also due to job growth not keeping up with population growth. East of the river, in 2008 the jobs/housing balance was 1.61, and is forecast to reduce to 1.54, even with the addition of 91,000 jobs.

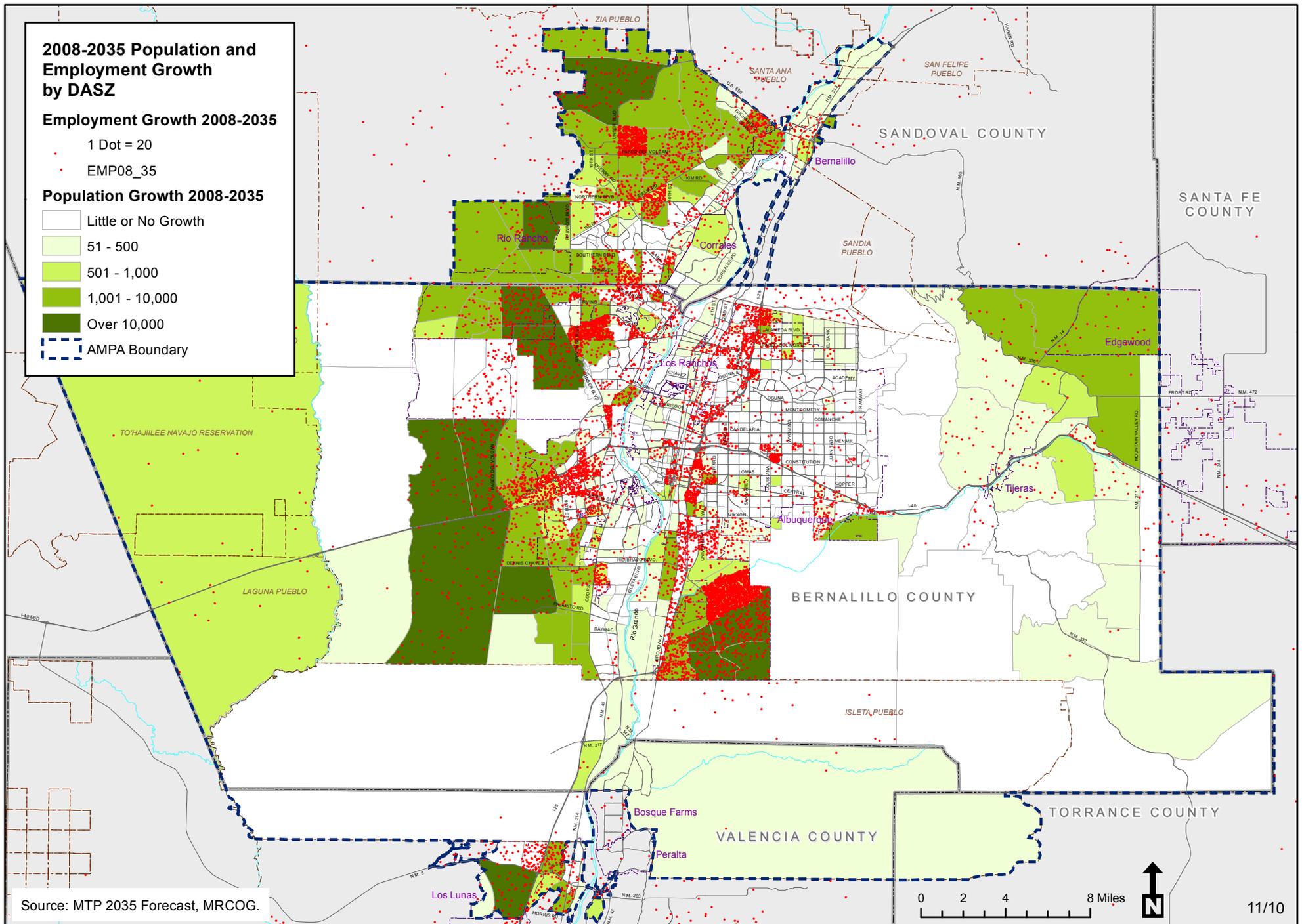


FIGURE 7 - POPULATION AND EMPLOYMENT GROWTH PROJECTION

### c) *2035 MTP Roadway Network Deficiencies*

According to the 2035 MTP base conditions projected by MRCOG, the large projected increase in population, and the resultant need to locate this additional growth on the periphery of the metro area due to zoning and land use constraints in the developed area; combined with the constrained financial resources available to address this growth, is expected to lead to a substantial deterioration in traffic operations by 2035. Figure 8 shows Map 3-5 from the 2035 MTP, showing the forecast PM peak hour build scenario volume-to-capacity (v/c) ratio for the roadways in the AMPA. This build roadway network assumes the almost \$6 billion dollars of transportation projects discussed above. The large amount of dark color roadway links (those orange, red or purple) indicate the roadways are forecast to operate at poor performance, as the volume of traffic trying to use those roadways exceeds the capacity of the roadway ( $v/c > 1.0$ ). This figure illustrates many roadways throughout the region will have severe problems in the future addressing anticipated growth and travel demand, with or without Santolina.

With regard to the roadways near Santolina, Interstate 40, the Frontage Road/Central Avenue, Atrisco Vista Boulevard, Dennis Chavez Boulevard, Paseo del Volcan, and portions of 118<sup>th</sup> Street and Gibson Boulevard, all are forecast to operate at high v/c ratios, and therefore with high congestion and delay.

### 3. *2035 PROJECTED DEVELOPMENT (PHASE 1) INTERNAL NETWORK ANALYSIS*

The following section will discuss the transportation analysis performed for the level of development anticipated to occur by 2035, called the 2035 Projected Development (Phase 1). The full build analysis will be discussed later in section I.D.4. Full Build Discussion, beginning on page 29. Discussion of off-site roadway effects, impacts on roadways outside of Santolina, is discussed in Section I.E, Off-Site Roadway Effects, beginning on page 42. This discussion will be limited to roadway operations within Santolina.

#### a) *Phasing - Absorption Schedule/Projected Land Use Summary*

The Santolina area forecast to be developed in 2035 Projected Development (Phase 1) is shown in Figure 9. A large part of the anticipated area of development is bordered by Atrisco Vista, Dennis Chavez, 118<sup>th</sup> Street, and Paseo del Volcan, with portions also served off the Frontage Road/Central Avenue, and Shelly Drive.

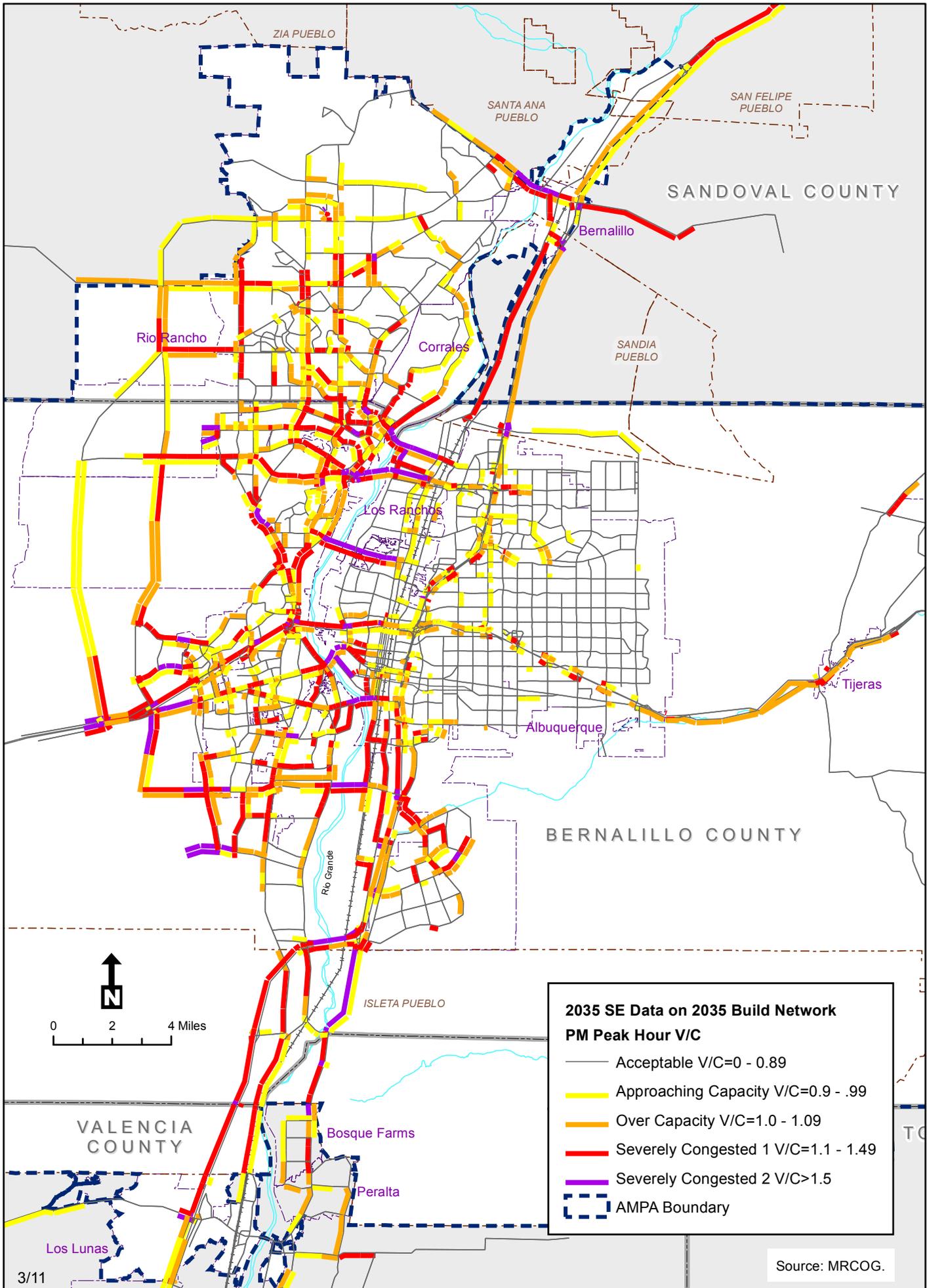
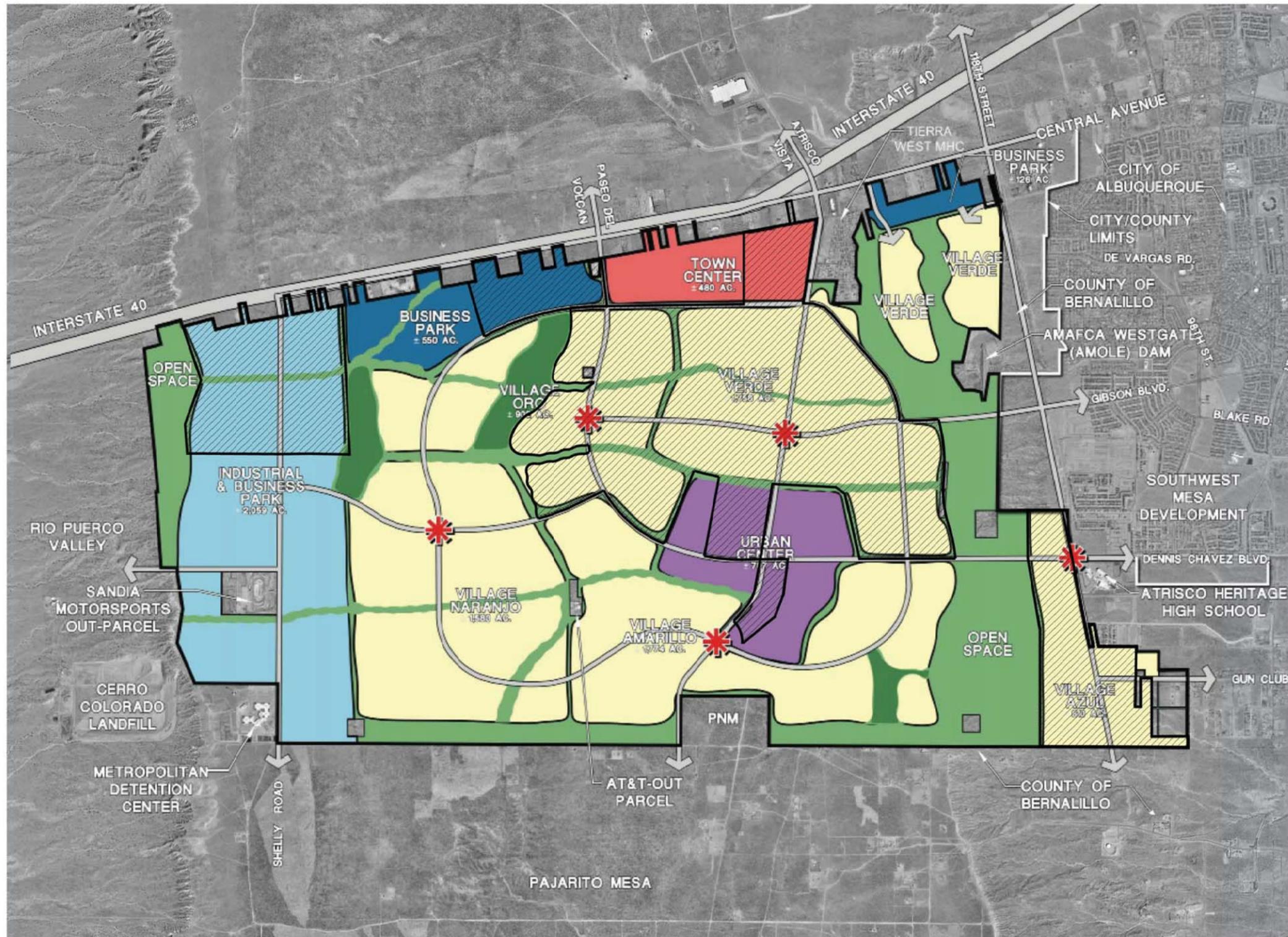


FIGURE 8 - 2035 MTP BUILD SCENARIO VOLUME TO CAPACITY RATIO

Source: MRCOG.



**SANTOLINA LEVEL A 2035  
PROJECTED DEVELOPMENT  
(PHASE 1) MASTER PLAN  
FIGURE 9**



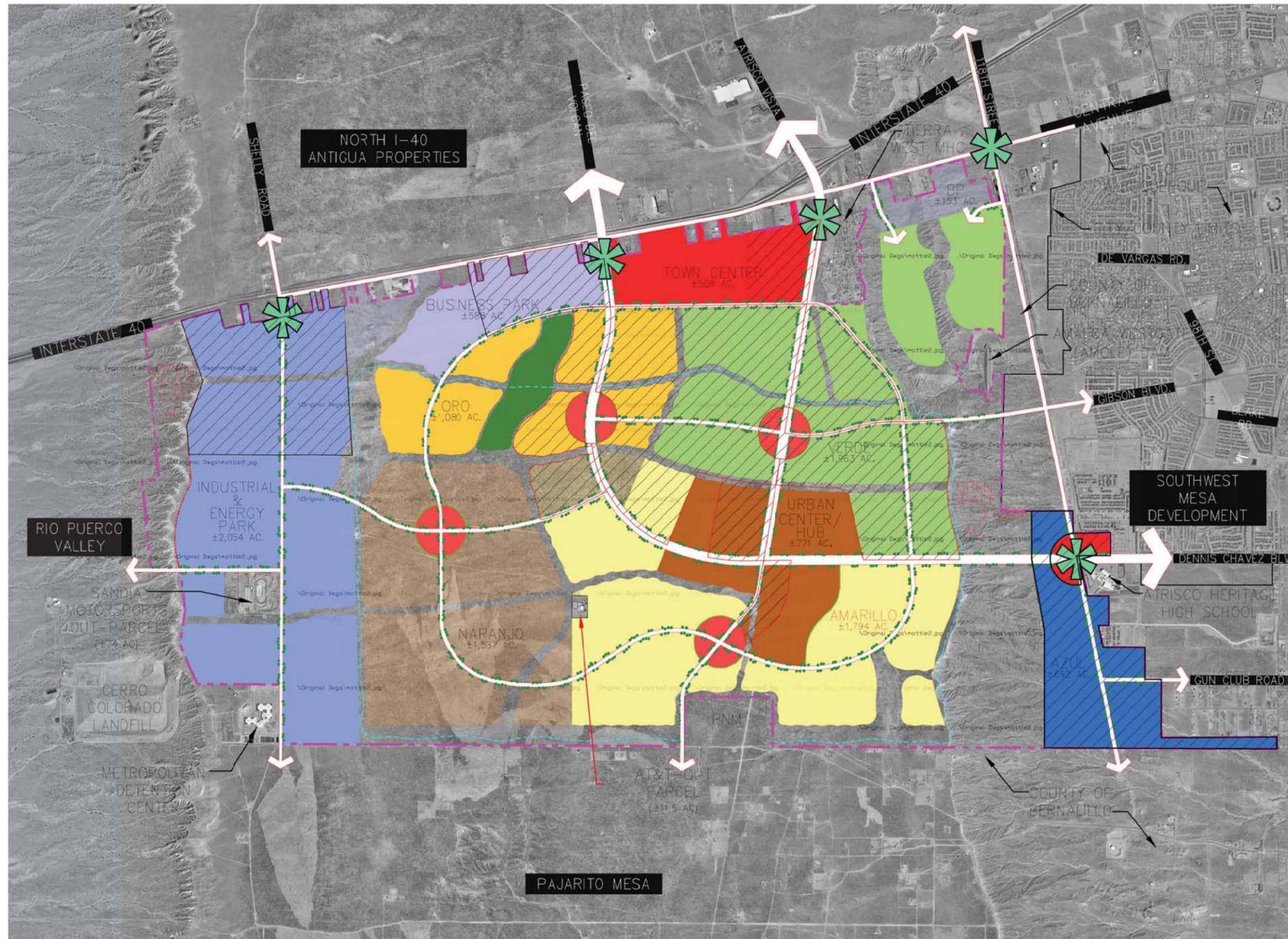
Table 1 lists the amount of development by land use type anticipated in Santolina by 2035 as given in the Level A Master Plan submittal.

<b>Table 1 – Level A Master Plan 2035 Projected Development (Phase 1) Level of Development</b>	
<b>Area</b>	<b>Acres</b>
Villages	2,932
Industrial & Energy Park	710
Open Space*	235
Urban Center	215
Business Park	274
Town Center	177
<b>Total</b>	<b>4,543</b>

In order to perform the transportation analysis using the MRCOG regional travel demand model, the 2035 Projected Development (Phase 1) level of development identified above needed to be broken down into data analysis subzones (DASZ) at a finer level in order to assess transportation performance. The site plan used to develop the DASZ's is shown in Figure 10.

As discussed above in Section I.D.1, Study Approach and Methods, on page 8, the employment was broken into the job categories used in the regional travel demand model based on the mixed use assumptions, anticipated FAR's, and estimates of square footage required per employee. Further discussion of these calculations is included in Appendix T-1, Travel Demand Modeling Procedures and Databases.

The transportation modeling was performed prior to the final survey that determined the actual acreages of the land uses in Santolina. Table 1 above lists the forecast 2035 Projected Development (Phase 1) development based on the final survey and subsequently identified in the Level A Master Plan. Table 2 below shows the 2035 Projected Development (Phase 1) forecast used in the travel demand modeling, and is the basis for the following analysis. The very small differences are considered to be acceptable for the Level A Master Plan to proceed at this time (4,543 acres versus 4,409 acres, or within 3% on a developed area basis), particularly as the focus of the Level A Plan is on full build and establishing appropriate right-of-way, and it will be shown later the differences between the actual survey full build and travel demand model full build are very similar.



**2035 PROJECTED DEVELOPMENT  
(PHASE 1) VILLAGE PLAN USED  
FOR TRAVEL DEMAND MODELING  
FIGURE 10**



<b>Table 2 – 2035 Projected Development (Phase 1) Level of Development Travel Demand Model</b>				
<b>Area</b>	<b>Acres</b>	<b>Population</b>	<b>DU's</b>	<b>Jobs</b>
Azul	290	7,946	3,227	-
Verde	823	14,576	5,797	-
Amarillo	752	1,390	549	-
Oro	453	9,641	3,849	-
Naranja	665	-	-	-
Industrial & Energy Park	677	-	-	4,708
Town Center	168	-	-	4,564
Business Park	245	-	-	7,383
Urban Center	203	2,548	1,178	6,347
Village Centers	133	3,304	1,414	2,506
<b>Total</b>	<b>4,409</b>	<b>39,405</b>	<b>16,019</b>	<b>25,508</b>
*- includes all Open Space within Santolina Master Plan area				

b) *2035 Project Phase 1 Transportation Network*

One of the major objectives of the Level A Master Plan transportation analysis is to assess the adequacy of the proposed internal roadway network to meet future traffic volume in order to set aside sufficient right-of-way to accommodate future needs.

The 2035 Projected Development (Phase 1) transportation network is shown in Figure 11. This network was developed to provide adequate connectivity and capacity to serve the forecast 2035 level of development. This network assumed the construction of projects as identified in the 2035 MTP, discussed above, and shown in Figure 5. Discussion of off-site roadway effects and impacts on roadways outside of Santolina, are discussed in Section I.E, Off-Site Roadway Effects, beginning on page 42. This discussion will be limited to roadway operations within Santolina.

Additional roadways beyond those shown in the Master Plan have been included in the model to more accurately evaluate the effects of the land use plan. These minor arterials and collector roads are for modeling purposes only, and are shown for illustration. Future Level B and Level C analyses will identify specific locations for future roadways. Roadway capacities for

these facilities followed MRCOG conventions as discussed in Appendix T-1, Travel Demand Modeling Procedures and Databases.

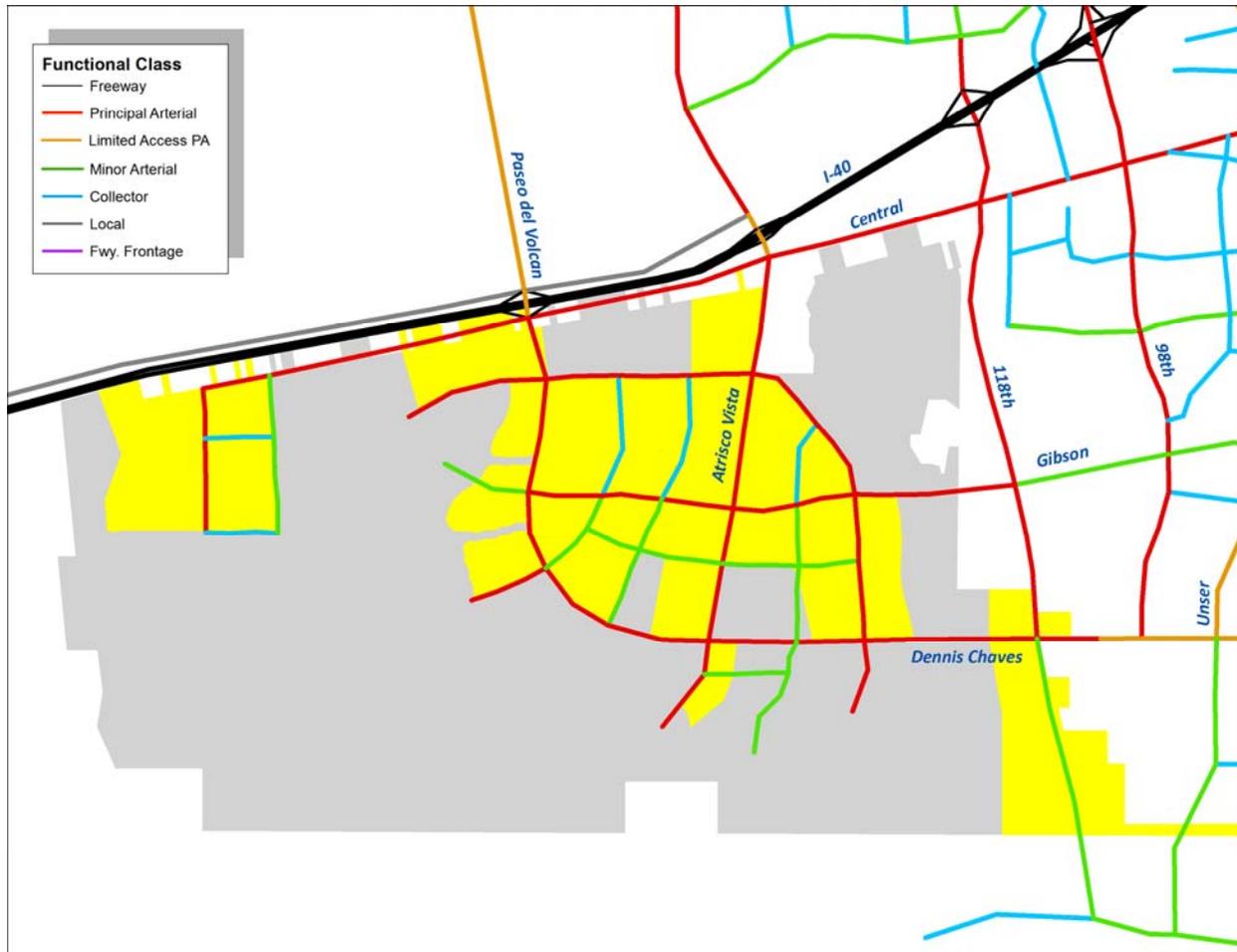


Figure 11 – 2035 Phase 1 Model Functional Classification

c) *2035 Projected Development (Phase 1) Network Analysis Discussion*

The modeled number of lanes for the 2035 Projected Development (Phase 1) analysis is shown in Figure 12. The main entry roads of Dennis Chavez, Gibson, Atrisco Vista and Paseo del Volcan are all 3 lanes in each direction initially, and then transition to 2 lanes in each direction. The minor arterials and collectors are generally 1 lane in each direction. No lane changes were made to streets outside Santolina in order to provide an accurate comparison to the 2035 MTP scenario.

The speeds modeled for each link are shown in Figure 13. Modeled speeds are 45 mph or less within Santolina, with the minor arterials modeled at 35 mph.

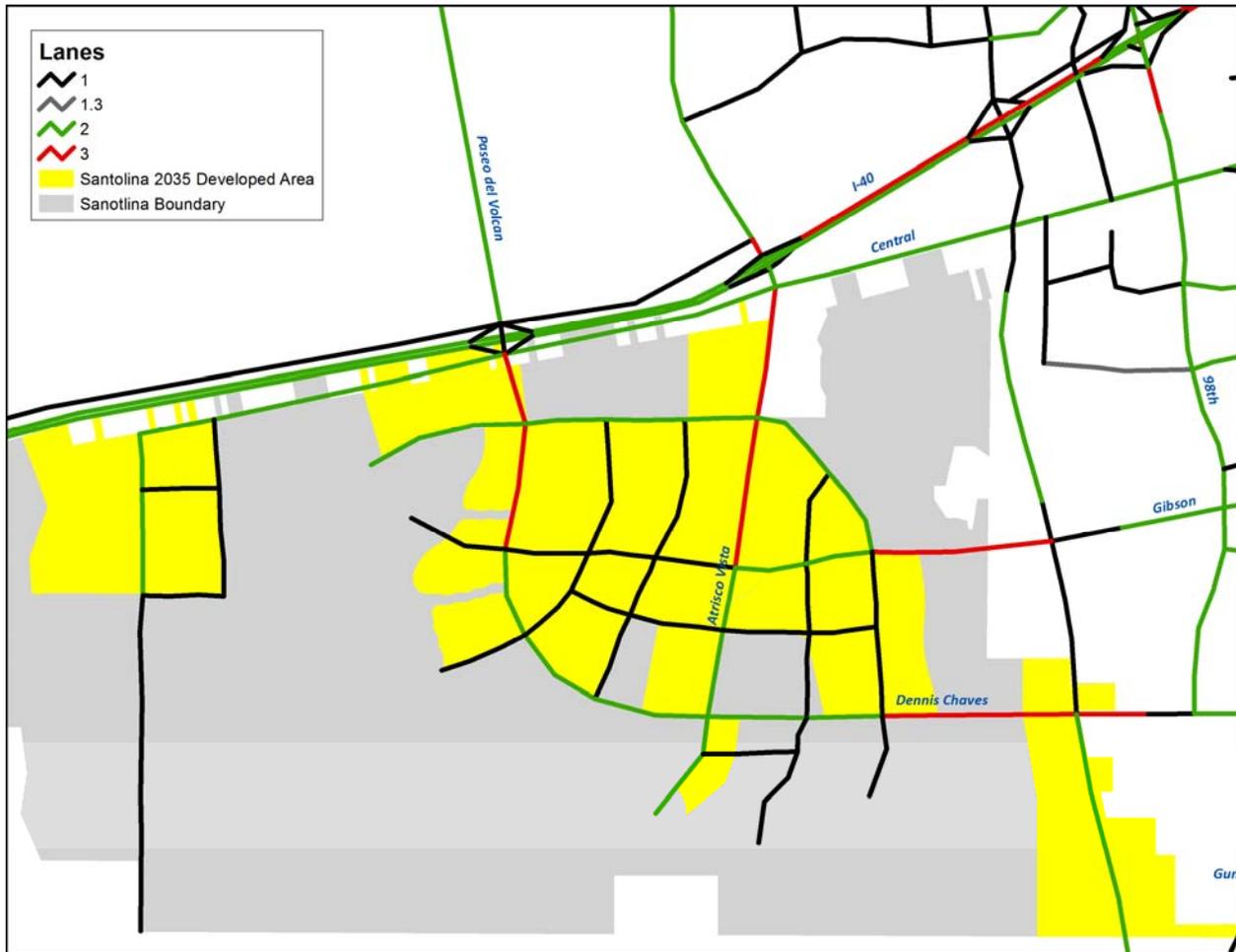


Figure 12 – Modeled Number of Lanes – 2035 Projected Development (Phase 1)

The forecast daily volume for 2035 Projected Development (Phase 1) is shown in Figure 14, Phase 1 2035 AM volume in Figure 15, and 2035 Projected Development (Phase 1) PM volume in Figure 16. The v/c ratios for the 2035 Projected Development (Phase 1) AM peak hour are shown in Figure 17, with the PM peak hour v/c ratio in Figure 18.

The results forecasted for the level of development anticipated to occur by 2035 (Projected Phase 1) show that the proposed internal roadway network is sufficient to accommodate the anticipated Phase 1 traffic volumes. The results also indicate the proposed internal network has additional capacity and right-of-way to accommodate faster growth than anticipated by the growth estimates. Most roadway links within Santolina are shown to operate at volume-to-capacity ratios (v/c) of less than 0.75, indicating acceptable levels of service (LOS), LOS C and LOS D, with many roadways operating at LOS B. This is considered acceptable for peak hour operations, as the off-peak hour will operate at better levels of service.

The Urban Street Facilities Generalized Volume tables from Chapter 16 of the 2010 Highway Capacity Manual were used to estimate LOS.

Overall, the proposed internal roadway system will meet the needs of the 2035 Projected Development (Phase 1) Santolina site generated traffic.

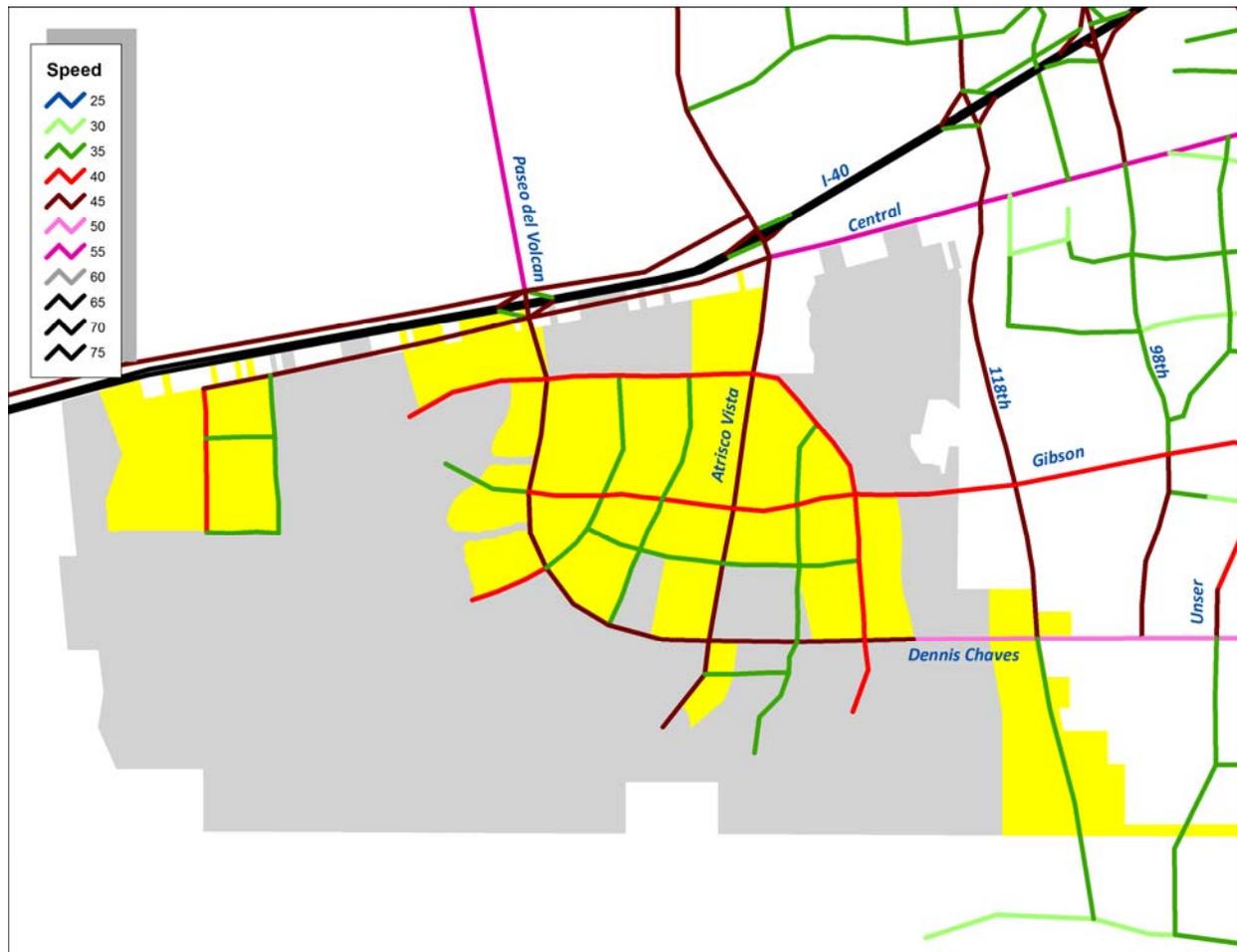


Figure 13 – Modeled Travel Speed – 2035 Projected Development (Phase 1)

The Projected Phase 1 analysis shows in 2035 that the main entry roads, Dennis Chavez, Gibson, Atrisco Vista and Paseo del Volcan, generally have higher v/c ratios than the rest of the internal roadway network, particularly Paseo del Volcan. This suggests additional connections to the site may prove beneficial in the future, especially as Santolina grows post-2035 (discussed below). For instance, additional connections from the east up the escarpment, such as via an extension of Gun Club or Grant Road would help to reduce congestion on Dennis Chavez and Gibson.

The area immediately to the north of Santolina, north of I-40, has been identified by MRCOG as a large growth area, however currently there is no Master Plan for that area and a roadway network has not been identified. Given the large amount of growth anticipated in this area, it is likely a substantial road network, similar to that proposed for Santolina, will also be proposed for this area. Grade separated connections across I-40, between this growth area and Santolina, as well as a possible future interchange at Shelly Drive, will also help reduce congestion on Atrisco Vista and Paseo del Volcan. Future Level B analyses and submittals for Santolina should include provisions that allow for appropriately spaced connections to be provided for overpasses between these future growth areas. The Business Park and Town Center concept plans shown in the Level A Master Plan portray the kind of connections needed. These overpass connections should continue appropriately into Santolina as a continuous route to facilitate mobility between the two growth areas. However, Santolina does not own the tracts of property immediately adjacent to Central Avenue/Frontage Road south of I-40, or the property immediately adjacent to the Frontage Road on the north of I-40. Right-of-way planning and acquisitions are needed in order to ensure these overpasses can be constructed.

Discussions with the NMDOT regarding changes in Frontage Road operation found they do not have long-range plans for changes at this time. The NMDOT indicated that additional interchanges or overpasses, west of Paseo del Volcan, would be necessary before conversion to one-way operations on the Frontage Roads would be considered. Future widening of Central/Frontage Road will also require coordination with the NMDOT, as it is NMDOT/Interstate ROW. As commonly required for transportation network expansions in developed and semi-developed areas such as this roadway segment, right-of-way acquisition along the Frontage Road parcels will be necessary to provide sufficient width for the four-lane roadway section. Due to the Central/Frontage Road's status as existing access to multiple existing commercial businesses and properties, with current business marketing exposure to the I-40 vehicular traffic, it is important to retain this roadway's current alignment and function, and expanded as necessary for future traffic volumes. The County's West Route 66 Corridor Plan promotes continued development of commercial and industrial uses along the extension of Central Avenue as it heads west. This will also require that the current alignment and road function be maintained to serve existing and future businesses in the area.



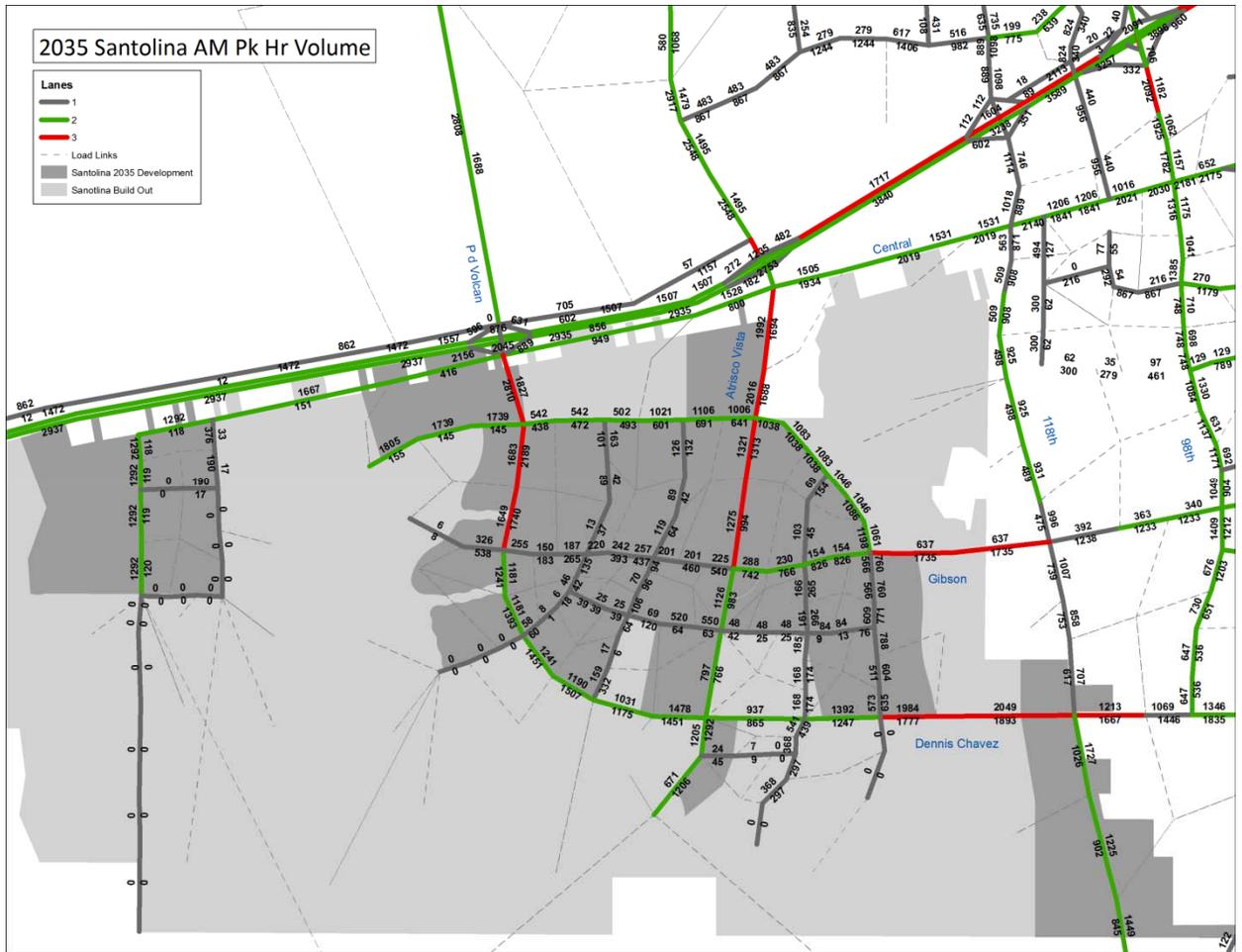


Figure 15 -- 2035 Projected Development (Phase 1) AM Peak Hour Volume

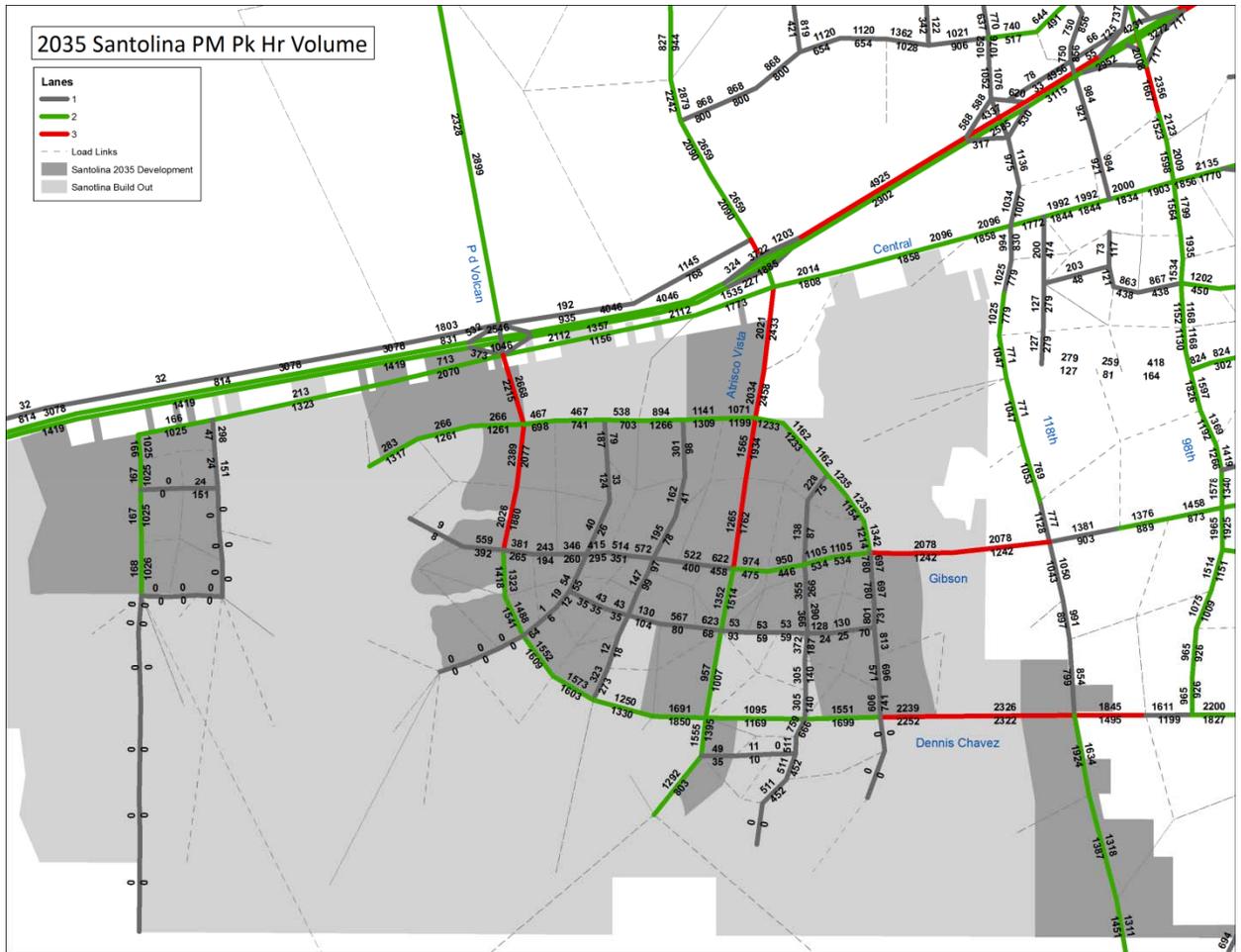


Figure 16 -- 2035 Projected Development (Phase 1) PM Peak Hour Volume

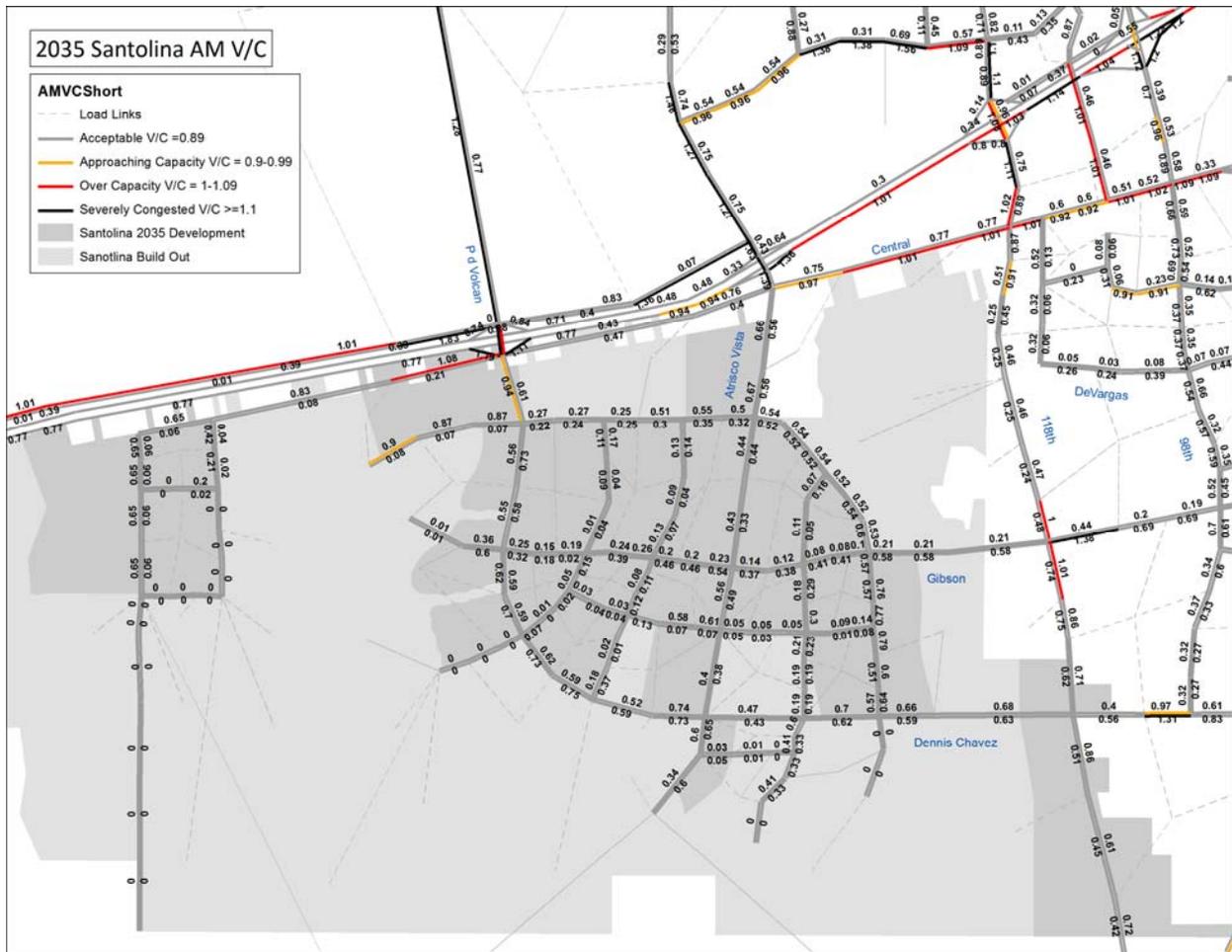


Figure 17 – Forecast Traffic Volume to Capacity Ratio AM Peak Hour – 2035 Projected Development (Phase 1)

The most significant capacity issues identified in the 2035 Projected Development (Phase 1) modeling occur off-site, on roadways that already exhibit operational problems in the 2035 Metropolitan Transportation Plan analysis, prior to the addition of Santolina. These operational problems will be addressed in the future through further studies and modeling that identify and utilize the required number of lanes, etc, in an adjusted MRCOG baseline model analysis.

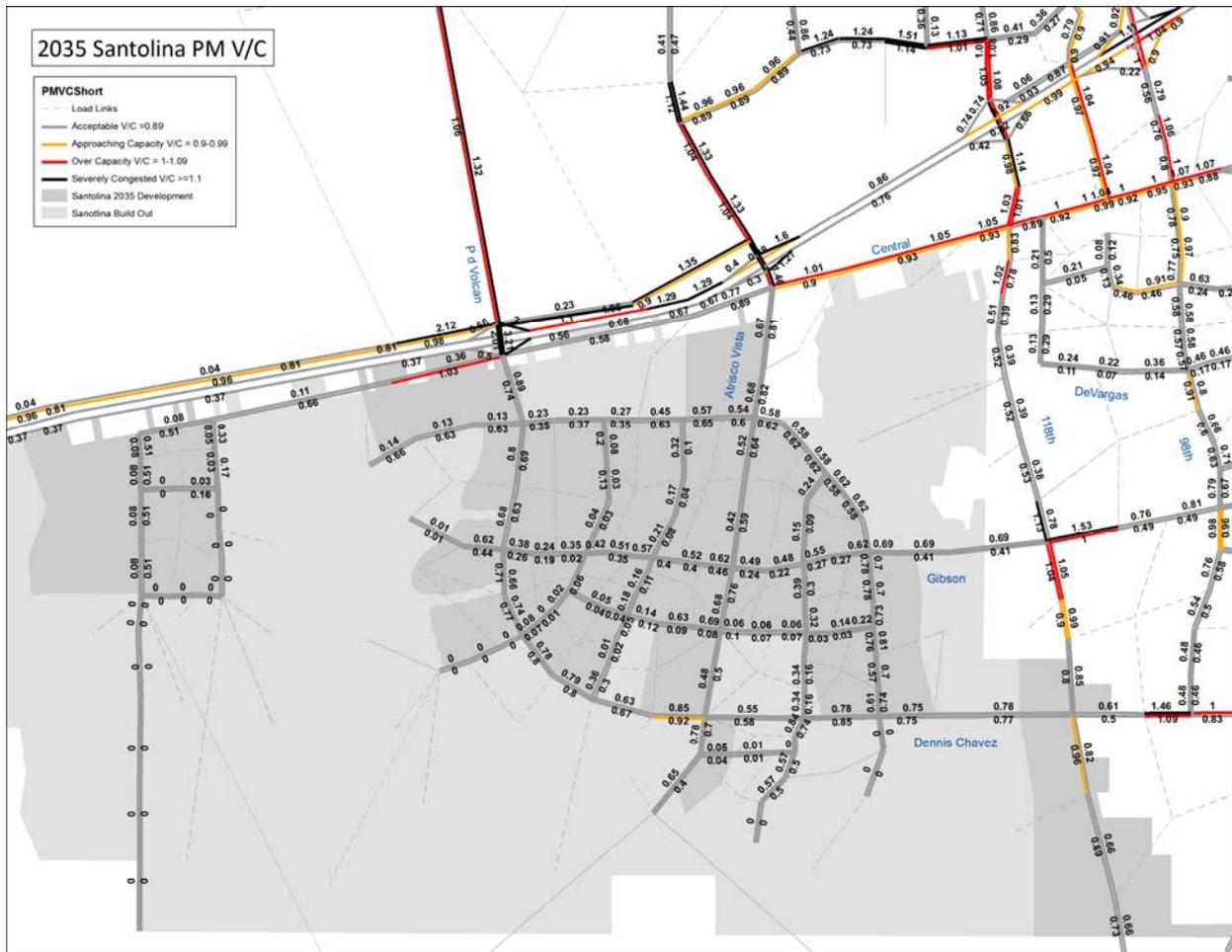


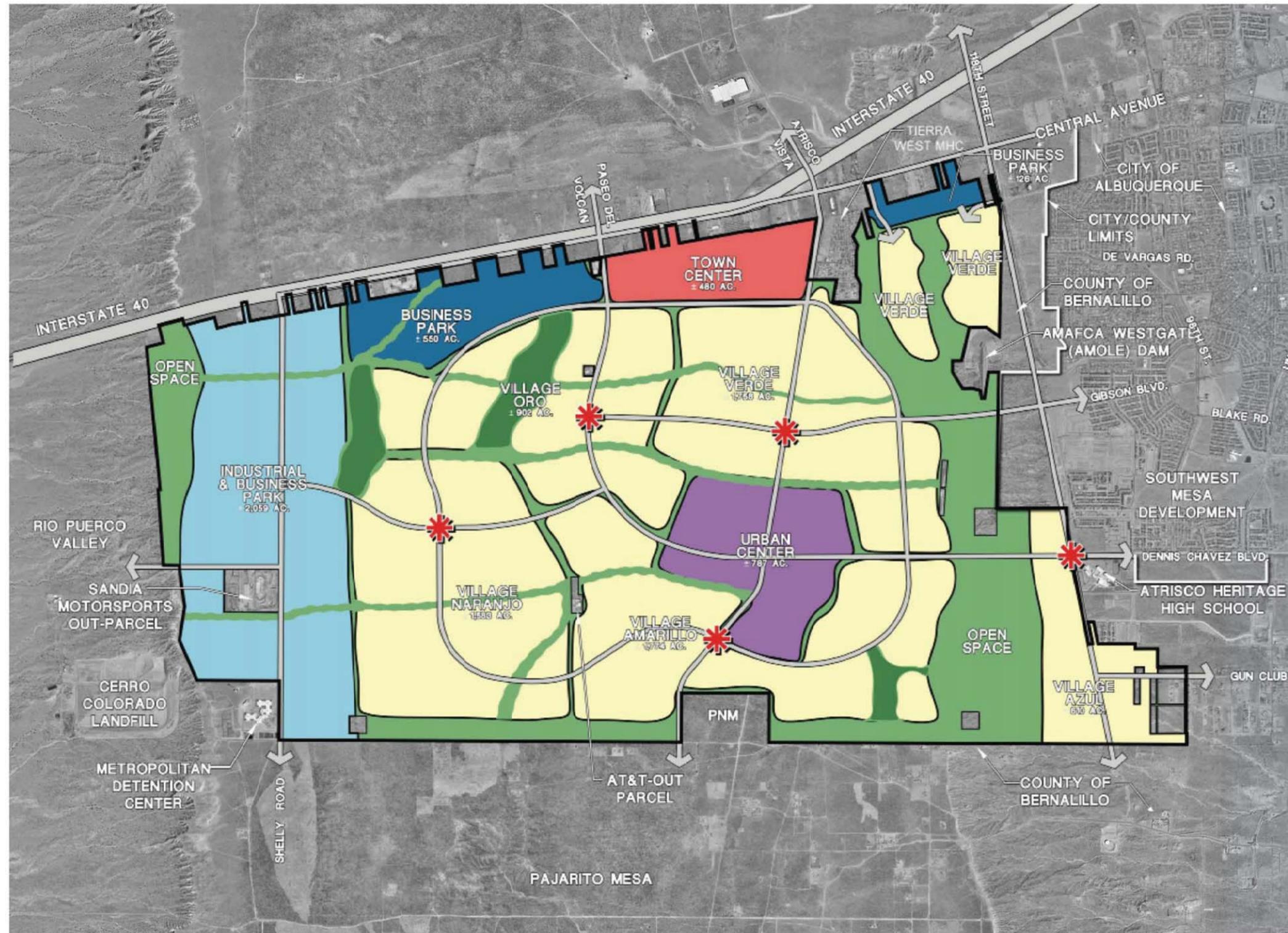
Figure 18 – Forecast Traffic Volume to Capacity Ratio PM Peak Hour – 2035 Projected Development (Phase 1)

4. FULL BUILD DISCUSSION

This section will discuss the transportation analysis performed for the Full Build scenario. This analysis forecast the population and employment anticipated upon full development of the entire Santolina Santolina. This analysis by definition is outside the current planning horizon for the region, and is estimated to be approximately 10-50 years in the future. As there is no adopted roadway network, or socioeconomic projection for this timeframe, the balance of the metro area was held at 2035 levels of development. This Full Build analysis will be used to ensure the internal roadways in Santolina are sized properly to accommodate all future development potential within the Santolina.

a) Phasing - Projected Full Build Land Use Summary

The Santolina Master Plan is shown again in Figure 19. The forecast levels of full build population, dwelling units, and employment is shown in Table 4.



**SANTOLINA LEVEL A  
MASTER PLAN  
FIGURE 19**



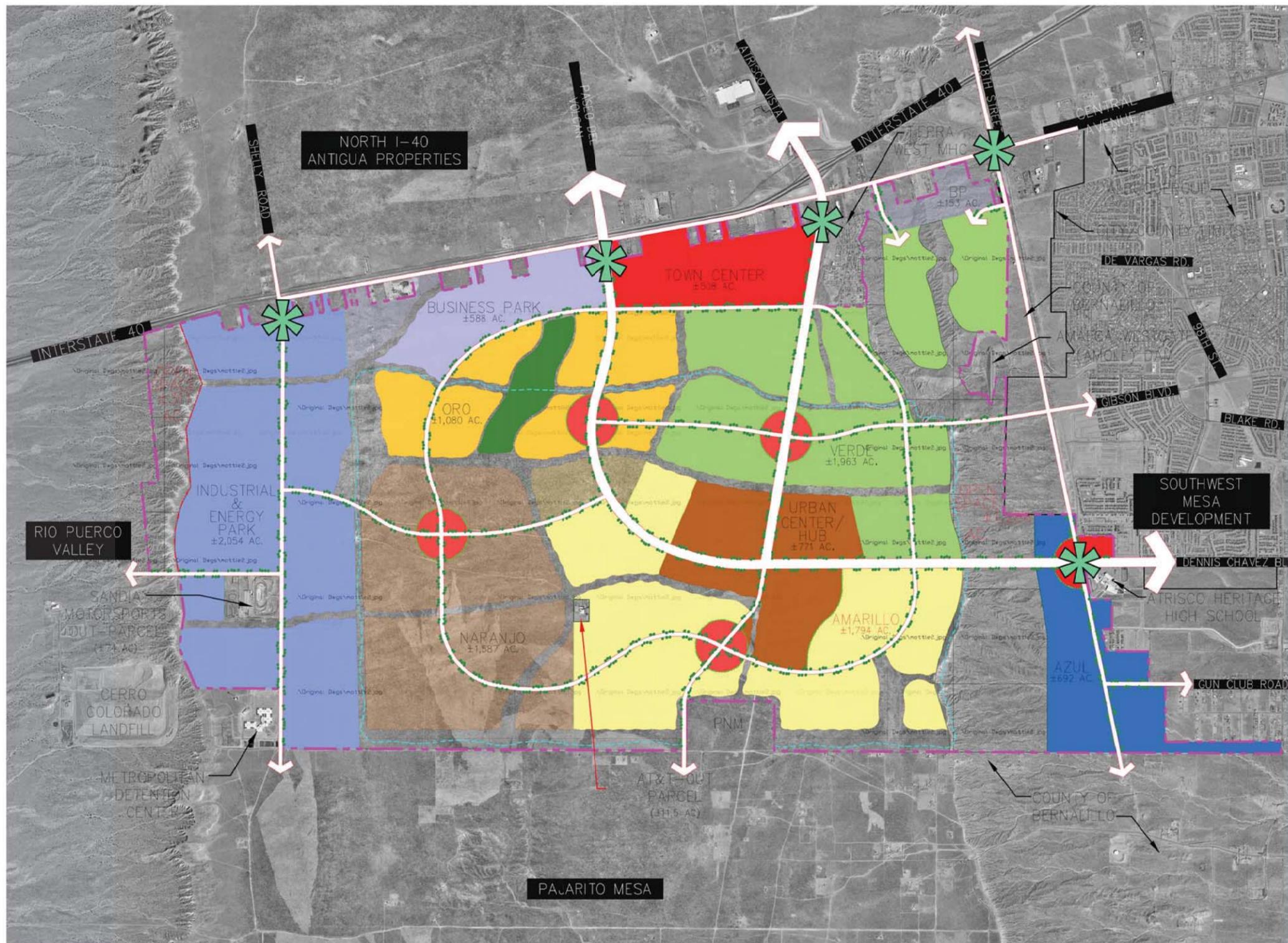
The Level A Master Plan document identifies the full build land use as shown in Table 3 below, and is broken down into the specific areas as shown in Table 4.

<b>Table 3 – Level A Master Plan Full Build Level of Development</b>	
<b>Area</b>	<b>Acres</b>
Villages	6,626
Industrial & Energy Park	2,059
Urban Center	787
Business Park	676
Town Center	480
<b>Total</b>	<b>10,628</b>

<b>Table 4 – Full Build Level of Development By Area</b>				
<b>Area</b>	<b>Acres</b>	<b>Population</b>	<b>DU's</b>	<b>Jobs</b>
Azul	610	6,753	2,745	-
Verde	1,758	19,456	7,909	-
Amarillo	1,774	22,423	9,115	-
Oro	902	9,983	4,056	-
Naranja	1,583	17,523	7,123	-
Industrial & Energy Park	2,059	-	-	14,303
Town Center	480	-	-	13,071
Business Park	676	-	-	20,413
Urban Center	787	11,119	4,520	19,629
Village Centers	375	6,052	2,460	7,590
<b>Total</b>	<b>10,628</b>	<b>93,309</b>	<b>37,930</b>	<b>75,006</b>

The full build development results in a jobs/housing balance of 1.98, thereby providing opportunities for commuting in the reverse of the typical west-to-east anticipated in the 2035 MTO forecast, and well above the 1.54 east of the river in 2035.

As mentioned previously, the transportation modeling was performed prior to the final survey that determined the actual acreages of the land uses in Santolina. Table 3 above lists the full build forecast development based on the final survey, and subsequently identified in the Level A Master Plan. Table 5 below shows the Full Build forecast used in the travel demand



LEGEND

- AZUL (±692 AC.)
- VERDE (±1,963 AC.)
- AMARILLO (±1,795 AC.)
- ORO (±1,080 AC.)
- NARANJO (±1,587 AC.)
- OPEN SPACE (±3,134 AC.)
- INDUSTRIAL & ENERGY PARK (±2,054 AC.)
- TOWN CENTER (±508 AC.)
- BUSINESS PARK (±741 AC.)
- URBAN CENTER / HUB (±771 AC.)

TOTAL: 14,325 AC. (APPROXIMATE)

- VILLAGE CENTER (75 AC./5 CENTERS)
- TRAIL
- PROJECT ENTRANCES

NOTES  
 1) OVERALL ACREAGE NUMBERS INCLUDE R.O.W. AND VILLAGE CENTERS.  
 2) ROADS ARE PRELIMINARY. INTERSTATE 40 INTERCHANGES AT 118TH STREET, ATRISCO VISTA, PASEO DEL VOLCAN, AND SHELLY ROAD AND FRONTAGE ROADS SHALL BE BY OTHERS.  
 3) BOUNDARIES BETWEEN VILLAGES AND OTHER AREAS ARE APPROXIMATE. FINAL PARCEL BOUNDARIES AND ACREAGE AMOUNTS WILL BE DETERMINED BY PLAT.

**FULL BUILD VILLAGE SITE PLAN USED FOR TRAVEL DEMAND MODELING**  
**FIGURE 20**



modeling, and is the basis for all of the figures and analysis discussed in the next section. The village site plan used to develop the travel demand forecast for full build is shown in Figure 20.

<b>Table 5 – Full Build Level of Development Travel Demand Model</b>				
<b>Area</b>	<b>Acres</b>	<b>Population</b>	<b>DU's</b>	<b>Jobs</b>
Azul	692	6,809	2,768	-
Verde	1,963	22,472	9,135	-
Amarillo	1,795	22,423	9,115	-
Oro	1,080	13,284	5,400	-
Naranjo	1,587	19,532	7,940	-
Industrial & Energy Park	2,054	-	-	14,267
Town Center	508	-	-	13,830
Business Park	741	-	-	22,373
Urban Center	771	7,262	2,952	19,235
Village Centers	375	3,690	1,500	7,596
<b>Total</b>	<b>11,566</b>	<b>95,472</b>	<b>38,810</b>	<b>77,301</b>

The level of development shown in Table 5 was included in the MRCOG regional travel demand model as discussed previously and in Appendix T-1, Travel Demand Modeling Procedures and Databases. For the Full Build analysis, the remaining balance of the Albuquerque Metropolitan Planning area was held at the forecast 2035 levels of development.

It can be seen from Table 4 and Table 5, that the forecast used in the travel demand has 2% more population and 3% more jobs, than that proposed in the Level A Master Plan (based on the actual survey). Given the very slight difference in land uses, we consider the travel demand model socioeconomics acceptable for use in this Level A Master Plan analysis.

*b) Internal Network Adequacy Discussion*

The proposed transportation system planned for Full Build consists of expanding the 2035 internal roadway network to accommodate the balance of Santolina. These additional roadways include completing the internal loop roadway, as well as connections to Shelly Drive and additional primary arterials to serve the development. As discussed above, a future interchange at I-40 with Shelly Drive may also be needed to alleviate congestion at the Atrisco Vista and Paseo del Volcan interchanges, and is currently not modeled because it is on no agency’s planning horizon.

The modeled functional classification for full build is shown in Figure 21. The functional classification is the same as for the 2035 Projected Development (Phase 1) roadway network, however the roadways have been extended to serve the entire Master Plan area.

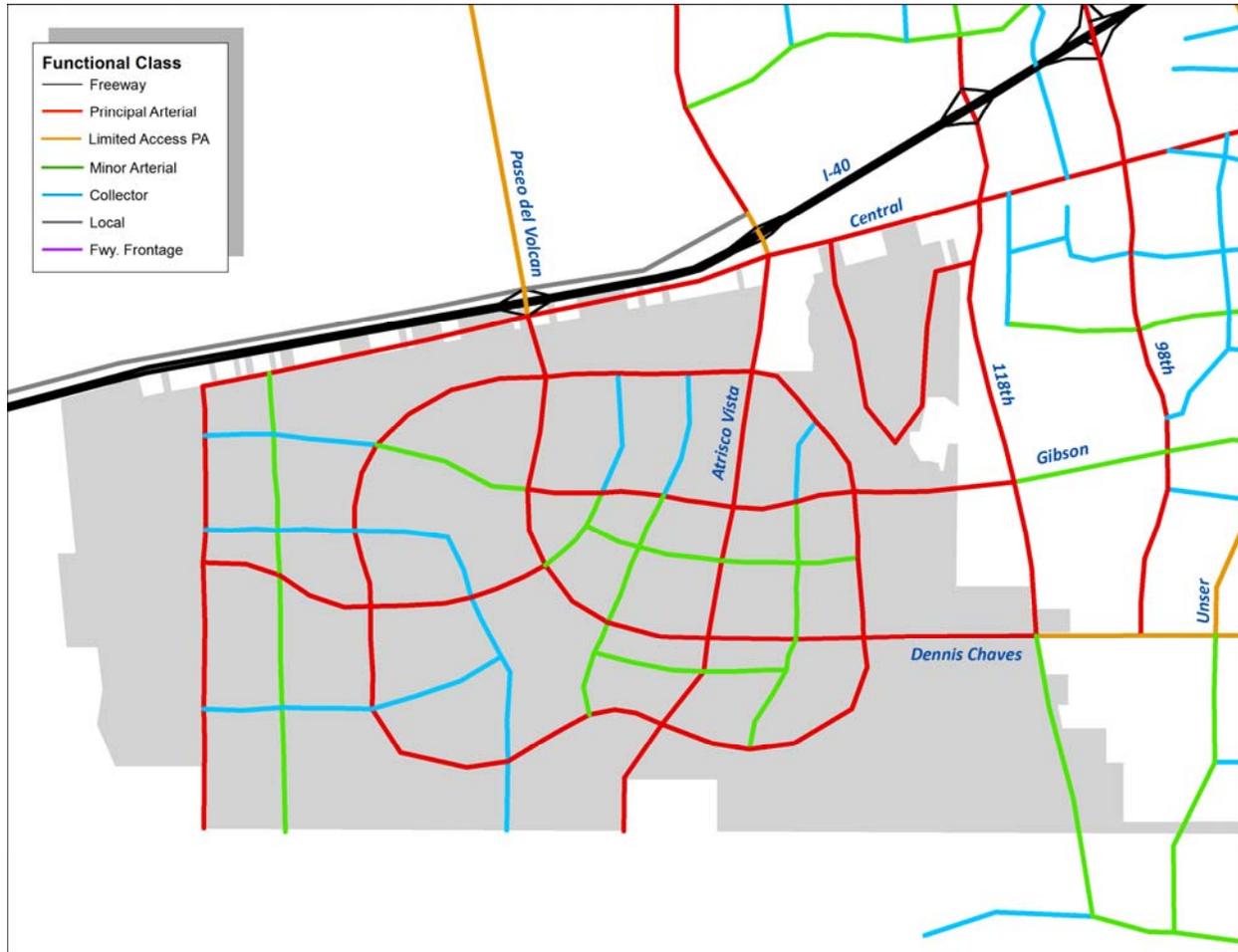


Figure 21 – Full Build Model Functional Classification

The number of lanes modeled for the full build scenario is shown in Figure 22. Due to additional traffic resulting from full development, the number of lanes has generally increased by 1 lane in each direction for all roadways. Exceptions to this are the roadways up the escarpment, due to environmental concerns. Atrisco Vista and Paseo del Volcan also remain at three lanes in each direction, however right-of-way to allow for four lanes will be shown to be worthy of consideration.



Figure 22 – Modeled Number of Lanes – 2035 Full Build

The modeled speeds for the full build scenario are shown in Figure 23. The modeled speeds are the same as for 2035 Projected Development (Phase 1), but extended to serve the balance of Santolina.

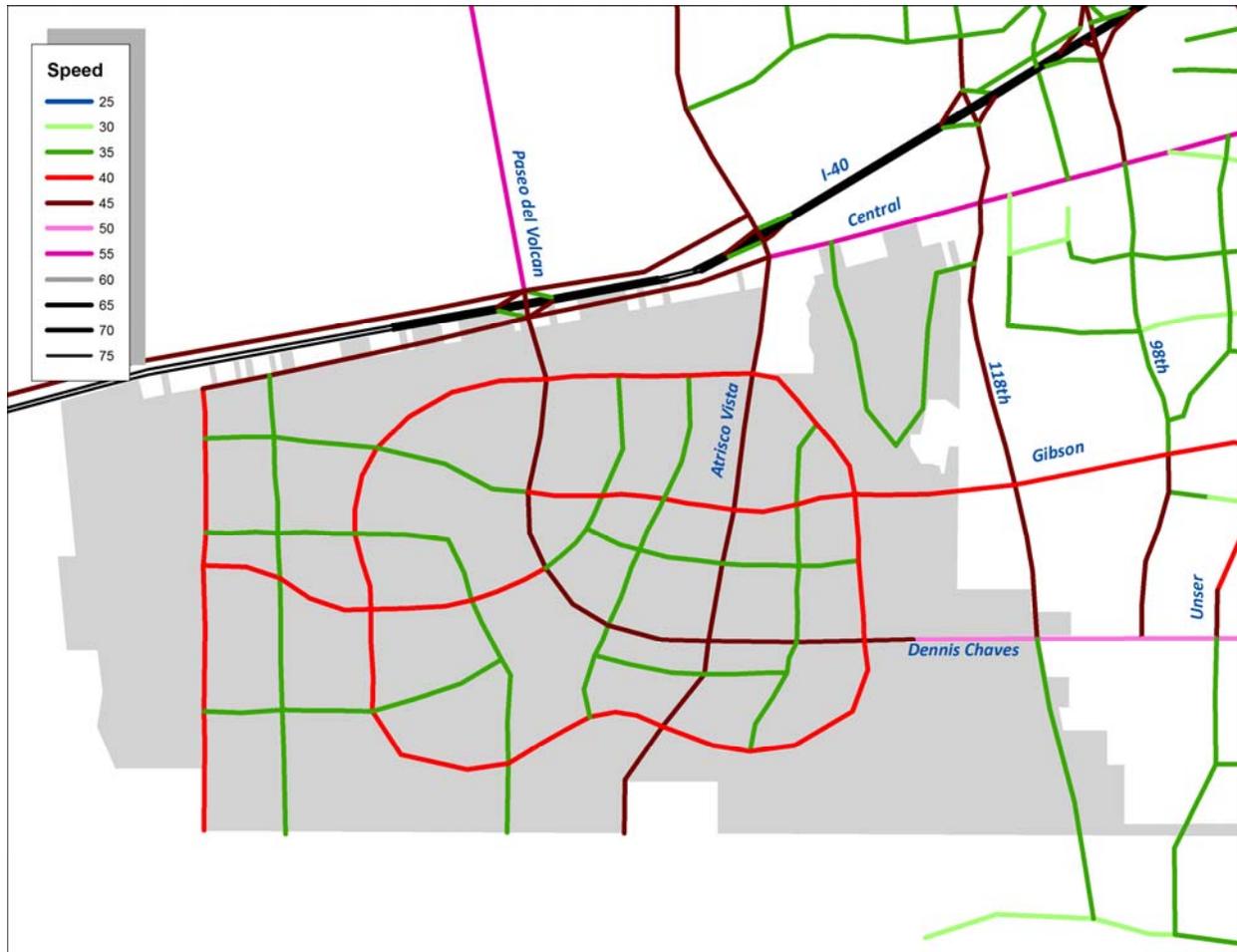


Figure 23 – Modeled Travel Speed – 2035 Full Build

Traffic volumes have been modeled for the Full Build scenario in the same manner as the 2035 forecast; however the Full Build scenario is likely to require almost 50 years to reach this level of development. There is also no adopted long-range transportation network, or forecast socioeconomic projection for this timeframe, so the Full Build scenario was modeled on the 2035 socioeconomic and roadway network established by MRCOG. This limitation leads to challenges identifying the source of future roadway capacity deficiencies, as additional roadways and other development will likely be in place by the time Full Build occurs, resulting in changes to travel patterns over that represented by the model runs reported here.

The forecast Full Build daily volumes are shown in Figure 24, the Full Build AM volumes in Figure 25, and the Full Build PM volumes are in Figure 26. The Full Build AM peak hour v/c ratios are shown in Figure 27, with the Full Build PM peak hour v/c in Figure 28.

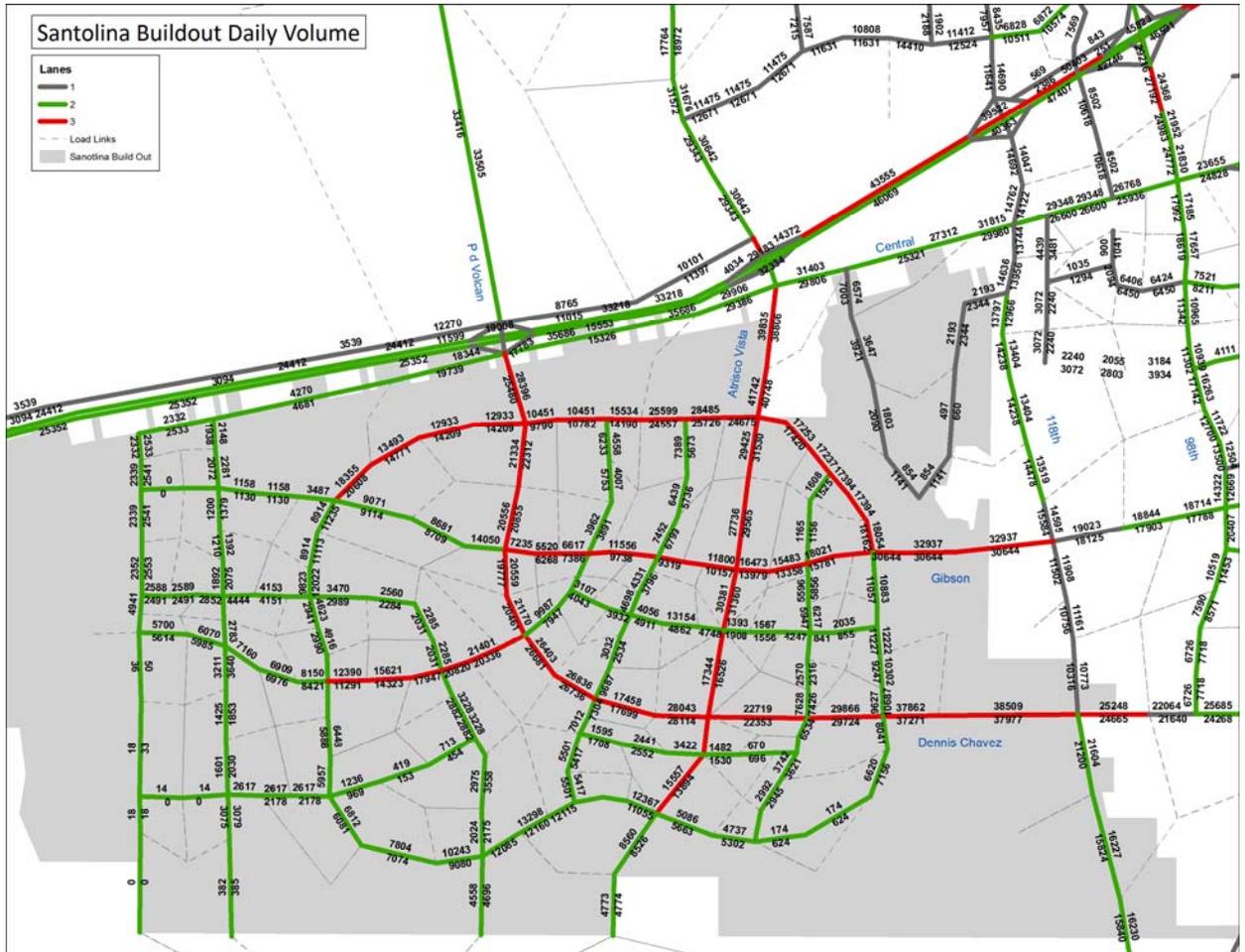


Figure 24 – Full Build Daily Volume

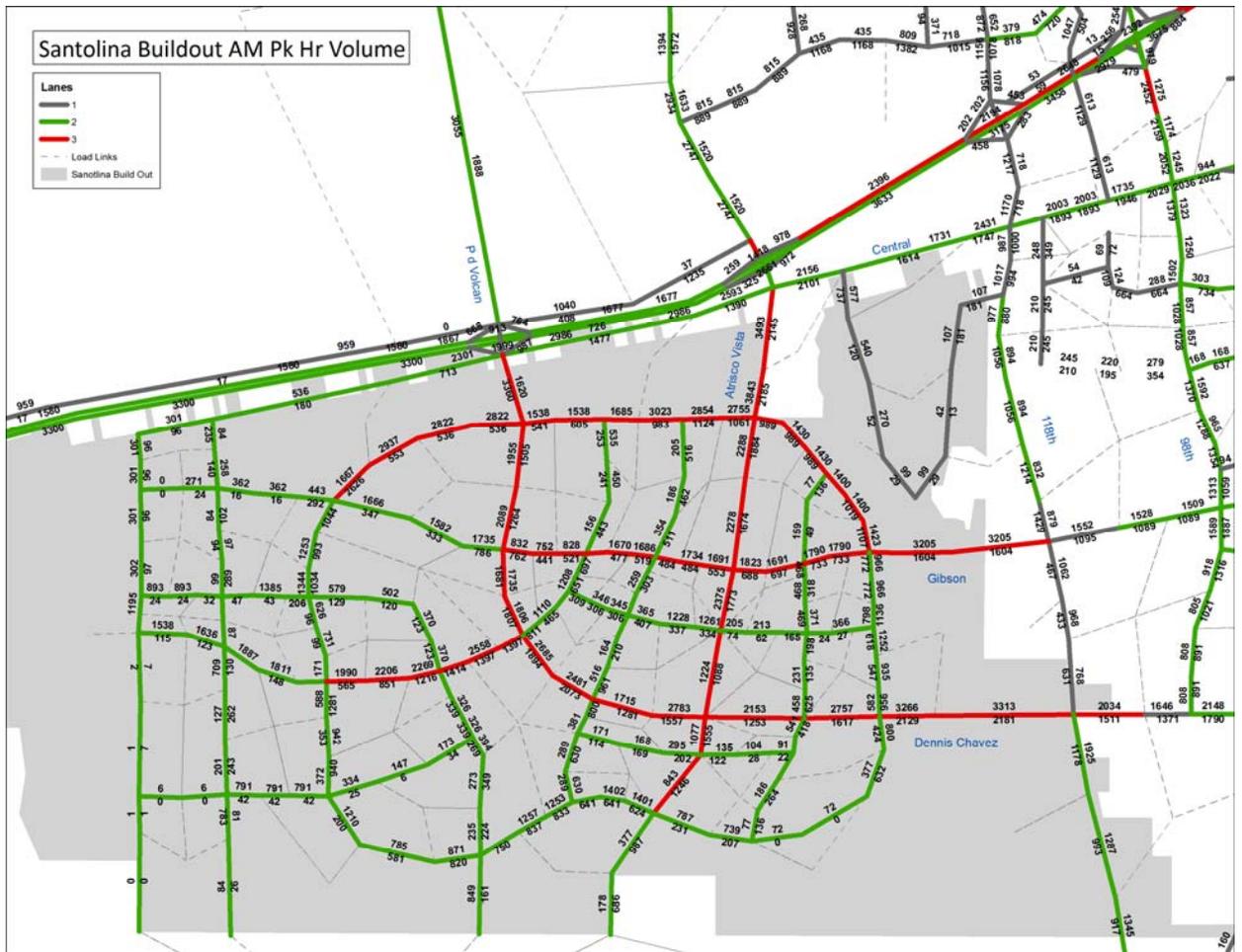


Figure 25 – Full Build AM Peak Hour Volume

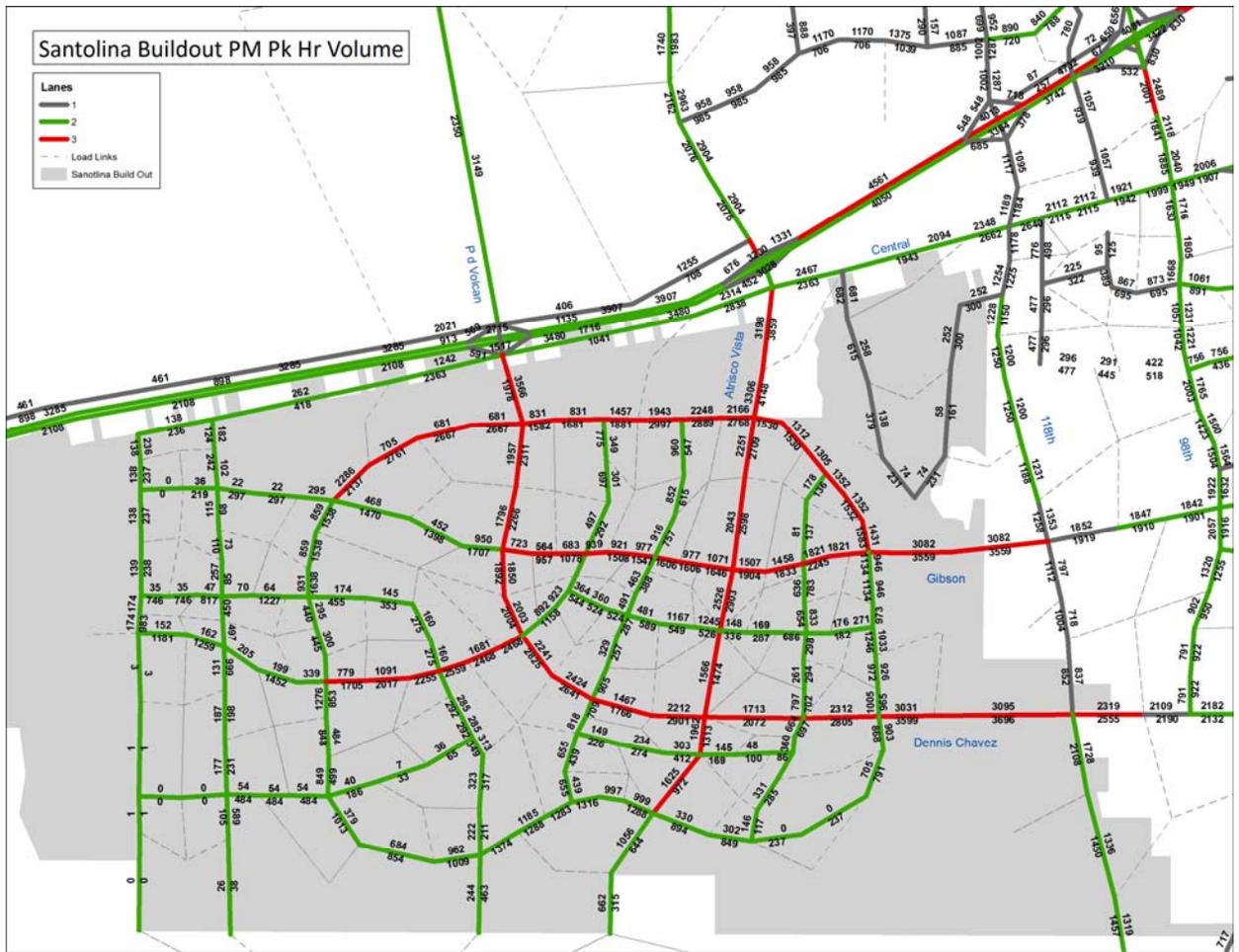


Figure 26 – Full Build PM Peak Hour Volume

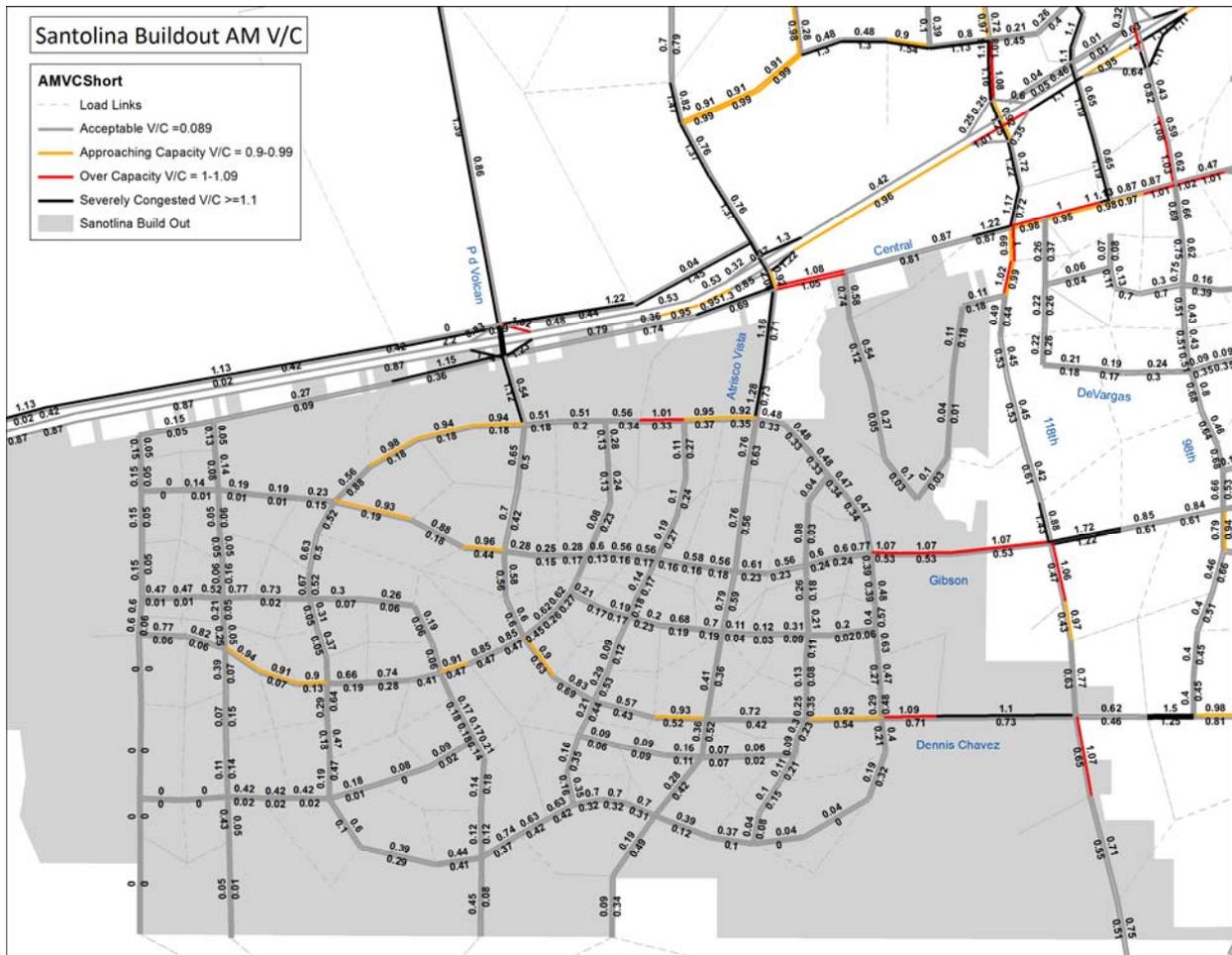


Figure 27 – Forecast Traffic Volume to Capacity Ratio AM Peak Hour – 2035 Full Build

Internal traffic volumes within Santolina increase with Full Build, however the proposed number of lanes within the Master Plan also increases, and these additional lanes in most cases accommodate the additional growth. Segments of Paseo del Volcan and Dennis Chavez, along with portions of the loop road are forecast to experience congestion (volume-to-capacity ratio close to 1.0). Intersections along these sections will likely experience peak hour delays similar to current metro Albuquerque intersections; however the vast amount of internal roadways will operate at acceptable levels of service.

All key entering and exiting roadways are projected to operate with congested conditions. Atrisco Vista and Paseo del Volcan, from I-40 south to the loop road, could be candidates for possible expansion to 8-lanes; however it is considered that widening Gibson or Dennis Chavez Boulevards to 8-lanes through the escarpment will be undesirable due to environmental impacts. The possible future extensions of Gun Club Road and/or Grant Road are also candidates for additional access to the site, if it proves necessary. Furthermore, overpass

connections across I-40 to the growth area north of I-40 and west of Atrisco Vista will also provide relief to Atrisco Vista and Paseo del Volcan. As mentioned above, future Level B analyses for Santolina should include provisions that allow appropriately spaced connections to be provided for overpasses between these future growth areas. Some of this congestion is also anticipated to be ameliorated by high capacity transit and local and commuter bus service.

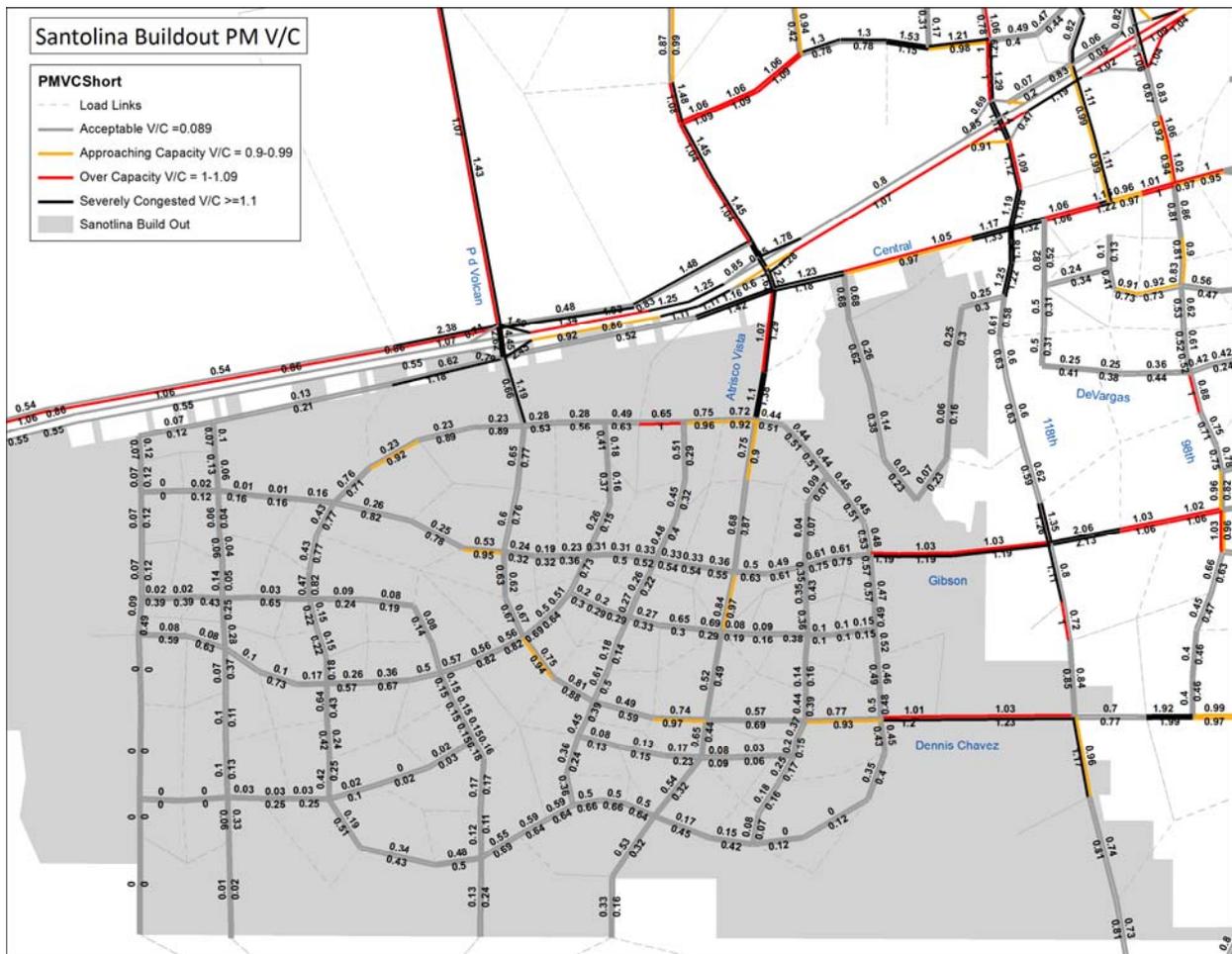


Figure 28 – Forecast Traffic Volume to Capacity Ratio PM Peak Hour – 2035 Full Build

The model forecasts poor off-site roadway performance due to network deficiencies; however these forecasts are of limited utility due to the post-2035 modeling limitations. More detailed traffic studies will be performed with each submittal of Level B and C plans. These futures studies will provide a more accurate assessment of required transportation improvement at the time, based on more specific development plans and the most current MRCOG forecasts and models.

## E. OFF-SITE ROADWAY EFFECTS

### 1. OFF-SITE EFFECTS

Comparisons with the pre-Santolina 2035 MTP model results are favorable for Santolina, and show the benefits of the jobs-housing balance proposed for Santolina. Traffic volumes on the surrounding roadway network outside Santolina generally are reduced from the levels shown in the 2035 MTP. Figure 29 and Figure 30 compare the 2035 Projected Development (Phase 1) Santolina model results to the MRCOG 2035 MTP (without the Santolina Master Plan) for the AM and PM peak hours. In these figures the 2035 MTP volume is subtracted from the 2035 Projected Development (Phase 1) Santolina. On these figures the negative values (shown as green) are links where the volume on the link is greater in the 2035 MTP than with the 2035 Projected Development (Phase 1) Santolina. Conversely, the links that are red are locations where the 2035 Projected Phase 1 Santolina volume is greater than the 2035 MTP. It is also important to note that the differences shown in these figures are on a *per lane* basis (based on MTP laneage), not total link volume.

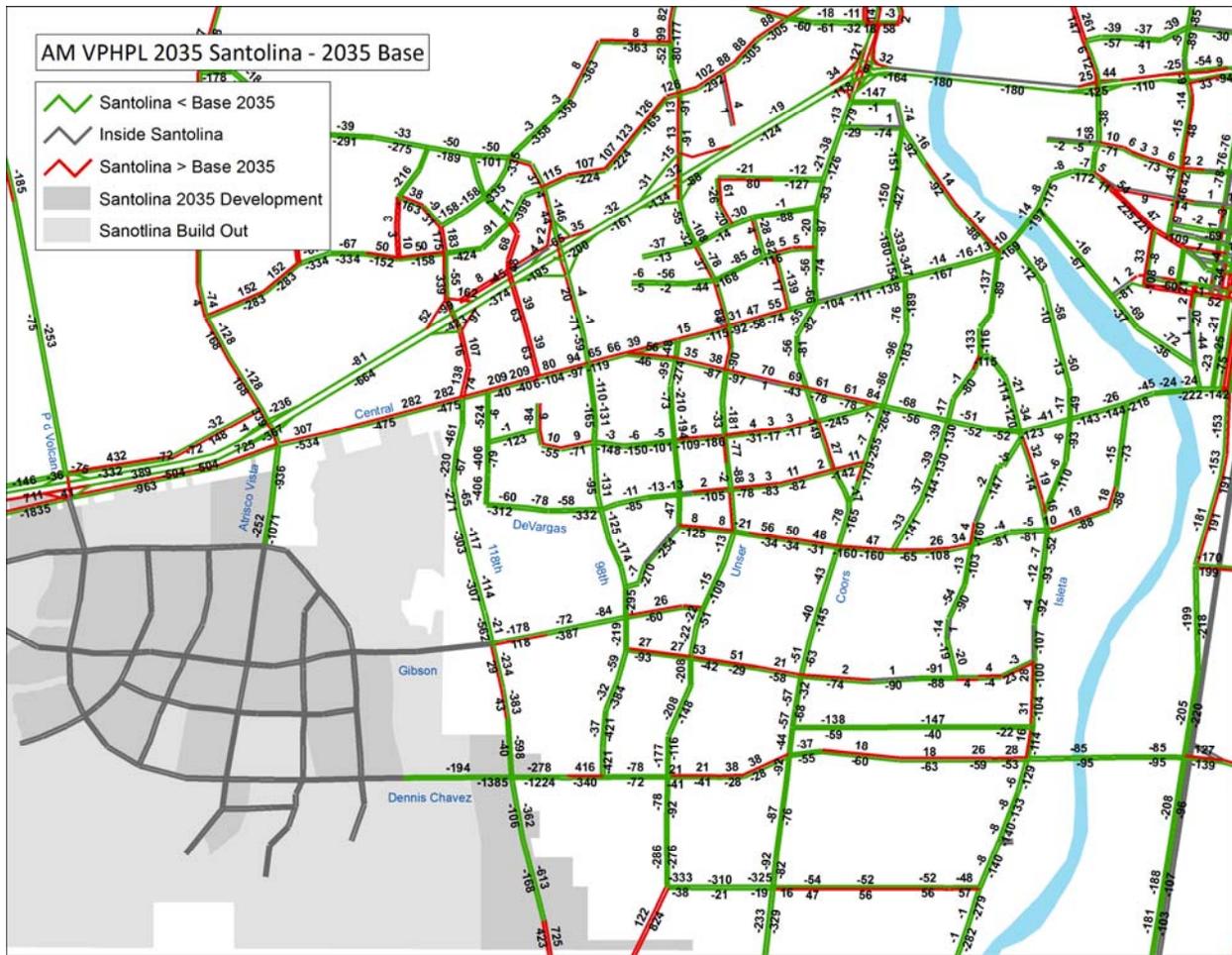


Figure 29 – 2035 Projected Development (Phase 1) Comparisons to 2035 MTP Base Model – AM Peak Hour

Volume reductions occur on I-40, Rio Bravo, 118<sup>th</sup> Street (south of Central), and Paseo del Volcan, as well as many other roadways. For example, in the AM peak hour, on eastbound I-40 between Atrisco Vista and 118<sup>th</sup> Street interchanges, Figure 29 shows there are 664 fewer vehicles on I-40 *per lane* in the 2035 AM peak hour with Santolina than there are in the MRCOG 2035 MTP. That means a total of 1,328 fewer vehicles on I-40 in 2035 because of the land use plan for Santolina, or *virtually an entire lane of interstate*. A similar situation occurs on eastbound Central Avenue/Frontage Road across Santolina frontage, where the reductions are also very large (1,000 vehicles total, as Central was just a single lane in each direction in the 2035 MTP), indicating fewer improvements are required due to Santolina. Although these are the highest values shown in the figures, other locations also show large reductions, such as 118<sup>th</sup> Street and Paseo del Volcan. Smaller reductions are shown throughout the surrounding roadway network, all the way east to the river. Indeed, although not shown completely, river

crossings are reduced by 1% on a regional basis, with over 9,300 fewer river crossings resulting from the Santolina Master Plan land uses.

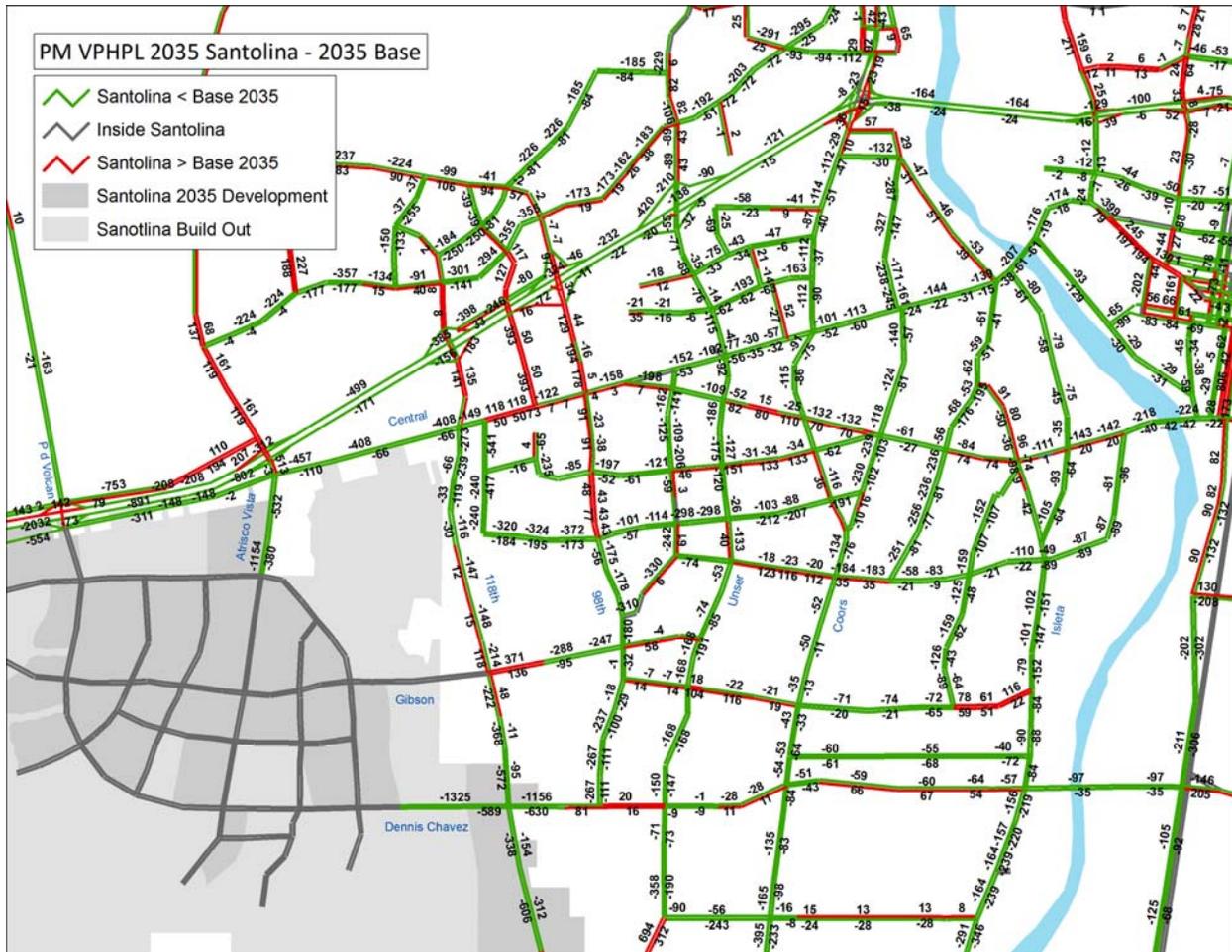


Figure 30 – 2035 Comparisons to 2035 MTP Base Model – PM Peak Hour

In the much smaller number of locations where traffic increases, it is often in the opposite direction than the existing peak hour, i.e., the results show an increase in traffic from east-to-west in the morning, indicating the counter-commute which results from the employment in Santolina. This is most visible in the AM figure, where Lomas, Central Avenue and the Frontage Road all have increases in AM westbound traffic volume. These changes in travel patterns resulting from the Master Plan preserves and optimizes the capacity and utilization of the existing roadways, thereby reducing the need for future improvements.

The comparisons with the pre-Santolina 2035 MTP also show approximately 10-20% of the traffic volume on Paseo del Volcan and Atrisco Vista in Santolina is pass-through traffic. In other words, 10-20% of the traffic on those roads in Santolina does not stop in Santolina, and

simply drive-through to their destination, demonstrating that Santolina improves regional connectivity and constructs a regional roadway not currently in the MTP. Furthermore, model results show 15-35% of the traffic on roadways in Santolina never leave Santolina, and stay internal to the area, further reducing impact to the regional roadway network. More detailed discussion of these results are included in Technical Appendix T-2, Analysis of Travel Demand Forecasts.

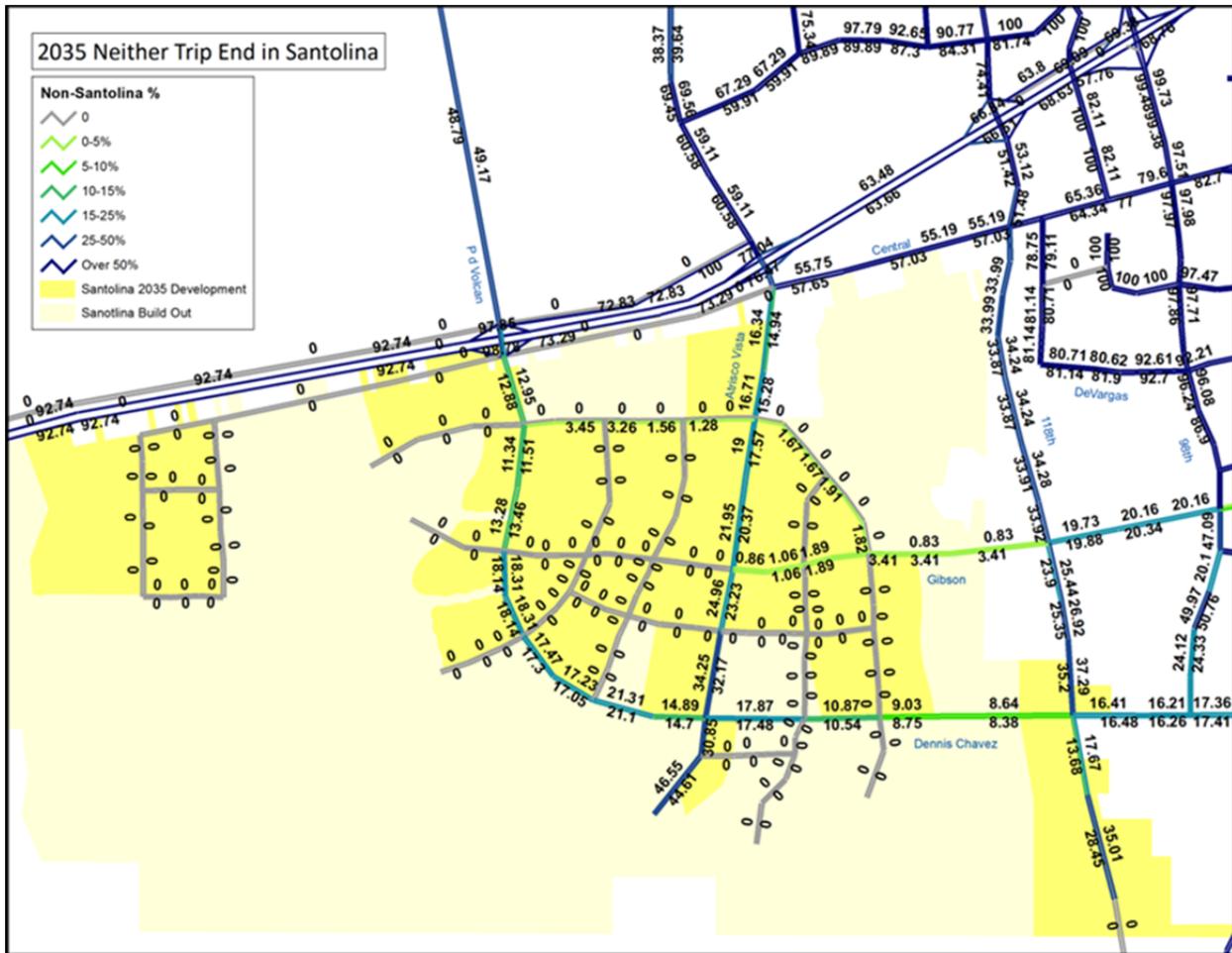


Figure 31 - Percent of Traffic with No Trip End in Santolina

Additional measures of effectiveness (MOE's) were also evaluated, including vehicle miles of travel, vehicle hours of travel, vehicle hours of delay, and number of river crossings. These are shown in Table 6. It should be noted the 2035 MTP numbers shown in Table 6 include the extension of Gibson Boulevard up the escarpment, and the extension of Paseo del Volcan to Dennis Chavez Boulevard, as included in the Santolina road network, roadways that are not currently included in the MTP.

<b>Measure of Effectiveness</b>		
<b>Measure</b>	<b>2035 MTP</b>	<b>2035 Santolina</b>
<b>Vehicle Miles of Travel</b>	<b>36,812,348</b>	<b>36,903,309</b>
<b>Vehicle Hours of Travel</b>	<b>738,364</b>	<b>742,744</b>
<b>Vehicle Hours of Delay</b>	<b>722,430</b>	<b>731,176</b>
<b>Total River Crossings</b>		
<b>I-25 South</b>	<b>102,783</b>	<b>98,894</b>
<b>Rio Bravo</b>	<b>71,503</b>	<b>70,099</b>
<b>Bridge</b>	<b>70,814</b>	<b>69,550</b>
<b>Central</b>	<b>83,418</b>	<b>78,894</b>
<b>I-40</b>	<b>230,904</b>	<b>229,030</b>
<b>Montano</b>	<b>61,978</b>	<b>64,289</b>
<b>Paseo del Norte</b>	<b>160,639</b>	<b>160,918</b>
<b>Alameda</b>	<b>77,923</b>	<b>80,294</b>
<b>US 550</b>	<b>83,551</b>	<b>82,114</b>
<b>Total River Crossings</b>	<b>943,513</b>	<b>934,082</b>

Table 6 – Measures of Effectiveness Comparison with 2035 MTP  
VMT and River Crossings

Table 6 shows a small (0.25%) increase in VMT for 2035 Projected Development (Phase 1) Santolina compared to the 2035 MTP. Some of this small difference can be attributed to the additional 4.7% of lane miles (231 lane miles) added to the 2035 model network with the addition of the entire Phase 1 Santolina road network. This additional lane mileage is not included in the 2035 MTP as there is no roadway network in the 2035 MTP in the Santolina Master Plan area. If the comparison were to be made against the actual 2035 MTP network, without the Gibson and Paseo del Volcan extensions as shown above, the VMT, VHT and VHD would actually be less than the 2035 MTP results, with VMT reduced by 0.56%. These results are discussed further in Technical Appendix T-2, Analysis of Travel Demand Forecasts

Table 6 also shows a reduction in river crossings, with the river crossings in the middle of the region having slight increases (Montano, Alameda, and Paseo del Norte), but with reductions on all the other river crossings in the metro area.

<b>Santolina from/to Atrisco Vista/Dennis Chavez (n=4188)*</b>			
	<b>Time</b>		<b>Difference</b>
	<b>2035 MTP</b>	<b>Santolina</b>	<b>Santolina -</b>
<b>Travel Time - AM Peak Hour</b>			
<b>To Downtown (n=3206)</b>	59.19	58.36	-0.83
<b>To Uptown (n=2820)</b>	64.75	67.67	2.92
<b>To Mesa del Sol (n=5497)</b>	55.09	55.51	0.42
<b>To Rio Rancho City Center (n=5936)</b>	38.00	38.78	0.78
<b>Travel Time - AM Peak Hour</b>			
<b>From Downtown (n=3206)</b>	18.92	19.02	0.10
<b>From Uptown (n=2820)</b>	21.47	21.89	0.42
<b>From Mesa del Sol (n=5497)</b>	28.29	28.63	0.34
<b>From Rio Rancho City Center (n=5936)</b>	67.02	71.58	4.56
<b>Travel Time - PM Peak Hour</b>			
<b>To Downtown (n=3206)</b>	22.96	22.02	-0.94
<b>To Uptown (n=2820)</b>	30.60	29.67	-0.93
<b>To Mesa del Sol (n=5497)</b>	41.73	42.21	0.48
<b>To Rio Rancho City Center (n=5936)</b>	87.04	95.58	8.54
<b>Travel Time - PM Peak Hour</b>			
<b>From Downtown (n=3206)</b>	63.02	61.58	-1.44
<b>From Uptown (n=2820)</b>	72.41	70.98	-1.43
<b>From Mesa del Sol (n=5497)</b>	68.37	69.58	1.21
<b>From Rio Rancho City Center (n=5936)</b>	48.28	51.38	3.10

Table 7 – Travel Time Comparison with 2035 MTP

Travel times from and to Santolina from four selected locations in the metro area were also evaluated. The node numbers used in the MRCOG regional travel demand model are listed for reference. The travel time in the AM and PM peak hour to and from these locations are listed in Table 7. The travel time differences from the 2035 MTP vary, with some reductions, and some increases, particularly for the longer commutes, particularly to or from Rio Rancho City Center. The travel time results also show the level of congestion anticipated for 2035 regardless of development patterns, and the need for additional roadway improvements, as well as additional job centers on the west side, such as planned for Santolina. Additional discussion of these results, including comparisons to the actual MTP, can be found in Technical Appendix T-2, Analysis of Travel Demand Forecasts.

A final measure of effectiveness is to compare the population to the number of lanes miles for Santolina with other areas of the AMPA. This is shown in Table 8. The other areas selected

were the South Valley, the Northeast Heights, Rio Rancho, and Mesa del Sol. All the areas have comparable acreages.

Functional Class	Pop / Lane Miles					Santolina Full Build
	South Valley	NE Heights	Rio Rancho	Mesa del Sol	Santolina	
Principal Arterials	736	390	574	1,861	374	561
Minor Arterials	3,224	1,048	1,433	1,464	2,475	1,813
Collectors	1,468	1,497	561	7,509	5,657	2,537
Total	426	239	237	739	307	367
Acres	16,256	15,383	14,167	13,863	4,480	14,700

Table 8 – Population per Lane Mile Comparison

The table shows, that for principal arterials in 2035, the population per lane mile for Santolina is lower than the other areas (smaller population per lane mile), and is comparable at Full Build. For the other functional classifications, even though the full Santolina roadway network has not been defined in Level A, Santolina is again within the ranges of the developed areas (South Valley, Northeast Heights, and Rio Rancho), and has higher population per lane mile than the other Level A Master Plan development, Mesa del Sol.

## F. NON-AUTO MODES OF TRANSPORTATION

Santolina's vision includes the principle of incorporating multi-modal travel with an emphasis on walkability and transit, and has as a clearly defined goal of a transportation and circulation system that allows for transit connections throughout the community, creates links between activity centers and villages, and provides opportunities for alternative modes through an extensive network of trails and bikeways.

The typical sections figure showed that anticipated primary arterial typical sections would have on-street bicycle lanes and sidewalks or trails on both sides of the street, and will tie into the trail systems contained in the Santolina Open Space. These bicycle and pedestrian facilities will tie into the extensive existing system identified in the MRCOG Long Range Bikeway System, and will expand opportunities for bicycle commuting, while providing continuous and connected pathways to encourage pedestrian trips throughout the Villages.

### 1. TRANSIT

In order to be effective in reducing regional traffic congestion, transit must be frequent, fast and reliable. With the extensive network of pedestrian facilities within Santolina, bus stops can be located within reasonable walking distance of residences, encouraging transit use. Bus

Rapid Transit and commuter routes can provide direct routes from Santolina to other regional job centers, or transport employees to the jobs located in Santolina. As the area further develops, local circulator buses can expand on the transit opportunities of the area.

Transit services to County areas are currently provided on a contract basis, as they are outside the City of Albuquerque's ABQ Ride jurisdictional area. As Santolina develops, the available markets for transit ridership is expected grow, prompting the consideration of transit service by the County and ABQ Ride. These discussions would not be expected to occur until the transit market appears with development.



Photo credit: ABQ Ride

a) *Existing*

Currently there are no transit routes serving Santolina. Route 66 (Central Avenue) and 766 (Rapid Ride Red Line) serve the Central and Unser Transit Center and Central Avenue.

Route 222 (Rio Bravo/Sunport) serves Dennis Chavez Boulevard/Rio Bravo Boulevard and turns north on 98<sup>th</sup> Street as it heads to the Central and Unser Transit Center. Route 54 (Bridge/Westgate) serves Bridge and Arenal as it winds its way to the Westgate Library area, before heading north on 98<sup>th</sup> Street, before reaching the Central and Unser Transit Center.

b) *Proposed*

The conceptual transit network for Full Build is shown in Figure 32, with the 2035 Projected Development (Phase 1) transit network shown in Figure 33. The backbone of the network is the proposed Bus Rapid Transit (BRT) routes. As Santolina develops, the area will not only be home to residential areas, but also employment centers. So transit has the opportunity to not only take people from Santolina to other regional employment centers, but also to take people from other parts of the metro area, to the employment centers in Santolina.

The BRT network as shown extends RapidRide Route 766, the Green Line, from its current terminus at the Central and Unser Transit Center into the Town Center in Santolina. This route extends west on Central to Paseo del Volcan, or possibly even further west, to provide transit access to a major employment center. A Transit Center is also proposed for the Town Center area, so as to serve as a park-and-ride facility, as well as a location for other, future commuter or local circulator bus lines to transfer passengers to other routes serving the area.

A second BRT route is along Dennis Chavez Boulevard, into the Urban Center. Although no BRT currently serves Dennis Chavez, it is identified as a Priority Transportation Improvement Corridor in the 2035 MTP, and with the Rio Bravo RailRunner Station just west of the river, is a prime candidate for use as a BRT or commuter route. Additionally, Dennis Chavez from 118<sup>th</sup> Street to the edge of the Urban Center has been identified as a roadway segment under consideration for a dedicated bus lane to remove the bus from general purpose traffic as it enters the Urban Center. A Transit Center, with park-and-ride and stops for other local or commuter bus routes is also proposed for the Urban Center. Transit center should also be considered near post-secondary education institutions, such as planned for the Urban Center/Hub area.

Although conceptual in nature, the transit network also shows bus stops at all signalized intersections. It is expected, that as future details emerge through the Level B and C studies, additional bus stops and routes will be in place for local service routes that serve not only the principal arterials shown in Figure 32 and Figure 33, but also future minor arterials and collector streets.

A goal for Village, Urban Center and Town Center design will be to locate transit stops and/or stations so as to maximize the number of residents and workers who can walk less than one-quarter mile to a stop or station. Care must be taken on these roadways to ensure safe and easy pedestrian crossings.

# FIGURE 32 TRANSIT NETWORK FULL BUILD



**NOTES:**

1. TRANSIT CENTER AND STOPS ARE APPROXIMATE AND ILLUSTRATIVE, SUBJECT TO CHANGE.

**LEGEND**

- T TRANSIT CENTERS
- TRANSIT STOP
- BRT / ROUTE COMMUTER



**FIGURE 33  
2035 PROJECTED  
PHASE 1 TRANSIT  
NETWORK**

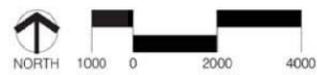


**NOTES:**

1. TRANSIT CENTERS AND STOPS ARE APPROXIMATE AND ILLUSTRATIVE, SUBJECT TO CHANGE.

**LEGEND**

- T TRANSIT CENTERS
- TRANSIT STOP
- BRT / ROUTE COMMUTER
- 2035 PROJECTED PHASE 1 AREA



## 2. BICYCLES

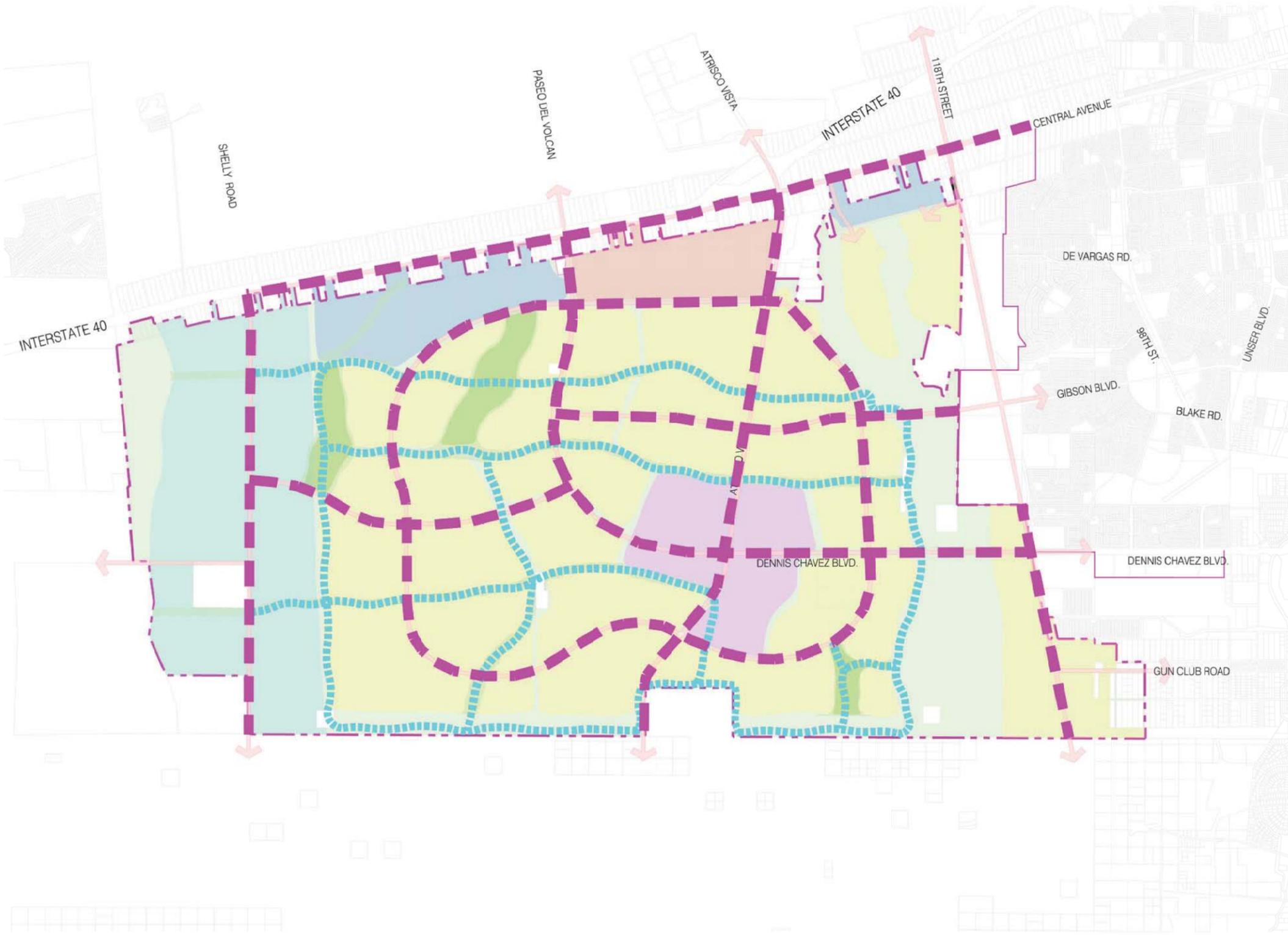
The proposed bicycle network shown in the Pedestrian and Bikeways Master Plan provides complete coverage of the Santolina Santolina, through the on-street bicycle lanes and proposed Open Space trails system. The bikeway network will be even more extensive than shown in the Bikeways Master Plan, as the proposed typical arterial roadway sections also include bike lanes on all future identified minor arterials and collector streets. Off-Street trails, combined with walking, are also proposed in the typical sections for the principal arterials. This will allow recreational bicyclists the opportunity to bicycle out of travel lanes, and provides biking opportunities for a wide-range of abilities. The relatively flat topography of much of the area is well suited to bicycle travel, while the ample open space and trail network provides opportunities for recreational biking.

The proposed bicycle network conforms to, and will integrated into, the MRCOG Long Range Bikeways System Map that envisions extending bikeway facilities on Dennis Chavez, Atrisco Vista, 118<sup>th</sup> Street, Gibson, Paseo del Volcan, and Central Avenue. This will provide direct access to the extensive network of existing and proposed bikeways in the metro area, providing opportunities for long-range cycling or commuting for those so inclined.



Photo credit: ACVB

# FIGURE 34 PEDESTRIAN AND BIKEWAYS MASTER PLAN



-  COMMUNITY TRAILS
-  ALL PRINCIPAL ARTERIALS HAVE ON-STREET BIKE LANES, SIDEWALK AND MULTI-USE TRAIL

**NOTES:**

1. ROADS ARE PRELIMINARY AND SHOWN FOR ILLUSTRATIVE PURPOSES.
2. ALL MINOR ARTERIALS AND COLLECTORS WILL ALSO HAVE ON-STREET BIKE LANES, SIDEWALK AND MULTI-USE TRAILS.



### 3. PEDESTRIAN

Similar to the bicycle network, the proposed typical arterial roadway sections provide complete pedestrian coverage throughout Santolina, with a sidewalk or multi-use on both sides of all streets collector and above. In addition, the Open Space trail system provides opportunities for walking separate from roadways and vehicular traffic.

Supporting Santolina's goals of walkability requires making walking convenient, pleasant and safe. The interconnected sidewalks throughout Santolina enable short walking trips to bus stops, schools, parks and other neighborhood amenities. Walking within Village Centers will be encouraged due to the land use and site layout and pedestrian facilities, and will encourage a "park-once" concept in the areas.

Marked at-grade crosswalks should be provided at all signalized intersections, with pedestrian actuated phases for crossing the streets.

### G. SUMMARY

In summary, the Santolina Level A Transportation Master Plan achieves the goals of the County's Planned Communities Criteria in the following manner. The Master Plan

- Provides an emphasis on walkability and transit, with the goal of creating a transportation and circulation system that allows for transit connections throughout the community.
- Due to the jobs-housing balance in Santolina, the Master Plan preserves and optimizes the capacity and utilization of the existing roadways, thereby reducing and/or delaying the need for future improvements, as the 2035 Projected Development (Phase 1) modeling results generally show reductions in directional traffic volumes on surrounding streets compared to the 2035 MTP model. The AM peak hour results clearly show an increase in east-to-west trips, instead of the typical west-to-east commute trip. For instance, on eastbound I-40 between Atrisco Vista and 118<sup>th</sup> Street interchanges, the results for Projected Phase 1 Santolina show a reduction of 1,325 vehicles in the 2035 AM peak hour. This is equivalent to almost an *entire lane on the freeway*, demonstrating the benefits the Master Plan land use has on the need for additional off-site roadway improvements.
- Comparisons with the pre-Santolina 2035 MTP also show approximately 10-20% of the traffic volume on Paseo del Volcan and Atrisco Vista in Santolina is pass-through traffic, and does not stop in Santolina, simply driving through to their destination, demonstrating that Santolina improves regional connectivity. Furthermore, 15-40% of the traffic on

roadways in Santolina never leave Santolina, and stay internal to the area, further reducing impact to the regional roadway network, again showing the benefit of the Master Plan.

- Models two phased development scenarios, Full Build and 2035 Projected Development (Phase 1).
- Proposes a 2035 Projected Development (Phase 1) internal roadway network that is sufficient to accommodate the anticipated Projected Phase 1 traffic volumes. The results also indicate the proposed internal network also has additional capacity and right-of-way to accommodate faster growth than anticipated by the growth estimates, as needed.
- Addresses Vehicle Miles Traveled (VMT) by forecasting a 0.56% reduction in VMT over that in the base 2035 MTP. When the Gibson extension and connection from Paseo del Volcan to Dennis Chavez is added to the 2035 MTP road network, the results show a 0.25% increase in VMT with Santolina, a very small increase that is negligible for the model.
- Reduces river crossings by 1% on a regional basis.
- Portrays that internal traffic volume within Santolina increase as Full Build conditions approach, however the proposed number of lanes within the Master Plan also increases correspondingly to manage and address the additional growth. This allows for phased construction of roadways to correspond to actual development progress with the community.
- Provides a framework to identify future transportation needs through future Level B and Level C transportation analyses.
- Requires that all arterial roadways adhere to the intersection and driveway spacing identified in the NMDOT's State Access Management Manual (SAMM), with any future proposed deviations to be approved by the County.
- Creates opportunities for alternative modes of transportation for the community through an extensive network of trails and bikeways.
- Provides arterial typical sections with on-street provisions for bicycle lanes and sidewalks or multi-use trails and have landscape buffers.
- Provides typical roadway sections with a robust set of principal roadways and bicycle and pedestrian facilities resulting in local and regional wide access to alternate travel modes.

- Provides bicycle and pedestrian facilities that will tie into the extensive existing system identified in the MRCOG Long Range Bikeway System, and that expand opportunities for bicycle commuting, while providing continuous and connected pathways to encourage pedestrian trips throughout the Villages.

# **Technical Appendix T-1 – Travel Demand Modeling and Databases**

## Level A Transportation Analysis Santolina

### Travel Demand Modeling Procedures and Databases (Revision 1/9/13)

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Planning Technologies, LLC

This paper describes the various procedures and databases that have been constructed for the Level A Transportation Analysis for the planned community at Santolina.

The regional travel demand model (Cube model) maintained by the Mid-Region Council of Governments (MRCOG) is one of the primary tools that will be used to estimate traffic loads, capacity needs, and network impacts associated with the proposed development. This paper describes the procedures that have been used to run the travel model.

Planning Technologies, LLC will be responsible for operating the travel model. Results forthcoming from the network forecasts will provide the traffic projections on which the balance of the traffic impact analysis will be predicated. This paper describes the various land use and network databases that have been constructed to depict conditions on which the travel model forecasts will be based.

### Scenarios

The analysis is predicated on several scenarios:

- √ **A “2035 MRCOG MTP Scenario”:** a “No-Build Scenario” depicts anticipated conditions on regional highways that will arise over the next 25 years, forthcoming from general growth in the region and unrelated to any specific development at Santolina. This is the MRCOG 2035 Adopted MTP.
- √ **A “2035 Phased Development Scenario”:** a “2035 Phased Development Scenario” depicts capacity requirements and impacts on the highway system related specifically to the development proposal at Santolina by the year 2035.
- √ **A “Build-Out Scenario”:** a “Build-Out Scenario” depicts the capacity requirements for the circulation system at Santolina as it will ultimately be built. This scenario is run against a backdrop of “2035” projections for the rest of the region (as they relate to both land use and network capacity) since there is no comparable MRCOG “build-out” scenario that applies to the distant future. The objective of the “build-out” scenario is to assure that the right-of-way provisions on-site are sufficient to support the ultimate development in the very long term. Inasmuch as it may be 50-80 years before this ultimate build-out scenario is achieved, it is inappropriate to look at off-site impacts related to this scenario – there is no related long range plan for the region that reaches this far into the distant future.

For regional assumptions off-property, the official MRCOG assumptions for the adopted Metropolitan Transportation Plan (MTP) have been assumed. All development proposals on the Santolina property itself

are considered to be replacements to *development* in the region. For the 2035 “Phased” scenario, the 2035 MTP socio-economic controls will be maintained.

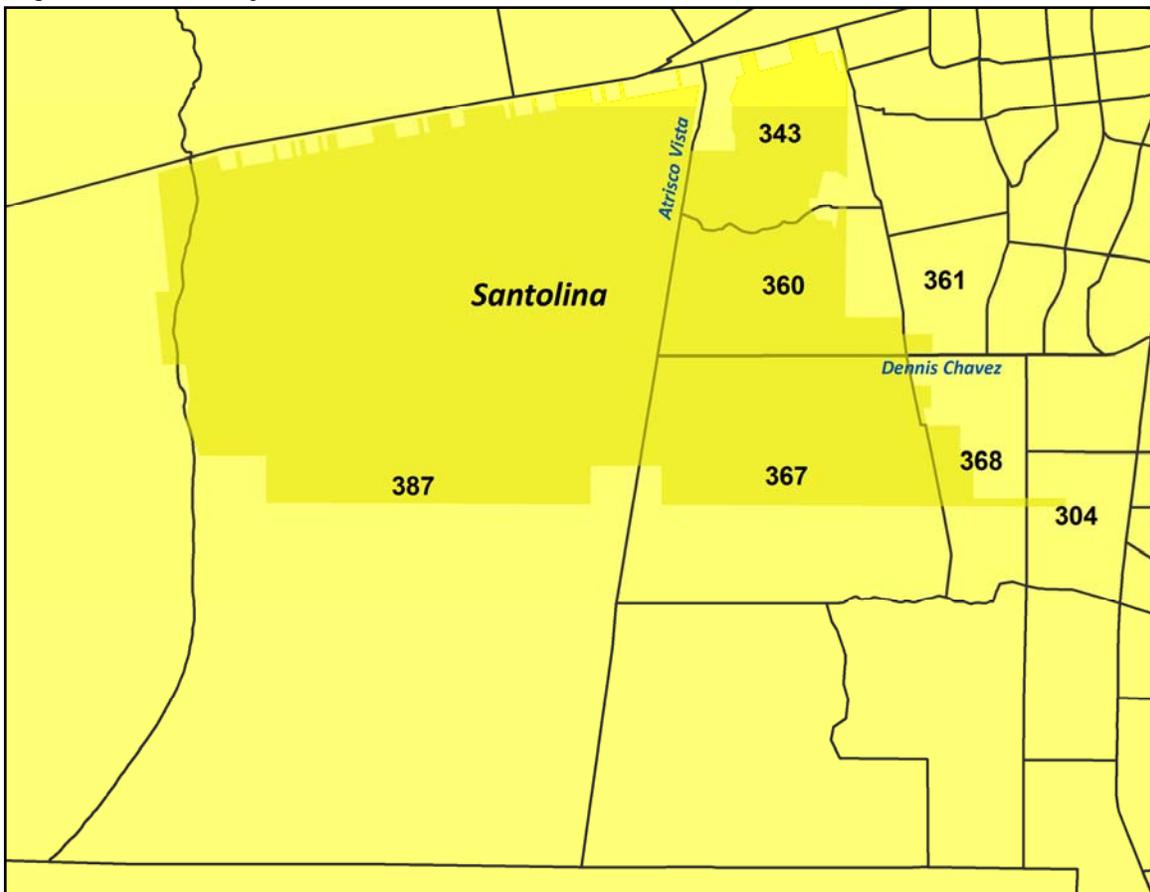
So, there are two “build” scenarios of interest – (1) one depicting both on-site and off-site impacts for the year 2035, and (2) another depicting on-site capacity needs at Build-Out. The other scenario is a “baseline” to provide a basis for comparison.

## Current MTP Assumptions at Santolina

The MTP plans from MRCOG currently carry a minimal representation of network and land use development in Santolina.

The project area covers 6 traffic analysis zones (Cube TAZs) in the travel model, plus a small portion of an additional Cube TAZ (304) that is only covered in a minor way by the project (Figure 1). The project area is approximately 14,700 acres. To understand the relative size of the development, this area is roughly equivalent to the area in the northeast heights bounded by Central Ave., I-25, Montgomery Blvd. and Juan Tabo Blvd.

Figure 1: Traffic Analysis Zones in Santolina



This is the profile of land use inside the project area for the year 2035, as it is depicted in the MTP.

Table 1: 2035 MTP Santolina Area Forecast

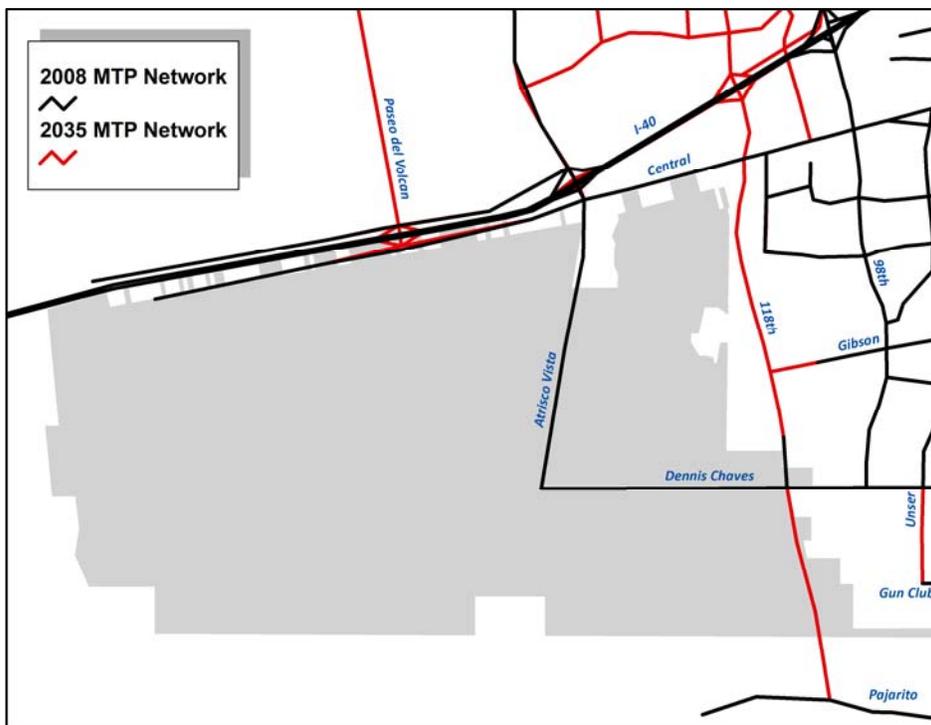
	TAZ						
2035 MTP	343	360	361	367	368	387	Total
POPULATION	2,998	3,349	7,566	16,091	5,058	41,009	76,071
HOUSEHOLDS	1,080	1,264	2,681	6,137	2,048	15,349	28,559
SFDU	959	1,296	2,886	6,533	2,208	16,722	30,604
MFDU	205	68	0	0	0	0	273
BASIC EMP	110	58	46	104	33	584	935
RETAIL EMP	135	129	39	21	67	570	961
SERVICE EMP	192	362	286	263	176	1,172	2,451
<b>TOTAL EMP</b>	<b>437</b>	<b>549</b>	<b>371</b>	<b>388</b>	<b>276</b>	<b>2,326</b>	<b>4,347</b>

In the 2035 MTP, MRCOG portrays a significant amount of residential development in the Santolina area as shown in the Table 1. These figures represent a 15 fold growth in population from 2008 (5,250 to 76,071). They represent 2 fold growth in employment (1,219 to 4,347). The jobs to households ratio is 0.15, meaning the vast majority of residents must travel out of the area for their jobs.

### Networks

In terms of networks, the MRCOG MTP depicts virtually no network development in the project area. This is described below and shown in Figure 2.

Figure 2: Network Development in Santolina Area 2008 & 2035 MTP



The MRCOG 2035 network has *no improvements* in term of additional lanes over the 2008 network. There are also *no speed limit changes* between the 2008 and 2035 networks. There are additional road segments added to the network between 2008 and 2035. New freeway interchanges will be added at 118<sup>th</sup> St. and Paseo del Volcan. A new freeway overpass will be added at 106<sup>th</sup> St. 118<sup>th</sup> between I-40 and Pajarito Rd. will be completed. Gibson will be connected to 118<sup>th</sup> St. The segment of Unser Blvd. between Dennis Chaves and Gun Club will be completed. Note: the freeway “frontage” roads are two way streets on both the north and south sides of I-40, not traditional one way freeway frontage.

The only roads that fall in the Santolina project area are Atrisco Vista Blvd., Dennis Chaves Blvd. and the I-40 south frontage road.

## General Approach

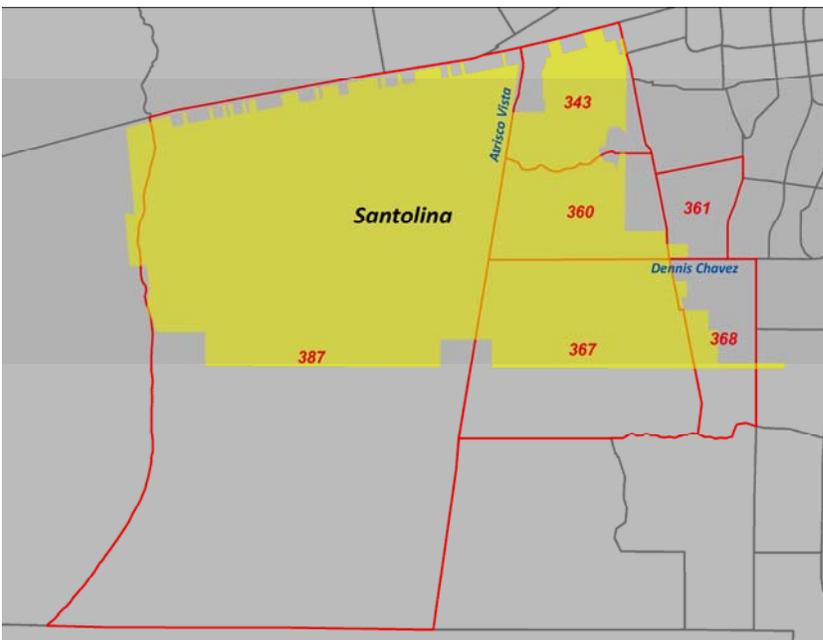
For the model runs supporting the Level A Transportation Analysis, we will be developing a more detailed representation of Santolina – both in terms of the transportation network as well as in terms of the TAZs describing land use. We will develop databases for the various scenarios that:

- √ Include roadway proposals for Santolina that follow the proposed transportation network plan. The result will be to extend and enhance network that MRCOG already has in the MTP for 2035 in Santolina.
- √ Include a detailed TAZ system that captures the Santolina land use proposal. The intent will be to create a database that substantially increases the number of TAZs covering the project area – from the 6 that MRCOG currently has coded in the model to 52.

## Santolina Socio-Economic Data Development

Santolina covers roughly 14,700 acres. The development area for Santolina with the current Cube TAZs is shown in Figure 3.

Figure 3: Santolina Development and Original Cube TAZs



Within the 6 zone area inside Santolina, the MRCOG socio-economic data will be replaced with the development proposal. New zones will be created following the development land use and transportation plans.

In the areas in the 6 zone area that are outside of Santolina, the socio-economic data will be apportioned according to the MRCOG LAM land use model data.

In the areas outside of the

Santolina development, two different approaches will be used for the 2035 and the Build Out scenarios. In the Build Out scenario, the 2035 data will be left as is. In the 2035 scenario the data will be normalized so that the 2035 MTP control totals are matched.

**Santolina Development Proposal**

Consensus Planning, the land use planners for the project, have supplied the descriptions of the development proposal for the 2035 “phased development” as well as the “build-out”.

Consensus Planning used planning standards and guidelines from Bernalillo County and the Mid-Region Council of Governments (MRCOG) for the allocation of land use within the development area. For the residential development, Comprehensive Plan Designated Area standards were used to calculate the acreages and number of dwelling units (Table 2). Population figures were derived from the number of dwelling units and the 2010 U.S. Census average household size figure of 2.46 persons / household.

The acreage of the employment areas were calculated using typical floor to area ratios by zoning/development districts and jobs per square foot estimates for various employment sectors. Bernalillo County park standards were used to calculate the type, number and size of parks. The total required parks and open space is 3,049 acres. After subtracting the area of the escarpment / major public open space the acreage required within the area is 1,450 acres.

**Table 2: Allowable Dwelling Units by Comprehensive Plan Area**

Plan Area	DUs/ Acre	Acres	Allowable DUs	% of Plan Area
<b>Reserve</b>	<b>3*</b>	<b>11,270</b>	<b>33,810</b>	<b>80%</b>
<b>Developing Urban</b>	<b>5</b>	<b>330</b>	<b>1,650</b>	<b>3%</b>
<b>Rural</b>	<b>1</b>	<b>2,030</b>	<b>2,030</b>	<b>14%</b>
<b>Semi-Urban</b>	<b>3</b>	<b>440</b>	<b>1,320</b>	<b>3%</b>
<b>Total</b>		<b>14,070</b>	<b>38,810</b>	<b>100%</b>
<b>*3 DUs are permitted in Reserve Areas when a Community Master Plan has been adopted, otherwise only 1 DU/Acre is permitted.</b>				

The land use plan for Santolina seeks to create favorable jobs to households balance (see Table 3). The lower density residential land use acreage is only 48% of the overall acreage. The Village Centers and Urban Center (mixed use with higher density residential and commercial uses) makes up 8% of the land use. The job's sectors land uses make up 22% of the land use. Parks and Open Space comprise 21% of the land use area.

**Table 3: Santolina Land Use Allocation**

Land Use Allocation	% Total
<b>Residential Villages (overall 4-5 DU/Acre average)</b>	<b>48%</b>
<b>Industrial &amp; Energy Park</b>	<b>14%</b>
<b>Urban Center &amp; Village Centers</b>	<b>8%</b>
<b>Town Center</b>	<b>3%</b>
<b>Business Park</b>	<b>5%</b>
<b>Parks &amp; Open Space*</b>	<b>21%</b>
<b>Total</b>	<b>100%</b>
<b>* 11% in escarpment, 10% in parks and trails in Village areas.</b>	

Within the development areas of mixed land use (multi-family residential, commercial, office and public institutions) are also planned (see Table 4)

**Table 4: Mixed Land Use Assumptions**

Mixed Land Use Assumptions				
	Multi-Family	Commercial	Office	Public
<b>Village Centers</b>	<b>30%</b>	<b>60%</b>	<b>10%</b>	<b>0%</b>
<b>Urban Center</b>	<b>30%</b>	<b>32%</b>	<b>10%</b>	<b>28%</b>

Using these methods the breakdown of residential and commercial development in the various land uses at Build-Out and in 2035 was completed. Table 5 shows the breakdown by each plan area. Overall, the phasing plan anticipates that residential development will proceed at a slightly more accelerated rate than the commercial aspects of the project -- 42% of the residential part of the development is projected to be built out by 2035, in comparison 33% of the commercial part will be developed.

**Table 5: Residential and Commercial Development in Land Uses at Build-Out and 2035**

Santolina Area	Build Out Acres	2035 Acres	Build Out Population	2035 Population	Build Out DUs	2035 DUs	Build Out Jobs	2035 Jobs
Amarillo (SF Res)	1,795	752	22,423	1,390	9,115	549	-	-
Azul (SF Res)	692	290	6,809	7,946	2,768	3,227	-	-
Business Park	741	245	-	-	-	-	22,373	7,383
Industrial & Energy Park	2,054	677	-	-	-	-	14,267	4,708
Naranjo (SF Res)	1,587	665	19,532	0	7,940	0	-	-
Open Space	3,134	3,134	-	-	-	-	-	-
Oro (SF Res)	1,080	453	13,284	9,641	5,400	3,849	-	-
Town Center	508	168	-	-	-	-	13,830	4,564
Urban Center	771	203	7,262	2,548	2,952	1,178	19,235	6,347
Verde (SF Res)	1,963	823	22,472	14,576	9,135	5,797	-	-
Village Centers	375	133	3,690	3,304	1,500	1,414	7,596	2,506
<b>Total</b>	<b>14,700</b>	<b>7,543</b>	<b>95,472</b>	<b>39,405</b>	<b>38,810</b>	<b>16,014</b>	<b>77,301</b>	<b>25,508</b>

These figures represent a departure from the MRCOG MTP socio-economic forecast for the Santolina area. Total population and households are lower in the Santolina proposal than the 2035 MTP forecast. The number of single family dwelling units is lower in the Santolina proposal. The number of multi-family dwelling units is higher in the Santolina development because of the mixed-use land uses in the Village Centers and Urban Center. The total number of jobs is higher than the 2035 MTP forecast. Table 6 shows the differences between the Santolina and MTP 2035 forecasts.

The planned land use for Santolina is shown in Figure 4. The extent of the 2035 "phased development" is in show in the yellow hatch pattern. The areas named Amarillo, Azul, Naranjo, Oro and Verde are single family residential. Village Centers and Urban Center are a mix of multi-family residential and commercial uses.

Figure 4: Santolina Land Use

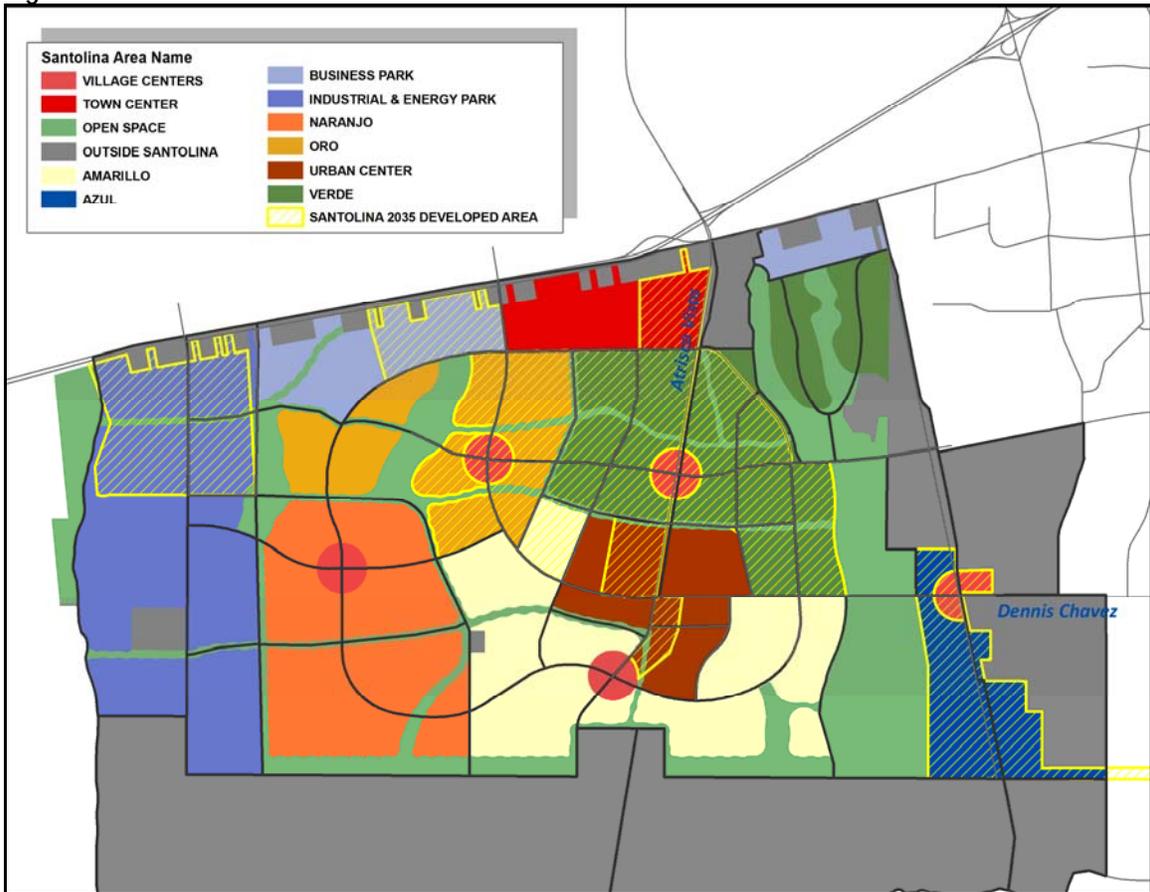


Table 6: Difference Between 2035 MTP and 2035 Santolina Forecasts

	2035 MTP - 2035 Santolina
<b>Population</b>	<b>-12,279</b>
<b>Households</b>	<b>-3,503</b>
<b>SFDU</b>	<b>-6,826</b>
<b>MFDU</b>	<b>2,462</b>
<b>Employment</b>	<b>23,574</b>

### The Circulation Plan

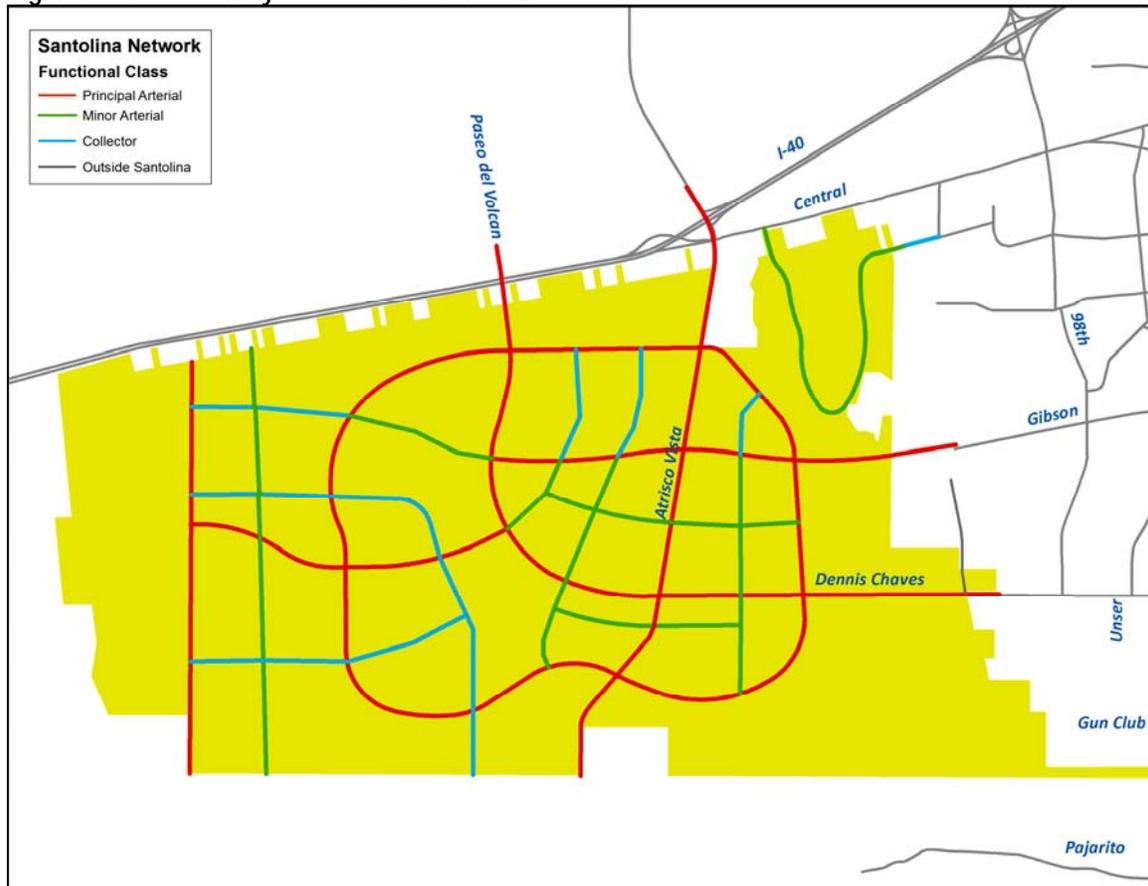
The proposed network consists of several major corridors, designated as principal arterials in the land use planner's terminology. The principle corridors are the connection of Paseo del Volcan Blvd. from the north with Dennis Chaves Blvd. from the east. Two other principal arterials, Atrisco Vista Blvd. and Gibson Blvd. provide access to the development. Freeway interchange connections I-40 at Paseo del Volcan and I-40 at Atrisco Vista Blvd. provide ready access to the interstate freeway system.

The characteristics of the roadways are as follows:

- √ Principal Arterials: 4-6 lanes, 40-45 mph,
- √ Minor Arterials 2-4 lanes, 35 mph
- √ Collectors : 2-4 lanes, 35 mph

The circulation plan proposed for the development is shown in Figure 5.

**Figure 5: Circulation System for Santolina at Build-Out**



### *Model Representation*

Network features appearing in the MRCOG Cube travel model need to be characterized by link “category” codes that reflect a close relationship to roadway functional classes defined for the Albuquerque metropolitan area. The functional class designations (i.e., the “link categories”) are important, as they relate to the capacities associated with these facilities. The MRCOG Cube travel model does not explicitly code “volume delay functions” that are associated with link capacities. The MRCOG Cube model uses Akcelik Volume Delay Function curves. The link capacities that are associated with different facilities are shown in Table 7.

Link speeds and lanes were all coded to reflect elements of the circulation plan as described above. Other link attributes pertinent to the model include:

- √ Link Length (in miles): as measured via the GIS
- √ Mode Specification: All coded “abe”, per MRCOG practice

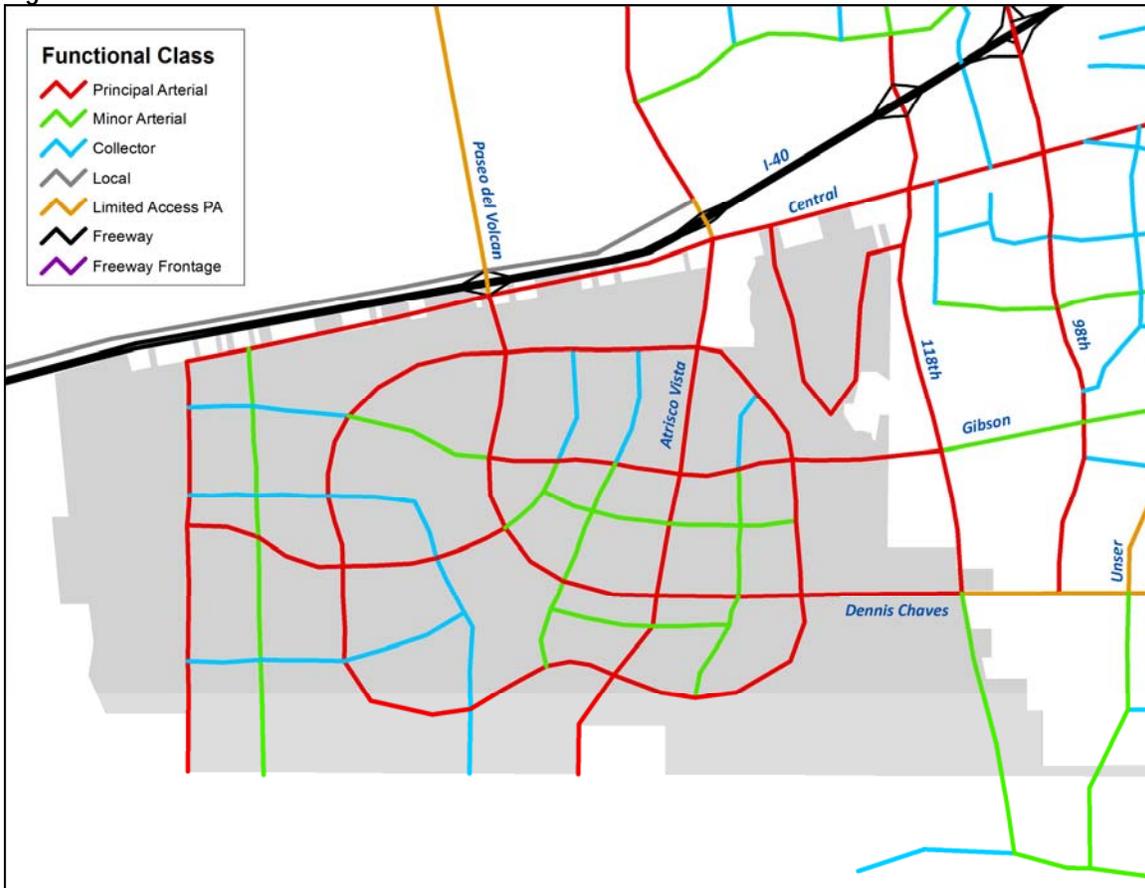
- √ Category: Link VDF Category
- √ Area Type: All coded to district "7"

Table 7: Link Capacities

Functional Class	Link Category	Lane Capacity
Principal Arterial	2	800
Minor Arterial	3	900
Collector	4	950

The Build Out scenario Cube network appears in Figure 7.

Figure 7: Build-Out Cube Network for Santolina - Functional Class



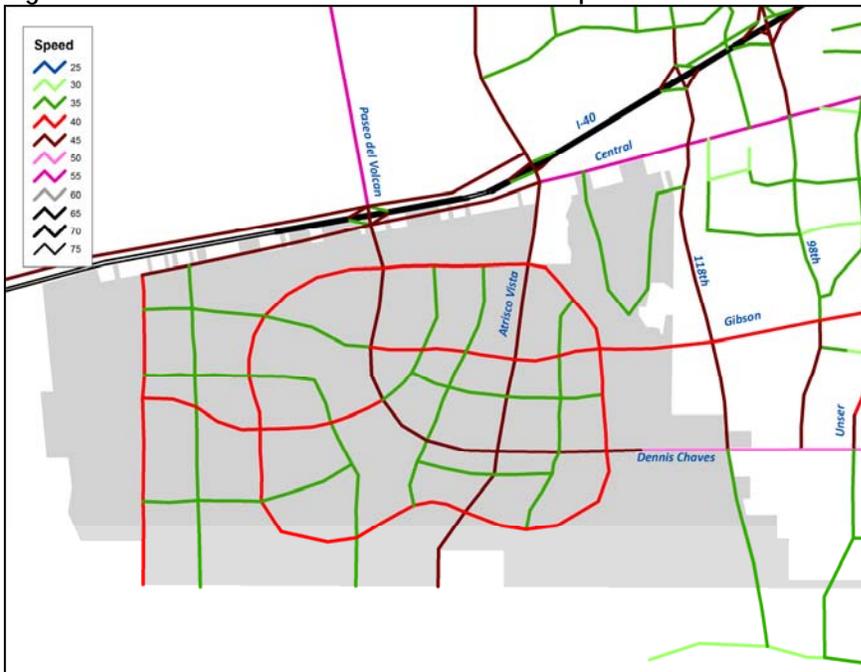
**Category/Functional Class:** For the Build Out scenario, the streets entering the development (Paseo del Volcan, Atrisco Vista, Gibson and Dennis Chavez) are designated as Principal Arterials. Other Principal Arterials include the loop circulation road and Shelly Road. Minor Arterials and Collectors were defined on the boundaries of the plan areas.

Figure 8: Build-Out Cube Network for Santolina - Lanes



**Capacity:** For the build-out scenario, Principal Arterials were coded with 2 or 3 lanes in each direction, depending on where capacity was needed. The other portions of the circulation system (Minor Arterials and Collectors) in the network were all coded with 2 lanes in each direction.

Figure 9: Build-Out Cube Network for Santolina - Speed



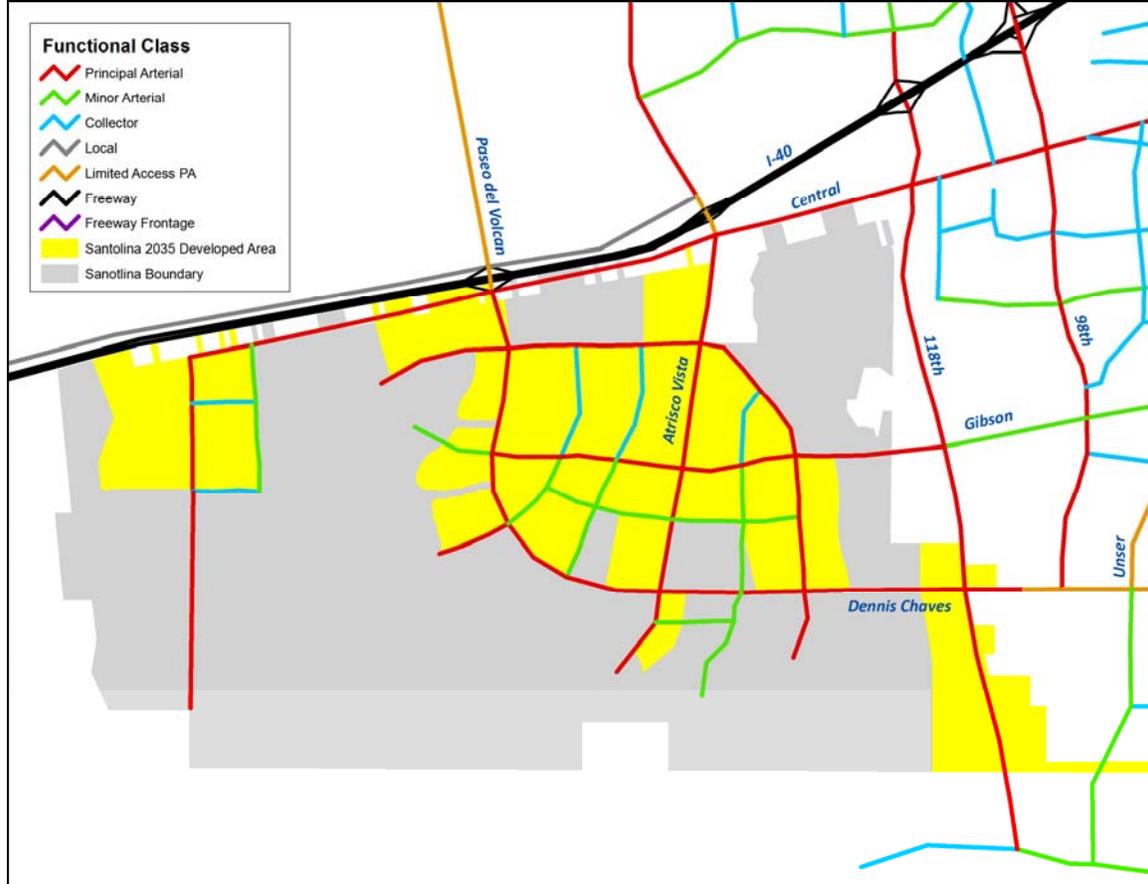
**Posted Speeds:** For the Build-Out scenario, Principal Arterials were coded with speeds of 40 & 45 mph. Minor Arterials and Collectors were coded with speeds of 35 mph.

### 2035 Phased Development Network

For 2035, a “phased” subset of the full build-out network was assumed, as shown in Figure 10. The network envisioned in this scenario consists of roadways that fall into the area envisioned to be developed by the year 2035, along with several others somewhat outside of the developed area but are needed to provide continuity and connections with the region.

The “phased” development plan for 2035 leaves the network assumptions outside Santolina untouched.

Figure 10: 2035 Network for Santolina - Functional Class



**Category/Functional Class:** The functional class declarations for individual roadways in this scenario are the same as for Build-Out.

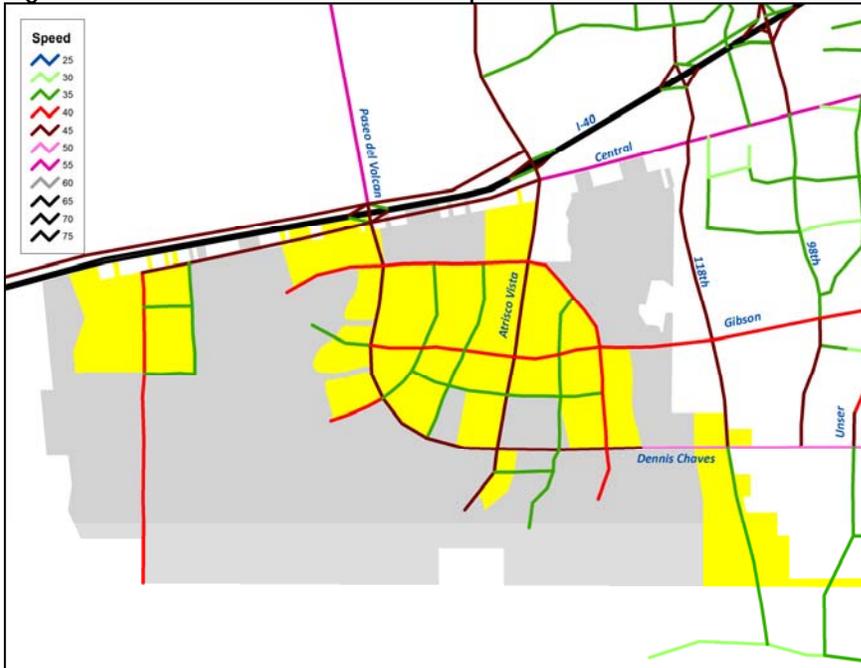
For the 2035 “phased” development, the road network is pared back to serve the developed areas.

Figure 11: 2035 Network for Santolina - Lanes



**Capacity:** Lane configurations for the 2035 scenario differ than those in the “Build-Out” scenario. On the principal arterials entering the development (Paseo del Volcan, Atrisco Vista, Gibson and Dennis Chavez) the capacity remains at 3 lanes. In the interior of the development, the capacity on these principal arterials and the northeast portion of the loop principal arterial is reduced to 2 lanes. Capacity on the minor arterials and collectors is reduced to 1 lane.

Figure 12: 2035 Network for Santolina - Speed

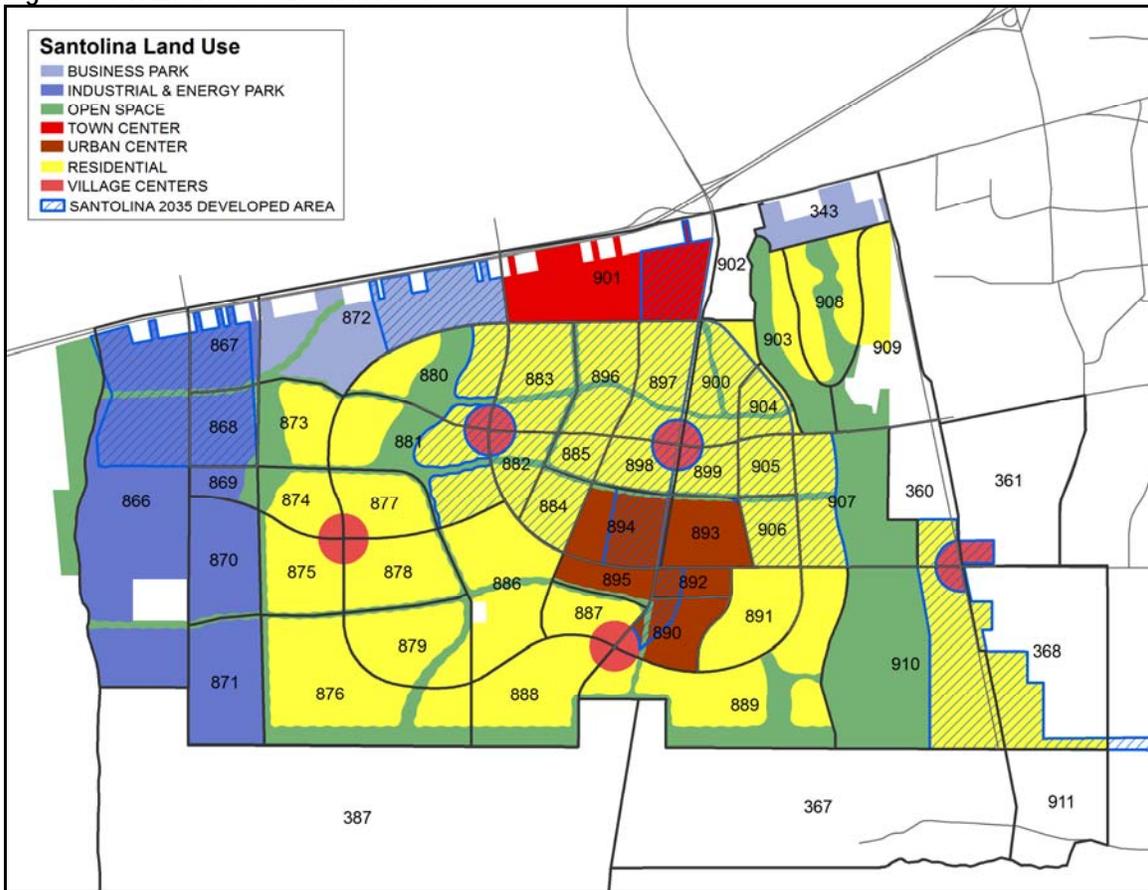


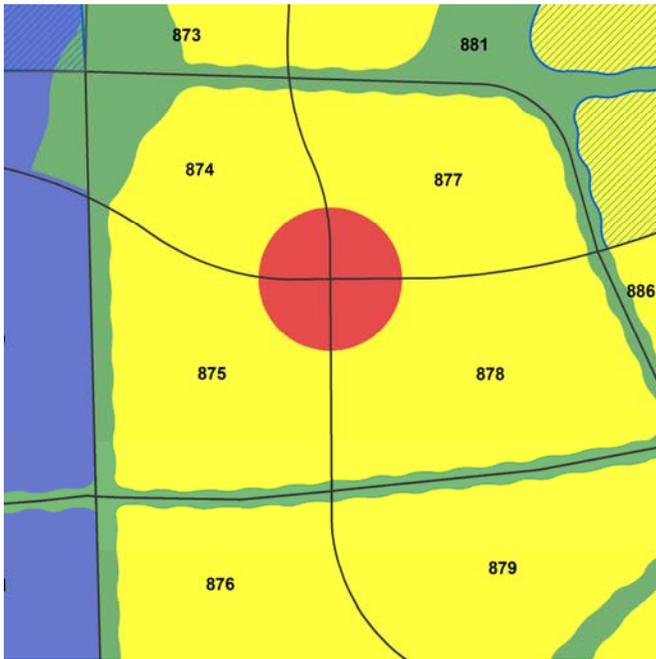
**Posted Speeds:** The posted-speeds for the 2035 scenario are the same as in the “Build-Out” scenario.

## Traffic Analysis Zones

A traffic analysis zone (TAZ) system has to be formulated for the Cube model. Inasmuch as we are providing considerable network detail in the project area, it is common practice to provide a zone system that matches the network in scale and resolution. This is to say, it is common that network streets themselves form the boundaries of TAZs. The MRCOG Cube TAZs in Santolina were therefore deleted from the regional TAZ system, and were replaced by a much more detailed system consisting of 52 TAZs. In addition, TAZs were also designed to isolate the different land uses. Since TAZ boundaries are formed by roadways in the proposed network, the Village Centers are typically "quartered" into four adjacent TAZs formed by the arterials that bisect them. The resulting TAZ system for Santolina is illustrated in Figure 13.

Figure 13: TAZs in the Santolina Area





**Figure 15: TAZ Detail in Vicinity of Village Center**

Here is a detail of the TAZ system, showing how TAZs were “quartered” in the vicinity of village centers, bisected by streets crossing the center.

### Summarizing Land Use for TAZs

Once the TAZ system was designed, development proposed for the various land uses in Santolina was then summarized for them. This involves a basic GIS operation calling for an intersection between the two spatial data layers – one for the development plan itself and the one for TAZs. Densities associated with the different developments were then migrated to TAZs, and the quantity of development in each one could then be computed for each type of development.

**Build-Out Scenario:** For the Build-Out scenario, the projected levels of development in the various land uses need to be expressed in terms of densities, so that they can be assigned to the TAZs in which they reside. Consensus Planning provided the population, dwelling units and jobs for each plan area (Table 5).

A number of the different developments in the project area are, in fact, mixed use. So, in addition to densities, we also have to establish the proportion of land area that will be dedicated to the various different kinds of dedicated land uses (Table 4).

This information was used to populate the TAZs with the development proposals targeted for them – the result being, that we now have estimates of housing and commercial development for each type of development in each TAZ.

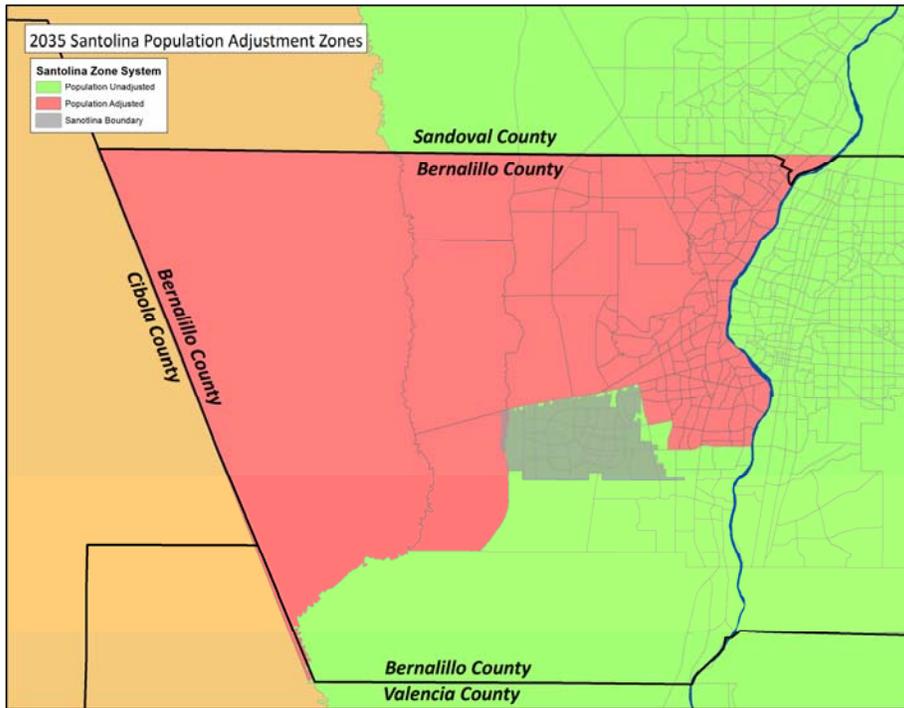
**2035 Scenario:** The targeted levels of development indicated above for the year 2035 suggest that a number of the individual land use developments in Santolina will only be partially built out. 42% of the residential development is projected to be built out by 2035. 33% of the commercial part will be developed by 2035. These were estimated, and then the same net density levels were assumed for the phased 2035 scenario as explained above for build-out (Table 5).

### Matching 2035 MTP Control Totals

The Santolina development proposal replaces the land use assumptions of the 2035 MRCOG MTP. As a result, the totals of the socio-economic data do not match the original 2035 MTP totals (see Table 6). In order to maintain control totals of the 2035 MTP dataset, values in TAZs outside Santolina had to be

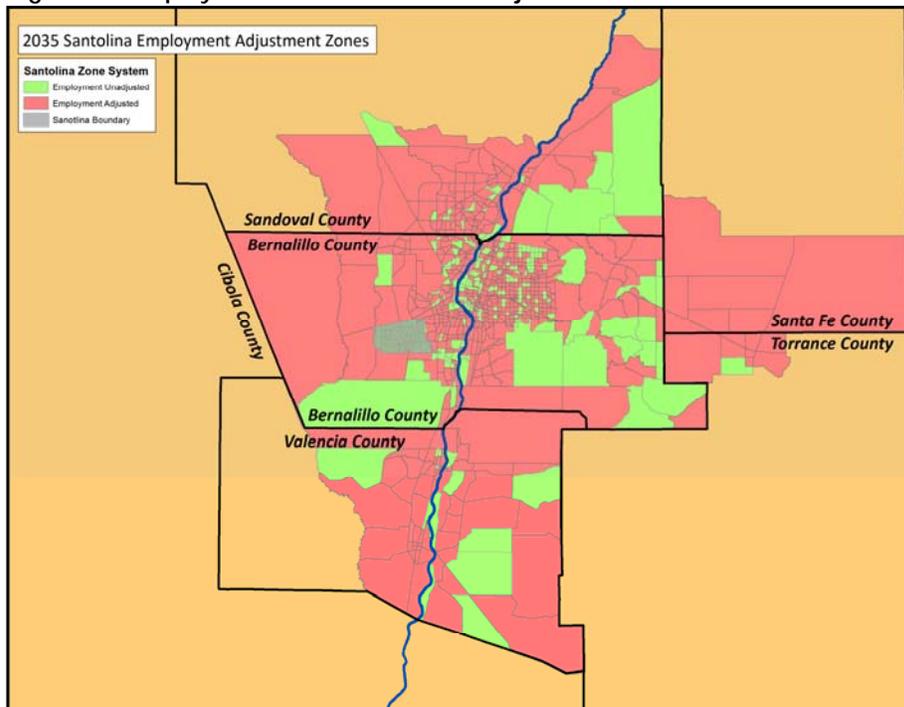
adjusted. After meeting with MRCOG and Bernalillo County staff the best approach to make the adjustments was agreed upon.

Figure 16: Population Related Variables Adjustment Zones



For the population related variables (population, households, single family dwelling units and multi-family dwelling units, elementary/middle school enrolment, high school enrolment), values in zones in Bernalillo County north of Dennis Chavez and west of the Rio Grande were adjusted. Figure 16 shows the zones which were adjusted in red.

Figure 17: Employment Related Variables Adjustment Zones



For the employment related variables (basic, service, retail employment) values in zones that show employment growth between the 2008 and 2035 MTP forecasts were adjusted. Figure 17 shows these zones in red.

## Socio-Economic Attributes

The MRCOG model is not actually driven by the estimates of land use (dwelling units and commercial development square footage). Instead, inputs to the MRCOG Cube travel model require estimates of a variety of socio-economic variables. These are all summarized briefly in the list below.

This means that the estimates of these socio-economic variables have to be derived from the descriptions of land use for the two Santolina scenarios. We therefore refer to these as “derived” variables.

This section describes the methodology that was used for each item.

<i>Area</i> <i>X Coordinate</i> <i>Y Coordinate</i>	√	Area is expressed in acres. The coordinates of the TAZ centroid is expressed in feet, State Plane Coordinates, Central New Mexico Zone, NAD 83. These three attributes can be easily generated for TAZs using GIS
<i>Population</i>	√	Resident population
<i>Dormitory Population</i>	√	Group quarters population residing in dormitory and military housing barracks
<i>Households</i>	√	Resident households
<i>SF Dwelling Units</i> <i>MF Dwelling Units</i>	√	The project development plan has “village” areas of areas comprised of single family dwelling units. The plan also has areas – Village Centers and the Urban Center defined as “mixed” land use with multi-family dwelling uses and commercial land uses.
<i>“Basic” Employment</i> <i>“Retail” Employment</i> <i>“Service” Employment</i>	√	MRCOG assigns employment to these three categories based on NAICS code. The development plan has areas of various types of employment. These were assigned to the MRCOG employment types as detailed below .
<i>Income Group</i>	√	TAZs are classified according to income five quintiles, ranging from low income (=1) to high income (=5). Note that it is the TAZ itself that is so classified. Since these are quintiles, the same number of TAZs (20%) are classified in each stratum.
<i>Elementary-Middle School Campus Enrollments</i> <i>High School</i>	√	Reflects the total number of students enrolled at campuses residing in each TAZ. Each TAZ with a school site (next set of fields) will have an enrollment associated with it here.

*Campus  
Enrollments  
UNM Campus  
Enrollments  
CNM Campus  
Enrollments*

<p><i>Elementary School Sites Elementary School Districts Middle School Sites Middle School Districts High School Sites High School Districts</i></p>	<p>√ TAZs that contain a school site are coded with the identifier of the school in question. Every TAZ belongs to a school district. Districts are identified by the identifier for the school to which it belongs. These data fields mean that hypothetical school district boundaries have to be established for each school.</p>
<p><i>UNM Campus Site</i></p>	<p>√ Boolean binary (=0/1) value indicating the presence of a UNM campus in the TAZ</p>
<p><i>CNM Campus Site</i></p>	<p>√ Boolean binary (=0/1) value indicating the presence of a CNM campus in the TAZ</p>
<p><i>Parking Cost</i></p>	<p>√ Costs of parking in the TAZ, typically \$0 except for downtown and several other zones in region. No parking costs were assigned to Santolina zones.</p>
<p><i>Riverside Flag</i></p>	<p>√ Boolean binary (=0/1) value indicating whether the TAZ is located east of the Rio Grande. In the south valley, the boundary between “eastern” and “western” TAZ shifts to I-25.</p>
<p><i>District</i></p>	<p>√ MRCOG district number to which the TAZ belongs. Most Santolina TAZs reside in district 12. District 5 applies to TAZs west of I-25</p>

*Demographics:* Data for Bernalillo County from the US Census was used to convert dwelling units planned for the development into estimates of demographics. Average household sizes reported by the census for dwelling units were used. So, households were computed from the dwelling unit counts for Santolina using an assumed vacancy rate of 5%. Population was then computed from households based on average household sizes for Bernalillo County.

**Employment:** The MRCOG model requires projections of three types of employment: (1) “basic” employment, (2) “retail” employment, and (3) “service” employment. Overall, employment associated with the individual developments proposed in Santolina was estimated based on floor space. MRCOG does not track floor-space statistics for the region, and so we relied on various sources including American Planning Association Planning Advisory Studies and Model Zoning Codes. Total employment, then, can be computed from floor space using these indices.

Data were split into the MRCOG model types of employment according to the following assumptions. For the Industrial and Energy Park area all jobs were assigned to the “basic” type. For the Business Park area the jobs were split equally between the “basic” and “service” types. For the Town Center & Village Centers jobs were split 80% to the “retail” type and 20% to the “service” type. For the Urban Center jobs were split 70% to the “retail” type and 30% to the “service” type.

So, in summary:

1. Overall employment estimates of jobs were generated for Santolina developments by first estimating gross acreage by floor area ratios and then on assumptions about average square foot per employee.
2. Those jobs estimates were broken down by to the MRCOG model job types by area type assumptions.

**Household Income Groups:** As indicated earlier in the table above, each residential zone must be assigned to an income class. These are defined to be strict quintiles, ranging from low income households (=1) to high income households (=5). By definition in the MRCOG model, all residents in a single individual TAZ belong to the same class. We do not know what price classes housing in individual subdivisions in Santolina will be marketed for – none of that is determined yet. More importantly, we can not predict what income classes individual subdivisions in Santolina will be occupied by 25 years from now, or beyond. Therefore, we merely randomly assigned income classes to residential TAZs in Santolina:

- √ TAZs that were predominantly “multi-family” were assigned income classes 2 and 3 ranging from the “low-medium” income class to the “medium” income class.
- √ TAZs that were predominantly “single family” were assigned income classes, 3 and 4 ranging from the “medium” income class to the “medium-high” income class.

Note that the “low” income class (=1) was used in two of the zones that were partially in Santolina and are currently assigned the “low” income class in the 2035 MTP dataset.

The overlapping income categories (2 and 3 for multi-family and 3 and 4, and 5 for single-family) means that the strict definition of “quintiles” is violated a little bit (that is, the zone count in each category is not strictly 20%). This, in fact, is not particularly important, as these classifications are only used in the MRCOG model to select appropriate trip generation rates to apply to housing in these zones.

**School Enrollments and Districts:** The MRCOG EMME/2 model also requires school sites, school districts, and enrollments associated with those districts, to be estimated. Enrollments were estimated based on resident households in Santolina. TAZs, using the prevailing average rates gleaned from the basic 2035 MRCOG database for the region. The per capita rates from Table 12 were used. From these rates, the number of students of each type, by place of residence, was estimated.

Table 8: Student Rates per Household

	Number of Schools	Total Students	Per HH	Per School
<b>Elementary</b>	<b>158</b>	<b>97,123</b>	<b>0.1586</b>	<b>615</b>
<b>Middle</b>	<b>58</b>	<b>44,487</b>	<b>0.0726</b>	<b>767</b>
<b>High</b>	<b>33</b>	<b>54,747</b>	<b>0.0894</b>	<b>1,659</b>

Note: Based on 612,399 households in the region, 2035

The Santolina forecasts showed the following numbers of schools by type needed (Table 9).

Table 9: Schools Needed in Santolina

	Santolina HHs	Elementary	Middle	High
<b>2035</b>	<b>15213</b>	<b>4</b>	<b>1</b>	<b>1</b>
<b>Build Out</b>	<b>36868</b>	<b>10</b>	<b>3</b>	<b>2</b>

The next step was to define the school districts associated with each school site. For this, we selected zones that would be school sites. Then zones that would comprise the school's district were selected. As school districts were designed, an attempt was made to maintain the prevailing average enrollments for each school reported in Table 15. Once school districts were defined, then resident students that were members of each district were assigned as campus enrollments to the school site itself.

*UNM and CNM Campus Sites and Enrollment:* No UNM or CNM campus sites are currently planned for Santolina, and therefore no enrollments were estimated.

### Santolina Socio-Economic Summary

When all of these factors are taken into consideration, Table 10 summarizes total socio-economics for the Santolina Development.

Table 10: Socio-Economic Summary

Attribute	2035	Build Out
<b>Residential</b>		
<b>Population</b>	<b>37435</b>	<b>90698</b>
<b>Households</b>	<b>15213</b>	<b>36868</b>
<b>SF Dwelling Units</b>	<b>13422</b>	<b>34358</b>
<b>MF Dwelling Units</b>	<b>2592</b>	<b>4452</b>
<b>Commercial</b>		
<b>Basic Employment</b>	<b>8409</b>	<b>25453</b>
<b>Retail Employment</b>	<b>10685</b>	<b>30608</b>
<b>Service Employment</b>	<b>6413</b>	<b>21246</b>
<b>Total Employment</b>	<b>25507</b>	<b>77301</b>
<b>Enrollments</b>		
<b>Elementary/Mid School</b>	<b>3517</b>	<b>8525</b>
<b>High School</b>	<b>1360</b>	<b>2678</b>

Detailed socio-economics on a TAZ by TAZ basis for both the phased 2035 and build-out scenarios is available in GIS on request.

# **Technical Appendix T-2 – Analysis of Travel Demand Forecasts**

## Level A Transportation Analysis Santolina

### Analysis of Travel Demand Forecasts (Revision 1/17/2013)

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Planning Technologies, LLC

#### INTRODUCTION

This appendix describes the travel demand forecasting results obtained from the Mid-Region Council of Governments (MRCOG) regional travel demand model on behalf of the Level A Transportation Analysis for Santolina Master Plan.

The regional travel demand model maintained by the MRCOG is the primary tool that will be used to estimate traffic loads, capacity needs, and network impacts associated with the proposed development. The modeling procedures and databases are described in Appendix X.

This appendix contains detailed analysis of the model runs conducted to provide data for assessment of the transportation impacts of the Santolina Master Plan.

#### MODELLING SCENARIOS

The analysis is predicated on several scenarios:

- √ **A “2035 MRCOG MTP Scenario”:** a “No-Build Scenario” depicts anticipated conditions on regional highways that will arise over the next 25 years, forthcoming from general growth in the region and unrelated to any specific development at Santolina. This is the MRCOG 2035 Adopted Metropolitan Transportation Plan (MTP).
- √ **A “2035 Phased Development Scenario”:** a “2035 Phased Development Scenario” depicts capacity requirements and impacts on the highway system related specifically to the development proposal at Santolina by the year 2035.
- √ **A “Build-Out Scenario”:** a “Build-Out Scenario” depicts the capacity requirements for the circulation system at Santolina as it will ultimately be built. This scenario is run against a backdrop of “2035” projections for the rest of the region (as they relate to both land use and network capacity) since there is no comparable MRCOG “build-out” scenario that applies to the distant future. The objective of the “build-out” scenario is to assure that the right-of-way provisions on-site are sufficient to support the ultimate development in the very long term. Inasmuch as it may be 50-80 years before this ultimate build-out scenario is achieved, it is inappropriate to look at off-site impacts related to this scenario – there is no related long range plan for the region that reaches this far into the distant future.

For regional assumptions off-property, the official MRCOG assumptions for the adopted Metropolitan Transportation Plan (MTP) have been used. All development proposals on the Santolina property itself are considered to be

replacements to *development* in the region. For the 2035 “Phased” scenario, the 2035 MTP socio-economic controls will be maintained.

So, there are two “build” scenarios of interest – (1) one depicting both on-site and off-site impacts for the year 2035, and (2) another depicting on-site capacity needs at Build-Out. The other scenario is a “baseline” to provide a basis for comparison.

**CAPACITY AND LEVEL OF SERVICE DEFINITIONS**

Link capacities (Table 1) coded in the MRCOG model were used as the basis for much of this analysis. These capacities vary by functional class, or “category”, as shown here. MRCOG considers these capacities to be capacities at “Level of Service E”.

Table 1 : Capacity		
Functional Class	Category	Lane Capacity
Principal Arterial	2	1000
Minor Arterial	3	900
Collector	4	950
Local	5	850
Frontage Roads	6	1300
Freeway	7	1900
Off-Ramps	8	750
On-Ramps	9	800
Limited Access	10	1100

Therefore, MRCOG considers the following volume-to-capacity ratios (V/C) to define levels of service, in Table 2:

Table 2: Level of Service	
Level of Service	Volume-to-Capacity Ratio (V/C)
Acceptable	<= 0.89
Approaching Capacity	<= 0.99
Over Capacity	<=1.09
Severely Congested	>= 1.1

### 2035 MTP Base Model Discussion

The MRCOG 2035 network has *no improvements* in term of additional lanes over the 2008 network. There are also *no speed limit changes* between the 2008 and 2035 networks. There are additional road segments added to the network between 2008 and 2035. New freeway interchanges will be added at 118<sup>th</sup> St. and Paseo del Volcan. A new freeway overpass will be added at 106<sup>th</sup> St. 118<sup>th</sup> St. between I-40 and Pajarito Rd. will be completed. Gibson Blvd. will be connected to 118<sup>th</sup> St. The segment of Unser Blvd. between Dennis Chaves and Gun Club will be completed. Note: the freeway “frontage” roads are two way streets on both the north and south sides of I-40, not traditional one way freeway frontage.

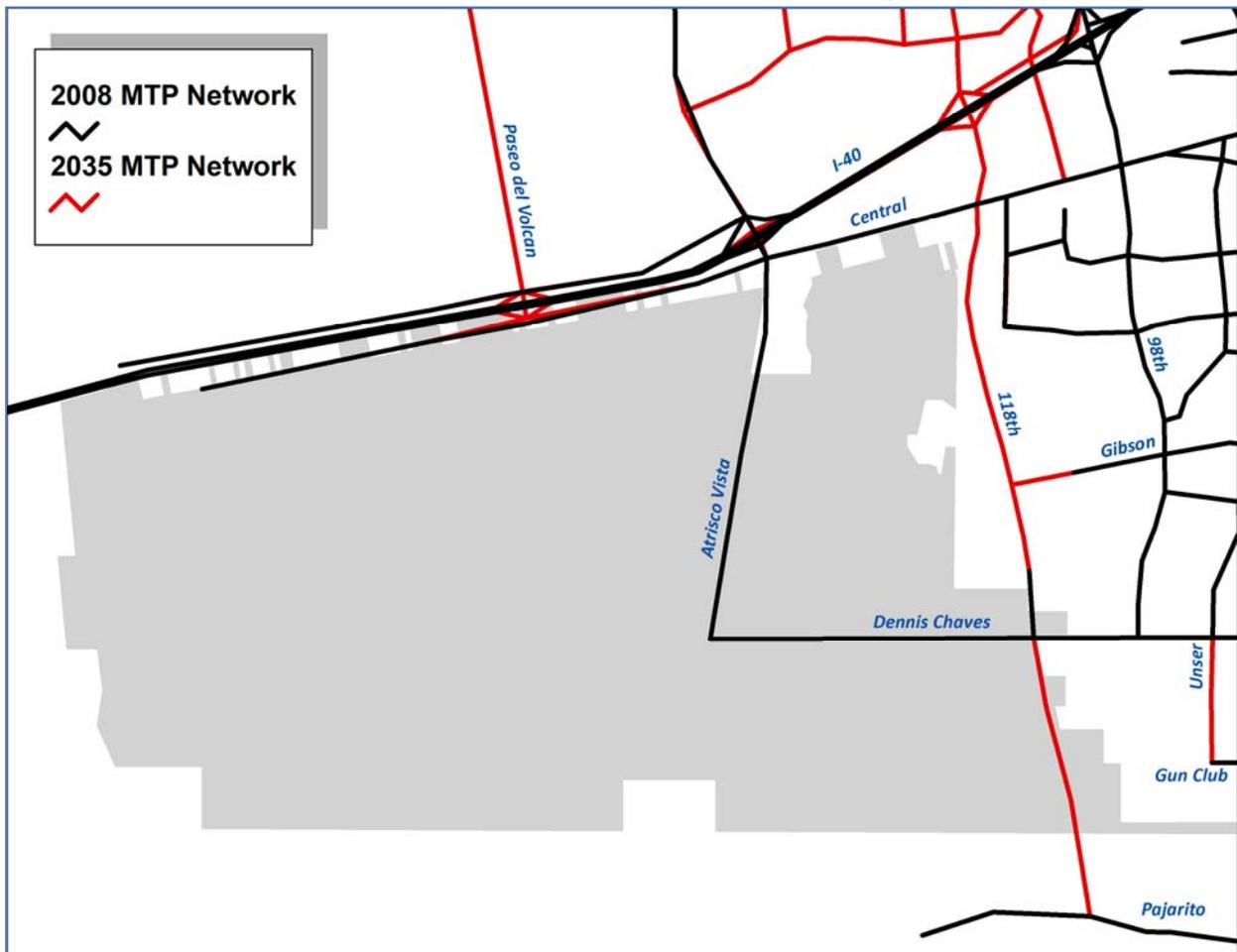


Figure 1 – 2008 & 2035 MTP Networks in Santolina Area

While there is significant growth in population and employment between the 2008 and 2035 MTP forecast, there is no commensurate growth in roadway capacity. The 2035 MTP network number of lanes is shown in Figure 2.

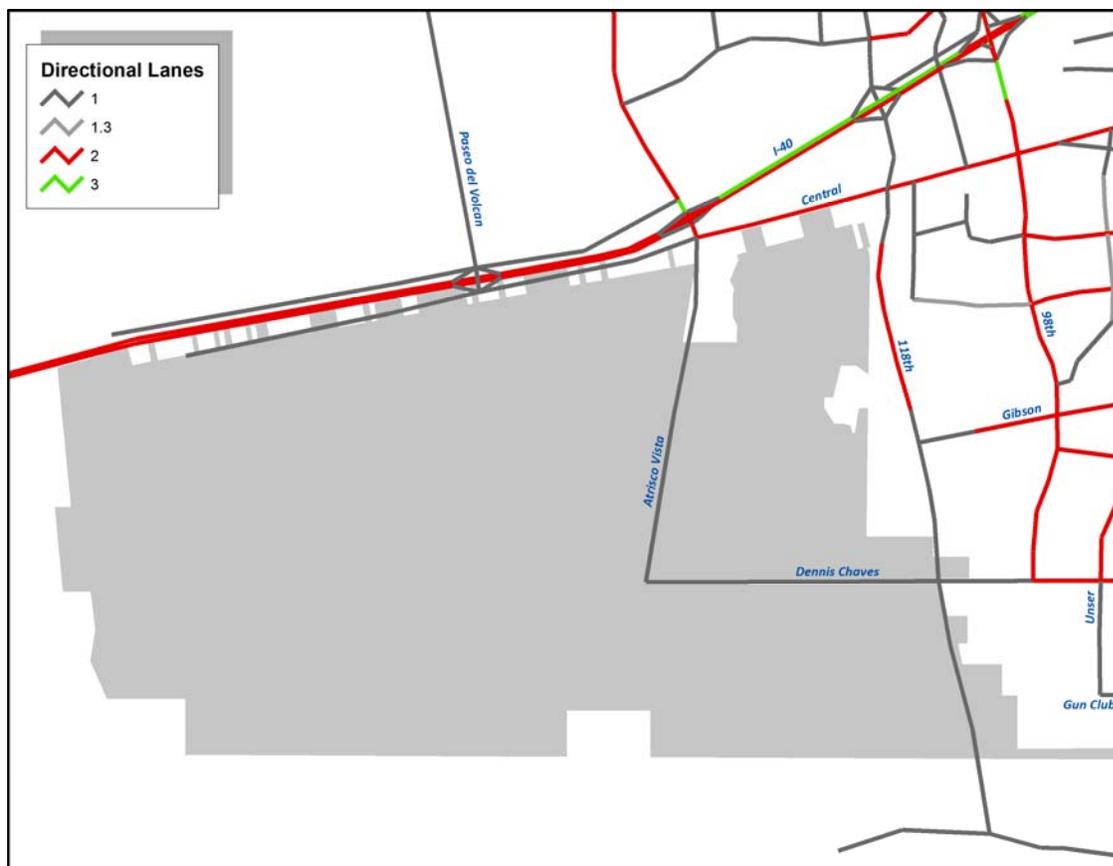


Figure 2: 2035 MTP Number of Lanes

Figures 3 and 4 show the growth in population and employment between the 2008 and 2035 MTP socio-economic data forecasts. There is fifteen fold growth in population in the six zones in that fall in the Santolina area between 2008 and 2035. Employment only grows by two fold by 2035. The large imbalance between jobs and population in the area means that the vast majority of work trips must be satisfied with at trip ends outside the area.

The 2035 network in the Santolina area has severe capacity deficiencies because of the 2035 socio-economic forecasts and the lack of roadway capacity in the area. The volume to capacity ratios for the 2035 MTP in both the AM and PM (Figures 5 & 6) show widespread system failure in the Santolina area.

In the peak flow direction (east and north) AM peak, all of the roads within the Santolina area and in the immediate vicinity of the area are severely congested. In the PM the road in the area and the immediate vicinity are over capacity or severely congested in *both* directions.

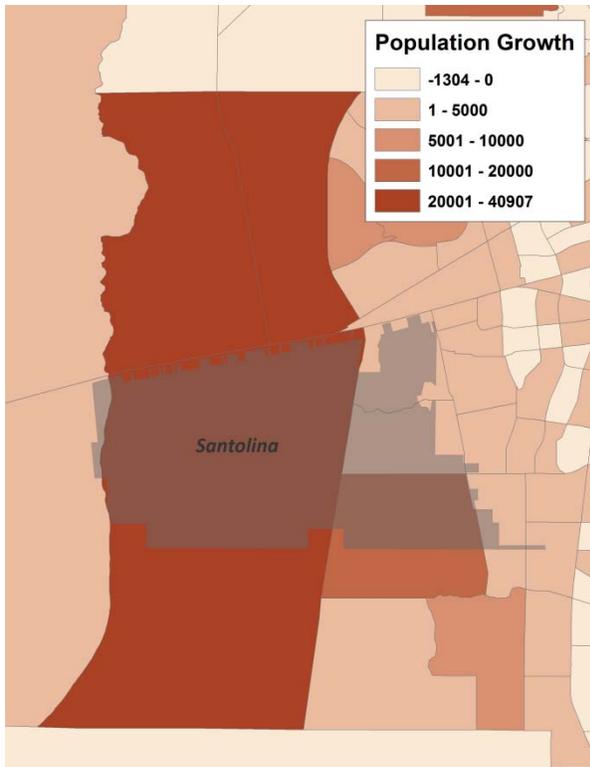


Figure 3: Population Growth 2008-2035 MTP

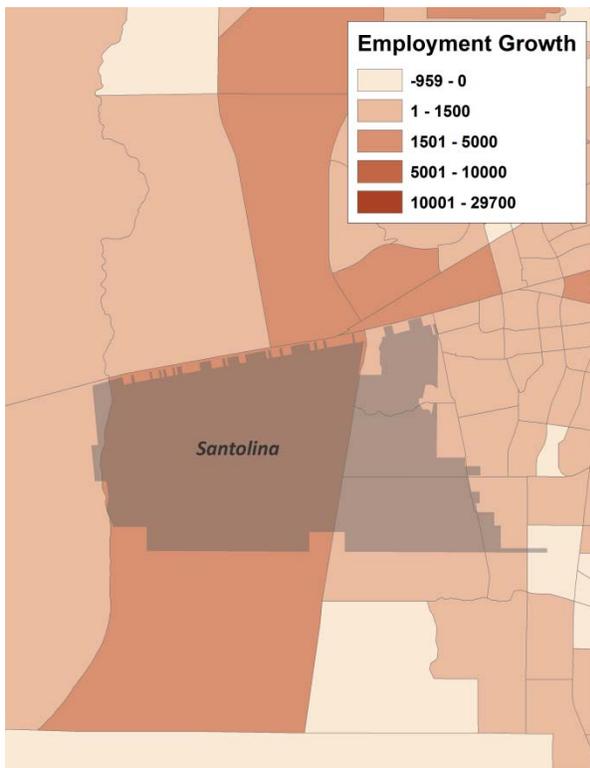


Figure 4: Employment Growth 2008-2035 MTP

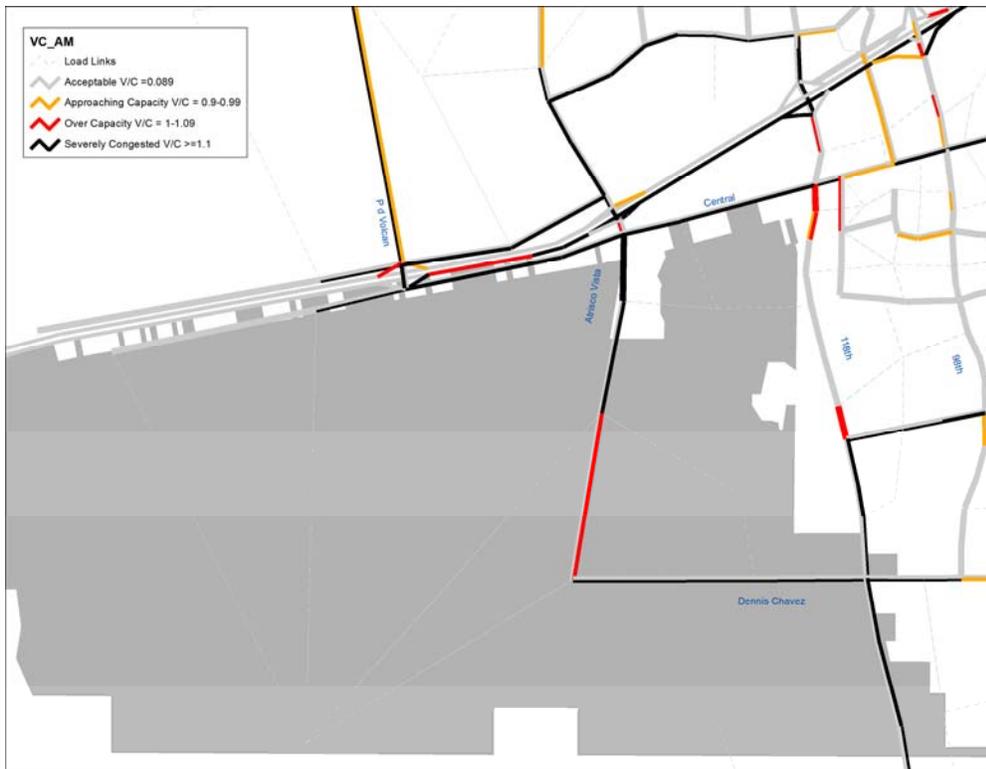


Figure 5 – 2035 MTP AM V/C Ratios



Figure 6 – 2035 MTP PM V/C Ratios

### 2035 Phased Development Scenario

The following section will discuss the transportation analysis performed for the level of development anticipated to occur in Santolina by 2035. The "Travel Demand Modeling Procedures and Databases" appendix documents socio-economic databases for all three of these scenarios. There are two significant differences between the MRCOG 2035 MTP adopted socio-economic data set and the socio-economic data set that results from the proposed Santolina development. First, population in the proposed development is 16% lower in the Santolina development. Second, the development proposal has over five times the employment of the 2035 MTP. The jobs to households balance for the three data sets are shown in Table 3.

Table 3: Jobs to Households	
	Job/HH
<b>2035 MTP</b>	<b>0.15</b>
<b>2035 Santolina</b>	<b>1.59</b>
<b>Santolina Build Out</b>	<b>1.99</b>

In the Santolina data sets the jobs-to-households ratios are much higher. The result of this is twofold. First, the development will be an *importer* of work trips regionally. Second, much of the job demand of the development population will be met *within* the development.

The road network to be built by 2035 to support the development is shown in Figures 7, 8, 9 and 10.

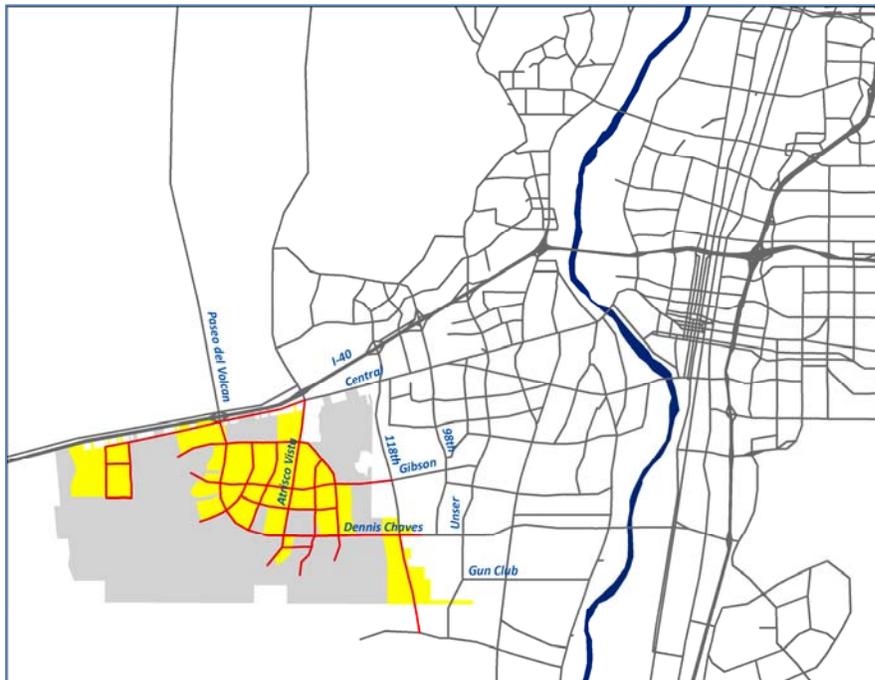


Figure 7- 2035 Santolina Network Regional Context

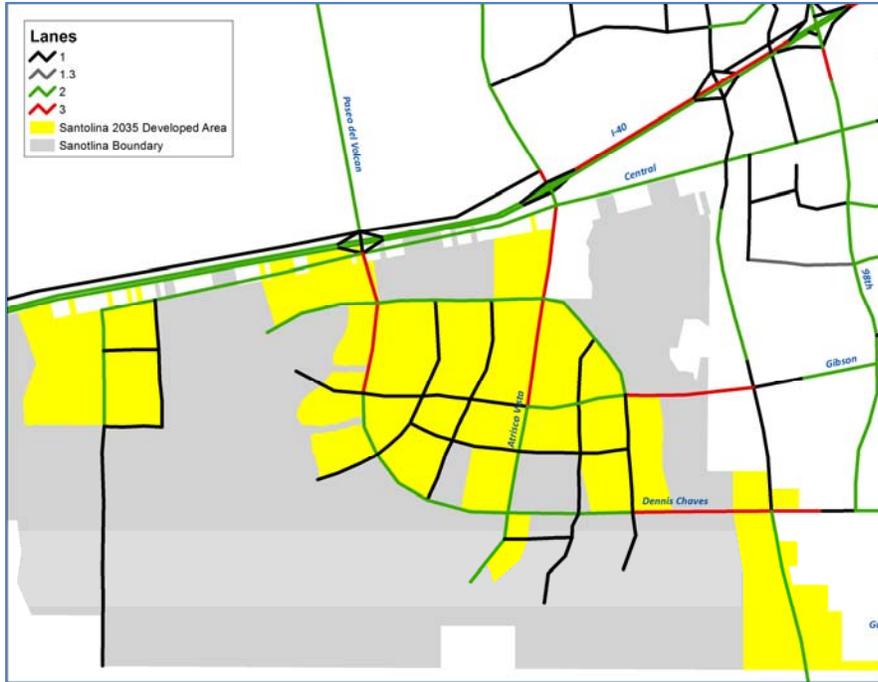


Figure 8- 2035 Santolina Network Directional Lanes

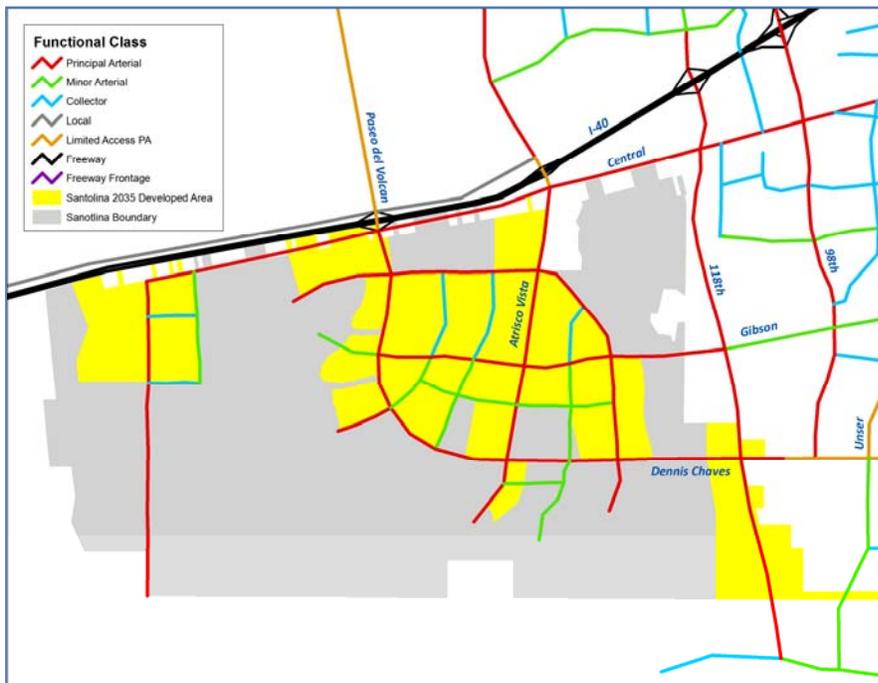


Figure 9- 2035 Santolina Network Functional Class

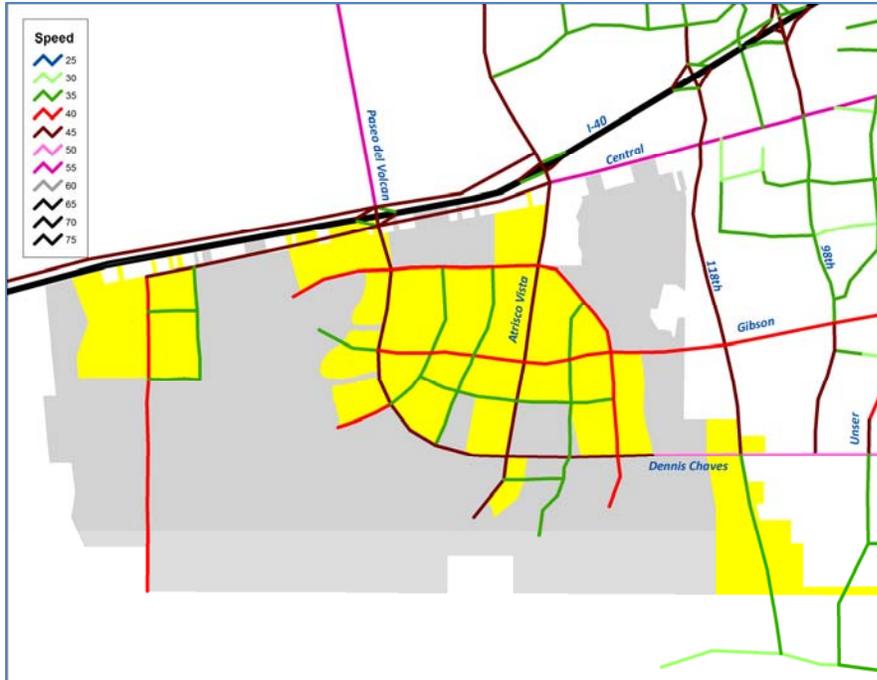


Figure 10- 2035 Santolina Network Speeds

The extent of the 2035 Santolina development is shown in yellow in these figures. The network density in the development is similar to the regional network density (Figure 7). For the roads found in the existing in the 2035 MTP network (Dennis Chavez from 118<sup>th</sup> St. to Atrisco Vista, Atrisco Vista from Dennis Chavez to Central Ave. and the I-40 south frontage road from Shelly Rd. to Central Ave.), the proposed Santolina network represents a significant increase in roadway capacity. The network also improves overall connectivity by adding the connection of Paseo del Volcan to Dennis Chavez Blvd. and the connection of Gibson Blvd. between Paseo del Volcan and 118<sup>th</sup> St.

The volume-to-capacity ratios (V/C) for the AM and PM peak hours in the 2035 Phased Development scenario are shown in Figures 11 and 12. In the both the AM and PM peak hours there is only one link (on the I-40 south frontage road, just west of Paseo del Volcan) internal to the Santolina development that is over capacity. There are no severely congested roads within the development. The capacities proposed for all other roads internal to Santolina (Figure 8) are sufficient given the projected level of development in 2035.

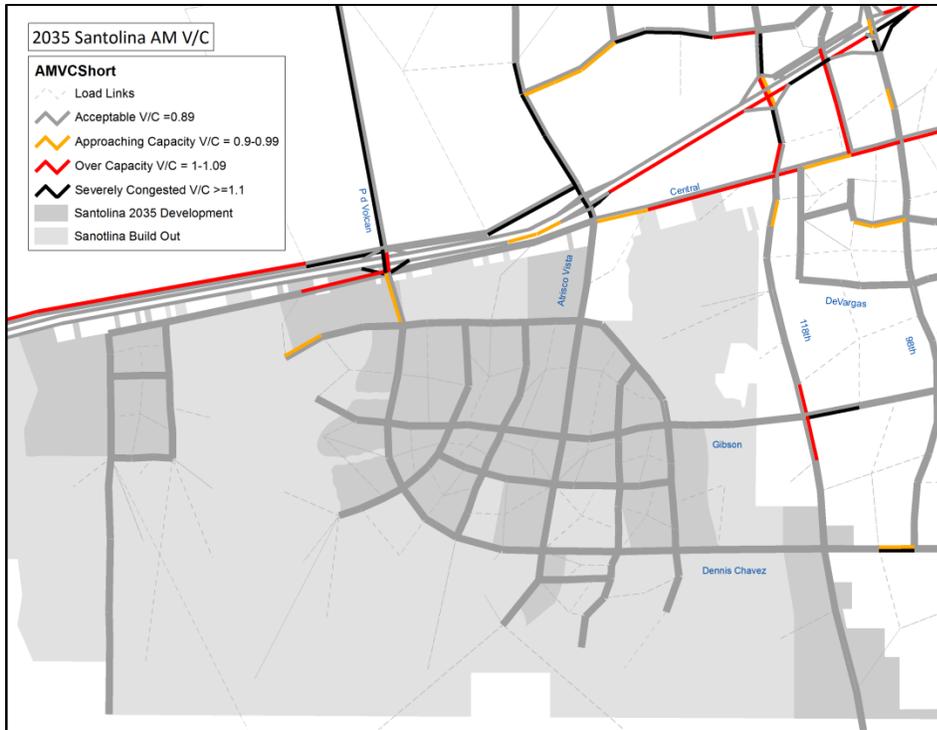


Figure 11 – 2035 Phased Development AM V/C

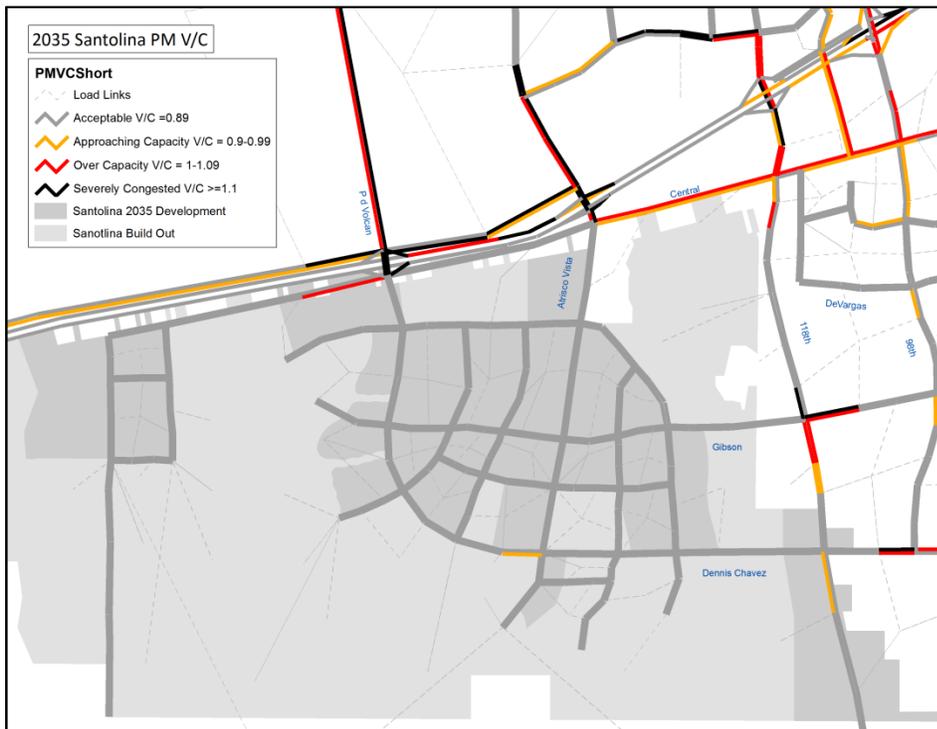


Figure 12 – 2035 Phased Development PM V/C

### *Off-site Roadway Effects*

The preceding analysis shows that the network internal to Santolina is sufficient for the projected level of development in 2035. The size and nature of the proposed development will also have impacts on the transportation system, both in the immediate area and regionally.

In addition to the differences between the input socio-economic data sets, differences in the network (increased capacity to the roadway system and the increased connectivity of the network) also impact the roadways outside the development.

One way to examine the positive effects of the development is to look at the differences between AM and PM peak hour traffic in the two scenarios (2035 Base MTP vs. 2035 Santolina Phased Development). This was done by looking at the difference in Vehicles Per Hour Per Lane (VPHPL) on a link by link basis in the two scenarios. All of the roads in the immediate vicinity of the development are Principal Arterials with a capacity of 1000 vehicles per hour per lane (see Table 1). So, if the difference in VPHPL is +/- 1000 vehicles this represents +/- one lane.

The differences in VPHPL for the two scenarios for the AM and PM peak hour are shown in Figures 12 and 13.

Figure 12 shows several significant things about how the Santolina development positively impact travel in the region. First, on Atrisco Vista Blvd. south of Central Ave. and on Dennis Chavez west of 118<sup>th</sup> St. outbound from the development, the differences between the Santolina 2035 Phased development and the 2035 MTP are -1071 (Atrisco Vista) and -1385 (Dennis Chavez). This means that with the Santolina development these roads require a full lane less than would be required with the 2035 Base MTP. Next, the figures on Central Ave. just east of Atrisco Vista show a reversal of the travel pattern with the westbound traffic increasing by 307 VPHPL and the eastbound traffic decreasing by -534 VPHPL. This shows that more work trips are moving towards Santolina in the 2035 Santolina scenario. Last, the figure shows that there are less river crossings in the peak hour (nearly 700 VPHPL).

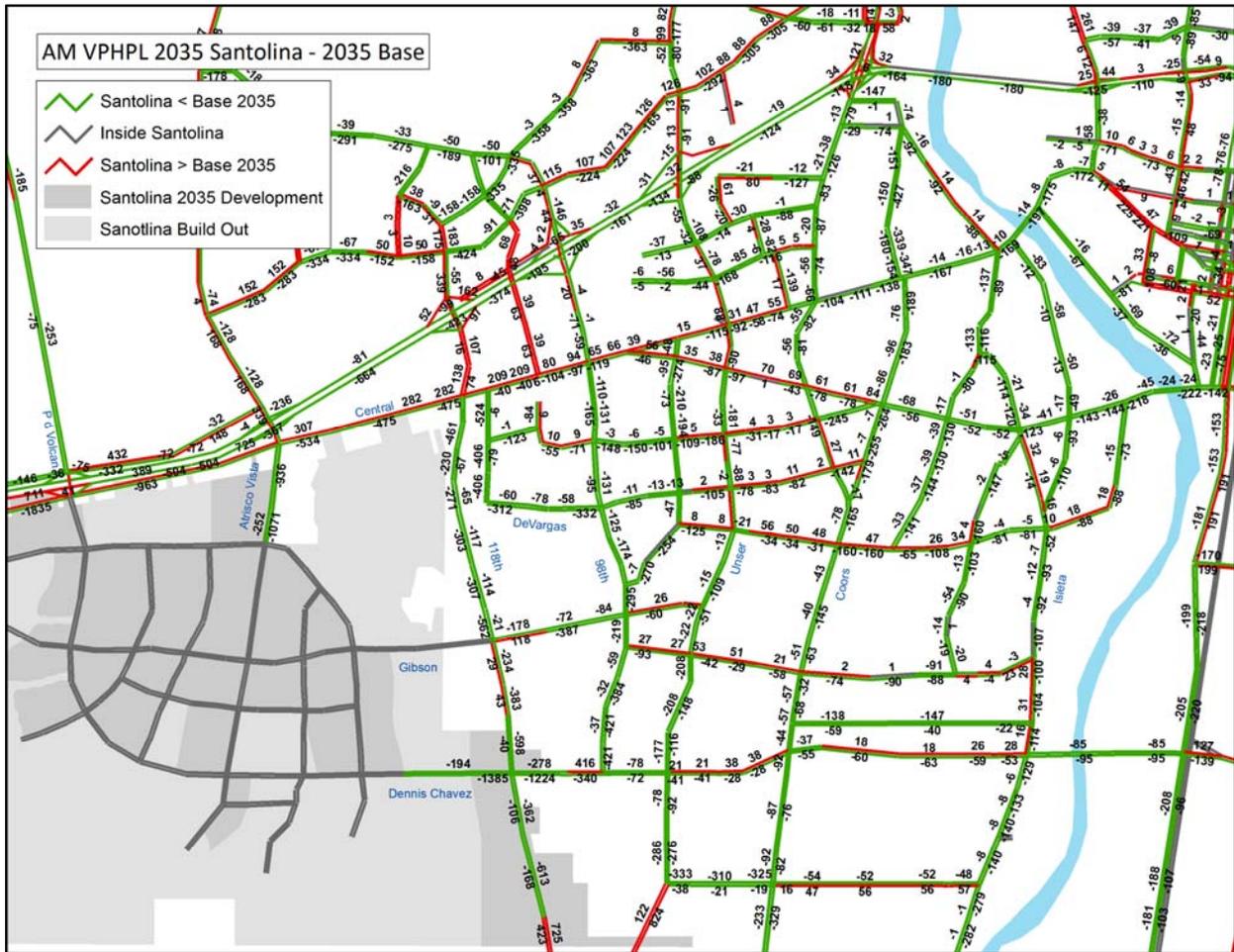


Figure 12 – Difference in AM VPHPL, Santolina 2035 Phased vs. 2035 MTP

Figure 13 shows several significant things about how the Santolina development positively impacts travel in the region in the PM peak. As in the AM, Atrisco Vista Blvd. at -1154 VPHPL and Dennis Chavez at -1325 VPHPL entering the development, show Santolina requires a full lane less than the 2035 Base MTP. There are also many less river crossings in the PM, nearly 900 less VPHPL.

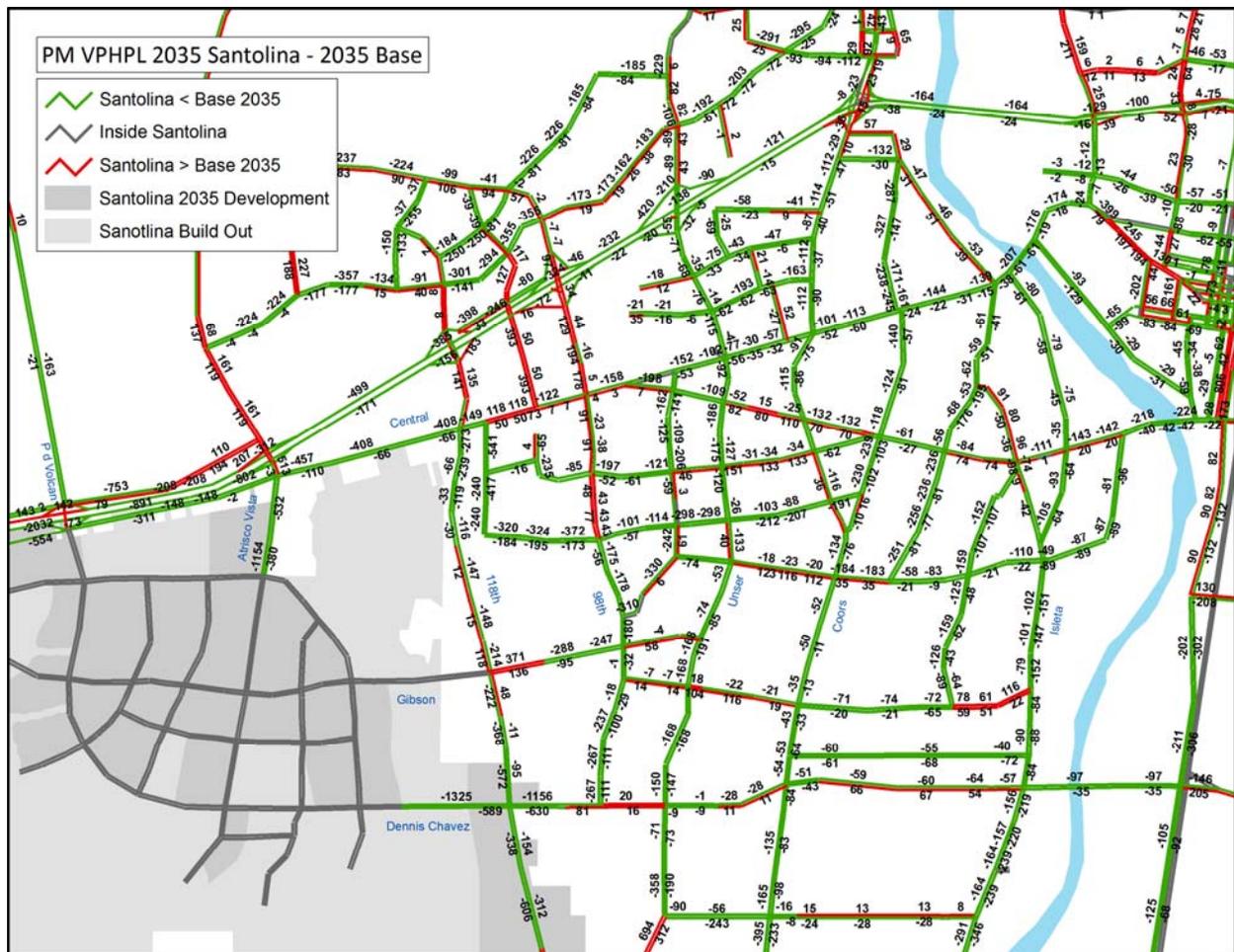


Figure 13 – Difference in PM VPHPL, Santolina 2035 Phased vs. 2035 MTP

### Measures of Effectiveness

There are several means of measuring of system performance that can be used to compare the proposed development and the MTP base. This section will discuss the relative differences between the 2035 Base MTP and 2035 Santolina Phased Development scenarios using these measures in order to evaluate the benefits of the proposed development.

### System-Wide Measures of Effectiveness

The Santolina 2035 Phased development roadway proposal increases the capacity of the regional road system from 4,933 lane miles to 5,164 (4.68%). Table 4 contains comparison of system-wide vehicle miles of travel (VMT), vehicle hours of travel (VHT) and vehicle hours of delay (VHD) for the 2035 Base MTP and the 2035 Santolina Phased development. Even though the lane mileage increases with the Santolina development, each of these system-wide measures decreases. This is a reflection of the nature of the project. The proposed development exports fewer trips to the region than the 2035 MTP Base.

Measure	2035 Base MTP	2035 Santolina	Difference between 2035 MTP and 2035 Santolina
Vehicle Miles of Travel	37,112,395	36,903,351	-0.56%
Vehicle Hours of Travel	750,745	742,746	-1.07%
Vehicle Hours of Delay	941,615	736,944	-21.74%
VMT Outside Santolina	36,885,201	36,261,347	-1.69%
VHT Outside Santolina	746,083	727,778	-2.45%
VHD Outside Santolina	924,153	734,563	-20.52%

### River Crossings

One of the primary concerns in the Albuquerque Metropolitan Planning Area is the issue of river crossing trips. There are no new bridges planned and the capacity of the existing bridges (number of lanes) remains constant between 2008 and 2035. In the future, the Cube model shows that each of the river crossings will be *severely congested*. Tables 5 and 6 illustrate the positive the effect on the volume-to-capacity ratios for each of the facilities crossing the river.

River Crossings	2035 MTP V/C AM Eastbound	2035 Santolina V/C AM Eastbound	Percent Change
I-25 South	1.76	1.73	-1.70%
Rio Bravo	1.82	1.73	-4.95%
Bridge	2.41	2.21	-8.30%
Central	2.15	1.97	-8.37%
I-40	1.62	1.51	-6.79%
Montano	1.68	1.60	-4.76%
Paseo del Norte	1.49	1.46	-2.01%
Alameda	2.48	2.38	-4.03%
US 550	2.63	2.44	-7.22%

While each of the facilities remains severely congested in both the AM and PM, the Santolina project reduces the volume-to-capacity ratios at each crossing.

Table 6: PM Westbound Volume to Capacity Comparison			
River Crossings	2035 MTP V/C PM Westbound	2035 Santolina V/C PM Westbound	Percent Change
I-25 South	1.49	1.47	-1.34%
Rio Bravo	1.87	1.79	-4.28%
Bridge	2.44	2.24	-8.20%
Central	2.14	1.95	-8.88%
I-40	1.37	1.28	-6.57%
Montano	1.74	1.67	-4.02%
Paseo del Norte	1.64	1.57	-4.27%
Alameda	2.57	2.55	-0.78%
US 550	2.58	2.39	-7.36%

In terms of sheer volume of traffic, the Santolina development will reduce total river crossings by over 42,000 vehicles per day (Table 7).

Table 7: Total Daily River Crossings			
	2035 MTP	2035 Santolina	Percent Change
I-25 South	103,282	98,894	-4.25%
Rio Bravo	72,438	70,099	-3.23%
Bridge	74,774	69,550	-6.99%
Central	90,157	78,894	-12.49%
I-40	235,537	229,030	-2.76%
Montano	65,759	64,289	-2.24%
Paseo del Norte	159,175	160,918	1.10%
Alameda	87,548	80,294	-8.29%
US 550	87,854	82,114	-6.53%
<b>Total River Crossings</b>	<b>976,524</b>	<b>934,082</b>	<b>-4.35%</b>

### *Isolation of Project Area Trips*

To evaluate the impact of the development further, the Cube model vehicle trip table (zone to zone vehicle trips) was divided into three separate tables: 1) trips with both trip ends in Santolina, 2) trips with one trip end in Santolina and 3) trips with neither trip ends in Santolina. Then model assignments, using the final network congested speeds and each of these new trips tables were made. The results of the assignment are shown in Tables 8 and 9.

<b>Table 8: VMT of Split Vehicle Trip Table - 2035 Santolina Phased Development</b>		
	<b>Tot VMT</b>	<b>% VMT</b>
<b>Santolina Internal Trips</b>	<b>102,153</b>	<b>0.28%</b>
<b>One Trip End in Santolina</b>	<b>2,323,440</b>	<b>6.36%</b>
<b>Neither Trip End in Santolina</b>	<b>34,098,498</b>	<b>93.36%</b>
<b>Total</b>	<b>36,524,091</b>	<b>100.00%</b>

<b>Table 9: VMT of Split Vehicle Trip Table - 2035 MTP</b>		
	<b>Tot VMT</b>	<b>% VMT</b>
<b>Santolina Internal Trips</b>	<b>25,511</b>	<b>0.07%</b>
<b>One Trip End in Santolina</b>	<b>2,258,014</b>	<b>6.10%</b>
<b>Neither Trip End in Santolina</b>	<b>34,705,693</b>	<b>93.83%</b>
<b>Total</b>	<b>36,989,218</b>	<b>100.00%</b>

These figures also demonstrate the favorable land use characteristics of the Santolina development. The percentage of Santolina Internal trips is four times higher in the 2035 Santolina Phased Development than in the 2035 MTP. This is a reflection of the improved jobs-to-households ratio. The percentage of trips with One Trip End in Santolina is also higher in 2035 Santolina Phased Development scenario. This shows that more regional trips are being attracted to Santolina.

In addition to looking at the overall VMT figures from these assignments we can also look at the actual network assignments of the three tables. Maps of these assignments are shown in Figures 14, 15 and 16.

These maps show the percentage of traffic on the links that is related to the given trip table. Figure 14 shows the percentage of traffic on the links that have both trip ends in Santolina (i.e. Santolina internal trips). For example, it shows that about 19% of the traffic on Dennis Chavez Blvd just west of 118<sup>th</sup> St. is related totally to Santolina.

Figure 15 shows the percentage of trips on the links where one trip end is in Santolina. For example, these are the work trips of those who live outside Santolina and travel to Santolina for their jobs.

Finally, figure 16 shows the percentage of trips on the links where neither trip end is in Santolina (i.e. "pass-through" trips). This figure illustrates the utilization of the Santolina roads for purposes not related to the development at all.

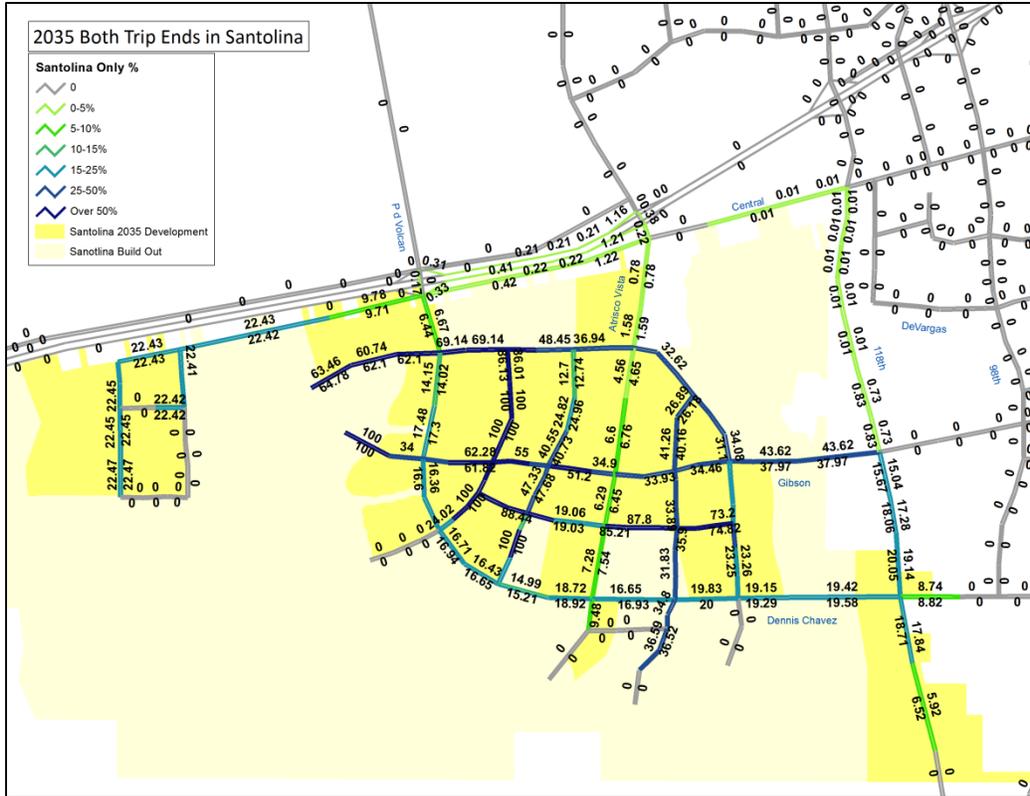


Figure 14: Percentage Santolina Internal Trips

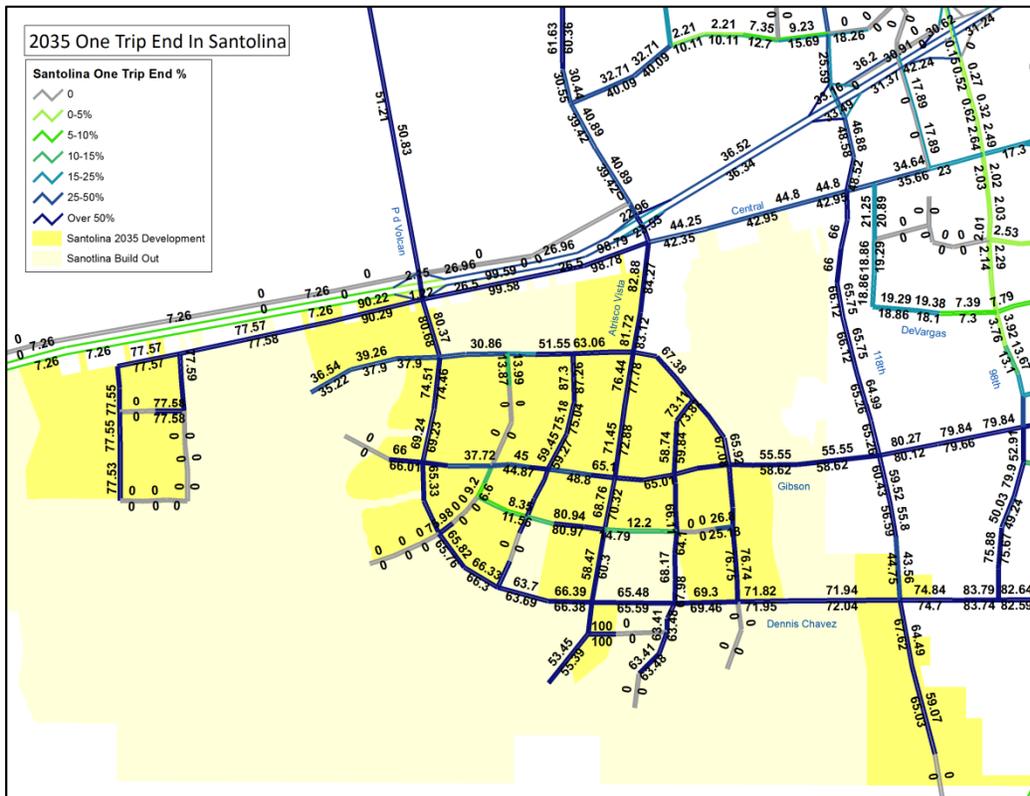


Figure 15: Percentage of Trips with One End in Santolina

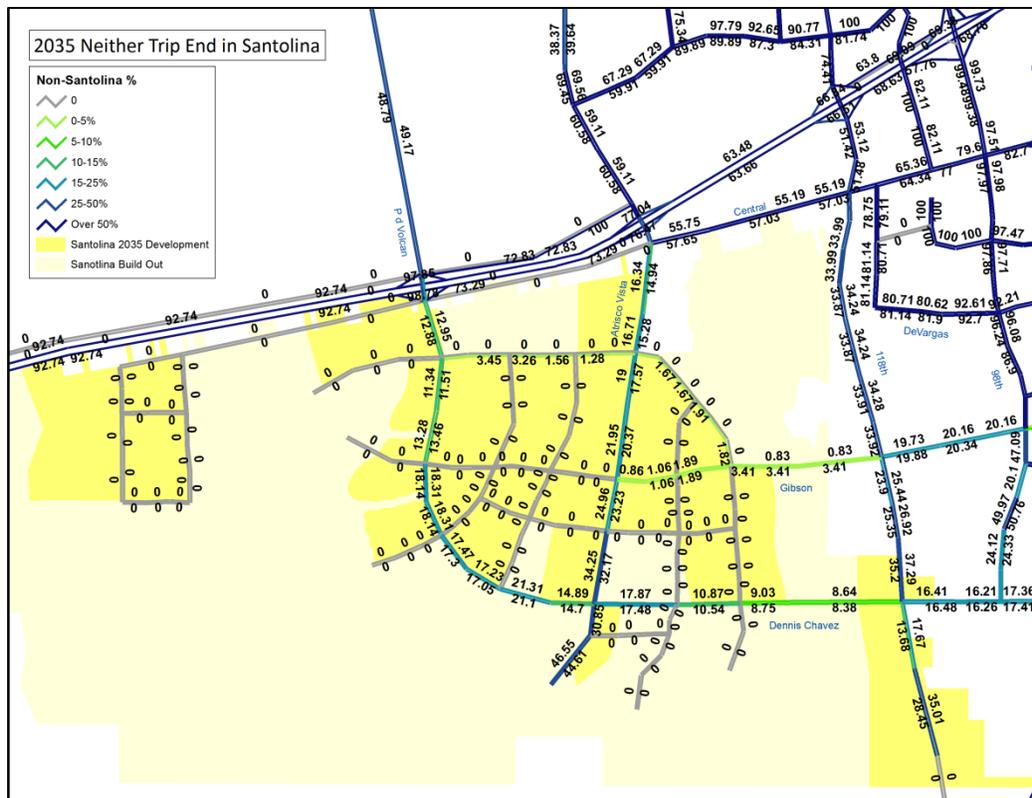


Figure 16: Percentage of Trips with Neither Trip End in Santolina

Figure 16 also shows the degree to which the Santolina road network benefits the overall functioning of the regional road network. For example, 11-21% of the traffic on Paseo del Volcan between I-40 and Atrisco Vista Blvd. are trips that are passing through the Santolina development.

### Comparison of Travel Time

The last measures of effectiveness examined are related to network congested speeds. Measurements were made of network travel times between various activity centers and the Santolina development in the 2035 Santolina Phased scenario and the 2035 Base MTP. Before examining the results, it needs to be noted that while the Cube model does output congested speeds, the model has *not* been calibrated on speed (i.e. there was no effort made to match model congested speeds to observed speeds in the base year).

The analysis results can be found in Table 10. The travel times for the 2035 MTP network seem to be severely skewed. This is due to two factors: 1) the severe capacity deficiencies in the base network (see Figures 2, 5 & 6) and 2) network density and connectivity in the Santolina area. The travel times are from Santolina at the intersection of Atrisco Vista Blvd. and Dennis Chaves Blvd. to various activity centers in the region.

<b>Table 10: 2035 MTP Travel Times Using network without Santolina Roads</b>			
<b>Santolina from Atrisco Vista/Dennis Chavez (n=4188)</b>			
<b>Model Comparison</b>			
	<b>Time</b>		
<b>Travel Time - AM Peak Hour</b>	<b>2035 MTP</b>	<b>2035 Santolina</b>	<b>Percent Difference</b>
<b>To Downtown (n=3206)</b>	<b>115.73</b>	<b>58.36</b>	<b>-49.57%</b>
<b>To Uptown (n=2820)</b>	<b>125.32</b>	<b>67.67</b>	<b>-46.00%</b>
<b>To Mesa del Sol (n=5497)</b>	<b>111.06</b>	<b>55.51</b>	<b>-50.02%</b>
<b>To Rio Rancho City Center (n=5936)</b>	<b>83.84</b>	<b>38.78</b>	<b>-53.75%</b>
<b>Travel Time - AM Peak Hour</b>			
<b>From Downtown (n=3206)</b>	<b>18.75</b>	<b>19.02</b>	<b>1.44%</b>
<b>From Uptown (n=2820)</b>	<b>21.69</b>	<b>21.89</b>	<b>0.92%</b>
<b>From Mesa del Sol (n=5497)</b>	<b>36.15</b>	<b>28.63</b>	<b>-20.80%</b>
<b>From Rio Rancho City Center (n=5936)</b>	<b>72.92</b>	<b>71.58</b>	<b>-1.84%</b>
<b>Travel Time - PM Peak Hour</b>			
<b>To Downtown (n=3206)</b>	<b>29.55</b>	<b>22.02</b>	<b>-25.48%</b>
<b>To Uptown (n=2820)</b>	<b>35.60</b>	<b>29.67</b>	<b>-16.66%</b>
<b>To Mesa del Sol (n=5497)</b>	<b>59.80</b>	<b>42.21</b>	<b>-29.41%</b>
<b>To Rio Rancho City Center (n=5936)</b>	<b>123.91</b>	<b>95.58</b>	<b>-22.86%</b>
<b>Travel Time - PM Peak Hour</b>			
<b>From Downtown (n=3206)</b>	<b>122.41</b>	<b>61.58</b>	<b>-49.69%</b>
<b>From Uptown (n=2820)</b>	<b>132.18</b>	<b>70.98</b>	<b>-46.30%</b>
<b>From Mesa del Sol (n=5497)</b>	<b>127.79</b>	<b>69.58</b>	<b>-45.55%</b>
<b>From Rio Rancho City Center (n=5936)</b>	<b>113.17</b>	<b>51.38</b>	<b>-54.60%</b>

As can be seen, the travel times in the 2035 Santolina are significantly less than the times in the 2035 MTP Base. The capacity deficiencies in the 2035 MTP network lead to very low speeds the streets leading out of the Santolina area (Figure 17). Also, Central Ave. and all of the river crossings have speeds less than 5 mph. The other factor contributing to the low speeds is the lack of network connectivity.

An additional model run was completed to see if some of the congestion problems seen in the 2035 Base MTP run could be resolved. This model run used the 2035 MTP socio-economic dataset with the addition of the 2035

Santolina Phased scenario network (Figure 18). The addition of the connection of Paseo del Volcan to Dennis Chavez Blvd. and Gibson Blvd. between Atrisco Vista Blvd. and 118<sup>th</sup> St. significantly impacts connectivity.

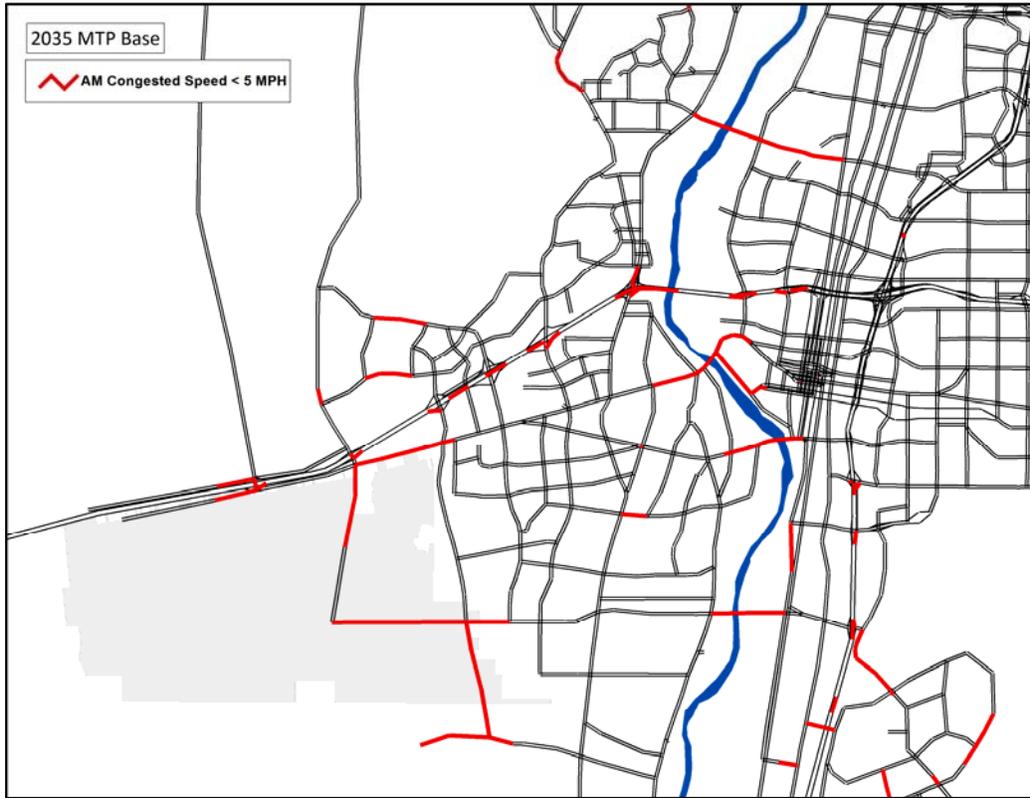


Figure 17: 2035 Base MTP AM Congested Speed

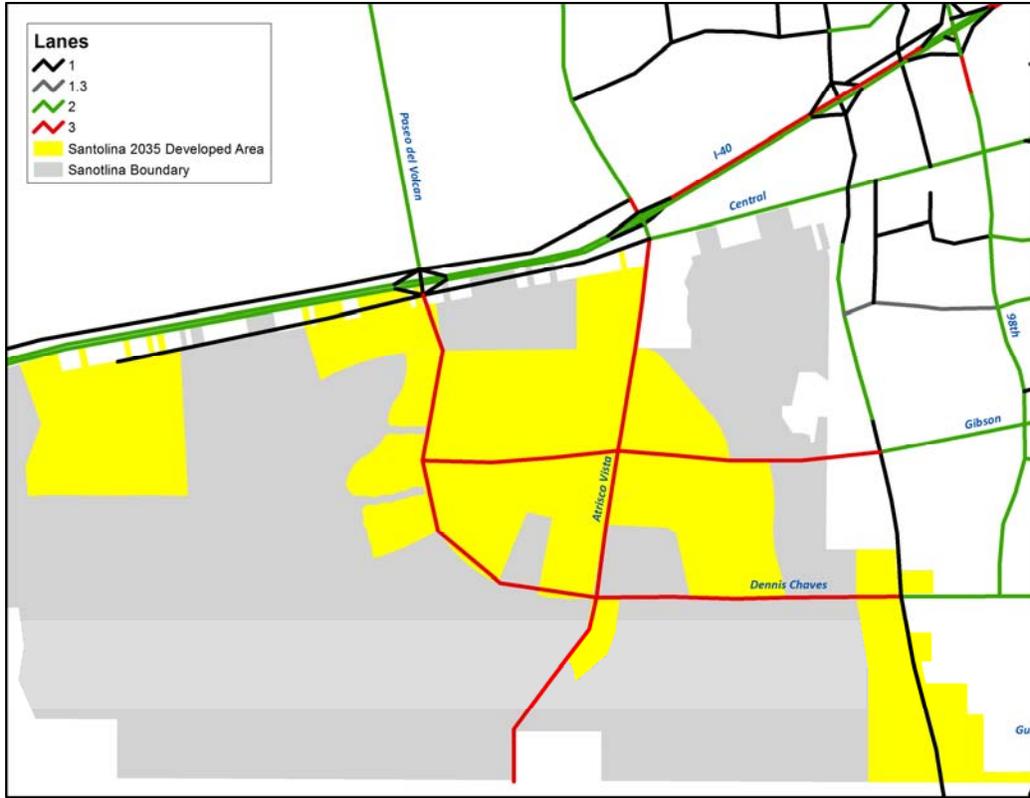


Figure 18 – 2035 MTP with 2035 Santolina Roads

The travel times results for this run are found in Table 11.

Table 11: 2035 MTP Travel Times Using network with Santolina Roads			
Santolina from/to Atrisco Vista/Dennis Chavez (n=4188)*			
Model Comparison			
	Time		
	2035 MTP	2035 Santolina	Difference
<b>Travel Time - AM Peak Hour</b>			
<b>To Downtown (n=3206)</b>	59.19	58.36	-1.40%
<b>To Uptown (n=2820)</b>	64.75	67.67	4.51%
<b>To Mesa del Sol (n=5497)</b>	55.09	55.51	0.76%
<b>To Rio Rancho City Center (n=5936)</b>	38.00	38.78	2.05%
<b>Travel Time - AM Peak Hour</b>			
<b>From Downtown (n=3206)</b>	18.92	19.02	0.53%
<b>From Uptown (n=2820)</b>	21.47	21.89	1.96%
<b>From Mesa del Sol (n=5497)</b>	28.29	28.63	1.20%
<b>From Rio Rancho City Center (n=5936)</b>	67.02	71.58	6.80%

<b>Travel Time - PM Peak Hour</b>			
<b>To Downtown (n=3206)</b>	<b>22.96</b>	<b>22.02</b>	<b>-4.09%</b>
<b>To Uptown (n=2820)</b>	<b>30.60</b>	<b>29.67</b>	<b>-3.04%</b>
<b>To Mesa del Sol (n=5497)</b>	<b>41.73</b>	<b>42.21</b>	<b>1.15%</b>
<b>To Rio Rancho City Center (n=5936)</b>	<b>87.04</b>	<b>95.58</b>	<b>9.81%</b>
<b>Travel Time - PM Peak Hour</b>			
<b>From Downtown (n=3206)</b>	<b>63.02</b>	<b>61.58</b>	<b>-2.28%</b>
<b>From Uptown (n=2820)</b>	<b>72.41</b>	<b>70.98</b>	<b>-1.97%</b>
<b>From Mesa del Sol (n=5497)</b>	<b>68.37</b>	<b>69.58</b>	<b>1.77%</b>
<b>From Rio Rancho City Center (n=5936)</b>	<b>48.28</b>	<b>51.38</b>	<b>6.42%</b>

These results are much more in line with what was expected. The 2035 Santolina Phased Development shows an improvement in travel times in the peak direction to the CBD. Most of the travel times are within +/- one minute. Exceptions to this are the travel times to and from the Rio Rancho City Center. This reflects the increase work trip interactivity between Rio Rancho and Santolina.

#### ***Full Build Discussion (2060)***

This section will discuss the transportation analysis performed for the Full Build scenario. This analysis involves the population and employment anticipated upon full development of the entire Santolina Master Plan area. This analysis by definition is outside the current planning horizon for the region, and is estimated to be approximately 2060 levels of development. As there is no adopted roadway network, or socio-economic projection for this timeframe, the balance of the metro area was held at 2035 levels of development. This Full Build analysis will be used to ensure the internal roadways in Santolina are sized properly to accommodate all future development potential within the Master Plan area. The road network to be built by 2060 to support the development is shown in Figures 19, 20, 21 and 22.

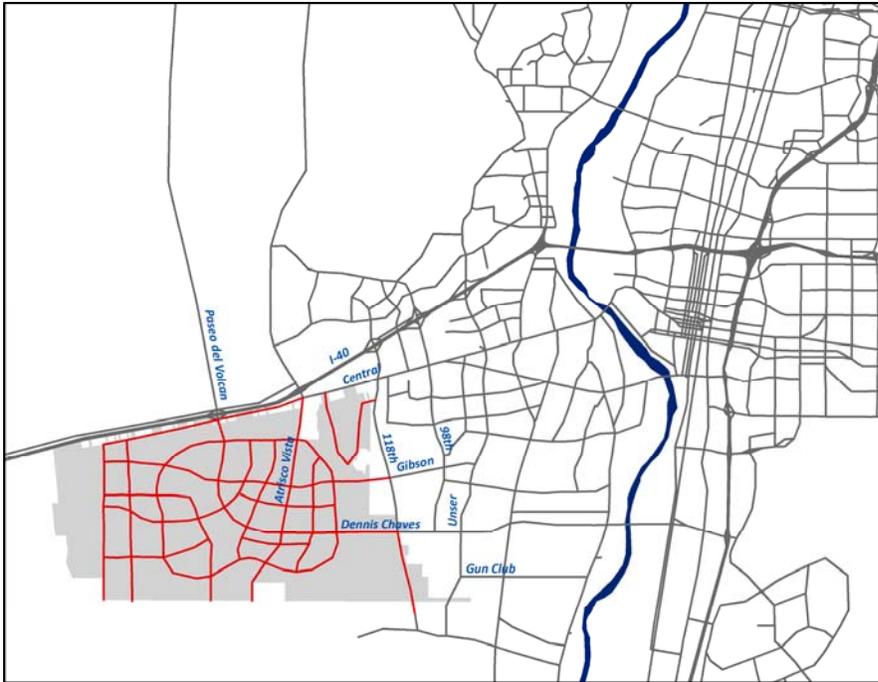


Figure 19: Santolina Build Out Network Regional Context

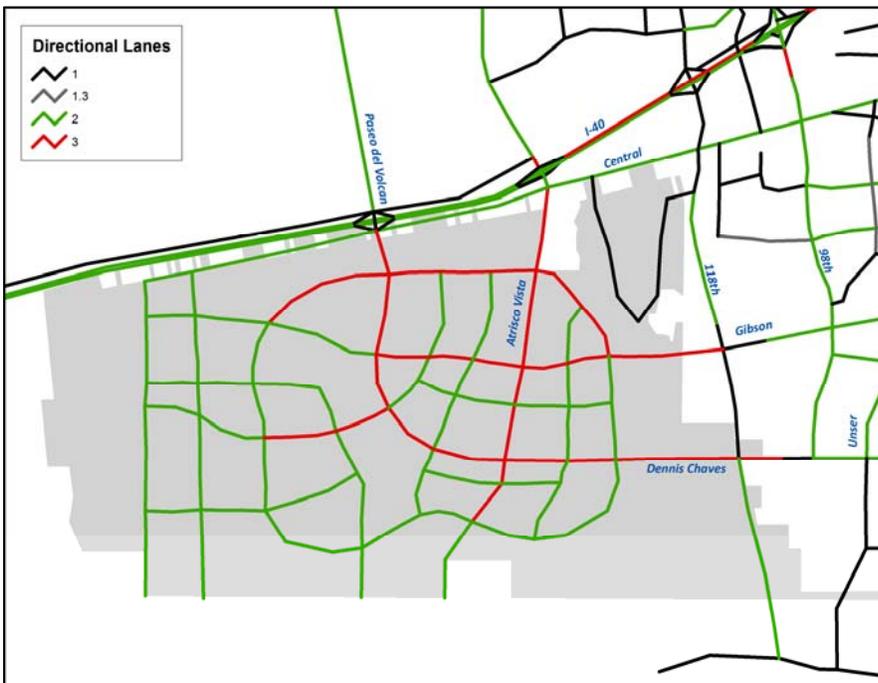


Figure 20: Santolina Build Out Network Lanes

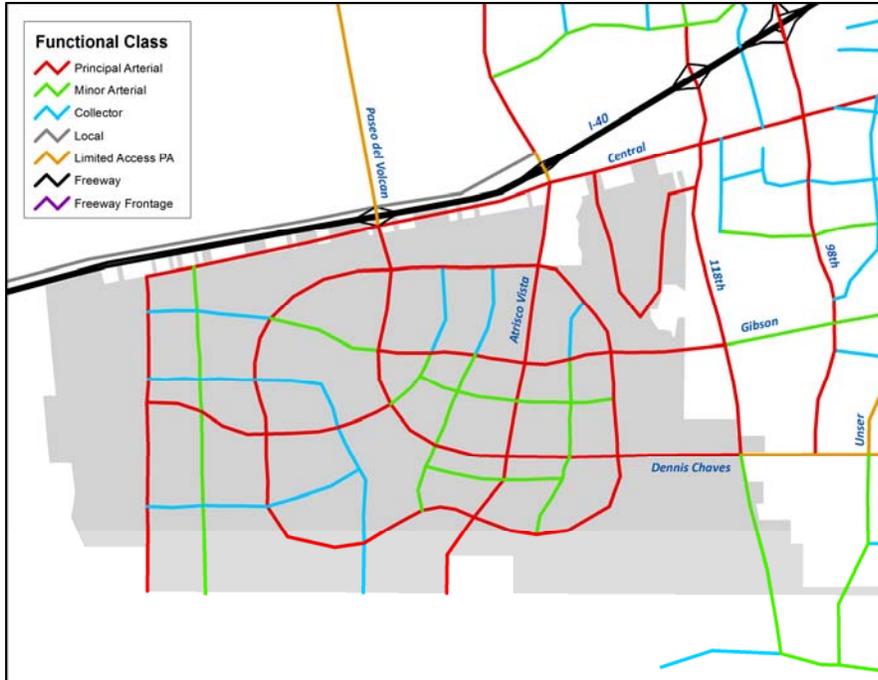


Figure 21: Santolina Build Out Network Functional Class

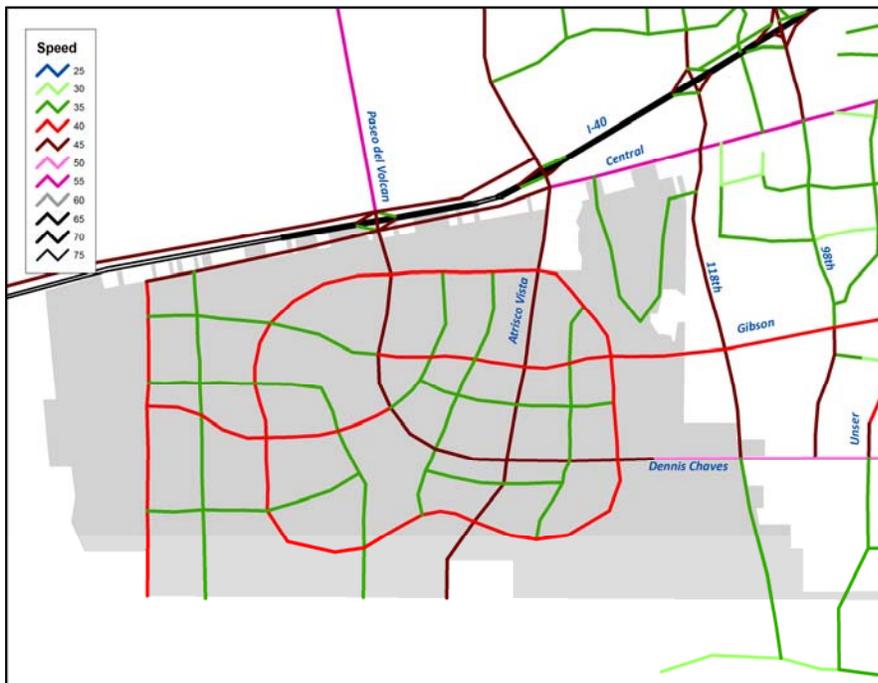


Figure 22: Santolina Build Out Network Speed

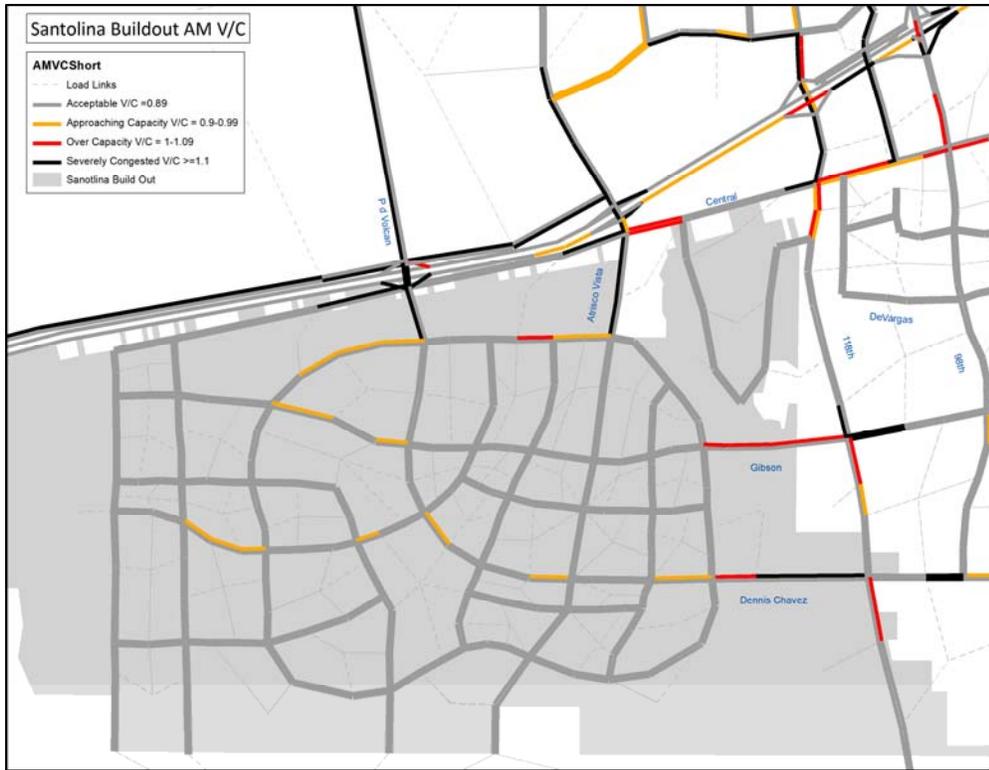


Figure 23: Build Out AM V/C Ratios

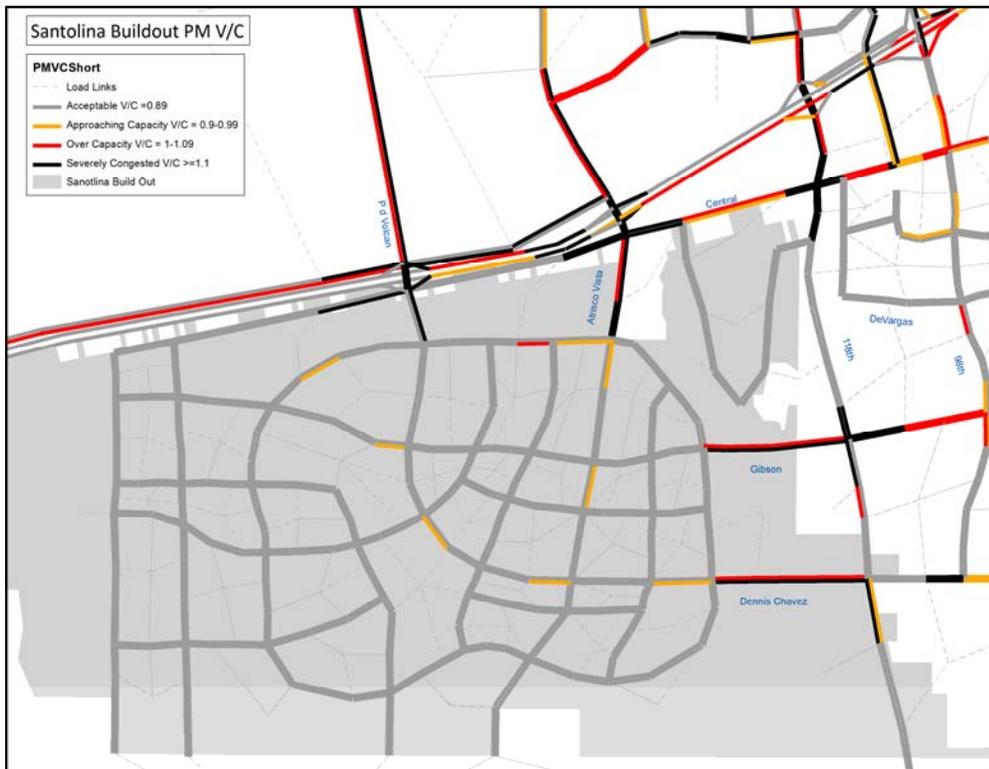


Figure 24: Build Out PM V/C Ratios

The volume-to-capacity ratios (V/C) for the AM and PM peak hours in the Build Out scenario are shown in Figures 23 and 24. In the AM peak hour, the links leading into the Santolina development (I-40 south frontage, Paseo del Volcan, Atrisco Vista Blvd, Gibson Blvd and Dennis Chavez Blvd) are either over capacity or severely congested. Within the development, there are some links that are approaching capacity, but the vast majority of the network is sufficient.

In the PM peak hour the road exiting the development (I-40 south frontage, Paseo del Volcan, Atrisco Vista Blvd, Gibson Blvd. and Dennis Chavez Blvd.) are severely congested. Additionally, Atrisco Blvd., Gibson Blvd. and Dennis Chavez Blvd. are over capacity or severely congested. Within the development, there are some links approaching capacity, but the vast majority of the network is sufficient.