



Buckland Area Transportation Study

Final Technical Memorandum No. 4 Land Use Study

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List of Acronyms

ADT	Average Daily Traffic
APA	Aquifer Protection Areas
BRT	Bus Rapid Transit
CERC	Connecticut Economic Resource Center
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CO	Carbon Monoxide
ConnDOT	Connecticut Department of Transportation
CRCOG	Capitol Region Council of Governments
CTDEP	Connecticut Department of Environmental Protection
CT Transit	Connecticut Transit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
EJ	Environmental Justice
GIS	Geographic Information Systems
GPS	Global Positioning System
HCM	Highway Capacity Manual
LOS	Level of Service
LWCFA	Land and Water Conservation Funding Act of 1965
MEV	Million Entering Vehicles
mp	Mile Post
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NDDDB	Natural Diversity Database
NO ₂	Nitrogen Dioxide
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
PAH	Polyaromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyls
pc/mi/ln	Passenger cars per mile per lane



List of Acronyms (cont.)

PM	Particulate Matter
RTS	Regional Transit Strategy
SCEL	Stream Channel Encroachment Lines
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO ₂	Sulfur Dioxide
SUBOG	Student Union Board of Governors
UConn	University of Connecticut
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service



1 – Introduction

1.1 Overview

The Buckland land use study has been conducted as a component of the overall Buckland Area Transportation Study. Its focus is on the relationship between land use and the transportation system and the dynamics of that in terms of how it influences traffic congestion, walkability, and access to transit. Consequently, the purpose of the land use analysis was threefold, to:

- Understand the effect of land use patterns/land use planning decisions on mobility within and through the study area.
- Investigate, via case studies, the potential for land use management strategies to influence travel behavior (use of alternate modes) and enhance and sustain mobility.
- Consider this in the context of full buildout in the Buckland study area under existing land use controls.

The end product of this analysis is the identification of effective land use management strategies for the study area municipalities to consider to manage and mitigate traffic congestion; in addition, to offer a range of effective techniques that could help local governments direct future growth in the Buckland area towards greater walkability and multimodal access. The information and findings of this analysis can be used as a starting point or basis for future more detailed evaluation of land use issues specific to the Buckland area.

This land use study included two primary tasks. The first was to conduct a build-out analysis of the hypothetical potential for added development in the Buckland study area. Then, potential trip generation associated with that added development was calculated. The second task was a case study of communities elsewhere in the country that are similar to the Buckland-area towns of Manchester, East Hartford, and South Windsor in terms of growth patterns and growth issues. The purpose was to explore effective tools they have used to manage growth and mitigate the effects of related traffic congestion.

This technical memorandum documents the findings of the buildout analysis and the case study research. Information gained from each task was correlated with the others to suggest which land use management strategies for the Buckland area could best help manage traffic congestion and enhance quality of life. The appendices to this memorandum include the buildout analysis map (Appendix A) and more in-depth information on each of the four case-study communities (Appendix B). The case study fact sheets include sample of the zoning and other tools the communities have used to implement their land use vision and transportation demand management objectives.

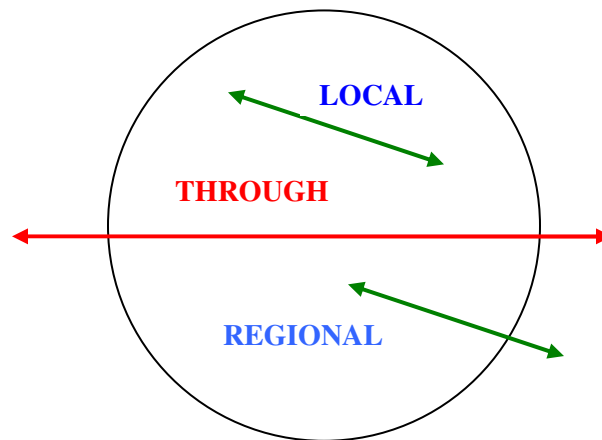


1.2 Study Context

In order to address the issue of traffic relative to land use, it is useful to review the nature of trips in the study area. Individual “person-trips” are made by people for an array of purposes. Those person-trips can be made by a variety of modes. If the person-trips are made by car, then this becomes a vehicle-trip (contributing to traffic impact) as opposed to a transit, bicycle, or walking trip, which generally minimizes traffic impact. To state the obvious, most person-trips in the Buckland study area are vehicle trips and most of those are personal automobile trips.

Whether or not the number of car trips in the Buckland area can be reduced is largely a function of the type of trip. There are three basic trip types:

- Regional Trips (into an area and back out)
- Local Trips (within an area or internal)
- Through Trips



The type of trips made correlates to which land use management strategies may be most effective in helping to divert some of those trips to other modes and mitigate traffic impacts.

The Buckland area currently consists primarily of retail development, with residential land use at the perimeter. Access to and from the area is provided by a combination of state and local roads, express bus service via a high-occupancy vehicle (HOV) lane on the interstate and local bus routes.

The Buckland area experiences all three vehicle-trip types. Regional and internal trips have the most potential to be diverted to other modes due to the opportunity to influence the length of trips and mix of destinations. Land use form within the Buckland area can, therefore, be expected to most strongly impact regional and internal trips, as opposed to through trips which are longer in distance and unrelated to local destinations. To the extent that some in/out (regional) trips can be converted to internal trips, and those trips can be diverted to alternate modes, this too would have some affect on the number of vehicle trips made. For example, an employee working in Buckland today but living farther out in the region and driving to work who relocates within the study area and switches to riding a bicycle to work would be diverting some regional trips to local trips and reducing car trips associated with his or her commute to work. The potential actual reduction in the number of car trips cannot be quantified within the scope of this study. However, some indicators of potential trip diversions were researched as part of the case



studies as well as a literature search. The findings are included in the proceeding sections.



2 – Study Area Buildout Analysis

The purpose of the build-out analysis is to provide an estimate of the theoretical maximum development in an area in terms of floor space and/or dwelling units. Thus, the build-out analysis starts with the amount of development existing today and calculates how much additional development could hypothetically be built if every vacant and redevelopable parcel were used to the full extent allowed by zoning and environmental constraints. As such, the analysis does not exist on a time line. Rather, it is a ‘what-if’ analysis that provides insight into what conditions might be like if the study area were developed to capacity. Similarly, the vehicle trips associated with the maximum development scenario are theoretical. They are based on the typical number of trips that the hypothetical use of the land in the study area would generate. This estimate can then be used to provide guidance to the municipalities in the study area regarding anticipated development patterns and the resultant transportation demand.

A meeting was held with the project study team, ConnDOT personnel, planners from the study area towns and Capitol Region Council of Governments (CRCOG) to discuss the details of the process and to delineate the specific study area to be analyzed. The study area for the purpose of the build-out analysis was restricted to those areas that were determined to be candidates for development or redevelopment as indicated by the town planners and CRCOG staff.

To conduct a build-out analysis, assumptions must be made which will be used to calculate build-out potential of the subject parcels. The assumptions indicate the constraints to development such as soils and topography. For the purposes of this analysis, development was limited to non-wetland soils. In addition, areas with slopes greater than 15 percent were not considered developable.

The buildable area was then decreased by an overall rate of 10 percent to reflect limitations on development due to infrastructure needs such as roadways. The final net buildable area was then used to estimate development capacity based on density and allowable land use parameters under existing zoning regulations. The map which resulted from this process is shown in Appendix A. The zoning designations that occur in the study area can be briefly described as follows:

- East Hartford
 - I-3 –Industrial; any non-residential use is allowed except those which require the use of noxious chemicals and are dangerous by reason of fire, explosion, radioactivity, or detrimental due to emission of dust, odor, fumes, smoke, wastes, refuse material, noise, or vibrations. No schools, hospitals, convalescent homes, motor vehicle junkyards, airports, or establishment engaged in the sale of alcoholic beverages are allowed



- R-2 – intended for single family residential uses on 15,000 square feet of land or more;
- Manchester
 - B-5 –Business; intended for “retail shopping and service facilities established to serve travelers on restricted access highways, and to be distinct from local neighborhood business districts because of its proximity to points of egress or ingress of such highways.”
 - GB – General Business; is intended for “commercial trade area for general public shopping convenience.”
 - CUD – Comprehensive Urban Development Zone; is intended to “allow planned development of various types of commercial, industrial and residential land uses as well as certain accessory uses”
 - I – Industrial; intended for “commercial operations and uses of a type which are not generally suitable or appropriate in retail sales areas.”
 - PRD – Planned Residential; intended for “medium density residential district which allows a mixture of various types of housing including single-family, duplex and multi-family dwellings as well as certain accessory uses ...”
 - RA – Residential A; intended for single family homes at a density of no more than 3 per acre
 - RC – Residence C; Intended for single-family homes at a density of no more than 4.8 per acre
 - RR – Rural residence; Intended for single-family homes at a density of no more than 1.3 per acre
 - RRAA- Residence AA; Intended for single-family homes at a density of no more than 2 per acre
 - SDC – Special design Commercial; “intended to provide retail, service, and professional office uses in locations close to limited access highways or on collector or arterial roads in a manner which ensures public safety and compatibility with surrounding uses. It is also intended to enhance the quality of new development or redevelopment and when appropriate preserve and enhance the special character of existing neighborhoods.”
- South Windsor
 - GD – Buckland Road Gateway Development Zone; intended to “foster high-quality development of businesses and sites, integration of historic structures where possible, and professional landscaping. Within the Zone, it is beneficial ...to introduce a multi-family residential component at certain, but not all locations to create a fully-integrated mixed-use land use pattern
 - RC – Restricted Commercial; intended for a mix of uses including residential, retail, office, and services activities. All uses are approved through Special Permit or Special Exception application process.
 - RR – Rural residential; intended for single family homes on one acre or more as well as agriculture and farms



The town tax assessment databases were used to establish existing conditions for the study area parcels with regard to dwelling units, floor area totals, and building uses. In locations that are currently developed, the net additional represents the total potential build-out given constraints minus existing floor area and dwelling units. In those locations where development has been proposed and approved, the specific floor area and dwelling unit totals were assigned to each parcel to represent net additional build-out. Totals were aggregated by category, either by development where the specific approved programs of development were known, or by existing zone/town.

Once the development capacities were calculated, the daily vehicle trips generated were estimated using trip generation rates from Trip Generation (2007), a reference published by the Institute of Traffic Engineers.

Table 2-1 presents a summary of the results of the analysis including the floor area, dwelling unit and total daily trip totals for existing conditions and maximum build-out.



Table2-1: Build-Out Analysis Summary

Category	Net Buildable Area (ac.)	Existing Conditions			Maximum Build-Out			Maximum Build-Out		
		Floor Area (sf.)	Dwelling Units	Total Daily Trips (est.)	Net Additional			Total (Existing plus Additional)		
					Floor Area (sf.)	Dwelling Units	Total Daily Trips (est.)	Floor Area (sf.)	Dwelling Units	Total Daily Trips (est.)
Evergreen Walk	207.3	463,690	2	19,924	950,000	200	22,979	1,413,690	202	42,903
Proposed Big Box Retail	81.6	320,696	0	13,771	357,035	0	15,331	677,731	0	29,102
The Buckland Mall Area	204.1	1,969,866	932	90,849	647,597	0	12,473	2,617,463	932	103,323
Zoned I-3 - East Hartford	146.2	806,508	0	5,621	3,015,354	0	21,017	3,821,862	0	26,638
Zoned R-2 - East Hartford	34.1	12,776	12	81	0	90	607	12,776	102	687
Zoned B5 - Manchester	19.9	227,790	0	9,781	1,660,094	0	71,284	1,887,884	0	81,066
Zoned GB - Manchester	54.8	331,019	2	8,943	4,440,228	0	119,775	4,771,247	2	128,718
Zoned CUD - Manchester	53.7	333,389	0	7,739	5,012,830	54	155,508	5,346,219	54	163,247
Zoned I - Manchester	101.8	206,432	0	1,439	2,455,334	0	17,114	2,661,766	0	18,553
Zoned PRD - Manchester	31.8	9,601	2	13	0	253	1,697	9,601	255	1,711
Zoned RA - Manchester	7.7	39,698	15	101	0	8	55	39,698	23	156
Zoned RC - Manchester	1.0	9,804	0	0	0	2	12	9,804	2	12
Zoned RR - Manchester	15.2	36,579	12	81	0	8	52	36,579	20	133
Zoned RRAA - Manchester	5.7	28,893	9	60	0	0	0	28,893	9	60
Zoned SDC - Manchester	2.9	11,264	0	304	307,154	0	8,285	318,418	0	8,589
Zoned GD - South Windsor	22.5	19,069	12	410	1,976,255	0	48,802	1,995,324	12	49,212
Zoned RC - South Windsor	33.3	0	0	0	0	0	0	0	0	0
Zoned RR - South Windsor	60.8	25,653	17	114	0	44	294	25,653	61	409
<i>Total</i>	<i>1,085</i>	<i>4,852,727</i>	<i>1,015</i>	<i>159,231</i>	<i>20,821,880</i>	<i>658</i>	<i>495,287</i>	<i>25,674,607</i>	<i>1,673</i>	<i>654,519</i>

Source: Fitzgerald & Halliday, Inc, 2008





As the table indicates, the build-out represents a net addition of over four times the existing floor area and over three times the existing total daily trips. Also, the net addition of dwelling units constitutes an increase of 65% of the existing dwelling units.

The build-out methodology has a narrowly-focused aim and is, therefore, limited in the conclusions that can be drawn from it. This table presents a theoretical maximum development capacity of the candidate study area parcels, establishing an outside parameter of development and, by extension, vehicle trips. By definition, build-out analyses address only the development potential without regard to market demands. As such, the analysis provides no information regarding the rate of growth nor does it provide any assurances that any particular portion of the latent capacity will be developed. However, the order-of-magnitude level estimate resulting from the analysis provides a framework for discussion regarding the future of the study area with regard to development and transportation demands.



3 – Case Study Findings

The land use analysis included four case studies of high-growth communities that can be defined as “Edge Cities” and have some locational and development characteristics similar to Manchester, East Hartford, and South Windsor. As a basic parameter of the research, it was agreed by the study team that the qualities which the candidate case study communities should have in common with the Buckland area communities are:

- Similar growth patterns – the community transitioned from a more rural and suburban development pattern, emerging as a regional commercial focus area
- Have access to an interstate highway
- Have congestion issues
- Be a regional retail center – perhaps with a regional mall
- Be within 15 (+/-) miles of a major City
- Have similar commuter patterns – workers traveling both through and to work in the community
- Have transit connections
- Have similar community development goals (walkability, pedestrian scale, development concentrated in nodes, multi-modal access)

The selected case study communities included Arlington County, Virginia, Cary, North Carolina, Henderson, Nevada, and Plano, Texas. Fact sheets with details about these communities including samples of implementation tools they have employed are included in Appendix B. The findings of the examination of each community are summarized below. A general observation about the case studies overall is that those communities which have employed some proactive growth management techniques have generally done so at a more advanced stage of growth and are generally much more heavily populated and growing at a much more rapid pace than the Buckland area. Despite this, their experiences provide some insight on how an Edge City can plan for future land use and implement strategies to influence future community quality of life, including walkability and transit access. More importantly, the fundamental growth issue for these high-growth Edge Cities has consistently been one of quality of life for community residents. It is not just an issue of traffic congestion, walkability, or transit access, but of residents’ overall positive experience of the built environment.

Finally, it is notable that only one of the case study communities attempted to quantify the effect of land use decisions on traffic congestion directly. Consequently, the case study research was supplemented with a literature search to delve into the current state of understanding about the quantifiable impacts of land use management strategies on travel behavior. Those findings are also summarized below. The case study findings are presented as a series of questions the research worked to answer.



3.1 What Are The Current Growth Issues In Each Case Study Community?

3.1.1 Arlington County, Virginia

Demand for development in Arlington County remains strong due to its proximity to Washington DC, three major airports, and numerous universities and colleges, as well as general accessibility and availability of developable (or redevelopable) land. The County's focus has been on creating urban villages and sustaining a balance between mobility and livability. Arlington's population grew by 10% (over 17,000 people) between 2000 and 2007. According to December 2007 estimates, the County is 83% built out. Yet, there remains the potential for the development of approximately 11.4 million square feet of office space, 2.0 million square feet of retail space, 24,500 residential units, and 1,100 hotel rooms. Most of this potential future development is expected to take place in the Metro (transit) corridors formed over the past 30 years.

3.1.2 Cary, North Carolina

Growth in Cary has been influenced over the past 50 years by its proximity to Research Triangle Park (RTP). RTP is a complex of research and development businesses and institutions. Since it was established, the Park has witnessed a steady increase in the number of companies and employees. The Park's developed space has increased from 200,000 square feet in 1960 to more than 24.5 million square feet in 2007. Cary is a popular location for RTP employees as well as in-migrating 'active' older adults or retirees. Cary is located at the heart of the Triangle region, with an economy also highly interconnected with the Raleigh-Durham-Chapel Hill metropolitan area. In the early years, Cary adopted zoning and other ordinances on an ad-hoc basis. Beginning in 1971, the town adopted Planned Unit Development (PUD) zoning as the primary mechanism to accommodate residential expansion. Kildaire Farms, a 967-acre development on the former Pine State Dairy Farm in Cary, was North Carolina's first PUD. Cary has had 35% population growth between 2000 and 2008. At the same time, there has been strong retail development with approximately three million square feet of shopping center space approved for construction since 1970.

3.1.3 Henderson, Nevada

The population of Henderson has grown 52% in the past eight years. The City of Henderson has been among the fastest growing cities in the nation, averaging nearly 12,000 new residents per year since 1990. Forecasts predict that this trend will continue for at least the next several years based on the availability of vacant land and the uses planned for that land. Since July 1, 2002, there have been on average 400 new dwelling units a month built to support this growth. In a 2006 resident survey, 22 percent of respondents felt that managing growth and development was the most important issue facing Henderson residents.



3.1.4 Plano, Texas

Plano is surrounded by other suburbs spreading out from the Dallas-Fort-Worth urbanizing area. Sprawl in those suburbs is still prevalent. For many years, Plano has been evolving as a community with typical single-family residences at varied densities. The City's planning efforts had primarily focused on addressing issues related to new residential growth. Now that the majority of the City's residential development and infrastructure is in place non-residential infill development, redevelopment, and revitalization are becoming the City's primary issues with opportunities for new development more constrained.

3.2 What Are The Key Tools Used To Manage Growth?

3.2.1 Arlington County, Virginia

Arlington has implemented an extensive array of plans and regulations to manage growth including:

- Zoning to increase density within the transit corridors and promote Transit-Oriented Development (TOD) around stations
- A parking task force that issued recommendations relating to a variety of parking and transportation initiatives including shared parking, on-street parking, and mass transit
- Ongoing investment in bicycle lanes, sidewalks, and off-road paths
- Neighborhood conservation plan where organized citizen groups can develop and implement a plan to address land use, zoning, traffic management, capital improvements, and parks in their neighborhoods
- Commercial revitalization program including comprehensive design guidelines including streetscape design guidelines for key roadway corridors
- Arlington County landscape standards with a series of graphics depicting preferred design
- Proactive and extensive TDM program

3.2.2 Cary, North Carolina

To manage growth, Cary has:

- A land use plan based on a hierarchy of development activity centers or nodes generally located at major roadway intersections
- A wide array of resource specific plans
- Adequate public facilities ordinance and impact fees
- 12 area-specific greenway, sidewalk, and bicycle plans



- Form that emphasizes transitioning from higher densities at activity center cores to lower-density residential neighborhoods

3.2.3 Henderson, Nevada

The City of Henderson is a pro-growth community. It is very accepting of growth and development as long as it adheres to the standards and policies set forth in the City's master plan and does not detract from the overall quality of life residents have become accustomed to. Consequently, the focus is on the quality of development versus the location. Nonetheless, Henderson has the typical arrangement of retail centered on arterial corridors and predominantly residential neighborhoods. Current zoning is designed to offer more mixed-use development options at higher densities. Additionally, since 87 percent of the land in Nevada is federal land, the City of Henderson and surrounding communities cannot expand past the Bureau of Land Management's (BLM) land boundaries.

3.2.4 Plano, Texas

To manage growth, Plano:

- Is focusing on retail infill, as less than 10% of the residentially zoned land remains available, and an over-abundance of commercially zoned land remains
- Is encouraging all non-residential development with development incentives including higher allowable density and infrastructure to support TOD
- Implemented pedestrian network and design guidelines
- Focused on quality of development versus quantity in zoning approvals.

3.3 How Is Density Addressed; What Ratio Of Uses To One Another Is Encouraged Or Required?

The only community studied that specified the ratio of one use to another in mixed-use zones was Cary, North Carolina. It defines the three types of development clusters, or activity nodes, in terms of hypothetical square footage of non-residential development and total population desirable for each. Most of the communities studied specify a maximum number of residential units per acre in mixed-use zones but present no corollary for ratio of residences to retail and office space. Table 3-1 shows the maximum FAR and maximum allowable lot coverage for the various communities, including those in the Buckland study area.



**TABLE 3-1
MAXIMUM FAR AND ALLOWABLE LOT COVERAGE BY COMMUNITY**

City/Town	Maximum FAR	Maximum Lot Coverage Allowed
Arlington County	3.8:1 at Metro stations with incentive density bonuses (up to 10:1)	75% (with a special permit)
Cary	None – relies on setbacks, height limits, etc.	None – relies on setbacks, other constraints
Henderson – Mixed-use Commercial zone	Not applicable – relies on setbacks and height limits	100% (flexible relative to setbacks and building height limits)
Plano – Corridor Commercial Zone (CC)	1:1 (CC) (4:1 downtown)	70% (CC) (100% downtown)
South Windsor – GD zone (Buckland Road)	Not applicable	30% (65% impervious w/bonus)
Manchester – CUD zone	1:1 (high-rise)	50%
East Hartford	Not applicable	25% (75% impervious)

3.4 How Has Development Form Been Adjusted To Influence Congestion?

3.4.1 Arlington, Virginia

For the past 30 years, TOD development has been encouraged to focus new and/or most dense growth around the transit stations and along transit corridors. One study documented up to 15% reduction in daily traffic volumes on arterial roadways as an indirect affect of the shift in development form.

3.4.2 Cary, North Carolina

Cary has devised a progressive system of development nodes or activity centers as its desired form of development. The strategy (articulated in the comprehensive plan) is based on tackling the land use plan via sub-areas and then based on an urban model in which small pieces (*neighborhoods*) fit together to form medium-sized pieces (*communities*) and adjoining communities fit together to form *regions*. *Activity centers* contain the shopping, services, recreation, office, and institutional facilities needed to support their neighborhood, community, or region, respectively. Thus, there are three different types of activity centers, neighborhood, community, and regional. They are similar in spatial arrangement and function but vary in terms of their scale and intensity, with the neighborhood center being the smallest and least intense of the three and the regional center being the largest and most intense. The comprehensive plan spells out policies and guidelines for development in both existing activity centers and targeted or ‘Greenfield’ activity centers by type. Each specified form is accompanied by related zoning regulations and an extensive system of pedestrian and bicycle networks to minimize the need to drive once inside an activity center.



3.4.3 Henderson, Nevada

So far Henderson hasn't worked to influence development patterns. Rather, Henderson is working to expand transit options and ensure that new growth is high quality in terms of living experience. However, fundamental themes and principles articulated in the 2006 Comprehensive Plan include:

- Balanced land use
- Quality development
- Integrated desert environment – much of the natural environment has been paved or lost as the Las Vegas Valley has developed. The city wants to curb this trend and find ways to integrate the desert such that natural landscapes weave through the built environment
- Connected places – in a connected community, the transportation system is designed in such a way that alternatives to automobile use are possible and vehicular congestion throughout the community is minimized
- Arts and culture – to build a stronger community, all citizens should have new opportunities for creative involvement, play, and cultural exchange.

3.4.4 Plano, Texas

Historically, Plano is organized around four major highways with boulevard arterials. There are noted pedestrian safety issues. Today, Plano is served by two new stations on the Dallas Area Rapid Transit (DART) system to facilitate commuting from Plano to Dallas and environs. TOD is developing around those stations. Downtown densities have been adjusted and form reshaped to facilitate revitalization around the transit station there. No direct impact to congestion measured.

3.5 Have The Strategies Worked?

3.5.1 Arlington, Virginia

Yes. Statistics on traffic demonstrate reductions in volumes on local arterials between 1996 and 2006. Transit ridership grew the most at the Rosslyn station – 132% – between 1991 and 2006 (there was comparable growth in ridership at all stations). Today, estimates are that 73% of transit commuters who live within 1/2 mile of the transit stations walk to use the Metro. Nonetheless, the county planner noted that highway congestion remains a significant issue in both the county and region and continues to grow.

3.5.2 Cary, North Carolina

The Cary Planning office says indications are that the development patterns as envisioned are emerging and are working very well. Initially, those living in residential



neighborhoods near the intersections targeted to be activity centers were skeptical and worried about more traffic. Over time, there has been less resistance as most residents are finding they have easier access to neighborhood services and shopping within the node-like development clusters. Many more people can walk to the grocery store or pharmacy therefore traffic concerns have become less pressing. Local developers have been very enthusiastic about the development opportunities the activity centers concept allows. They like the specificity of the design guidelines which also allow them to maximize their use of their land.

Cary has not gathered any statistics on impacts to congestion. Most of their findings are anecdotal. Still, they feel that the emphasis on connectivity as a design principle has gone a long way to offset some vehicle trips by guaranteeing each development will incorporate access by other modes connected to other like facilities elsewhere. The planner noted that it seems most bicycle commuters prefer to use the roads as opposed to trails to travel by bicycle. In addition, the transit system has not grown as quickly as the overall community has. Commuters to other employment centers like RTP still predominantly need to use their own cars,.

3.5.3 Henderson, Nevada

Since the City of Henderson is pro-growth and is experiencing growth despite the jurisdictional limits on its physical expansion, it is difficult to address the issue of success of their initiatives with respect to traffic congestion. Developers are responding to the development regulations and using them as intended such that quality of growth is considered high. Henderson has not focused on concentrating development in nodes as is a common Smart Growth theme. They also have not measured the impacts of growth on congestion and citizen feedback lists congestion as a significant issue. Henderson is in the middle of a transit expansion project and the benefits of that on congestion are still unknown. Transit is seen more as a quality of life mobility option as opposed to a congestion mitigation measure.

3.5.4 Plano, Texas

So far, there are mixed results. There has been limited interest by developers in the retail space available in the TOD-style neighborhoods near the two DART stations. One of these new stations is at the end of a line and the other is in the downtown. The planner in Plano said they had not yet figured out why the intended mixed-use is not shaping up as anticipated. It may be a mixture of several factors including the availability of retail space along major highway corridors and at destinations for commuters. The large amount of available retail space means developers do not need to take a chance on an unproven market in the new mixed-use centers. It may also be the fact that sprawl is still alive and well beyond, but near, Plano. There is an abundance of green space beyond Plano, further away from Dallas proper, and cheaper development opportunities in those emerging suburbs. The planner says that the City welcomes growth, particularly non-residential growth, but has had limited success in revitalizing the downtown and attracting non-



residential development to the transit stations neighborhoods. Nonetheless, the interest in living near the DART stations and using the light rail to travel has been very strong. One final issue has been the parking for the DART stations. The DART system management has a policy of expanding parking near the stations to serve the maximum potential demand and will not invest in parking structures, leading to expansive surface parking lots. The City struggles with DART to prevent their parking expansion from degrading the quality of neighborhoods where the stations are located.



4 – Literature Review

4.1 Overview

A literature search revealed the following findings on trip reduction with alternate development patterns:

4.1.1 Reid Ewing

Best Development Practices – household travel study of six Florida communities: Development patterns have a significant effect on household travel beyond any relationship they have to socio-economic and demographic characteristics – the same households, regardless of income, in more accessible residential locations will cut down substantially on the vehicular travel (vehicular hours of travel or VHT).

- Accessibility of residences to a mix of land uses is key to vehicular travel reduction. Access to shopping in itself, for example, is relatively unimportant but households with good access to shopping, services, schools, and other households will link trips for multiple purposes, thus reducing VHT.
- Residences with good regional access cut down on household vehicular travel to “a far greater extent” than those with just localized density or mixed-use – meaning isolated pockets of mixed-use or new-urbanist developments or pedestrian network pockets in remote locations without corresponding linkages to regional jobs, shopping, and services do not contribute to reducing trips nearly as much as good regional access does.
- Good accessibility of work places to other activities also has a counter effect on vehicular travel; it reduces the average length of work-related trips – meaning it reduces the number of single-purpose trips. However, work places that have good accessibility to other destinations like shopping and services but which are single-purpose employment centers increases the number of trips made in connection with the work day.

4.1.2 Freilich, White, and Murray

21st Century Land Development Code – Model traditional neighborhood TND and transit-oriented development TOD zoning language:

- For TND, there should be a minimum FAR of 1.5 and a maximum of 6.
- TOD dimensional standards: for the TOD – core area within ¼ mile of transit stations, the FAR should be a minimum of 2 to 2.5; for the TOD- periphery ¼ to ½ mile from transit station, the FAR should be a minimum of 1 to 1.5.



4.1.3 Moore, Thorsnes, and Appleyard

The Transportation/Land use Connection:

- There are five dimensions of the influence of the built environment on travel behavior: diversity, density, destinations, distance, and design.
- Diversity translates to the jobs/housing balance
- Destinations = accessibility of important regional activities
- Distance – ½ mile from transit station (living and/or working) is optimum/maximum for walking to and using transit
- Design – balance of form and function

Recommended densities supportive of transit service include:

**TABLE 4-1
 RECOMMENDED RESIDENTIAL DENSITIES FOR TRANSIT SERVICE**

SERVICE LEVELS	RESIDENTIAL DENSITY THRESHOLDS
Bus: Minimum service (20 buses/day)	4 dwelling units/acre
Bus: Intermediate service (40 buses/day)	7 dwelling units/acre
Bus: Frequent service (120 buses/day)	15 dwelling units/acre
Light Rail: 5 minute peak headways	9 dwelling units/acre (25-100 sq. mile corridor)
Rapid Rail: 5 minute peak headways	12 dwelling units/acre (100-150 sq. mile corridor)
Commuter Rail: 20 trains/day	1-2 dwelling units/acre (existing track)

Source: Pushkarev and Zupan 1977, 1982



TABLE 4-2
RECOMMENDED RESIDENTIAL DENSITIES AND
EMPLOYMENT CENTER SIZES FOR TRANSIT SERVICE

MINIMUM SERVICE LEVEL	RESIDENTIAL DENSITY	COMMERCIAL/OFFICE SPACE
1 bus/hour	4-6 dwelling units/acre	5-8 million sq. ft
1 bus/30 minutes	7-8 dwelling units/acre	8-20 million sq. ft.
Light Rail and feeder buses	9 dwelling units/acre	35-50 million sq. ft.

Source: ITE 1989

4.1.4 Victoria Transport Institute

Land Use Factors That Affect Travel (Excerpt- paraphrased)

- *Density and Clustering.* Density refers to the number of people or jobs in a given area. Clustering refers to related activities located close together, often in commercial centers. Density and clustering affect travel patterns through the following mechanisms:
- *Land Use Accessibility.* The number of potential destinations located within a geographic area tends to increase with population and employment density, reducing travel distances and the need for automobile travel. For example, in low-density areas, a school may serve hundreds of square miles, requiring most students to travel by motor vehicle. In higher density areas, schools may serve just a few square miles, reducing average travel distances and allowing more students to walk or cycle. Similarly, average travel distances for errands, commuting and business-to-business transactions can decline with density.
- *Transportation Diversity.* Increased density tends to increase the number of transportation options available in an area due to economies of scale. Higher density areas tend to have better sidewalks, bicycle facilities, and transit service because increased demand makes them more cost effective.
- *Reduced Automobile Accessibility.* Increased density tends to reduce traffic speeds, increase traffic congestion, and reduce parking supply, making driving relatively less attractive than alternative modes.

As a result of these factors, increased density and clustering tend to reduce per capita automobile ownership and use, and increase use of alternative modes.



5 – Conclusions

5.1 Summary Findings

- The communities studied have worked to manage growth primarily by shaping community form. In the face of intense growth pressures, each of the communities that were studied focused much more heavily on community form and quality of development to achieve high quality of life rather than controlling quantity of development.
- Two communities had very specific/clearly defined policies for the desired form with concentrated development nodes and related zoning regulations (high density allowed as well as clear strong design standards) to implement the policies. These two communities appear to have had the most success with implementation.
- The communities each had strong programs to increase the availability of transit, pedestrian, and bicycle access and each report that those modes are well used. Their programs have been proactive and do not rely on regulatory approaches. The communities invest in infrastructure and actively work on public education and public-private partnerships to discourage single-occupancy vehicle travel. Only one community, Arlington County, has documented the effect on traffic congestion and notes a reduction in traffic congestion on arterial roads as an impact of transit access.
- Increases in residential density to complement transit station locations have been successful for all the communities studied. People have moved in to the transit area homes and walk to transit. Increased allowable density for retail and office uses has not consistently resulted in infill where desired and in drawing developers to those locations. Market forces for retail, in particular, seem to be a stronger variable for economic development than incentives such as density bonuses and tax abatements for locating in a particular spot.
- While ‘Smart Growth’ approaches to development form and transit access can have a positive effect on reducing car trips, congestion continues to grow along with community growth and remains a significant issue in all four high-growth communities.
- Supplemental literature research reveals a common finding that increases in development will necessarily result in an increase of *person*-trips (individuals making trips for all purposes), yet land use management strategies can be used to influence the mode by which those trips are made, and some shift from



automobile trips to transit, pedestrian, and bicycle trips can be achieved with implementation of those land use strategies.

- Key land use factors that influence travel behavior include:
 - a. Density
 - b. Regional accessibility
 - c. Concentration of development in activity nodes
 - d. Land use mix – residential, commercial, services, and institutional
 - e. Connectivity
 - f. Walking and cycling conditions
 - g. Transit accessibility

- Hypothetically, the total build-out trip generation for the Buckland study area could be reduced with use of best development practices as shown in the Table 5-1:

**TABLE 5-1
 POTENTIAL DAILY BUCKLAND AREA VEHICLE
 TRIP REDUCTION THROUGH LAND USE STRATEGIES**

Technique	Pct. Reduction
Density	2-3%
Regional accessibility	10-30%
Concentration of development	40-50%
Land use mix	5-15%
Connectivity	*
Walking and cycling conditions	*
Transit accessibility	5-10%

* Potential for reductions in trips but percentage has not been quantified
 Source: Use Impacts on Transport, Victoria Transport Policy Institute, 2008

The cumulative effect of these measures when combined has not been quantified. Yet, it is safe to assume that the combined effect of increasing density, increasing land use mix, improving connectivity, and increasing access to transit and bicycle and pedestrian facilities in the Buckland Area would have a substantial impact on local and regional traffic.

5.2 Options – Land Use Strategies For Transportation Demand Management

Based on the research regarding Edge Cities, the literature search, and the outcome of the build-out analysis, the following strategies have been identified as the best options for helping to guide growth in the Buckland study area in the future. These strategies can form a starting point for discussions by local boards, commissions, and other governing bodies. In order for these strategies to be most effective, it is recommended that East



Hartford, Manchester, and South Windsor continue to collaborate to look at the area as a whole, despite municipal boundaries, and approach growth management from a regional perspective. To accomplish traffic congestion mitigation objectives, it is also important that state agencies such as the State Traffic Commission responsible for permitting of development support the local implementation of strategies through their permitting policies to help shift person-trips away from the personal automobile.

Best Land Use Strategies include:

1. Provide a more balanced mix of uses within the entire study area – This would allow for more internal trips and less regional trips. Depending on walkability, these internal trips may not result in a vehicle trip. In addition, if local transit connections are available, these internal trips may be transit trips rather than car trips.
2. Focus on Form
 - a. View and approach development from a regional perspective – work towards mixed-use activity centers organized at a macro-level within a region rather than allowing land use patterns based on clustering of individual uses or even mixed-uses in specific locations such as zoning to congregate major big-box retail/malls with some office uses at highway interchanges.
 - b. Develop mixed-activity nodes including residential, services, retail, and office uses (jobs and housing balance) with a transition from highest density and mix of uses at the core of the activity node to lower-density development at the edges and interface with low-density residential neighborhoods.
 - c. Emphasize quality-of-life design – develop design standards for such quality of life features as connectivity (sidewalks, transit stops, and etcetera), pedestrian scale of the environment, streets as public spaces, landscaping, streetscaping, parks and public spaces, and public amenities such as street furniture and wayfinding kiosks.
3. Emphasize connectivity within identified activity nodes – increase capacity to travel within the node without a car.
 - a. Design for inter-parcel connections with multimodal access.
 - b. Provide transit service within the node as well as between nodes.
 - c. Provide sidewalks and bicycle facilities interconnected within the node.
4. Promote regional connections – transit stops/hubs in one activity node that connect to other activity node transit stops and other key regional destinations.
5. Apply Travel Demand Management (TDM) Strategies – implement strategies that encourage more efficient travel patterns in conjunction with land use policy reforms. These strategies include better transport linkages among modes (such as bicycles on buses), supporting employer programs to reduce employee VMT (such as telecommuting, alternate work schedules, and free transit passes), financial incentives to commuters to carpool/vanpool, car-sharing options, parking pricing, and easy



access to information/guides to alternate modes of travel including web-based ride sharing systems.

5.3 Conclusions

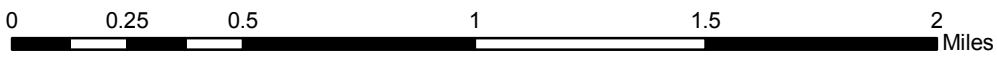
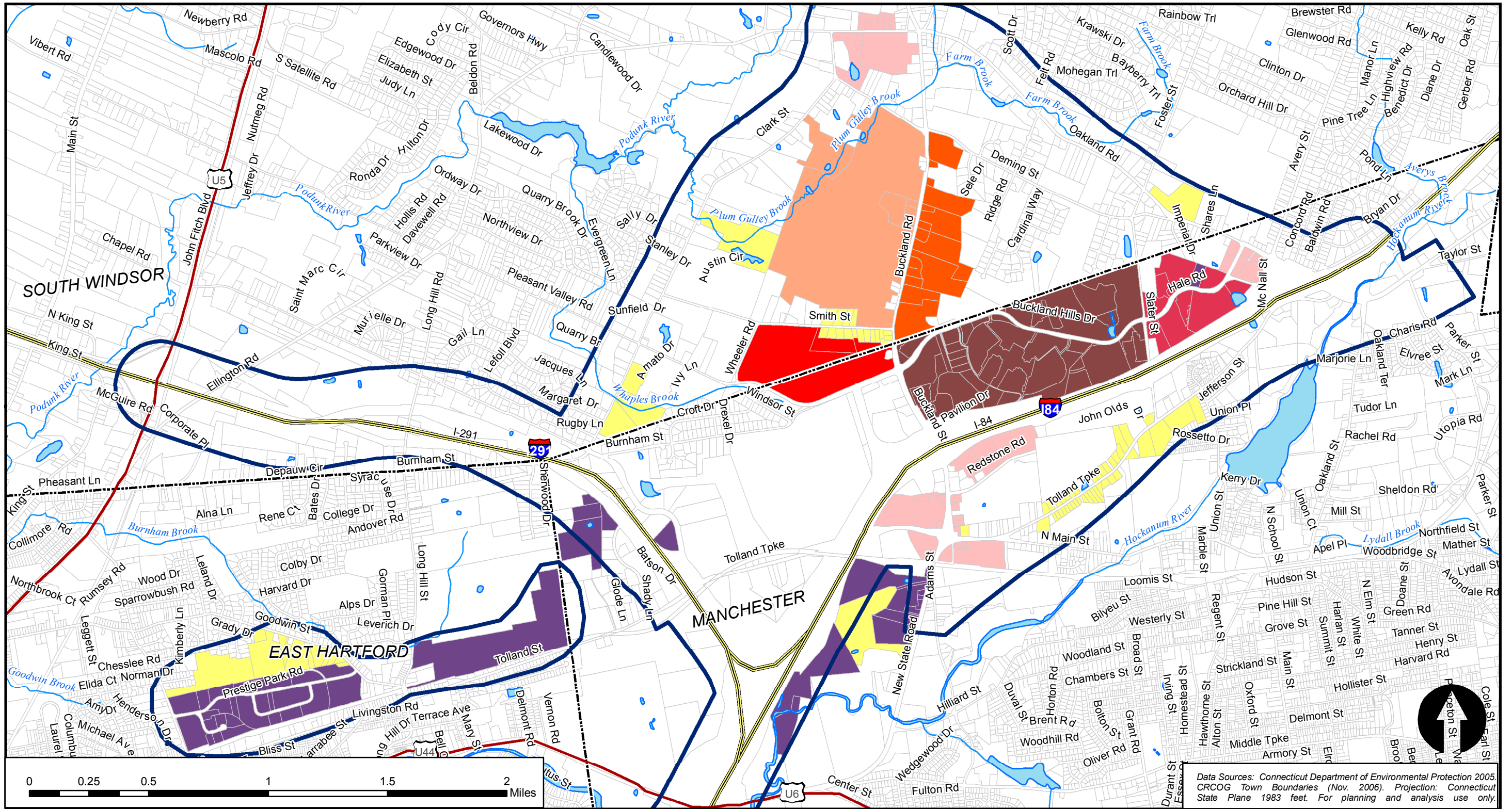
A basic finding was that land use management can be expected to have limited impact on overall traffic volumes on congested major roadways in communities where strong growth is continuing. New growth equals new person-trips. However, land use management techniques can complement other congestion mitigation efforts by creating a critical mass of mixed-use and more options for travel. The result may be to shift some person-trips to other modes than the automobile with some shift also to multi-purpose trips, reducing VMT overall.

The greatest potential impact from best land use management strategies for Buckland may be reduction of internal automobile trips within the study area to offset current conditions where people are now making multiple short trips amongst retail and services destinations.

A pattern of mixed-use concentrated activity nodes within the Buckland study area in an organized pattern relative to one another can achieve car-trip reductions much more effectively than a random general increase in density and mix. That is, the Buckland region's form of development can influence vehicle trips to a greater extent than simply changing current zones to offer the option of mixed-use development at high densities.



Appendix A Buildout Analysis Map



Data Sources: Connecticut Department of Environmental Protection 2005, CRCOG Town Boundaries (Nov. 2006). Projection: Connecticut State Plane 1983 feet. For planning and analysis use only.



- Study Area
- Town Boundary
- Open Water
- Zoned Residential
- Zoned Commercial
- Zoned CUD
- Evergreen Walk - multiple zones
- Zoned GD
- Zoned Industrial
- Mall Area - multiple zones
- Proposed Big Box - multiple zones

Study Area - Build-Out Analysis Buckland Area Transportation Study Manchester/South Windsor/East Hartford



Appendix B

Case Study Community Fact Sheets

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**BUCKLAND AREA LAND USE STUDY
CASE STUDY FINDINGS SUMMARY SHEET**

ARLINGTON COUNTY, VIRGINIA

COMMUNITY PROFILE

Arlington County is located directly across the Potomac River from Washington, D.C. Despite being a county, it is considered a Central City of the Washington, D.C. area by the U.S Census. With a land area of 26 square miles, it is geographically the smallest self-governing county in the United States.

Development History Summary

Originally part of the area surveyed for the nation's capital, the portion on the west bank of the Potomac River was returned to the Commonwealth of Virginia by the U.S. Congress in 1846. This area was known as Alexandria City and Alexandria County until 1920 when the county portion was renamed Arlington County. The new name was borrowed from Arlington National Cemetery.

For over 30 years, Arlington County has had a policy implemented through zoning of concentrating much of its new development near transit facilities, such as Metrorail stations and the high-volume bus lines of Columbia Pike. Within the transit areas, there has been a policy of encouraging mixed-use and transit-oriented development. Outside of those areas, the County generally limits density increases, but makes exceptions for larger projects that are near major highways. Much of Arlington's development in this 30-year period has been concentrated around 7 of the County's 11 Metrorail stations within two transit corridors: the Rosslyn-Ballston Metrorail Corridor and the Jefferson-Davis Metrorail Corridor, both of which are central hubs of business, tourist, and residential activity. More than 90 percent of the businesses and nearly all of 40 hotels in Arlington are located within these two corridors. However, infill development elsewhere in the County has also been taking place and recently many undeveloped lots and small single-family dwellings have been replaced with row houses and larger homes.

Quick Facts (January 2008 estimates)

- Population – 206,800
- Median age - 34
- Housing units – 102,152
- Median Household Income - \$91,896
- Distance to Washington, DC – 8 miles



LAND USE PROFILE

Current Land Use

- **Mix** - Arlington's tax base is approximately divided between 45% commercial and 55% residential properties. Arlington's website boasts 589 restaurants. Best known as the home of the Pentagon and Arlington National Cemetery, Arlington is characterized more by its numerous residential neighborhoods (there are more than 60 recognized neighborhoods). It is also notable that there are almost 200 public parks and playgrounds, 14 community centers, and eight libraries in Arlington County. In addition, Arlington has more private office space than downtown Boston, Los Angeles, Dallas, and Denver. At the close of 2007, the County had:
 - 755,652 square feet of office space was completed in 2007
 - 878,000 square feet of office space was still under construction.
 - 9.8% Office Vacancy Rate: (lower in the Metro Corridors)
 - 31,219,267 square feet of office space and 5,041,772 square feet of retail was completed between 1960 and 2005

- **Density** – Arlington is very densely populated with almost 8,000 residents per square mile. Arlington's approach to density from a development perspective is to focus high-density commercial and residential development around Metrorail stations in the Rosslyn-Ballston and Jefferson-Davis Metrorail Corridors while maintaining lower density residential neighborhoods in the rest of the County. The County issued 8,000 new residential building permits between 2000 and 2004.

- **Growth Issues** – Demand for development in Arlington County remains strong due to its proximity to Washington DC, three major airports, and numerous universities and colleges, as well as general accessibility, and availability of developable (or redevelopable) land. The County's focus has been on creating urban villages and sustaining a balance between mobility and livability. Arlington's population grew by 10% (over 17,000 people) between 2000 and 2007.

According to December 2007 estimates, the County is 83% built out. There remains the potential for the development of approximately 11.4 million square feet of office space, 2.0 million square feet of retail space, 24,500 residential units, and 1,100 hotel rooms. Most of this potential future development is expected to take place in the Metro corridors

Total development approved by the Arlington County board in 2007:

- 2,699,637 s.f. office GFA
- 2,050 residential units
- 276,074 s.f. retail GFA
- 767 hotel rooms



-
- 903,178 s.f. other GFA

Land use Vision

The purpose of the Comprehensive Plan for Arlington County (2004) is based on the following general principles:

- Retention of the predominantly residential character of the County, and limitation of intense development to limited and defined areas;
- Promotion of sound business, commercial and light industrial activities in designated areas appropriately related to residential neighborhoods;
- Development of governmental facilities which will promote efficiency of operation and optimum public safety and service, including the areas of health, welfare, culture and recreation;
- Provision of an adequate supply of water effectively distributed;
- Maintenance of sewage disposal standards consistent with the program of pollution abatement of the Potomac River;
- Provision of an adequate storm water drainage system; and
- Provision of an adequate system of traffic routes which is designed to form an integral part of the highway and transportation system of the County and region, assuring a safe, convenient flow of traffic, thereby facilitating economic and social interchange in the County.

An overarching theme of many of Arlington's initiatives, from land use to transportation to stormwater management, is that of sustainability and Smart Growth. In support of Arlington's overall policy goals, the following adopted land use goals and objectives have been incorporated into the Comprehensive Plan;

- Concentrate high density residential, commercial and office development within designated Metro Station Areas (MSA's) in the Rosslyn-Ballston and Jefferson Davis Metrorail transit corridors.
- The boundaries of the MSA's include all land within one-quarter mile of the Metrorail station entrance.
- Promote mixed-use development in Metro Station Areas to provide a balance of residential, shopping and employment opportunities.
- Create individual communities or urban villages so that residents can live, work, play, and shop without ever having to use their car.
- Dense development is clustered around Metrorail station entrances in a bulls-eye pattern with the tallest buildings adjacent to the station.
- Increase the supply of housing by encouraging construction of a variety of housing types and prices at a range of heights and densities in and near Metro Station Areas.
- Preserve and enhance existing single-family and apartment neighborhoods. Within Metro Station Areas, land use densities are concentrated near the Metro Station, tapering down to surrounding residential areas to limit the impacts of high-density development.
- Preserve and enhance neighborhood retail areas.



Other goals and objectives have been incorporated into the Comprehensive Plan through the years, including the provision of an adequate supply of beneficial open space and targets for affordable housing. Arlington County's Comprehensive Plan is currently comprised of the following nine elements:

- General Land Use Plan
- Master Transportation Plan
- Storm Water Master Plan
- Water Distribution System Master Plan
- Sanitary Sewer System Master Plan
- Recycling Program Implementation Plan and Map
- Chesapeake Bay Preservation Ordinance and Plan
- Public Spaces Master Plan
- Historic Preservation Master Plan

Current Zoning

General Zoning Districts

Arlington has 28 zoning districts, most of which allow some mixed-use. They include:

- 14 residential districts
 - Several of the residential districts are mixed apartment and commercial use districts including a mixed- hotel and multi-family district
- The Columbia Pike Form-based Code zone
- 13 Commercial zones of which eight are mixed use with a residential component
- A mixed-Use Virginia Square zone
- Three industrial zones
- One public services zone

Zoning Provisions of Note

- Form-based code for the Columbia Pike corridor which focuses on development form and density rather than uses
- Streetscape requirements in most zones
- Densities in terms of allowable FAR and Lot Coverage vary widely from a maximum of 25% to 53% lot coverage in the lowest density residential zones (1/2 acre lot minimum) to some zones that have no lot coverage limit but an FAR of 1.5 to as much as 10 (with site plan approved) and lot coverage up to 75% (with a special permit) in some of the special development zones. The general allowable by-right FAR in the zones around the metro station is 3.8 with increases for a development plan that provides all the features the County is looking for including some public infrastructure improvements.
- A new Lot Coverage provision to limit lot coverage – essentially to prevent “McMansion” style development and protect the character of some single-family residential zones.



TRANSPORTATION SYSTEM PROFILE

Transportation System

- Roadway Access – issues/ congestion – In recent history the Washington, DC area has ranked as one of the most congested in terms of traffic in the country. Arlington is accessed directly from I-395, Route 50/29, and U.S. 66.
- Transit – Arlington County has continued to promote improvements and expansion of the transit system in response to traffic congestion issues and its policy of enhancing both mobility and quality of life. The transit system had (as of 2005);
 - 12 miles of Metrorail (subway) lines and 11 stations
 - 18 major Metrobus route lines with about 100 individual route variations
 - A fleet of 30 ADA-accessible buses operated on 12 routes by Arlington County Transit (ART).
 - Virginia Railway Express (VRE), the publicly funded, commuter rail service connecting the communities in Northern Virginia with Washington, D.C. VRE operates commuter rail service on two lines with both lines serving stations in Arlington and Washington, D.C.
- Bicycle and Pedestrian Access – 87 miles of on-street biking lanes and 34 miles of paved off-road trails. On average, over two miles of new sidewalks as well as two miles of new bicycle lanes/routes are added each year. Also the County recently retimed 190 traffic signals to improve pedestrian crossing times with another 60 signals scheduled to be retimed in the coming year
- TDM – Arlington Transportation Partners works with employers to promote alternatives to single-occupancy work trips. Arlington County has been actively promoting car-sharing. The County has partnered with FlexCar and ZipCar for car-sharing vehicles and currently locates both types of vehicles at all Metrorail stations located within the county. The Metro area is also known for its informal 'slug lines' where commuters line up at key advertised locations and wait for willing drivers to pick them up and transport them to or from Washington, DC for work and so that drivers can take advantage of high-occupancy vehicle lanes on I-395. Arlington also has a Commuter Services program to support carpooling and vanpooling.

GROWTH MANAGEMENT TOOLS APPLIED

Land Use Regulation and Management/ Initiatives

Management

- An array of plans for every key community resource including
 - A Retail Action Plan





- An industrial land use and zoning study
- A 2007 build-out analysis
- A Master Transportation Plan with key elements for walking and bicycling
- A Parking task force that issued recommendations relating to a variety of parking and transportation initiatives including shared parking, on-street parking, and mass transit.
- Ongoing investment in bicycle lanes, sidewalks, and off-road paths
- A Lot Coverage Study to identify neighborhoods where the existing residential character needs preservation
- Neighborhood Conservation Plan where organized citizen groups can develop and implement a plan to address land use, zoning, traffic management, capital improvements, and parks in their neighborhoods.
- Commercial Revitalization Program to target commercial revitalization within existing commercial areas and also within neighborhoods.
- Comprehensive design guidelines including streetscape design guidelines for key roadway corridors
- Policy as well as zoning provisions to promote increased density at transit locations
- Arlington County landscape standards with a series of graphics depicting preferred design
- Tree preservation ordinance and tree replacement guidelines

Transportation System Management

Management

As noted above, Arlington County is heavily invested from a policy, regulatory, and investment perspective in promoting TDM and use of alternate modes of travel.

Initiatives

- Neighborhood Traffic Calming Program
- CommuterPage.com – sponsored by Arlington County, this web site provides transportation options for commuters in the Metro Area, as well as provides real-time traffic and mass transit information.
- Mobile commuter store – travels to transit stops and major employers within the county so commuters can purchase fare cards and view schedules.

Perceived Effectiveness

A recent study of the effects of the TOD focused planning and zoning in the County by the County planning department noted the following:





- When the planning process started, 89% of the land was zoned for low density use.
- Much of the by-right zoning remained low density, with options for greater density with a comprehensive site plan
- 73% of commuters who live within 1/2 mile of the transit stations walk to use transit
- EPA Smart Growth Award
- APTA Outstanding Transit System Award
- Arlington Square development received an award from the *Washington Business Journal* as the project with the greatest “community impact” for the creation of in the region, for the creation of live-work units and the inclusion of a major affordable housing component in this mixed-income redevelopment.

- The site plan allows significantly higher density & height than underlying zoning

<u>By-right</u>	<u>Site Plan</u>
1.5 FAR	3.8 – 10 FAR
35-45 FT	100-300 FT
4 spaces	2 spaces per
per 1,000 SF	per 1,000 SF



MEASURING SUCCESS

METRO RIDERSHIP (Average daily entries and exits)

1991

ROSSLYN

■ 13,637

COURT HOUSE

■ 5,561

CLARENDON

■ 2,964

BALLSTON

■ 9,482

2006

ROSSLYN

■ 31,662

COURT HOUSE

■ 14,199

CLARENDON

■ 8,190

BALLSTON

■ 24,150

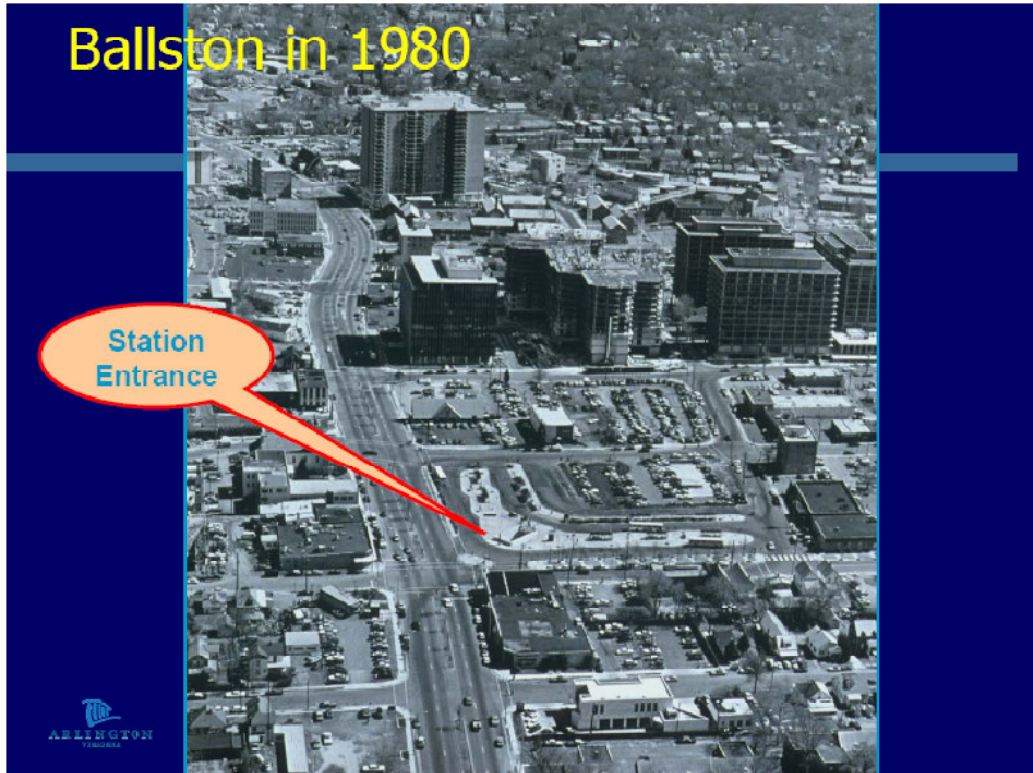


MEASURING SUCCESS

Traffic Trends on Arterial Streets

Street Segment	Street Type	1996	2001	2006	% Change 1996-2006
Lee Hwy - Rossllyn	EW 6-lane arterial	37,770	33,632	32,428	-14.1%
Wash. Blvd – VA Sq.	EW 4-lane arterial	20,469	19,478	18,069	-11.8%
Clarendon Blvd.	EW 2-lane 1-way arterial	13,980	14,199	14,539	4%
Wilson Blvd. - Clarendon	EW 2-lane 1-way arterial	16,368	16,265	13,797	-15.8%
Arlington Blvd.	EW 6-lane arterial	55,865	63,272	60,223	7.8%
Glebe Road - Ballston	NS 6-lane arterial	35,230	39,409	35,900	1.2%
G. Mason Drive – west of Ballston	NS 4-lane arterial	20,002	22,578	23,386	16.9%







**BUCKLAND AREA LAND USE STUDY
CASE STUDY FINDINGS SUMMARY SHEET**

CARY, NORTH CAROLINA

COMMUNITY PROFILE

Cary is the second largest municipality in Wake County, North Carolina . It is in the Raleigh-Durham metropolitan area and part of the Research Triangle Park area.

Development History Summary

Cary was founded in 1750 as a settlement called Bradford's Ordinary. About 100 years later, the construction of the North Carolina Railroad between New Bern and Hillsborough placed Bradford's Ordinary on a major transportation route. Frank Page bought 300 acres surrounding the railroad junction in 1854 and named his development Cary after a former Ohio congressman and prohibitionist he admired. The Town of Cary was incorporated on April 6, 1871. In 1879, the Raleigh and Augusta Air-Line Railroad (now CSX Transportation) arrived in Cary from the southwest, creating Fetner Junction just north of downtown and spurring further growth.

Growth in Cary has been influenced over the past 50 years by its proximity to Research Triangle Park (RTP). RTP was established in January 1959. It is a complex of research and development buildings where educators, researchers, and businesses come together to collaborate. The vision was to provide a ready physical infrastructure that would attract research oriented companies and stimulate economic growth. Since it was established, the Park has witnessed a steady increase in the number of companies and employees. Currently, there are more than 160 research and development related organizations in RTP. The original parcel of land that made up RTP in 1959 consisted of 4,400 acres. Through the years, the Foundation acquired more land, totaling 6,971 acres presently. In the same period, the Park's developed space has increased from 200,000 square feet in 1960 to more than 24.5 million square feet in 2007.

The 2003 comprehensive plan described Cary as located at the heart of the Triangle region, with an economy highly interconnected with the Raleigh-Durham-Chapel Hill Metropolitan Area. Northern Cary borders the RTP and the Raleigh-Durham International Airport (RDU), two major employment generators. The proximity of RTP and RDU places Cary in a favorable position to receive supporting and spin-off high technology and service industry and offices. Cary also serves as a convenient residential location for many employees of businesses and industries located within or in close proximity to RTP.

In the early years Cary adopted zoning and other ordinances on an ad-hoc basis to control growth and give the city structure. Beginning in 1971, the town adopted Planned Unit Development (PUD) zoning as the primary mechanism to accommodate residential expansion related to the growth of Research Triangle Park nearby. Kildaire Farms, a 967-acre development in Cary was North Carolina's first PUD. It was developed on the former Pine State Dairy Farm.

Recent initiatives (listed below) in Cary have included a program to conserve drinking water by reclaiming treated wastewater for irrigation and industrial processes, new





transit connections, and pro-active development of an extensive pedestrian and bicycle path network

Cary's website notes that *"The January 2004 issue of Money Magazine names Cary, N.C. the hottest town in the East and one of six Hottest Towns in America. In August 2006, Cary was again recognized by Money Magazine as one of the Best Small Cities in America, ranking fifth on the magazine's 2006 list of Best Places to Live."*

Quick Facts

- Population – 1990 -43,858; 2000 - 94,536; 2006 – 117,442; 2008 – 127,640
- 35% population growth 2000-2008
- Cary is the second largest municipality in Wake County, North Carolina and the third largest municipality in The Triangle behind Raleigh and Durham
- Median age - 34
- Housing units – 2006 -36,863
- Median Household Income - \$80,896
- Distance to Raleigh – 8 miles

Current Land Use

- **Mix** - The largest type of construction in Cary over the past 20 years (1988-2002) has been residential, with the greater portion of this development coming as single-family detached housing. Cary has some large lot zoning that includes 5 acre lots. However, more recently there has been an upsurge in multi-family housing development and it appears likely that this type of housing will continue to provide a more affordable housing option. In addition to residential development, Cary has also seen the construction of a number of office parks, with a number of corporate headquarters choosing to locate in the Town. Significant retail and commercial growth is also taking place, with approximately three million square feet of shopping center space approved for construction since 1970.
- A number of regionally significant recreational opportunities are also accessible from Cary. Most notable, the B. Everett Jordan Reservoir, a U.S. Army Corps of Engineers (COE) multi-use facility, and the surrounding COE lands provide opportunities for swimming, boating, camping and hiking.
- **Density** – A land supply analysis in the 2003 comprehensive plan documents Cary as having 24,228 acres within its municipal limits [The Town does have some extra-territorial limits or annexed area]. At a 2008 population of 127,640, this translates to 5.3 persons per acre. As of 2003, Cary had an estimated 16,890 acres of developable land supply.
 - The comprehensive plan defines density by development form:
 - **Neighborhoods** are contiguous areas, usually containing approximately 600 to 1,500 dwellings, or about 1,500 to 3,500 people. A **neighborhood activity center** (NAC) should provide the commercial and institutional uses necessary to support the common day-to-day demands of the surrounding neighborhood for goods, services, and facilities. Based on observations and research, NACs will likely contain plus or minus 250,000 square



feet of non-residential floor space. As a guide the Town would normally be looking to achieve roughly equal parts of commercial and office/institutional uses at a center, and at least 1 multifamily unit per 1,000 square feet of non-residential floor space.

- A **Community** is a collection of approximately 3-5 adjacent neighborhoods, with a total population of about 10,000 to 20,000 people, or about 2,000 to 7,000 dwellings. A **community activity center** (CAC) includes the typical mix of commercial, office, and institutional uses and facilities offered by a neighborhood activity center. Additionally it includes commercial and institutional uses that provide goods, services, and facilities which are demanded less frequently than on a daily basis by the surrounding community as a guide based on observations, CACs will likely contain plus or minus 500,000 square feet of non-residential floor space. The Town would normally be looking to achieve roughly equal parts of commercial and office/institutional uses at a center and at least 1 multifamily unit per 1,000 square feet of non-residential floor space.
- A **Region** is made up of a collection of adjacent communities, providing a total population of approximately 80,000 to 150,000 people. A **regional activity center** (RAC) provides the nonresidential elements intended to provide goods, services, and facilities which are demanded less frequently than on a daily basis by the surrounding region. As a guide based on observations, RACs will likely contain plus or minus 1,500,000 square feet of non-residential floor space. As a guide the Town would normally be looking to achieve roughly equal parts of commercial, office/institutional uses at a center and at least 1 multifamily unit per 1,000 square feet of non-residential floor space.
- All activity centers, which are the focus of the comprehensive plan, are considered in one of three basic stages of development: **Greenfield** – no urban/suburban development has yet occurred within the boundaries of the activity center; **Partially Built** – some urban/suburban development of the activity center has already occurred, however there is still some remaining vacant or rural tracts within the boundaries of the activity center. Typically, the shopping center portion has at least been built, or is under construction or has an approved site plan; **Fully Built** – all parcels/lots within the boundaries of the activity center have already been built at urban/suburban intensities. The recommended spacing of the activity centers as excerpted from the comprehensive land use plan is as follows.



Table 6.1 Recommended New Center Spacing

	Neighborhood Activity Center (NAC)	Community Activity Center (CAC)	Regional Activity Center (RAC)
Population Served:	Plus or minus 5,000	Plus or minus 20,000	80,000 to 200,000
Service Radius:	5 minutes drive	10 minutes drive	15 to 30 minutes drive
Minimum Separation from Neighborhood Activity Centers:	0.75 to 1 miles	1 to 1.5 miles	1 to 1.5 miles
Minimum Separation from Community Activity Centers:	1 to 1.5 miles	2 to 3 miles	2 to 3 miles
Minimum Separation from Regional Activity Centers:	1 to 1.5 miles	2 to 3 miles	5 to 6 miles

Table 6.1 Recommended New Center Spacing

- Zoning allowances
 - Allowable density in units per acre range from 0.54 (R-80 zone) to 50 in the Town Center high density mixed-use area
 - Cary does not use any measures of non-residential density – they rely on setbacks, height limits and other factors such as parking to determine densities. Setbacks range from 10 to 50 feet. The maximum height limits set forth above may be increased by one foot for every foot provided in addition to the minimum setbacks.
 - For mixed-use zones, they require 1/3 commercial, 1/3 office and 1/3 residential.
 - The residential units must be at a ratio of at least 1 unit per 1,000 gross square feet of non-residential development.

Land Use Vision

The 2003 Cary Land Use Plan and Future Land Use map feature the following:

1. A very strong emphasis on urban design.
2. A great deal of flexibility in the arrangement of future land uses, while still avoiding strip development and promoting a pedestrian- and transit-friendly community.
3. Strip development is avoided by encouraging the creation of a number of “*activity centers*”, at certain locations throughout Cary. Activity centers are intended to be mixed-use nodes, having commercial, office, institutional, and high-density residential uses clustered together in a pedestrian-friendly, village-like manner.





4. Very strong guidance for the development of Cary's roads, sidewalks, and bikeways. The Plan as encourages a higher degree of connectivity for roadways and pedestrian and bicycle paths.
5. The design and landscaping of roadways is also addressed by the Plan. It recognizes that roadways serve many functions in addition to the movement of traffic.
6. Strong support for transit-friendly development. Notably, the Plan states strong support for the planned Regional Rail System for the Triangle area.
7. Reserves prime employment areas for future office and industrial development.

Land Supply and Demand Analysis/Long Range Plan

The 2003 Cary long range plan contains an interesting analysis of land supply and demand. It develops ratios of land use by category to population. Then, by modifying the amount of land in different uses, most notably higher density housing, it calculates how much population the town can support with a different land use mix. The analysis also compares a compact, higher density land use scenario with the future land use map. The future land use map was developed based on the community vision and related land use goals, such as open space preservation. The interesting observation was that twice as much land appears on the future land use map for office/industrial use as the land use demand analysis predicted would be needed.

Current Zoning

The Land Development Ordinance (LDO) regulates how land may be developed within Cary and its planning jurisdiction. The ordinance controls zoning, subdivision of land, building appearance, landscaping, signs, parking, and other aspects of development.



TABLE 4.1-1: GENERAL ZONING DISTRICTS ESTABLISHED		
	Abbreviation	District Name
<u>Residential</u> Districts	R-80	<u>Residential</u> District
	R-40	<u>Residential</u> District
	R-20	<u>Residential</u> District
	R-12	<u>Residential</u> District
	R-8	<u>Residential</u> District
	TR	Transitional <u>Residential</u> District
	RMF	Multi- <u>Family Residential</u> District
<u>Non-Residential</u> Districts	RR	Resource/Recreation District
	OI	<u>Office</u> and Institutional District
	GC	General Commercial District
	CT	Corridor Transitional District
	ORD	<u>Office/Research and Development</u> District
	I	Industrial District
	TC	<u>Town</u> Center District
<u>Planned Development</u> Districts	PDD (Minor)	Minor <u>Planned Development</u> District
	PDD (Major)	Major <u>Planned Development</u> District

Zoning Provisions of Note

- Pre-application review conference – some required depending on application type
- Application must include mixed-use sketch plan
- Requirement for a tree-clearing certificate
- Buffer requirements include a streetscape protection zone
- Requirements for an Adequate Public Facilities Certificate (i.e. roads) – applicants may get credits or re-imburements for qualifying transportation system improvements
- Transitional Residential District - The TR district is established as a district in which the principal use of land is for a variety of residential uses, with the exception of multi-family structures. This district is appropriate for infill developments smaller than ten acres in established neighborhoods, for denser residential neighborhoods, and for areas identified for medium-density residential uses in the Town's Land Use Plan
- Corridor Transitional District
 - *Purpose*; The CT district addresses concerns unique to areas when other zoning districts cannot achieve the desired results. This district addresses the needs of specific areas defined in the Comprehensive Plan, special plans, or studies. They may be applied for some or all of the following reasons:
 - To provide buffering and compatible land uses between residential areas and thoroughfares, where the residential character of an area has changed or is changing or may be subject to development pressure;



- To facilitate development solutions that will enhance area character, address existing deficiencies and provide benefits to the area and/or community; and
 - To provide opportunities for consolidation of properties to encourage and permit unified planning and compatibility of uses within the districts and the existing and anticipated development in the surrounding area. They also provide a means to ensure that the land uses permitted by the existing zoning on adjacent properties are not negatively impacted by the uses permitted in CT districts.
- *Establishment*; A CT district shall not be established until a neighborhood plan, a corridor plan, or an area plan is completed for the area encompassed by the district. A CT district may be established if all the following criteria are met:
- The area proposed for the CT district has special characteristics or problems of a natural, economic, historic, public facility, or transitional land use or development nature which are not common to other areas of the Town;
 - Existing general use districts are inadequate to achieve a desired public benefit or to address an identified problem in the area;
 - The proposed CT district and standards are the result of a study and plan documenting the special characteristics or problems of the area and describing how a CT district will best address the relevant issues; and
 - The standards of the CT district are in conformance with the comprehensive plan, or there is a determination that the comprehensive plan should be amended to reflect the proposed standards
- Two types of Planned Development Districts – Major (25 acres or more) and Minor (less than 25 acres)
- Several overlay districts – Mixed-use; Conservation Residential; Thoroughfare; Airport; Watershed Protection
- The intent of the Mixed Use Overlay District is to recognize existing and encourage the establishment of new “mixed use centers”, which are higher-density, mixed-use development nodes of varying sizes, as an alternative to lower-density separate-use suburban sprawl-type development. The intensity, amount, and size of development within the Mixed Use Overlay District are based on three types of the center designations used on the Land Use Plan Map and Zoning Map; there is a mixed-use sketch plan approval process as part of the overlay application
 - There are 7 design principles that must be met for site development plan
 - The Conservation Residential includes density bonuses for clustering
 - The purpose of the Thoroughfare Overlay is to provide orderly development along controlled/limited access highways, to encourage the most appropriate use of adjacent lands, to maintain the scenic natural beauty of the area, and to promote the safe and efficient movement of traffic. The Thoroughfare Overlay is established along both sides of existing and planned controlled/limited access highways within the Town's jurisdiction. The



overlay requirements focus on buffers and maintaining streetscaping/existing vegetation

- Standards for bicycle parking, shared parking, parking alternatives, off-site parking
- Requirements for connectivity – transportation system

Transportation System

- Roadway Access – issues/ congestion
 - Primary Highway Routes - Interstate 40 ; US 1 ; US 64 ; State Highway 54 ; State Highway 55
 - Ongoing roadway widening and signalizations projects are planned to respond to congestion
 - Transportation Development Fees – Cary has a system in place to collect fees from developers to help pay for the impacts new development will have on public infrastructure, such as roads; Adequate Public Facilities Ordinance
 - Development of Cary's thoroughfare system is guided by the Town's long-range Thoroughfare Plan. The Thoroughfare Plan is developed in cooperation with the Capital Area Metropolitan Planning Organization (CAMPO) and with the N.C. Department of Transportation. The Town's Thoroughfare Plan consists of north-south as well as east-west arterials. These major roads are augmented by loop thoroughfares
 - The proposed alignment of the Outer Wake Expressway will serve as a multi-lane, limited access beltway for Wake County, with the City of Raleigh as its focal point. The 2003 comprehensive plan states that the Town should work with NCDOT to ensure that adequate connections for roadways, greenways, pedestrian paths, and other transportation routes are provided between the areas on the western and eastern sides of the expressway, via under- and overpasses and other crossovers.
- Transit - Public transit within the town is provided by C-Tran. There are three fixed-routes: North-South, East-West and the Maynard Loop. There is also a door-to-door service for the elderly (55+) and riders with disabilities. Triangle Transit operates fixed-route buses that serve the metropolitan region and connect to the local municipal transit systems in Raleigh, Durham and Chapel Hill. Amtrak's Silver Star, Carolinian and Piedmont passenger trains stop at the Cary (Amtrak station). They offer service to Charlotte, New York City, Miami, and intermediate points. Regional Transit links include:
 - Triangle Transit Authority
 - Capital Area Transit
 - Durham Area Transit Authority
 - Chapel Hill Transit
 - NCSU Wolfline
 - Wake Technical Community College Shuttle



The Triangle Transit Authority (TTA) regional transit plan proposes development of a heavy-rail transit system that will connect urban and employment centers within the Triangle area. As presently configured this plan calls for development of one transit station in downtown Cary. Other nearby transit stations have been proposed and development of this system is expected to ease congestion on some Cary entranceways by providing citizens with an alternate method of getting to and from work.

- Bicycle and Pedestrian Access - The League of American Bicyclists awarded Cary one of the first *Bicycle-Friendly Community* awards for "providing safe accommodation and facilities for bicyclists and encouraging residents to bike for transportation and recreation". The Cary Greenways and Trails organization maintains a network of sidewalks and paved trails connecting neighborhoods and parks throughout town. These greenways place strict requirements on environmental conditions to preserve a park-like atmosphere. In addition, standard sidewalks and paths exist throughout the city.

GROWTH MANAGEMENT TOOLS APPLIED

Land Use Planning and Initiatives

Cary's growth management starts with the way in which the future land use plan organizes land use and establishes objectives, specific criteria, and guidelines for different categories of development form. The 2003 plan's land uses fall into six major categories:

- Activity Centers: Neighborhood, Community, and Regional Activity Centers
- Office Parks and Office & Industrial Parks
- Nonresidential Uses not in Activity Centers or Office/Industrial Parks: Commercial, Office/Institutional, and Office/Industrial
- Residential Elements: Very Low-, Low-, Medium-, and High-Density Residential, and Traditional Neighborhood Development (TND)
- Parks, Greenways, Conservation Corridors, and Open Spaces
- Special Opportunity Sites (SOS)

The plan's strategy is based on tackling the land use plan via sub-areas and then based on an urban model in which small pieces, or *neighborhoods*, fit together to form medium-sized pieces, or *communities*, and adjoining communities are fitted together to form *regions*. **Activity centers** contain the shopping, services, recreation, and office and institutional facilities needed to support their neighborhood, community, or region, respectively. Thus, there are three different types of activity centers, **neighborhood**, **community**, and **regional**. They are similar in spatial arrangement and function, but vary in terms of their scale and intensity, with the neighborhood center being the smallest and least intense of the three, and the regional center being the largest and most intense. The Plan then spells out policies and guidelines for development in both existing and targeted or 'Greenfield' activity centers by type. Thus, there are guidelines for infill and redevelopment as well as "Greenfield" development. The plan also lays out a recommended spacing for new activity centers. It then lists the elements that an ideal



activity center should have. An excerpt of the plan's 'elements' table relative to these guidelines is provided below.

“Definition: *Activity centers are physically and aesthetically unified, concentrated mixed-use areas containing commercial, office, institutional, and high- and medium-density residential uses, arranged in a walkable, compact, pedestrian- and transit-friendly manner. All elements and land uses are designed to function as an integrated whole (rather than as a series of unconnected, unrelated developments). They are focal points for the surrounding neighborhood and community, and should have a strong sense of identity.”*

Generally, small activity centers are clustered around major roadway intersections



Table 6.2 Expected Center Elements

<i>Category</i>	<i>Expected Center Elements</i>
<i>Spacing</i>	New activity centers will normally be spaced in accordance with the spacing guidelines of this plan. (See Table 6.1.)
<i>Mixing</i>	<p>Activity centers are appropriate locations for a concentrated mix of uses. Commercial, office, and high-density residential uses, at a minimum, should all be represented in the center.</p> <p>As a guide the Town will normally be looking to achieve roughly equal parts of commercial and office/institutional uses at a center and at least 1 multifamily unit per 1,000 square feet of non-residential floorspace.</p>
	Land uses or activities may be placed adjacent to one another, or on different floors of the same building, such as dwellings over shops. Such mixing of land uses encourages a compact and pedestrian-oriented center.
	Activity centers are often located around arterial intersections, and are thus generally divided into quadrants by the intersection roadways. They might also be located mid-block along an arterial. The design and layout of buildings, uses, and site elements on each quadrant should provide short, safe and convenient pedestrian and bicycle links between buildings on one quadrant and those on the other quadrants. Where this proves unfeasible, a mix of commercial and or office, and supportive higher-density residential uses should be provided on the same quadrant or same side of an arterial.
<i>Residential Density</i>	Centers should include high or high and medium density residential uses.
	For new greenfield centers housing densities should progressively decrease outward from the center boundary in order to transition with adjoining neighborhoods. (See Figure 6.1)
<i>Low-density residential Use</i>	Except in existing centers, low density residential uses will normally not be allowed. In such cases it will normally be restricted to locations where it can be used as a transition to existing single family neighborhoods adjoining the center.

It is also notable that the 2003 comprehensive plan includes an entire chapter dedicated to design guidelines for Cary.



Initiatives

- Affordable Housing Initiative
- 2001 Town Center Plan implementation
- Carpenter Community Plan
- Chatham/Cary Joint Land Use Plan Cross Connection Control
- Facade Improvement Program
- Healthy Neighborhoods Initiative
- Low Impact Development Pilot Project
- Northwest Cary Area Plan
- Open Space plan implementation
- Public Art Master Plan – includes an Artist Registry and Imagebank
- Picture Downtown - Currently preparing a comprehensive package of graphics that will illustrate the long-range downtown development vision of Cary's adopted downtown master plan
- Reclaiming Water for Irrigation
- Town Center Civic & Cultural Arts Study

Zoning Tools

- Adequate public facilities ordinance
- Mixed-use districts and overlays linked to the comprehensive plan
- Requirements for connectivity – transportation system
- Transportation development fees

Transportation system

Initiatives

- Annie L. Jones Park and Greenway Renovation
- Black Creek Greenway Realignment
- Bond Park Trails Master Plan
- Downtown Cary Streetscape Project
- Downtown Parking Strategic Implementation Plan
- Green Level Stream Restoration and Greenway project
- Green Level Historic District Preservation Initiative
- Sidewalks - Each year the Town establishes a priority list of locations for annual sidewalk projects that have been requested by citizens and the Police Department.
- Southeast Area Plan; Southeast Planning Activities
- Southwest Area Plan
- Traffic Calming
- US 1/64 Greenway Project ; US 1/64 Pedestrian Greenway Bridge
- White Oak Creek Greenway; White Oak Stream Restoration and Greenway Project



Perceived Effectiveness

The Cary Planning office (telephone interview 7-14-2008) says indications are that the development patterns as envisioned are emerging and are working very well. Initially, those living in residential neighborhoods near the intersections targeted to be activity centers were skeptical and worried about more traffic. Over time, there has been less resistance, as most residents are finding they have easier access to neighborhood services and shopping with the node-like development clusters. Many more people can walk to the grocery store or pharmacy, and so the traffic concerns have become less pressing. Local developers have been very enthusiastic about the development opportunities the activity centers concept allows. They like the specificity of the design guidelines which also allow them to maximize their use of their land. Cary has not gathered any statistics on impacts to congestion. Most of their findings are anecdotal. But, they feel that the emphasis on connectivity as a design principle has gone a long way to offsetting some vehicle trips by guaranteeing each development will incorporate access by other modes connected to other like facilities elsewhere. The planner noted however, it seems most bicycle commuters prefer to use the roads as opposed to trails to travel by bicycle. In addition, the transit system has not grown as quickly as the community. Commuters to other employment centers like RTP still need to use their own cars, predominantly. The Cary area does have the website and GIS based commuter service – eRideShare.com – which allows riders to connect with drivers and vice versa using an online service that connects people geographically by origin and destination.



**BUCKLAND AREA LAND USE STUDY
CASE STUDY FINDINGS SUMMARY SHEET**

HENDERSON, NEVADA

COMMUNITY PROFILE

Henderson is a suburb in Clark County, Nevada, adjacent and southeast of the Las Vegas metropolitan area.

Development History Summary

The township of Henderson emerged in the 1940s to supply the country with magnesium during World War II for munitions and airplane parts. By 1947, magnesium production was no longer necessary for defense and most of the factory employees moved away. In that year the United States War Asset Administration actually offered Henderson for sale as war surplus property. In an effort to save the city, the Nevada Legislature unanimously approved a bill giving the Colorado River Commission of Nevada the authority to purchase the industrial plants.

The City of Henderson was incorporated in 1953 with a population of 7,410. It was about 13 square miles in size. In 1988, the [PepCon](#) rocket fuel factory, the largest local employer, became engulfed in fire. The entire site was destroyed. The explosion and political and economic consequences spurred the development of Henderson from industrial to the largely residential area it is today. There are now numerous master-planned residential areas in Henderson. There are no remaining signs of the PepCon facility today, and the site now consists mostly of office buildings.

As Las Vegas and the overall region has grown, an increasing number of major shopping malls, movie theater complexes, restaurants and casino resorts have been built in Henderson. The City also boasts the largest recreational facility – the Multigenerational Facility at Liberty Pointe – in Nevada as well as Nevada's only scenic Bird Preserve. Henderson is located just a few miles from McCarran International Airport. Henderson Executive Airport was recently acquired by Clark County and is planned for major renovation and development as a reliever airport to McCarran.

Quick Facts

- Population – 265,790 as of July, 2007: In 2000, the city had a population of 175,381, so it has grown by almost 52% in 8 years.
- Area – 94.4 square miles as of 2006 [None of it is covered by water]
- Median age in 2000 – 36 years old – with an average household size of 2.7 people
- Housing units – In 2000, there were 71,149 housing units at an average density of 892.8 units per square mile or 1.4 units per acre
- Median Household Income – In 2000, the median household income was \$61,176
- Distance to Las Vegas – 16 miles



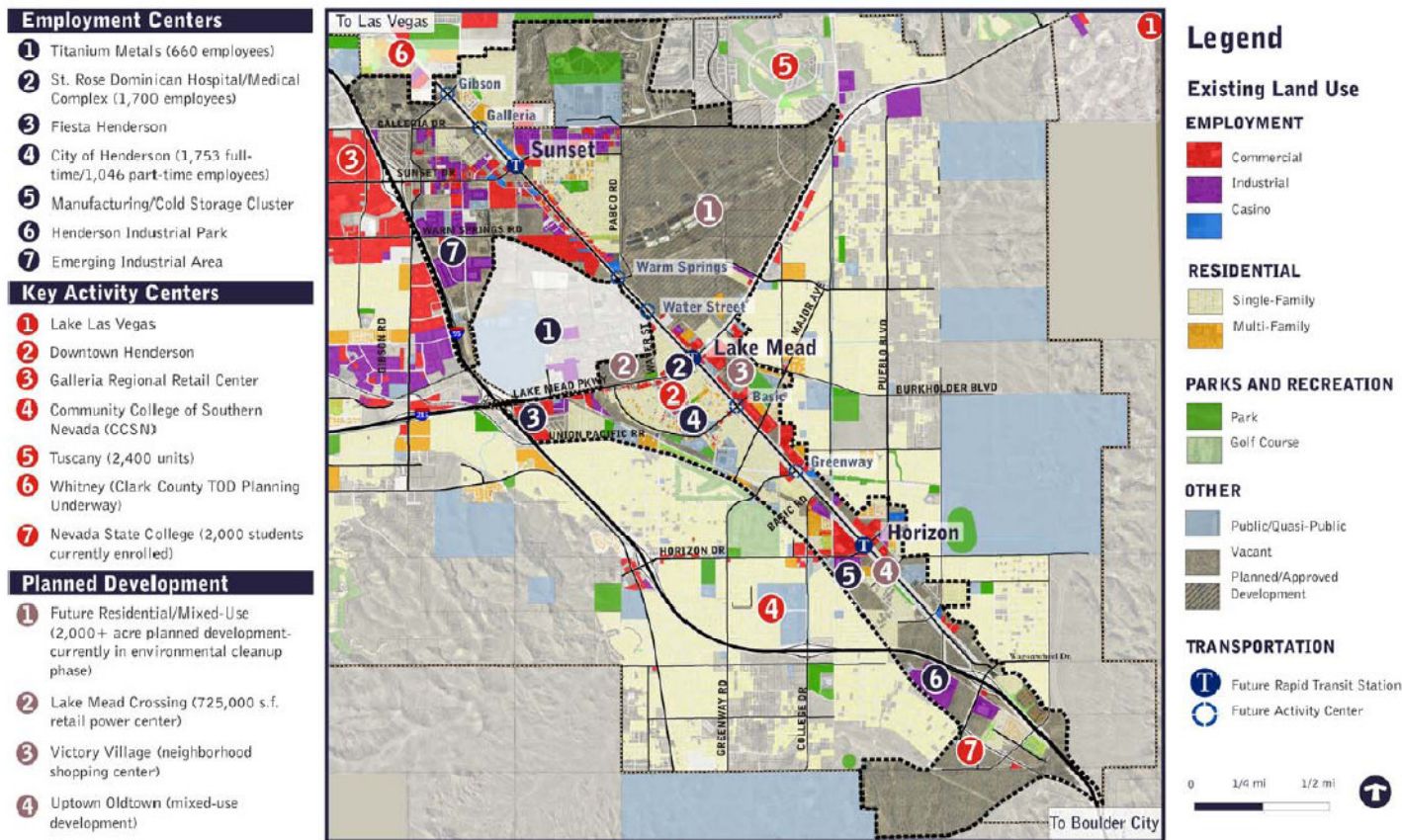


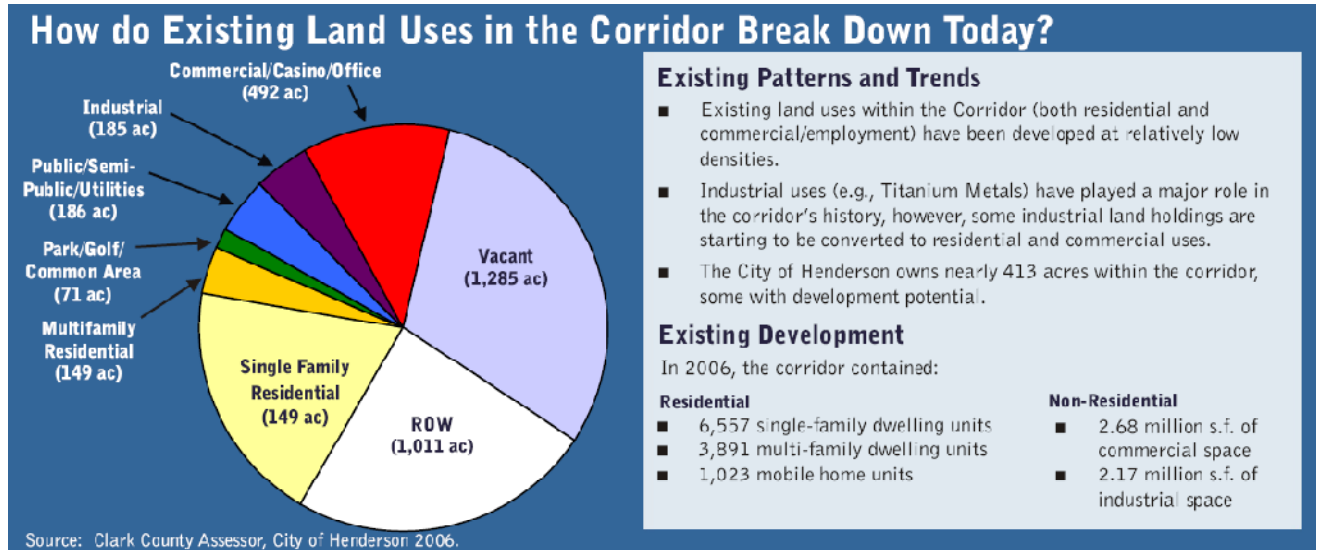
LAND USE PROFILE

Current Land Use

- Mix – See map from Boulder Corridor Investment Strategy Plan below; the Boulder Corridor represents central Henderson and the mix of uses typical in Henderson today. The red represents commercial clusters while the white represents single-family residential.

FIGURE 5: CURRENT AND PLANNED CENTERS OF ACTIVITY





- Density** – In 2000, there was an average density of 1.4 units per acre in Henderson. The zoning regulations allow a range of densities with allowable lot coverage for non-residential uses of 35% up to 100% in the Mixed-Use Commercial zone. Although there is an average 40 foot height limit, hotels, timeshares, and casinos allowed in the Tourist Commercial district can be up to 100 feet in height. Residential densities range from 1 unit per acre in the low-density category to 36 units per gross acre for high-intensity multi-family residential. Densities for the commercial zones is as follows:

Site Development Standard	Zoning District: CN	Zoning District: CO	Zoning District: CC	Zoning District: CH	Zoning District: CT	Zoning District: CA	Zoning District: CM
Maximum Height (feet)	35	50	50	40	40	40	60
Maximum Lot Coverage (percentage)	35	40	35	40	30	40	100

- Growth Issues** - The City of Henderson has been among the fastest growing cities in the nation, averaging nearly 12,000 new residents per year since 1990. Forecasts predict that this trend will continue for at least the next several years based on the availability of vacant land and the uses planned for that land. Since July 1, 2002, there have been on average 400 new dwelling units a month built to support this growth. In a 2006 resident survey, 22 percent of respondents felt that managing growth and development was the most important issue facing Henderson residents.

It should be noted that the City of Henderson is a pro-growth community; it is very accepting of growth and development as long as it adheres the standards and policies set forth in the City's master plan and does not detract from the overall quality of life residents have become accustomed to. Additionally, since 87 percent of the land in Nevada is federal land, the City of Henderson and



surrounding communities cannot expand past the Bureau of Land Management's (BLM) land disposal boundary.

Land use Vision

"We envision our city as a fully integrated, progressive, and engaged community of citizens and neighborhoods enjoying premier amenities, services, and opportunities." (City of Henderson Comprehensive Plan, Clarion Associates, February 2006)

Fundamental themes and principles articulated in the 2006 Comprehensive Plan include (excerpt - quote):

- *Balanced land use* - Henderson will build community through a pattern of Balanced Land Uses.
- *Quality development* - The City of Henderson is well known for its high quality master planned communities, exemplary parks, and first-rate civic facilities and services. By emphasizing quality development, the city will foster creativity and variety in development projects, promote stable neighborhoods that retain their quality over time, create beautiful public places within our city. Good design also adds economic value to neighborhoods and commercial areas and contributes to reinvestment.
- *Integrated desert environment* - Much of the natural environment has been paved or lost as the Las Vegas Valley has developed. The city wants to curb this trend and find ways to integrate the desert such that natural landscapes weave through the built environment to add beauty, provide wildlife corridors and habitat for birds, and to give our community a unique image and closer identity with our desert environment.
- *Connected places* - In a connected community, the transportation system is designed in such a way that alternatives to automobile use are possible, and vehicular congestion throughout the community is minimized. Public transit is designed so citizens find it convenient and feel safe and comfortable using it. Connectivity also provides a means of linking neighborhoods and places to one another, and to open spaces, bike trails, to other desirable recreational/outdoor places, and to transit.
- *Arts and culture* - To build a stronger community, all citizens should have new opportunities for creative involvement, play, and cultural exchange.

Current Zoning

The Henderson Development Code (HDC) constitutes the zoning regulations for Henderson. It is notable that the statement of overall purposes for the code includes the intent to (among other more common things):

- Preserve the character and quality of residential neighborhoods;
- Foster convenient, compatible, and efficient relationships among land uses;
- Promote the economic stability of existing land uses that are consistent with the comprehensive plan and protect them from intrusions by incompatible land uses;
- Prevent excessive population densities and overcrowding of land or buildings;



- Ensure that service demands of new development will not exceed the capacities of existing streets, utilities or other public facilities and services;
- Encourage the improved design and effective use of the built environment through the use of CPTED (crime prevention through environmental design) principles for the purpose of reducing the fear and incidence of crime, and to improve the quality of life;

The regulations are quite complex, with an emphasis on site design criteria for mixed-use projects and projects of ‘significant impact’. A project of significant impact means “a development project resulting in 500 or more dwelling units, 300 or more hotel rooms, nonresidential development on 160 or more acres, or commercial/industrial development generating over 3,000 average daily vehicle trips.”

General Zoning Districts

Henderson zoning has;

- Four types of residential districts, with a maximum density for high-density multi-family residential of 63 units per acre
- Seven types of commercial districts, all of which allow some mix of uses, but not necessarily including residential other than caretaker’s quarters – including
 - CN, Neighborhood Commercial District
 - CO, Commercial Office District.
 - CC, Community Commercial District. To provide sites for community and regional retail shopping centers The CC district is most appropriate along Boulder Highway, Lake Mead Parkway, and other locations adjacent to the intersection of two arterials
 - CH, Highway Commercial District; To provide sites for auto-oriented commercial uses
 - CT, Tourist Commercial District. To provide sites for visitor-oriented uses, including casinos
 - CA, Auto Mall Commercial.
 - CM, Mixed-Use Commercial. To provide sites for a mixture of residential uses with commercial, office, research and development, and/or public uses. All mixed-use projects must include a residential as well as non-residential component in which the residential uses are intended to complement the non-residential uses and create a pedestrian-friendly environment with decreased reliance on individual vehicles.
- Three types of industrial districts
- A Public and Semi-Public use overlay district – for a diversity of large scale uses including airports and heliports
- Six ‘Downtown’ districts including:
 - DRL, Downtown Low-Density Residential District; to preserve the general character of existing residential development in downtown neighborhoods, while encouraging compatible infill development and redevelopment.
 - DRM, Downtown Medium-Density Residential District; to encourage a greater mix of housing types in the downtown area by allowing single-family attached homes on individual small lots. .



- DRH, Downtown High-Density Residential District; to provide opportunities for high-density residential uses, including apartments or condominiums.
- DCC, Downtown Core Commercial District; to create an attractive, pedestrian-oriented environment that functions as the shopping, office, arts and entertainment center of downtown.
- DHC, Downtown Highway Commercial District; to create an inviting gateway to downtown that transitions from auto-oriented uses on Lake Mead Parkway and Boulder Highway to the more pedestrian-oriented downtown core commercial district by consolidating smaller lots and providing access from arterial streets.
- DP, Downtown Public District; to provide an attractive, functional arts and entertainment hub, government services, recreational opportunities
- 13 overlay zones including a master plan overlay and an ‘efficiency-lot’ overlay
 - The specific purposes of the MP, master plan overlay district are to (quote):
 - Ensure orderly planning for the development of large, unsubdivided parcels of the city within limited service areas, and in other developing areas, consistent with the comprehensive plan;
 - Maintain an environmental “equilibrium” consistent with existing vegetation, soils, geology, topography and drainage patterns, and protect sensitive natural resources;
 - Avoid premature or inappropriate development that would result in incompatible uses or create public service demands or traffic exceeding the capacity of existing or planned facilities;
 - Encourage innovative and sensitive site planning and design with high levels of landscaping and other site amenities;
 - Ensure adequate provision of open space, recreational facilities, and other community amenities;
 - Encourage high-quality structures in terms of design, materials and layout;
 - Ensure that transportation links are maintained and enhanced with adjacent developments and other areas in the city;
 - Implement the center’s concept as recommended in the 1996 Henderson comprehensive plan;
 - Accommodate neo-traditional (traditional neighborhood development) designs
 - The efficiency lot overlay is intended to allow for very small lots and clustering offset with open space. Lots can be as small as 4,000 square feet. It is also intended to encourage sensitive site planning and design in a manner that utilizes transitional housing densities of 6 to 10 units per acre as buffering developments between land uses of greater and/or lesser intensity

Zoning Provisions of Note

- The City has a series of checklists and fact sheets to help development applicants understand and meet the design requirements.





- In the Mixed-use Commercial (CM) zone, Design Themes are specified. Proposed developments must incorporate the following design themes into a mixed-use project.
 - (1) Flexibility; Mixing of retail, office, residential, research and development and other public uses within the site, location of uses within the buildings, providing live/work units.
 - (2) Connectivity/Integration.
 - (a) Pedestrian connections;
 - (b) Transit connections.
 - (3) Context Sensitivity/Recognition. Project shall be sensitive to existing developments with respect to, but not limited to the following:
 - (a) Height; No blank wall area or façade shall exceed 30 feet in horizontal or vertical direction.
 - (b) Density;
 - (c) Scale;
 - (d) Character.
 - (4) Design. The project design shall address the following design elements. These elements shall be incorporated into the design of the project site:
 - (a) Site design;
 - (b) Building design;
 - (c) Ground level uses;
 - (d) Treatment adjacent to single-family residential;
 - (e) Parking;
 - (f) Parking alternatives.
 - (5) Pedestrian Realm. Project is encouraged with short blocks, wide sidewalks, controlled vehicular movements, provide areas for outdoor activities:
 - (a) Pedestrian realm improvements;
 - (b) Automobile movement control;
 - (c) On-site pedestrian crossings.
 - (6) Proximity to Transit.
 - (a) Parking may be reduced when project site is located within one quarter to one half mile of transit station or on existing transit route;
 - (b) Where required, projects shall provide direct access to trail corridors;
 - (c) Pedestrian access plan.
 - (7) Proximity to Services.
 - (8) Amenities. Project shall provide active and passive amenities for residential units.
 - (9) Urban/Suburban Experience.
- Site Design – Any project in the CM zone must be designed to be sensitive to adjacent developments. Projects are encouraged to provide elements such as common gathering spaces, and outdoor dining opportunities.
- Buildings at intersections are encouraged to provide strong corner entrance elements. Balconies, trellises and covered walkways must be utilized within on-site parking areas.
- Projects must provide strong pedestrian connections from the perimeter street network, as well as pedestrian connections to adjacent developments.



- Buildings have to be of a pedestrian scale and oriented to the streets. Balconies, trellises and covered walkways shall be utilized to break up the massing of buildings.
- Buildings must be designed for the desert environment.
- Maximum lot coverage - There is some flexibility in the maximums based on site usage, such as an exception for hotels, and variable setbacks relative to lot coverage and building height; 100% lot coverage is allowed in two of the mixed-use Downtown zones
- Downtown Residential Districts Design Standards with a so-called step down in height and intensity for transitioning from the Downtown core to adjacent residential zones
- Extensive landscaping requirements with great depth of detail
- Residential protection standards to minimize nuisances, including noise and excessive lighting
- Pedestrian access and design standards including sidewalk design criteria
- Transportation and circulation requirements; primarily for connectivity among subdivisions and connectivity with transit and pedestrian facilities, such as trails
- A Residential Construction tax

TRANSPORTATION SYSTEM PROFILE

Transportation System

- **Roadway Access** – issues/ congestion; Major highways serving Henderson include I-15, US 93/95, Highway 146, and the Southern Nevada Beltway (I-215). I-15 also provides immediate east-west access via I-80, I-70, and I-40, as well as north-south access via I-15. In the 2006 resident survey, congestion was identified as the second most significant issue facing Henderson.
- **Transit** – Bus Rapid Transit is in the planning stages for the Boulder Highway Corridor. The City of Henderson is currently working with the Regional Transportation Commission (RTC) to determine locations for mixed-use nodes along the proposed BRT corridor, and what the implications of this development could be for the rest of the community. Bus service is provided via the Citizens Area Transit (CAT) mass transit system. CAT operates 50 routes with many routes providing service 24-hours a day. Air destinations to and from Southern Nevada are served from McCarran International Airport.
- **Bicycle and Pedestrian Access** - Prevention magazine tapped Henderson in 2007 as the sixth best walking city in America ahead of San Diego, California and just behind Seattle, Washington[5]. Henderson has more than 37 miles of trails.





GROWTH MANAGEMENT TOOLS APPLIED

Land use regulation and management/ initiatives

Management

The following City of Henderson adopted Plans and Agreements were incorporated as a part of this Comprehensive Plan, by reference;

- 1) Open Space Plan – Department of Community Development
- 2) Economic and Demographic Overview - Office of Budget and Strategic Management
- 3) Affordable Housing Policy Plan – Department of Neighborhood Services
- 4) Affordable Rental Housing Inventory – Department of Neighborhood Services
- 5) Downtown Investment Strategy – Department of Property Management and Redevelopment
- 9) Henderson Redevelopment Plan – Department of Property Management and Redevelopment

Henderson also has the following plans:

- Master Bicycle Plan
- Rural neighborhood preservation area plan
- 3 separate neighborhood plans
- Master streets and highways plan
- Boulder Highway Corridor Investment Strategy – The Strategy is intended to facilitate the City’s efforts to take advantage of opportunities provided by the Rapid Transit facility planned for Boulder Highway. This plan includes the following outcomes:
 - Design recommendations for Rapid Transit stations;
 - A vision and framework for development, including the identification of catalyst Transit Oriented Development (TOD) projects;
 - Recommended mixed-use zoning amendments;
 - Landscaping and signage design guidelines, code revisions or design standards for TOD zoning

Initiatives

- Henderson held a design competition and awarded prizes for sketches that demonstrate a site with the design principles from the comprehensive plan and constraints of the zoning regulations
- Henderson has a Development Services Center which brings together employees from 7 different city departments to provide coordinated plan review, inspection, and permit services. They are open Monday through Friday from 7:30 a.m. to 5:30 p.m.



Transportation system management

Initiatives

- Bus Rapid Transit line for the Boulder Highway - The system will link Henderson with downtown Las Vegas. The project includes roadway modifications to create dedicated lanes for the transit vehicles as well as the construction of 21 station platforms on each side of the 17-mile corridor.

Perceived effectiveness

Since the City of Henderson is pro-growth and is experiencing growth despite the jurisdictional limits on its physical expansion, it is difficult to address the issue of success of their initiatives. Developers are responding to the development regulations and using them as intended, such that quality of growth is considered high. Henderson has not focused on concentrating development in nodes as is a common Smart growth theme. They also have not measured the impacts of growth on congestion, but citizen feedback lists congestion as a significant issue. Henderson is in the middle of a transit expansion project and the effects of that on congestion are unknown. Transit is seen more so as a quality of life mobility option as opposed to a congestion mitigation measure.



**BUCKLAND AREA LAND USE STUDY
CASE STUDY FINDINGS SUMMARY SHEET**

**PLANO, TEXAS
8-6-2008**

COMMUNITY PROFILE

Plano is a city in Collin and Denton Counties in Texas. Located mainly within Collin County, it is a wealthy northern suburb of Dallas. It is, therefore, within the Dallas–Fort Worth–Arlington metropolitan area, locally referred to as the Metroplex. The city is home to many corporate headquarters, including Ericsson Inc, Rent-A-Center, Crossmark, Perot Systems, Electronic Data Systems, JCPenney, Frito-Lay, Cinemark Theatres, and UGS. In 2005, Plano was designated the best place to live in the Western United States by *CNN Money* magazine. Plano sits at the confluence of four expressway/highway corridors, each creating its own development corridor.

Development History Summary

In the early 1840s, settlers first came to the area around Plano. Several businesses were established including a sawmill, gristmill and a store which in turn brought more people there. In 1872, the completion of the Houston and Texas Railroad again helped the city to grow, increasing the population to somewhat more than 500 by 1874. In 1873, the city officially incorporated.

Unlike many of the other Dallas suburbs, which are closer to Dallas itself, the population of Plano initially grew slowly, reaching only 1,304 in 1900 and 3,695 in 1960. By 1970, however, Plano began to feel some of the boom its neighbors experienced. Following World War II a series of public works projects and a change in the tax structure segregated the farming community from the town. With a more cohesive form, Plano experienced both growth and substantial infill. By 1980, the population had risen to 72,000 people. Sewers, schools and street development were able to keep pace with this increase largely due to Plano's flat topography, grid layout and planning.

During the 1980s, many large corporations moved their headquarters to Plano, including JC Penney and Frito-Lay, which helped to further grow the city as many employees chose to locate close to where they worked. Today, Metroplex suburban sprawl has pushed beyond Plano and the city's population is stabilizing. Plano is completely locked in by other municipalities and cannot expand in area, and there is little undeveloped land remaining within the city limits. Additionally, nearly 100 percent of residentially zoned land has been approved for development, and is currently under construction.

Quick Facts

- Population – The population was 222,030 at the 2000 census, making it the ninth largest city in Texas. According to a 2005 census estimate, Plano had grown to 250,096, a growth rate of about 13% in five years. The City Planning office has estimated that at 'maturity' (all vacant developable green space developed) the City could have a population of 270,000 – timeline estimated to be by 2010.





- Median age – 36 (as of 2005)
- Housing units – 90,813 (as of 2005 – est.)
- Median Household Income - \$106,335
- Distance to Dallas – 17 miles

LAND USE PROFILE

Current Land Use

- Mix – Plano is transitioning from an outer-tier suburb to a first-tier inner-ring suburb. Today about 95% of residentially zoned land is built out while only about 60% of commercially zoned land is developed. Plano has a mix of uses common to suburban cities. Plano's land use pattern is generally organized around a system of major, east-west and north-south arterials spaced at one mile intervals. Each one square mile of land area has developed as a neighborhood with predominantly low density single-family housing surrounding an elementary school and city park. The outer edges of the neighborhoods often include higher density housing with direct access to the major roadways. Most of the corners of the intersections of the major thoroughfares are zoned and developed for retail uses.
- Density – Plano has developed residentially with mostly single family homes. Current zoning provides for a range of residential densities from 2.5 acre minimum lot sizes with 20% lot coverage for agricultural/ranch residential to 18 units per acre with as much as 72% lot coverage when specified stormwater management techniques are applied. Non-residential densities range from 0.6:1 FAR and 30% lot coverage in the general retail zone to 1:1 FAR and 70% lot coverage in the Corridor Commercial Zone and as much as 100% lot coverage and 4:1 FAR with up to 175 dwelling units per acre in the Central Business zone.
- Urban Centers – Plano currently has 2 urban centers: Eastside Village and Legacy Town Center:
 - East Side Village was developed in anticipation of DART light rail service being extended through Plano. East Side Village consists of three separate apartment complexes located within one block from the light rail platform; each complex contains 250 apartments and a limited amount of retail. The residential components have been very successful, while the retail components have not been very successful.
 - Legacy Town Center is located in the core of a 2,600-acre office campus that housed the headquarters of many large corporations. This development contains a mix of retail, apartments, and town homes.
 - The City of Plano is currently working on a policy for the Comprehensive Plan that would set the tone for all future Urban Center Development. The draft policy would require 50-acre minimum land area and would differentiate between mixed use developments (infill of a disparate use in a predominantly single-use area) and multi-use developments (TOD, TND etcetera); this policy would make it more clear to the Planning



Commission and the Zoning Board of Appeals what the city wants to accomplish with these type of developments.

- The City of Plano is currently studying two to three more urban center developments.
- Downtown Redevelopment – Over the last few years, the downtown area has been reduced to gift shops and antique stores. With the DART extension, more restaurants have been moving in (with limited success) and the smaller, retail/gift stores have been moving out. The restaurants that have managed to be successful have been adding a second story at the back of the buildings to create a patio and outdoor dining space. Additionally, Haggert Park and an old railroad depot museum have become successful city attractions.
- Growth Issues - For many years Plano has been a evolving as a community with typical single-family residences at varied densities. The City's planning efforts have primarily focused on addressing issues related to new growth. Now that the majority of the City's development and infrastructure is in place, infill development, redevelopment and revitalization are becoming the City's primary issues with opportunities for new development more constrained. In its new role as an inner tier suburb, the City is also seeing newer forms of development, including mixed use and higher density projects. The Dallas-Forth-Worth Metroplex is projected to continue to grow quite rapidly - adding three million people by 2030. Much of this growth will likely take place in cities on the urban fringe. However, Plano will still play a role in assuming some of this growth and the most recent comprehensive plan focused on strategies that can help mitigate impacts, such as road congestion and air and water pollution, as well as to improve the quality of life for Plano's citizens. The Comprehensive Plan calculates this will require housing outside of traditional neighborhood areas (mixed-use), redevelopment, more urbanizing centers and new and likely denser housing types.

Land Use Vision

The Land Use Element of Plano's 2005 comprehensive plan is built around three themes; a Livable City, a City of Organized Development, and a City in Transition. These themes are described as follows (quote):

- **Theme I - Livable City** - Quality of life is one of the top priorities of the City of Plano's planning efforts. A careful balance of land use activities helps create a sustainable physical environment which, in turn, enhances the daily lives of those who live and work in Plano. This theme establishes ways in which the city will maintain its livability by effectively integrating daily activities - residence, work, education, culture and leisure - into a diverse environment.
- **Theme II – City of Organized Development** - Plano has experienced significant growth over the past three decades but today that growth is leveling off. The City has relied on a comprehensive planning strategy, supported by the future land use plan, to guide this growth and its physical arrangement. This ongoing process of assessing needs, setting objectives, implementing programs and



monitoring progress has resulted in an organized land use pattern; existing and future development patterns can be used to further enhance the community.

- **Theme III – City in Transition-** Now that the majority of the City’s development and infrastructure is in place, infill development, redevelopment and revitalization are becoming the City’s primary opportunities for new development. This theme examines factors contributing to and resulting from the transition to a maturing city.

Land Use Plan

The land use plan for Plano has a detailed set of land use categories with associated policy for acceptable densities for non-residential uses as follows:

- **Residential**
 - Neighborhoods
 - Non-Neighborhood - infill and redevelopment that does fit the traditional neighborhood; residential development that occurs in non-neighborhood settings such as in mixed-use developments and specialized housing complexes.
- **Service and Production**
 - Downtown Business Government Center - a 24-hour mixed-use community. Housing, shops, restaurants, cultural facilities and government offices comprise the major use area. Urban density and transit-oriented design is encouraged.
 - General Commercial - intended to provide a wide range of retail, service, office, light production and research and development uses.
 - Major Corridor Development - This designation applies to areas that are served by major expressway facilities: development in these corridors is expected to include a mix of commercial, office, and technical production uses. Floor area ratios (FAR) should range from 0.4:1 to 1:1, and heights should be limited by proximity to residential areas. Residential development is generally not appropriate within these corridors
 - Freeway Commercial - intended to define the unique character of the U.S. 75 corridor including major retail development along with general commercial, entertainment, lodging and office uses. Basic components of the category include 1:1 floor area ratios and a 20 story maximum height limit. Lower FAR’s and maximum heights are recommended for areas located within 500 feet of residential areas.
 - Major Commercial - may include malls and large shopping centers anchored by department stores, along with specialty shops, restaurants, theaters, offices and other uses. These centers serve both a local and regional population, and are located along regional thoroughfares. Major commercial centers usually contain 500,000 square feet plus of floor area on sites of 50 acres or more. Multi-story buildings with an overall FAR of up to 1:1 may be appropriate in conjunction with retail development.



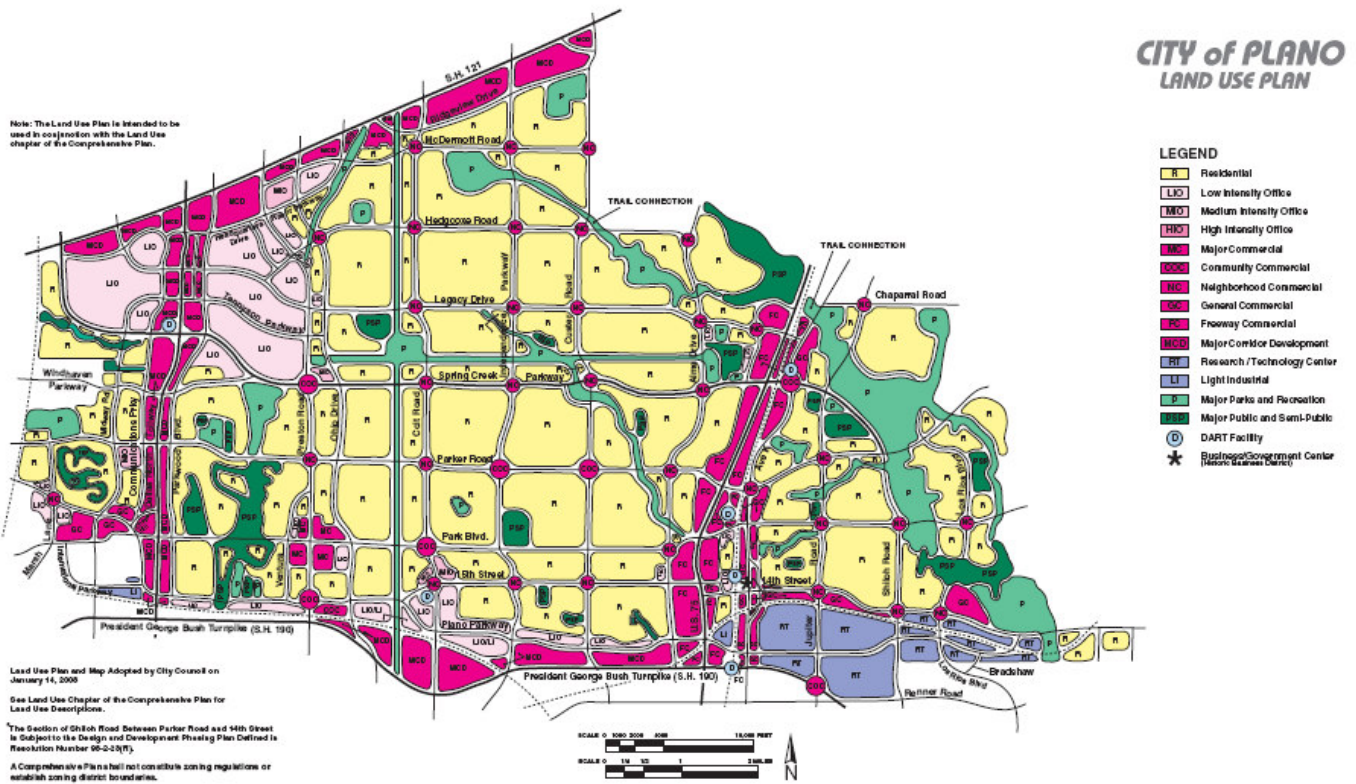
- Community Commercial - generally serve a neighborhood area of three to five miles, and include department or discount stores, grocery stores, specialty shops and restaurants along with office uses. These centers are located on sites 15 to 35 acres in size along regional expressways or at intersections of major arterial streets. Typical FAR's are less than 0.4:1. Two or three corners may be developed at intersections designated as community commercial centers on the land use plan.
- Neighborhood Commercial - intended to serve adjacent residential neighborhoods, and include grocery stores, drugstores and small retail and service uses. These centers serve a one to one and one-half mile radius and contain 100,000 to 150,000 square feet of floor area (at a rate of 30 square feet per resident of the service area). They require a site of 10 to 15 acres, and development intensity less than 0.3:1 FAR. Neighborhood commercial centers are located at the intersections of major arterial streets. One or two corners may develop with commercial uses at intersections designated as a neighborhood commercial center on the Land Use Plan, based on the size and population of the service area.
- Neighborhood convenience - the population of some areas of Plano will not support a typical neighborhood commercial center, and smaller neighborhood convenience centers may be appropriate. Neighborhood convenience centers contain a convenience store with gas pumps and small shops, with total retail space less than 25,000 square feet. Sites are less than five acres, yet they are larger than a single corner convenience store.
- Office - includes a variety of employment uses, including office towers, medical centers, corporate campuses and small neighborhood offices. There are three categories of office development designated on the Land Use Plan – High Intensity, Office, Medium Intensity Office and Low Intensity Office. High Intensity Office should include offices with FAR's up to 1:1 and building heights up to 12 stories. Medium Intensity Office areas should include development up to 0.75:1 FAR and eight story building heights. Low Intensity Office development serves local needs and heights are typically less than four stories with FAR's less than 0.4:1.
- Light Industrial - includes a variety of industries such as research facilities, assembly or production operations, warehousing and associated administrative offices. Industrial development is limited to a 0.5:1 FAR and a maximum building height of four stories. Light industrial and associated development is appropriate in areas with access to the arterial street system and, where possible, access to the railroad system. Light industrial development is most appropriate in industrial parks or other suitable planned settings.
- Research/Technology Center (RT) - provides for low-density office, research and development facilities, and limited assembly operations. It is intended to attract high technology businesses; to accommodate multiple users in a campus environment. Warehousing is planned to serve a supporting role in the RT area.



- Public and Semi Public (PSP) - includes a wide range of public and private uses such as colleges and universities, public and private schools, golf courses, country clubs and large private open spaces.
- Parks and Recreation (P) - includes major public open spaces as well as parks and recreation facilities serving the community. Included are floodplain areas to be preserved such as major parks, linear parks, athletic complexes and City-owned golf courses.

▪ **Special Areas**

- There are several major transportation and land use corridors throughout the City. There are four primary corridors. Legacy and Spring Creekwalk are two other unique land use areas in Plano as highly visible, activity centers within the City.



NOTE: An update to the 2005 plan was initiated in 2007. Key issues being addressed by the update include (quote):





-
- Demand for housing versus preservation of land for economic development
 - Changing land-use needs
 - Traffic Impact Analysis
 - Travel Demand Management
 - Dallas Area Rapid Transit (DART) 2030 Plan
 - Impact of regional traffic patterns on Plano

Current Zoning

Interestingly, the 2005 comprehensive plan for Plano notes that there was an imbalance in zoning. As noted above, most corners of the major arterial intersections were zoned for retail uses. Although this arrangement has been easy to navigate, it has contributed to more land zoned for retail and office uses than is estimated to be supportable by the market over time. This zoning pattern along with growth trends resulted in the development of almost 60 square feet of retail per capita (approximately three times the national average – according to the plan). As new retail centers develop in surrounding cities, this amount of retail could no longer be fully supported and as evidence of this, some retail facilities have become vacant or underused.

General Zoning Districts

Plano has 28 zoning districts including:

- Agricultural
- Estate development (single family home in ranch setting) – Minimum lot size of 2.2 acres
- 13 residential zones ranging in densities from 2 units per acre to 18 units per acre including an Urban Residential Zone with a minimum lot area of 5,000 square feet
- Two office zones
- Five commercial zones
- A Downtown Business/Government Zone
- Two ‘Employment’ zones – one commercial and one regional
- A research/technology center zone
- Two light industrial zones

Zoning Provisions of Note

- Lot coverage can increase when specified stormwater management features are employed
- Provisions in each zone for “usable open space”
- Provision for attached dwellings, accessory dwellings, mobile homes and patio homes
- Extensive landscaping requirements
- Separate development handbook for applicants
- Design guideline manuals for some mixed-use zones
- A graphic/visual streetscape plan based on different roadway typologies



- Impact fees
- Development incentives and so-called alternate standards, mostly for density bonuses for strong stormwater management and alternate parking requirements
- Traffic impact reports generally required
- Five highway/arterial road overlay zones which are mostly to establish design standards including landscape edge, location of utilities underground, and signs

TRANSPORTATION SYSTEM PROFILE

Transportation System

- **Roadway Access** – issues/ congestion - Plano is served directly by several major roadways and freeways. Central Plano is bordered to the East by U.S. Highway 75, the West by the Dallas North Tollway, the South by President George Bush Turnpike, and the North by SH 121 (which is under construction as a toll road). Preston Road or State Highway 289 is also a major thoroughfare through the city. Plano was the first of many cities in Collin County to adopt a master plan for their road system. The use of wide, multi-lane, divided highways for all major roads allows for higher speed limits, yet due to this, concerns for pedestrian safety have arisen.
- **Transit** - Plano is one of 12 suburbs in the Dallas area served by the Dallas Area Rapid Transit (DART) system. Until recently, Plano was lightly served by bus lines, but the completion of the Red Line of the DART light rail project included stations in Downtown Plano and at Parker Road which provides access to commuters traveling to work elsewhere in the Dallas area.
- **Bicycle and Pedestrian Access** – The City has an extensive network of bicycle lanes, sidewalks, and multi-use trails. The 2005 comprehensive plan includes an adopted Bicycle Policy Statement that emphasizes the need for connectivity among bicycle facilities and safe bicycle crossings on major highways. There is also a “Six Cities” plan for connections among the bicycle networks in six suburban communities around Dallas.
- The 2005 comprehensive plan has an in-depth transportation element. The strategies in the transportation element are linked to the land use themes for the overall plan. The transportation system management approach is broadly multimodal and includes emphasis on:
 - TDM – Employer programs, and non-transit reduction in VMT such as car-sharing and carpooling
 - Light rail expansion
 - New northwest Plano transit center
 - Promotion of TOD
 - ITS
 - Maximize efficiency and safety of the “thoroughfare” system including cross-town and neighborhood circulation with an emphasis on major intersection upgrades



GROWTH MANAGEMENT TOOLS APPLIED

Land use regulation and management/ initiatives

- The entire City has been divided for planning and purposes of generating data into neighborhood units.

Initiatives

- Plano Park and Recreation Fee Ordinance
- Retail Corner Design Guidelines
- Workforce Housing Study
- Downtown Plano Retail Action Plan
- Urban Centers Report
- Tri-City Retail Study
- Plano at Maturity Final Report
- 15 individual neighborhood plans
- Tax abatements/incentives for businesses/developers considering Plano

Transportation System Management

Initiatives

- Pro-active membership in DART and planning for and implementing system improvements in transit service in Plano
- Promotion of TDM and ITS (through MPO and long range planning process)
- Dallas North Tollway Design Guidelines
- Dallas North Tollway Streetscape Plan
- Thoroughfare Standards Rules and Regulations for medians

Perceived Effectiveness

So far there are mixed results. There has been very limited interest by developers in the retail space available in the TOD style neighborhoods near the two DART stations. One of these new stations is at the end of a line and the other is in the downtown. The planner in Plano said they had not yet figured out why the intended mixed-use is not shaping up as anticipated. It may be a mixture of several factors including the availability of intense retail along routes and at destinations for commuters, the saturation of retail space available means developers do not need to take a chance on an unproven market in the new mixed-use centers, or the fact that sprawl is still alive and well near Plano. There is an abundance of green space beyond Plano and cheaper development opportunities in those emerging suburbs. The planner says that the City welcomes growth, particularly non-residential growth, but has had limited success in revitalizing the downtown and attracting non-residential development to the transit stations neighborhoods. Nonetheless, the interest in living near the DART stations and using the light rail to travel has been very strong.

One final issue has been the parking for the DART stations. The DART system management has a policy of expanding parking near the stations to serve the



maximum potential demand and will not invest in parking structures, leading to expansive surface parking lots. The City struggles with DART to prevent their parking expansion from degrading the quality of neighborhoods where the stations are located.