TRANSIT ORIENTED DEVELOPMENT IN THE TRUCKEE MEADOWS: BRIDGING THE GAP BETWEEN PLANNING AND IMPLEMENTATION

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Well implemented transit-oriented development (TOD), which involves the integration of land use and transportation planning principles to promote compact, pedestrian-friendly, mixed-use development surrounding a vibrant transit system, is proving a viable solution to the excessive land consumption, declining air quality, and burgeoning transportation infrastructure budgets wrought by automobile dependence.

Although transit-oriented development is becoming an increasingly popular tool across the nation as a means of providing a new housing product to meet changing lifestyle preferences, reducing infrastructure expenditures, spurring economic development, and mitigating negative environmental consequences, TOD is a relatively new tool in the Truckee Meadows that is certainly more complex than traditional auto-oriented development. Transit-oriented development is often thought of in terms of its most prominent component parts including higher densities and mixed uses in proximity to transit stations. However, strictly looking at these physical characteristics of TOD detracts from the overall goal of TOD, which is to create places that function in an entirely different way from suburban auto-oriented development that has been the status quo in many communities across the country since the 1950’s. Rather than designing development and the streetscape to primarily accommodate the mobility of the automobile to the detriment of other modes of transportation, transit-oriented development requires a sophisticated streetscape that itself is an amenity and where development interacts with the streetscape to create a vibrant environment in which people are dominant.

As an alternative to suburban-style development that is characterized by few choices for housing types and transportation options, TOD offers the ability to create diverse and walkable, mixed-use neighborhoods which are served by high-quality multi-modal transportation systems that promote reduced automobile usage. However, moving from the vision to the implementation of TOD can be a challenging process because successful TOD requires a paradigm shift not only in land use planning, but also in multi-modal transportation planning. Land use planning and decisions must embrace the integration of uses, human-scale design, street design standards that enhance walkability, and density increases to support high-quality transit services. Transportation planning and decisions must also conceptually embrace the parity of walking, bicycling, and mass transit with the private automobile. Moreover, these paradigm shifts in both land use and transportation planning must translate into decisions that complement each other. Creating these new synergies that allow for the built environment and the streetscape to interact and produce vibrant places can be impeded by a variety of barriers.

Since the concept of transit-oriented development was adopted into the Regional Plan in 2002, the region has made large investments in developing land use plans that will enable higher-density, mixed-use development in the region’s Centers and TOD Corridors in the future and a transportation plan that defines modal objectives for the region and
policies that over time will enhance the transit, pedestrian, and bicycle networks. The supporting policies and planning tools found in these planning documents establish the foundation for TOD in the region as they remove potential regulatory barriers such as limitations on the mixing of uses and the specification of maximum densities, identify certain existing environment barriers, and to varying degrees identify future multi-modal improvements necessary to implement the plans. However, the Truckee Meadows, like many communities, still faces barriers to moving the vision of transit-oriented development to reality. Regionally, regulatory barriers, mobility improvement barriers and existing environment barriers currently exist and present challenges to implementing transit-oriented development. Specific implementation challenges associated with overcoming these barriers can be grouped into the following three categories:

1. The “Congestion Conundrum” While TOD can help mitigate regional traffic congestion, increases in residential density can lead to localized spot congestion. However, potential widening of roadways to mitigate spot congestion may not be appropriate for TOD areas as they are to be walkable places in which the automobile is not the dominant form of transportation. Ultimately, increases in residential densities and their associated trips must be balanced with the need for walkable environments;

2. Getting to Complete Streets and a Multi-Modal Transportation Network: Current roadway conditions favor the mobility of the automobile above other modes of transportation and land use and street patterns do not always promote connectivity and ultimately mobility. To implement transit-oriented development, a connected, multi-modal transportation network that is characterized by streetscape environments in which people are dominant and bicycling and transit are accommodated is needed. However, rights-of-way are limited in many of the region’s Centers and TOD Corridors, existing development and street patterns that limit connectivity pose challenges to constructing multi-modal mobility improvements, and parking policies may in places encourage the use of the private automobile; and,

3. Funding Transit Operations and Mobility Improvements to the Streetscape: While funding is always a scarce resource and funding for transit operations and streetscape improvements is particularly limited in the current economic environment, it is worthwhile to consider various financing mechanisms currently being used elsewhere as ways to ultimately move forward with providing a multi-modal transportation network.

In spite of these implementation challenges, large opportunities remain to explore and develop additional policy, planning, and implementation approaches that better integrate land use and transportation planning and promote synergies between land use and transportation decisions. Approaches that promote such integration and interaction can enhance the vision of transit-oriented development, planning efforts, and prioritization processes between local governments and the transportation agency such that multi-
modal improvements necessary for the success of the region’s Centers and TOD Corridors occur in a targeted manner that recognizes the scarcity of time and money, but yet still strategically advance TOD.

Given that transit-oriented development is a departure from traditional auto-oriented development and requires a different approach to land use and transportation planning, it is unsurprising that new policy, planning, and implementation approaches are needed to guide TOD from concept to reality. Moreover, many other communities across the nation have faced similar implementation challenges and have responded by evaluating existing policies and tools and developing innovative approaches to advancing TOD. Over time, new approaches and tools will emerge; however, the approaches presented below are innovative ways of supporting TOD that are currently in use elsewhere and that could augment the large body of planning that has already taken place in the region. The following policy, planning, and implementation approaches to advancing TOD have been developed for consideration in addressing the three implementation challenges that the Truckee Meadows faces.

**Implementation Challenge 1: The “Congestion Conundrum” in Walkable Environments**

**Approach 1-A:** Examine lowering roadway LOS standards in Centers and TOD Corridors

**Approach 1-B:** Examine impact of TOD on travel characteristics

**Approach 1-C:** Support policies and tools that provide incentives to lower automotive trips such as:
- Location efficient mortgages;
- Pay-as-you-drive insurance; and,
- Roadway user fees based on VMT.

**Implementation Challenge 2: Getting to Complete Streets and a Multi-Modal Transportation Network:**

**Approach 2-A:** Develop Multi-Modal Level of Service (LOS) standards

**Approach 2-B:** Establish street typologies for roadways in Centers and TOD Corridors that:
- Replace functional classifications
- Also identify mode priority
- Also establish multiple roadway cross-sections based on modal priority of roadway

**Approach 2-C:** Establish a prioritization system for investments in multi-modal infrastructure and place-making amenities for Centers and TODs

**Prerequisite:** Spatially evaluate connectivity and walkability in Centers and TOD Corridors to identify existing impediments to connectivity and walkability
Approach 2-D: Evaluate transportation network in Centers and TOD Corridors and identify streets that would benefit from innovative multi-modal improvements such as road diets, shoulder lanes for buses, and bike facilities

Approach 2-E: Continually evaluate parking policies

**Implementation Challenge 3: Funding Transit Operations and Mobility Improvements to the Streetscape**

- Approach 3-A: Local-option taxes (gas, sales, property)
- Approach 3-B: Tax increment financing
- Approach 3-C: Special assessment districts
- Approach 3-D: Road Pricing for Transit Funding
- Approach 3-E: Impact Fees for Transit and Multi-Modal Improvements
- Approach 3-F: Mobility Fees
  - **Add On:** Reduced Vehicle Impact Fees in Centers and TOD Corridors

While these approaches are not an exhaustive list of innovative ways to advance TOD, they represent regional avenues for promoting synergies between land use and transportation decisions and developing additional methods of financing multi-modal improvements. If the RPGB and RTC have interest in pursuing any of the approaches presented, additional study would be needed to further examine potential implementation.

However, it must be emphasized that three critical elements are needed for any of these approaches to be successful in advancing the implementation of TOD. These elements include a **paradigm shift** in thinking about the interaction between land use and transportation and the conceptual commitment to TOD as a way to create places that function in an entirely different way from suburban-style development that offers limited housing types and requires an automobile to access most destinations; **political leadership** to advocate the many benefits of TOD across multiple organizations and analyze how decisions made at both local and regional levels impact the ability of TOD to be successful in the Truckee Meadows; and, **consensus building** that allows for affected stakeholders to examine in more detail a particular approach, express ideas regarding the application of such an approach, clarify areas of agreement and disagreement, and develop shared strategies for potential implementation. Without each of these elements in place, TOD is likely to remain merely a vision for years to come.
Figure 1: 2007 Regional Plan Map 4 - Downtown Centers, Regional Centers and TOD Corridors
INTRODUCTION
Transit-oriented development differs from location to location. However, in general, transit-oriented development (TOD) consists of compact, mixed-use development located directly adjacent to or within one-half mile of a light rail, heavy rail, bus rapid transit route, or traditional bus route. Typically, the development pattern of transit-oriented development should increase accessibility and reduce the need for automobile-scale infrastructure.

TOD is becoming a widely adopted aspect of a broader land use planning strategy that when implemented has the potential to reduce automobile dependency, increase accessibility, curb sprawl, improve public health, and promote the long-term economic and environmental sustainability of a region. In the United States, where the automobile has dictated land use patterns in most parts of the country for the past half-century, TOD is a viable solution to reverse that trend.

In the Truckee Meadows, TOD is an evolving land use planning tool. The concept to concentrate growth in areas of higher density along established bus routes emerged as part of the 2002 Truckee Meadows Regional Plan update process and was subsequently incorporated into the 2002 Regional Plan. TOD planning remains a fundamental component of the 2007 Regional Plan and a key mechanism to manage population growth in the region.

There are currently five TOD corridors, eight regional centers, and two downtown centers identified in the Regional Plan and depicted in Map 4 (see Figure 1). Collectively, these areas are designated to absorb larger amounts of future population and employment growth, support a non-automobile transportation network, and be central to the economic prosperity of the region.

The primary purpose of this paper is to assist stakeholders in the Truckee Meadows in bridging the gap between TOD planning and implementation. Accordingly, this paper contains four parts. Part I provides a brief macro-scale framework for TOD and serves as an introduction to potential policy considerations in the Truckee Meadows. Part II contains a more focused assessment of the current status of Centers and TOD Corridors in the Truckee Meadows.

Building on the introductory framework in Part I and summary of current conditions in Part II, the bulk of the paper is found in Part III where policy, planning, and implementation approaches are considered that may better support TOD in the Truckee Meadows. Part III describes the current challenges facing transit-oriented development in the Truckee Meadows and presents a series of innovative approaches being employed in various metropolitan areas around the country. Part IV concludes this paper with a series of approaches for moving forward.
PART I: TOD FRAMEWORK

THE EVOLUTION OF MODERN TOD
Focusing development around transit is not a new planning concept. For centuries, towns and cities have flourished along transportation routes because of the accessibility and mobility those routes offer. Prior to the 20th Century, the typical city or town was also compact to facilitate non-motorized movement.

After World War II, proliferation of the automobile allowed city boundaries to expand and the distance between cities to lengthen without significantly compromising mobility. By the end of the century, the annual rate of land consumption for urban development matched the total land area of Delaware. At the same time, the average suburban resident spent upwards of 500 hours per year, equivalent to twelve 40-hour work weeks, commuting (Duany 2000).

In reaction to decades of auto-oriented development and sprawling urban footprints, the modern TOD planning concept emerged in the 1990s and is largely attributable to Peter Calthorpe. In his book, The Next American Metropolis, Calthorpe advocates a compact development pattern with a range of commercial, civic, and residential uses all within walking distance of a transit stop. Calthorpe’s model also calls for infill development, positive public spaces, and a mix of housing types available for all income levels. Each transit node or station area is to be connected to other nodes by transit.

Since Calthorpe first re-invented the idea of transit-oriented development, communities nationwide have adopted policies to encourage or require development patterns to mirror Calthorpe’s model. In reality, few have truly achieved outright transit-oriented development. Some experts (Dittmar and Ohland 2004) offer terms such as transit-adjacent or transit-related development to describe an urban form that falls short of meeting the threshold of transit-oriented.

The primary hindrance to TOD is the continued reliance upon, and planning for automobile use. As long as there is an expectation that TOD developments should also provide for a sustained level of auto mobility, the true rewards of TOD cannot be reached. This is because auto-oriented streets must be of a sufficient width to accommodate automobile traffic and large parking areas are needed to serve the auto-centric environment, which compromises opportunities for transit, walkability, bicycling, and higher densities.

On another level, well-implemented transit-oriented development has the ability to improve the overall quality of life for residents in a community or region. For instance, compact mixed-use developments served by transit can promote improved air quality, reduce land consumption per capita, lower rates of obesity and type II diabetes, and
encourage more active participation in community-level social organizations. These added benefits materialize when the land use and transportation paradigms truly shift from auto-oriented to transit-oriented.

Moreover, contrary to some critics, TOD is not a luxury planning tool available only to those cities or regions with extra funding capacity. In fact, TOD can be a revenue catalyst through its ability to increase property values, improve retail sales, and reduce the demand for costly roadway improvements to distant suburbs. Part III of this paper describes some of the innovative funding tools being employed around the country to support TOD.

**THE 2007 REGIONAL PLAN AND TOD CORRIDORS**
The 2007 Truckee Meadows Regional Plan, adopted in July 2007, defines transit-oriented development as “moderate and high-density housing concentrated in mixed-use developments located along transit routes. The location, design, and mix of uses in a TOD emphasizes pedestrian-oriented environments and encourages the use of public transportation.” Originally introduced as part of the 2002 Regional Plan, transit-oriented development is a central aspect of the 2007 Regional Plan.

The combination of Downtown Centers, Regional Centers, and TOD corridors defines a regional system of transit oriented development (see Figure 1) and this system is a primary planning mechanism identified in the Regional Plan to manage growth in the region through 2030. Local governments must develop more specific plans for their respective Centers and TOD corridors. According to Regional Plan Policy 1.2.11, these local government plans must establish exact boundaries, require mixed uses, specify land patterns that support transit options, provide for human-scale development, and ensure TOD corridors are linked to the community via multiple transportation modes.

The Regional Plan also establishes minimum and average density standards for Centers and TOD corridors. Residential density in Downtown Centers must be a minimum of 30 dwelling units per acre (du/ac) and on average must be 45 du/ac. Non-residential density in Downtown Centers must have a floor area ratio (FAR) of 1.5. Residential density in the Regional Centers and TOD corridors must be a minimum of 18 du/ac and must be on average 30 du/ac. Non-residential density in Regional Centers and for station areas, or nodes, within the TOD corridors must have a FAR of 1.5. Areas within TOD corridors, but between transit nodes, must demonstrate an FAR of 0.25 in order to be in conformance with the Regional Plan.

Regional Plan Policy 1.2.15 further specifies the desired future condition of TOD corridors with which local government master plans and affected entity planning documents, including the Regional Transportation Plan (RTP), must conform. These desired future conditions include transit stations at appropriate intervals, incorporation of high occupancy vehicle (HOV) lanes, exclusive bus lanes, and bus signal prioritization in the
near term, bus rapid transit (BRT) and/or rail transit service in the longer term, and provide for pedestrian access.

Moreover, transit-oriented development as a planning tool is fundamental to the core planning principles guiding Modules 1 through 3 of the Regional Plan. For Module 1 - Regional Form and Pattern - TOD planning is a means to limit the spread of the urban footprint while directing employment and population growth toward the traditional urban core. The TOD concept also supports Module 2 - Natural Resource Management - by limiting the consumption of currently undeveloped areas, improving air quality, and minimizing impacts to surrounding open space and wildlife habitat. TOD also favors the objectives of Module 3 - Public Services and Facilities - by setting forth a plan to maximize infrastructure and service provision. As development expands outward from the core at lower densities, public service and infrastructure costs rise. A more compact development pattern that accommodates new growth in existing urbanized areas requires less capital improvement expenditure up front and costs less to serve and maintain.

**TOD at a Glance**

Thanks to Calthorpe’s reintroduction of compact urban development surrounding a transit stop as a veritable approach to urban planning, research regarding TOD now abounds. In general, the basic elements of TOD fit within two broad categories: “development pattern” and “transit network.” Development pattern is the land use aspect of a TOD such as land use mix, density, and walkability that can be readily understood through an assessment of the existing urban landscape. Transit network variables describe the existing or planned transit mode, station areas, and consider aspects of that system such as accessibility and ridership.

**Development Pattern**

**Land Use Mix**

A fundamental element of transit-oriented development is the adequate mixture of residential, commercial, and civic land uses. In general, mixed-use development promotes urban vitality, increases access for more people, and decreases dependence on the automobile for mobility. Similarly, a mixture of retail and office types within the commercial category will create a more diverse workforce and foster a richer urban environment.

**Density**

Studies show that the success of transit, especially light-rail and heavy rail, hinge on adequate densities in corridor and station areas. While there is no uniform standard for densities within TODs, the general rule is that densities should be distinctly higher than that found elsewhere in the region.
Residential density is likely the most critical as it provides the local population base to support the transit network and surrounding non-residential land uses. Residential dwelling unit densities in TODs can range from 10 du/ac on the TOD fringe to upwards of 100 du/ac or more near transit nodes.

Non-residential density is equally as important to TODs, as it harbors the employment, entertainment, services, and products necessary to support a dense, mixed-use urban lifestyle in an automobile-discouraged setting. Commercial density is most often quantified in terms of FAR, a ratio of the gross building floor area to land area on which the building sits. Like non-residential density, FAR varies by location within the TOD, but can range from 0.25 in fringe areas to upwards of 5 or higher in the densest locations.

Walkability
Successful transit oriented developments cater foremost to the pedestrian. In the absence of an automobile and convenient parking located directly adjacent (or even within) buildings, all trip segments in TODs other than those made on the transit system are on foot or bicycle. Accordingly, TODs must contain streetscapes with sufficient interconnected sidewalks, crosswalks, and buffering from non-pedestrian spaces. Building and site designs should be interesting and inviting for pedestrian use.

In addition to providing the adequate pedestrian accommodations, land use mixing, and compact development, properly planned TODs ensure that most pedestrian trips are of a limited distance - usually less than one-half mile. In Calthorpe’s model, for example, all land uses are within a one-quarter mile walk to a transit stop. These short distances, combined with safe and vibrant streetscapes improve accessibility and mobility for all demographic groups. As a result, more people are likely to forego automobile travel in favor of walking, bicycling, or transit.

Transit System
Transit is the backbone of transit-oriented development. In a well functioning TOD, transit will support higher densities and more employees, reduce automobile dependency (and the associated infrastructure demands), and promote walkability. To be effective, however, transit must provide a level of convenience at an appropriate cost that makes it a viable alternative to the automobile. Accordingly, choosing correctly among the spectrum of transit modes is a key factor influencing transit ridership levels and ultimate success of TOD as a land use planning model.

Mode
Standard transit mode options include local bus service, bus rapid transit (BRT), light rail, heavy rail, and commuter rail. Local bus service is the most decentralized form of transit and generally has the slowest travel times and the lowest rider capacity. Fixed rail modes are centralized and can support rider demands in high density areas. BRT, a modified bus
system where buses have dedicated rights-of-way, signal priority, and optimized loading areas, can be a viable intermediate solution.

In many TODs, more than one transit mode may be in place to serve an array of ridership needs. A popular mixed-mode example is the case where a local bus network serves as the feeder for a more centralized fixed-rail mode such as light or commuter rail. In general, standard bus and BRT services are cheaper to implement and require substantially lower densities in order to be fiscally sustainable. However, in higher density areas, bus service alone may not provide the capacity necessary to support the existing ridership demand. Fixed rail transit, and to a lesser extent, BRT can accommodate more passengers per route, but are more costly to build ($0.25 - $1.00 per passenger mile). Of the major modes of transit, at nearly 80 cents per passenger mile, standard bus is the most costly to operate, compared to roughly 50 cents for commuter rail and 65 cents for light rail. Nonetheless, in comparison, the total operation, roadway, and parking costs for an automobile in a large city can exceed $1.60 per passenger mile (Litman 2004) (see Figure 2).

Transit Stops and Station Areas

Transit station areas and stops are the gateways to the transit system. Accordingly, stops and station areas should be located within close proximity to existing development - both commercial and residential - at a frequency that makes them accessible to a walking constituency within approximately 1/8 to 1/4 mile away. In a bus transit oriented development scenario, a level of redundancy is required in stop locations so people are not forced to wait at bus stops. Transit stops should be spaced appropriately so that higher density areas are served by multiple stops and multiple routes. This strategy increases ridership potential and decreases the likelihood for congestion.

On the other hand, too many stops in a small area may diffuse the potential of creating central “nodes.” According to the body of literature on TOD (e.g. Dittmar and Ohland 2004), station areas offer the greatest potential for densification, employment, housing, and concurrent economic development. Currie (2006) refers to the over-concentration of transit stops as scale dilution and notes this issue is of particular concern for standard bus TOD. Options to overcome scale dilution include: strategically reduce the number

![Cost comparison for various modes of transportation](Litman 2003)
of stops per route (especially for BRT) or employ standard bus service as a complimentary transit mode in a system that might also include BRT or fixed rail.

Ridership
Successful transit-oriented development relies in large part on an increase in transit ridership (and concurrent decreased dependence on the automobile). Travel time is arguably the most influential factor when it comes to transit ridership. In an age when time can become a person’s most valuable asset, it is important that transit provide a comparable trip duration to the automobile for a route of equal distance. Researchers with the Transportation Research Board (2004) estimate the average speed for automobile travel in a lower density urban setting is 32mph. In comparison, local bus provides an average speed of 13mph, BRT as high as 21mph, light rail 16 mph, and commuter rail 32mph. In congested areas, the average automobile speed slows significantly providing an opportunity (and impetus) for transit to become the preferred mode, especially if the necessary infrastructure (e.g. dedicated right-of-way) is in place to favor higher transit speeds.

Perhaps in a counterproductive fashion, transit agencies often advocate transit as a means to simply relieve automobile congestion. One survey by the American Public Transportation Association (2002) reveals that 98 percent of Americans support the use of transit by others. In order for TOD to be successful, transit must be part of a larger solution to manage growth and reduce environmental degradation, rather than simply a tool to increase automobile travel speeds.

Ultimately, ridership is the pulse of a TOD. When ridership is at or near capacity (and the capacity is determined to be sufficient), it can be assumed that the transit system is providing an appropriate level of accessibility and the development pattern is supportive of the transit system, i.e. high density and mixed-use. In the event of low ridership, the density may be too low, the land use pattern too uniform, the transit system too inaccessible, or the mode of transit inappropriate. Research would need to be done to determine the likely cause(s).

**QUALITY OF LIFE AND ECONOMIC BENEFITS OF TOD**
The benefits of TOD are often described strictly in terms of how well the elements highlighted above are being implemented. Beyond density and transit ridership, however, there are a range of environmental, social, and economic benefits that can be realized from well designed and implemented TOD. These benefits include improvements in environmental quality, social/psychological quality, and physical health that collectively influence ones quality of life. Additionally, studies indicate that transit-oriented development presents many economic benefits for the city and region as a whole as well as for the individual living or working within the TOD.
Quality of Life

Environmental Quality
On average, the burning of one gallon of gasoline produces 20 pounds of carbon dioxide emissions (Ewing, et al. 2007). The more automobile miles driven, the greater the amount of carbon that is released into the atmosphere. On the largest scale, research demonstrates carbon emissions proliferate the natural greenhouse effect by trapping more radiating heat than would otherwise escape the earth’s atmosphere and into space. The result is a gradually warming planet with potentially catastrophic impacts on the planet’s many natural systems. Accumulating research shows these impacts are being realized at the regional and local level in the forms of drought, severe storms, and biodiversity loss through habitat alterations.

More acutely, research (Miller 2002, Hanson and Giuliano 2000, and Ewing, et al. 2007) concludes automobile usage leads to localized negative environmental impacts in the form of air, water and soil pollution. In addition to carbon dioxide, automobile emissions contain carbon monoxide, sulphur dioxide, nitrogen dioxide, particulate matter, and volatile organic compounds, all capable of diminishing local environmental quality and adversely affecting human health.

Even with the recent improvements in automobile technology that reduce emissions and improve gas mileage, auto-oriented infrastructure such as parking facilities and multi-lane streets remain essential and can also adversely impact local environmental quality. Scientific reports (EPA 2000) show parking areas and road surfaces contribute to more severe stormwater runoff events, which in turn promote erosion, limit natural filtration processes, and jeopardize downstream water quality.

Parking areas and roads also enhance the urban heat island effect by absorbing heat and raising surface temperatures. The result can be a localized reduction in precipitation, greater susceptibility to droughts, and unhealthy surface temperatures during summer months (Miller 2002).

As an alternative planning paradigm, transit-oriented development has the potential to alleviate the negative environmental impacts associated with the automobile. Foremost, TOD reduces the need for an automobile for mobility and access. As the demand for other non-auto services increases, the supply of services and infrastructure to meet those demands will rise and in the process replace existing automobile-oriented features.

Health & Lifestyle
Land use patterns also have an impact on human health. According to a growing body of literature (see Ewing et al. 2007), the correlation between aspects of an auto-oriented lifestyle and risks of obesity, diabetes, and heart disease is statistically significant. In other words, the more compact and pedestrian-friendly a community, the more likely residents
are to walk or ride their bicycles instead of driving. Compact developments such as TOD therefore provide the opportunities for residents to be more physically active. Even in TODs where there is the option to travel by transit, one is still likely to make short connecting trips via foot or bicycle from home or work to the transit stop.

TOD also promotes a social atmosphere distinct from that of a suburban-style development. Higher density, mixed use development centered on public transportation promotes more opportunities for interpersonal communication. Since TOD has far fewer fences and garage doors separating people from their neighbors, studies (see Duany 2000) show there is more socialization and sharing of ideas in compact urban environments.

Despite being in contrast to the prevailing suburban-style development pattern, TOD may also appeal to a broad cohort of the population. A 2004 study by the Center for Transit-Oriented Development (CTOD) of 42 U.S. metropolitan areas demonstrates a notable long-term demand for a TOD lifestyle among those ages 15-34 and over 65. By 2025, the CTOD study projects a total demand for TOD throughout the 42 metro areas of over 14 million households, equal to 21% of all projected households in those areas (see Figure 3). Of the total projected demand, 64.1% are singles or couples with no children. However nearly 21%, equal to 3 million households, are projected to be married couples or single parents with children. The CTOD study illustrates the demand for TOD across many demographic groups.

**Economic**

Funding a burgeoning automobile-oriented transportation network is a burden for both government agencies and individuals. According to a Transportation Research Board report, if the pattern of low-density, auto-oriented, sprawl-like development persists as the dominant land-use model, new road infrastructure investment through 2025 in the U.S. is estimated to be $927 billion. Conversely, if the paradigm shifts to a more transit-oriented, high-density, mixed-use model, that investment could be reduced substantially to $110 billion over the same time period. To illustrate TOD’s potential for long-term cost savings at the regional level, Envision Utah, the greater Salt Lake City region’s preferred long-range growth model that promotes compact growth and reduced automobile dependence, projects total infrastructure spending from the year 2000 through 2030 in the amount of $24.5 billion. This scenario translates into a 16%, $4.5 billion savings over...
projected infrastructure spending for a baseline scenario that entailed continued sprawl-like development (Envision Utah 2003).

For the individual, automobile ownership is the single most costly expenditure behind home ownership (see Figure 4). Automobile use entails internal and external costs. Internal costs include fuel, maintenance, and the initial investment. External costs, although often downplayed, may outweigh the combination of hard costs. Potential soft costs include health risks, medical expenses, and increased insurance premiums from: decreased physical activity, exposure to automobile emissions, and involvement in automobile collisions.

For the municipality, these external costs translate into more tangible services and program expenditures designed in part to facilitate on-going automobile usage, such as police, medical and fire services, street cleaning, and the myriad of publicly-funded health care programs. Transit-oriented development offers many solutions to relieve municipal and individual budget woes associated with automobile-oriented development.

Figure 4: Internal and external costs of automobiles per vehicle mile (Litman 2009)

City and Regional Benefits
As noted, automobile-oriented development carries a large price tag. Low-density, single-use development patterns require substantial infrastructure investments for roadways, sewer, water, stormwater, and schools as well as increased public service expenditures for police and fire. More compact development provides an opportunity to concentrate these investments in a smaller area and maximize the use of each lane mile, sewer and water line, school site, and emergency service personnel.

Critics of TOD argue transit expenditures make TOD unattainable. While initial investment in a transit network, especially rail transit, is high, studies demonstrate that return on investment can be achieved in a reasonable time period and result in a positive overall investment option for a city or region. In San Diego, for example, the estimated annual rate of return on investment in a rail-transit network is 107% (after accounting for tax-funded transit subsidies) (Cevero 2002). More modest returns may be more in the range of 10-20 percent annually (Dittmar and Ohland 2004).
In the San Diego example, the region’s primary economic benefits from rail-transit come in the form of land value increases. In the downtown area, land value premiums for commercial properties located within walking distance (half-mile) of a rail-transit station exceeded 91% when compared to identical “dummy” properties with no rail-transit access. The Dallas area has also experienced higher property values for properties in proximity to light rail stations. Between the years 1997 to 2001, median values of residential properties within a quarter mile of a light rail station increased 32.1 percent versus 19.5 percent with control group properties and office properties within a quarter mile of a light rail station increased 24.7 percent versus 11.5 percent with control group properties (Weinstein and Clower 2002). In short, the city benefits from transit investment through higher property and sales tax revenues. At the same time, private investors are rewarded in the form of higher property values, increased patrons, and larger profits. For example, in Englewood, Colorado, the City Center transit-oriented village experienced 100 percent occupancy rates, gross annual lease rates of $21 to $25 per square foot of office space as opposed to annual office lease rates in Englewood of $13.50 to $17 per square foot, and apartment rental rates of $1,005 to $1,735 per month as opposed to $500 to $700 per month for multifamily housing in Englewood and $550 to $750 in the metropolitan Denver area (Lockwood 2003).

Well designed TOD can also translate into economic benefits for the transit agency in the form of increased ridership. According to a survey of 90 U.S. transit agencies conducted by the Transportation Research Board (2004), ridership ranks first among transit agency goals for implementing TOD projects; economic development and revenue increases are a close second and third (see Figure 5). Increased ridership combined with a reduced need for investment in roadway infrastructure results in larger profits for the transit agency. At the same time, community support for transit-related services increases as the public realizes the benefits of successful TOD implementation. With broad community support, transit agencies are allowed greater flexibility in implementing transit projects to support TOD (Cevero,
et al. 2004). In such a self-fulling scenario, the transit agency is but one of many financial beneficiaries.

Individual Benefits
Through survey techniques, researchers are also able to quantify individual cost savings associated with living and in a TOD. According to the American Public Transportation Association (2002), Americans spend 18 cents of every dollar earned on their car. Actual costs, however, as Figure 4 demonstrates may be much higher when all factors are considered (Litman 2009). In a TOD, car-ownership may prove impractical. Similarly, couples or families may need only one car instead of two or more. The resultant economic benefit of single or no-car ownership is a marked reduction or elimination of automobile expenses such as fuel, maintenance, storage/parking, and general ownership.

Clearly, transit-oriented development offers many benefits over automobile-oriented development. As mentioned, however, TOD is not a one-size-fits-all planning tool. TOD policies must be tailored to fit the unique aspects of a region. Even more appropriately, individual streets and neighborhoods may require the application of different combinations of regional TOD policies and implementation approaches. For this reason, a prerequisite for bridging the gap between TOD planning policy and implementation is to gain an understanding of the underlying characteristics of each TOD. In an attempt to satisfy this foremost requirement and paint a picture of TOD in the Truckee Meadows as it exists today, Part II highlights the unique aspects of each TOD Corridor and Center in the region. A more comprehensive and graphical analysis can also be found in Appendix A of this report.
PART II: STATUS OF TOD IN THE TRUCKEE MEADOWS

REGIONAL ANALYTICAL PROCESS OVERVIEW
The following analysis is intended to provide a wide lens snap-shot of certain land use and transit characteristics for the region’s currently adopted Centers and TOD corridors. These characteristics were chosen because they represent many of the components necessary for functional TOD and therefore help illustrate the health and maturity of TOD in the Truckee Meadows. Although the Regional Plan defines two downtown centers, eight regional centers, and five TOD corridors (see Figure 1), the Western Gateway Regional Center and Sparks Downtown Center are excluded from this analysis as they have yet to be adopted by their respective local governing bodies and found in conformance with the Regional Plan.

Since these factors produce mostly high-level data, the results are not intended for, and should not be used for local-level planning exercises. However, the information generated from this regional analysis enables preliminary conclusions to be drawn regarding the current “maturity” of each Center or Corridor relative to other Centers and Corridors in the region. Using the characteristics below, the Centers or Corridors exhibiting the highest returns in comparison to the other areas are considered “Most Mature.” Those areas with moderate returns or an imbalance between high returns in one category but low in another are described as “More Mature.” Centers and Corridors with generally low returns for all categories are considered “Least Mature.” As will be discussed, the maturity level of a TOD Corridor or Center is an important first step for considering different approaches to bridge the gap between planning and implementation.

REGIONAL ANALYSIS - TOD CHARACTERISTICS

Residential Density
For transit-oriented development to become a reality, higher-density residential development clustered around mixed-use station areas is needed to support the provision of high-quality bus rapid transit (BRT) service that has travel times comparable to those of the automobile. BRT, as opposed to light rail, is the transit service around which the goals and policies of the Regional Plan relating to Centers and TOD corridors were developed to support. The Regional Plan specifies that the minimum density for Downtown Centers is 30 du/ac and the overall average density for Downtown Centers is 45 du/ac. For Regional Centers and TOD Corridors, the minimum density is 18 du/ac and the average residential density is 30 du/ac. Residential densities of approximately 15 du/ac are generally accepted as supportive of BRT services (as cited in Cevero, et al. 2004).

Density in the Regional Plan is defined as the result of dividing the total number of dwelling units on a site by the total site area (excluding non-residential, mixed use and public facility properties, development constraints area (DCA), parks, golf courses, and street and rail right-of-way (ROW)).
It is also important to note that this residential density analysis does not account for mobile homes or other potential types of residences without a fixed foundation. The Washoe County Assessor does not currently identify individual mobile home as assessable dwelling units. Parcels with mobile homes often contain a fixed-foundation office or service facilities. On such parcels, only fixed-foundation structures are considered in the current density analysis.

Non-Residential Floor Area Ratio (FAR)
Just as higher-density residential development clustered around transit stations is needed to support high-quality transit services, so too is higher intensity non-residential development. Embracing the nodal concept, the Regional Plan calls for FARs of 1.5 in the region’s Downtown Centers, Regional Centers, and Station Areas. Areas located between Station Areas within a TOD corridor have a lower FAR requirement of 0.25 which serves to focus areas of higher density and intensity of use in Centers and around Station Areas.

As defined in the Regional Plan, FAR is the ratio of the total floor area of buildings on a certain plot to the area of the plot.

Evaluating FAR within Station Areas at this point in time is however difficult as relatively few have been geographically defined. Currently, only two Station Areas have been defined and each is located in the City of Reno. These Station Areas include Plumb Lane Crossing and the River Landing at Mill. Per the Regional Plan, Station Areas must have a non-residential FAR of 1.5. However, due to the limited number of Station Areas in the region, these geographical areas have not been separated from the non-residential FAR analysis for the TOD corridors that they are located in. As the region’s TOD corridors evolve over time and additional Station Areas are defined, a non-residential FAR analysis of Station Areas could be conducted.

Overall Floor Area Ratio (FAR)
In addition to analyzing the non-residential FAR of each currently adopted Center and TOD Corridor, an analysis of overall FAR is also presented. This overall FAR analysis provides a gross assessment of the ratio of the total building square footage in a particular Center or TOD corridor to the total parcel acreage that all buildings are located on. This analysis is distinct from the way in which FAR is used in the Regional Plan to establish the minimum density requirements for non-residential uses, but is in its own right useful in gaining a more general understanding of overall density in the region’s Centers and TOD corridors as it incorporates both residential and non-residential uses.

Total Employment and Employment Density
A key component of transit-oriented development is the mixing of residential and non-residential uses within easy walking distance of a transit stop. While higher density residential development is crucial in generating transit ridership, so too is the level of employment and density of employment to the success of transit-oriented development because high employment densities create more potential trip destinations for transit
riders. As an analytical tool to evaluate minimum employment density to support high capacity transit service, the Puget Sound Regional Council utilizes a measure of 25 jobs/acre (as cited in Cevero, et al. 2004). Ultimately, Centers and TOD Corridors with high densities and intensities of employment are in essence more mature than those Centers and TOD Corridors with low employment.

**Intersection Density per Square Mile**
Intersection density is an important indicator of street connectivity and walkability. A high level of street connectivity is critical for transit-oriented development as connectivity provides multiple and direct routes to destinations. As illustrated in the graphics below, greater numbers of intersections in a well-connected street network allow for an individual to choose between many different routes to a single location. However, in a subdivision characterized by cul-de-sacs the number of intersections is much lower and the number of available routes is limited which requires much greater travel distances to reach a destination and degrades walkability.

*Figure 6: Street Patterns and Connectivity*

Noting how intersections enhance the number of routes available, Centers and Corridors with higher intersection densities would be considered more accessible than those with lower intersection densities. Langdon (2006) suggests that a low intersection density is approximately 81 intersections per square mile or less and that a high intersection density is 225 intersections per square mile or greater.

**Transit Ridership per Route Mile**
Transit ridership per route mile in each Center and TOD corridor is an indicator that allows for comparison of transit ridership levels across each geographic area and illustrates which Centers and TOD Corridors currently have the highest ridership base. As Centers and TOD Corridors mature over time, increasing levels of transit ridership should be experienced.
Vacant Parcel Area and Percent Vacant Parcel Area
The amount of vacant land in a Center or TOD Corridor indicates not only the amount of land that is available in the future for infill development that does not have a structure already in existence, but also provides a sense of how built out a certain Center or TOD Corridor is at a specific point in time. It is fair to conclude that Centers and TOD Corridors with high proportions of vacant lands may not exhibit characteristics of transit-oriented development in the near future. Therefore, higher amounts of vacant land usually characterize the least mature Centers and Corridors.

Bus Stops
The number of bus stops serving the region’s Centers and TOD Corridors is an important component of transit service as they represent an investment in transit infrastructure. The overall number of bus stops serving the region’s Centers and TOD Corridors should increase over time as the transit network expands.

Land Use Mix
Again, transit-oriented development is predicated on a mix of residential, employment and shopping opportunities designed for pedestrians located within easy walking distance of a transit stop. This mixing of uses allows not only for increasing amounts of non-automobile trips, but also allows for reductions in trip length as uses are within a much closer proximity to each other than when uses are segregated. While each Center and TOD Corridor in the region is unique and there is no one-size-fits-all guideline to the appropriate percentages of residential, commercial, industrial, and park uses within these areas, Centers and TOD Corridors that are dominated by one or two uses do not necessarily allow currently for synergy between uses.

Average Parcel Area
The average parcel area in the region’s Centers and TOD Corridors is a relatively straightforward measure. Smaller parcel sizes are more common in denser areas in which parcels have already been subdivided whereas larger parcel sizes are more common in less urbanized portions of the region.

Total Number of Parcels
As with the average parcel area in the region’s Centers and TOD Corridors, the total number of parcels is indicative of denser urban areas as opposed to less dense areas. Centers and TOD Corridors that have higher numbers of parcels are most often more urbanized areas whereas Centers and TOD Corridors with relatively low levels of overall parcels are more commonly less dense and less urbanized.
MOST MATURE CENTERS AND TOD CORRIDORS

Downtown Reno Center
The Downtown Reno Center is arguably the most mature transit-oriented development area in the region. It consistently ranks high among the TOD characteristic criteria and specifically has the highest intersection density, employment and employment density, non-residential and overall FAR, and number of bus stops when compared to all of the Centers and TOD Corridors. The non-residential FAR for the Center is 2.87 and the overall FAR in the Center is approximately 3.0. This non-residential FAR is well above the minimum FAR of 1.5 for Downtown Centers set forth in the Regional Plan. Moreover, the overall FAR of approximately 3.0 indicates that the Center as a whole is dense. The average residential density is approximately 50 du/ac which is above the average 45 du/ac residential density specified in the Regional Plan. Employment density in the Center is high at approximately 29.8 jobs/ac. In terms of residential, non-residential and employment density, the Downtown Reno Center is well suited to immediately support bus rapid transit services.

Additionally, the Center is arguably the most connected and accessible Center in the region. With 230 intersections/square mile, the Downtown Reno Center is considered to have a high intersection density. Its land use mix further reveals that the Downtown Reno Center has the highest percentage of streets of any Center or TOD Corridor, which is likely linked to its high intersection density that accompanies its traditional grid street pattern. While approximately 33 percent of the area in the Downtown Reno Center is used for commercial purposes, residential uses do account for approximately 11 percent of the Center area. Importantly, approximately 6 percent of the Center is vacant lands and another 5 percent is classified as vacant with minor improvements, which most often indicates the presence of surface parking lots. Furthermore, these vacant lands are dispersed throughout the Center. This relatively high level of vacant lands indicates that efforts to focus on infill development can provide increasing amounts of residential uses to the Center.

Medical Regional Center
The Medical Regional Center is currently the smallest Center or TOD Corridor in the region, encompassing approximately 227 acres. However, the Medical Regional Center ranks within the top five Centers and TOD Corridors in terms of intersection density, residential and non-residential density, employment density, and transit ridership. The Medical Regional Center’s residential density is approximately 32 du/ac, which is above the 30 du/ac average density set forth in the Regional Plan. However, the Center’s non-residential FAR is approximately 0.39, which is well below the 1.5 FAR set for Regional Centers and its overall FAR is currently approximately 0.3. In spite of a higher residential density, the FAR analyses indicate that development in the Medical Regional Center will need to be more intense in the future to increase FAR. Though relatively high in comparison to other Centers and Corridors in the region, the Medical Regional Center’s
intersection density is moderate at 121 intersections/ac. This Center has approximately 15 acres of vacant land and has relative balance amongst its land uses (37% commercial; 17% streets; 14% Industrial; and 12% residential). Opportunities to enhance the functionality of this Center include strategic increases in FAR as well as targeted improvements to provide better connectivity.

**Sparks TOD Corridor**
The Sparks TOD Corridor is one of the region’s most mature areas in comparison to other Centers and TOD Corridors with regards to development density, intersection density, transit ridership, and total bus stops. The average residential density for the Sparks TOD Corridor is approximately 27 du/ac which is certainly above the minimum density requirement for TOD Corridors of 18 du/ac and approaching the average density set forth in the Regional Plan. The non-residential FAR for the Sparks TOD is approximately 0.55 and the overall FAR for the Sparks TOD Corridor is approximately 0.7. As there are no Station Areas yet geographically defined in the Sparks TOD, whether or not the 1.5 FAR requirement set forth in the Regional Plan is being met cannot be determined. However, the non-residential FAR of 0.55 is certainly above the 0.25 FAR requirement for areas of TOD Corridors between Station Areas. Employment density in the Sparks TOD Corridor is however rather low at approximately 6.4 jobs/ac.

The Corridor’s intersection density is moderate at about 132 intersections/ac and streets account for approximately 20 percent of the Corridor’s area. However, the Sparks TOD Corridor has the third highest transit ridership per mile amongst the Centers and TOD corridors and the second highest number of bus stops (201), which indicates the Sparks TOD Corridor has one of the larger ridership bases in the region. Focusing on the land use mix within the Sparks TOD Corridor, commercial and residential uses each account for approximately 20 percent of the uses within the corridor while industrial uses account for approximately 16 percent. Approximately 11 percent of the corridor area is classified as vacant; however, most of these vacant lands are located within the eastern portions of the Sparks TOD Corridor. Overall, the Sparks TOD Corridor is a fairly well-balanced corridor that could benefit from targeted policies to increase employment densities and floor areas throughout the corridor.

**More Mature Centers and TOD Corridors**

**UNR Regional Center**
The UNR Regional Center illustrates mixed results in terms of transit-oriented development characteristics. The average residential density in the UNR Regional Center is approximately 18.3 du/ac, which is just above the minimum residential density for Regional Centers. The Center’s non-residential FAR is approximately 0.35 and its overall FAR is 0.28, which indicates that development in the UNR Regional Center will need to be more intense in the future to increase FAR. The UNR Center has a moderate intersection density and the fifth highest total employment amongst all Centers and TOD corridors.
Employment density in the Center is however fairly low at approximately 12 jobs/ac. The UNR Regional Center has 122 total bus stops (third highest), but yet has only the eighth highest transit ridership per route mile when compared to the region’s other Centers and TOD Corridors which may be due to the UNR campus shuttle services offered within the campus. Moreover, the UNR Regional Center displays a balanced land use mix with approximately 38 percent of the area being used for commercial purposes, 14 percent for streets, 20 percent for residential purposes (almost 9 percent of which is multi-residential). Over 16 percent of the UNR Regional Center area is vacant; however, as most of this vacant land is located at the north end of the UNR campus, this land will likely develop consistent with the UNR Regional Center Plan which indicates primarily Health Science uses.

**Mill Street TOD Corridor**
The Mill Street TOD Corridor at first glance appears to be a relatively mature TOD Corridor when compared with other Centers and TOD Corridors in the region with a non-residential FAR of 0.68 and an overall FAR of approximately 1.3, and a very high residential density of 110 du/ac. However, the land use mix reveals that the Mill Street TOD is dominated by commercial uses (57 percent) with streets being the next highest use in the area (17.5 percent). Residential uses within the Corridor account for only about 2.5 percent of the area and all of these residential uses are condominiums located within the Grand Sierra Resort & Casino. Realistically, the Mill Street TOD Corridor has limited residential uses and a low employment density of approximately 5.7 jobs/ac. Transit ridership per route mile is the third lowest amongst Centers and TOD Corridors. As this corridor develops over time, special attention will need to be paid to strategically identifying Station Areas and ensuring that residential uses develop to support premium bus service.

**Convention Regional Center**
The Convention Regional Center is a relatively mature center that is characterized by an average residential density of approximately 54 du/ac, which is well above the average density of 30 du/ac specified in the Regional Plan for Regional Centers. The Center further has a non-residential density of 0.30 and an overall FAR of 0.8 which indicates that the density of non-residential development in the Center falls short of the 1.5 FAR minimum requirement found in the Regional Plan, but that overall FAR in the region increases due to more intense residential uses. This Regional Center further has the third highest transit ridership and the fourth highest number of bus stops (119) in comparison to the region’s Centers and TOD Corridors. This Center has approximately 48 acres of vacant land (3.9 % of the total area) and an additional 45 acres of land that is vacant with minor improvements (3.7% of the total area). While the Center is predominantly commercial in nature (46% of the total area) and the next highest use is streets at approximately 21 percent of the Center’s area, residential uses are present and comprise approximately 13 percent of the Center. Total employment in the Center is approximately at 13,000 jobs and employment density is fairly low at 10.5 jobs/ac. Overall, the Convention Regional
Center could benefit from targeted policies to increase residential development, increase employment densities and floor area ratios throughout the Center.

**South Virginia Street TOD Corridor**
The South Virginia Street TOD Corridor illustrates mixed results in terms of transit-oriented development characteristics. The average residential density within the Corridor is quite high at approximately 42.5 du/ac, which is well above the average density of 30 du/ac specified in the Regional Plan. The non-residential FAR for the corridor is approximately 0.43 and the overall FAR for the TOD corridor is 0.4. The non-residential FAR of 0.43 is certainly above the 0.25 FAR requirement for areas of TOD corridors between Station Areas. Employment density in the Corridor is however relatively low at approximately 8.6 jobs/ac. The land use mix for the Corridor illustrates that there is a relative balance amongst uses in the Corridor at this point in time (33.5% commercial, 18.3% streets, 15.5% vacant, 12.6% residential, and 8% industrial). In addition to 15.5 percent of the Corridor being classified as vacant, and additional 4.4 percent of the Corridor is vacant with minor improvements. This high percentage of vacant land within the Corridor signals that there are opportunities to promote higher-density and intensity uses on these lands over time. The South Virginia Street TOD Corridor contains 67 bus stops and has the fifth highest transit ridership per route mile when compared with the other Centers and TOD Corridors in the region. Opportunities to intensify development around Station Areas in the Center would enable this Center to further increase residential and non-residential density while enhancing transit ridership.

**East Fourth Street TOD Corridor**
The East Fourth Street TOD Corridor displays many transit-oriented development characteristics. With a residential density of approximately 15 du/ac, this Corridor is approaching the minimum residential density for TOD Corridors of 18 du/ac set forth in the Regional Plan. However, residential uses in the Corridor area are primarily confined to a small area between 6th Street and I-80, mainly west of Sutro. The Corridor also has a non-residential FAR of 0.40 and an overall FAR of 0.24. The non-residential FAR of 0.40 is certainly above the 0.25 FAR requirement for areas of TOD corridors between Station Areas. However, employment density in the Corridor is low at approximately 6 jobs/ac. The Corridor further supports the sixth highest transit ridership when compared to the other Centers and TOD Corridors. Approximately 34 percent of the Corridor area is streets. This high percentage is likely attributable to the southern half of the I-80/US 395 interchange (Spaghetti Bowl) being located in this corridor and to its moderately high intersection density of 142 intersections/square mile. It should be noted that while this intersection density does not approach 225 intersections/square mile, this intersection density is second only to the Downtown Reno Center. The land use mix for the East Fourth Street TOD Corridor reveals that following streets, industrial and commercial uses each account for approximately 23 percent of the Corridor area. Residential uses account for approximately 4.5 percent of the Corridor and importantly, vacant lands account for approximately 9 percent of the Corridor area and are relatively dispersed throughout.
the Corridor. Of these vacant lands, 4.5 percent of them are classified by the assessor as vacant with minor improvements which indicates primarily the presence of surface parking. Ultimately, infill development efforts targeted for vacant lands and efforts to provide structured parking could produce increasing amounts of residential uses in the Corridor to provide a more balanced land use mix.

**Least Mature Centers and TOD Corridors**

**North Virginia Street TOD Corridor**
The North Virginia Street TOD Corridor, while not yet mature, exhibits characteristics that will enable it to become a functioning TOD in the future. The Corridor’s residential density is approximately 15 du/ac, its non-residential FAR is 0.16 and its overall FAR is 0.25. Intersection density in the Corridor is however low at approximately 80 intersections/square mile as is overall employment (2,760) and employment density (1 job/ac). The land use mix for the North Virginia Street TOD illustrates that the most dominant use is vacant lands (34 percent). Aside from this large amount of vacant area, the Corridor is relatively balanced with regards to uses with 15 percent industrial, 11 percent streets, 16 percent residential, and 8 percent commercial. Over time, if efforts are made to enhance connectivity and walkability and develop functional station areas that contain a mix of higher density and intensity residential and non-residential uses, this Corridor will likely evolve to support BRT. Policies and implementation strategies for the North Virginia Street TOD Corridor should also be sensitive to the exceptional potential of this corridor to serve as a multi-modal link between housing in the North Valleys and jobs in the UNR Regional Center and the Downtown Reno Center.

**West Fourth Street TOD Corridor**
The West Fourth Street TOD Corridor ranks relatively low among the key TOD characteristics when compared with the Centers and TOD Corridors in the region. The Corridor has an average residential density of approximately 3.4 du/ac, a non-residential FAR of 0.36, and an overall FAR of 0.14. Although the non-residential FAR of 0.36 is above the 0.25 FAR requirement for areas of TOD corridors between Station Areas, the overall FAR and average residential density illustrate that the Corridor is not dense at this point in time. The average parcel size in the Corridor is approximately 3 acres and currently only 227 parcels exist. The limited number of parcels can be partially attributed to the width of the Corridor. In many segments of this Corridor, the Corridor width does not extend laterally beyond the Fourth Street right-of-way (ROW). In these areas, TOD policies would not currently apply to parcels directly adjacent to the ROW. Examining the land use mix in the Corridor, residential uses account for approximately 25 percent of the uses; however, of that 25 percent, 19 percent are single family residential uses. Vacant lands and streets each account for an additional 19 percent of the Corridor while industrial uses account for approximately 12 percent and commercial uses account for approximately 11 percent. The West Fourth Street TOD Corridor is not dominated by any one use; however, future challenges to this TOD Corridor’s development will likely be
increasing residential density and non-residential FAR in Station Areas to a level that can support expansions in transit service throughout the Corridor.

**Dandini Regional Center**
The Dandini Regional Center is characterized by low densities for many of the TOD characteristics. Residential density is currently 4.4 du/ac with all 124 units clustered in one development in the southwest corner of the Center. The Center further has a low non-residential FAR of 0.11 and a low overall FAR of 0.04. Employment density is approximately 1.5 jobs/ac and intersection density is approximately 27 intersections per mile. In spite of having only 5 bus stops, the transit ridership per route mile in the Dandini Regional Center is the seventh highest when compared with each of the region’s Centers and TOD Corridors which may be due to transit trips taken to the Truckee Meadows Community College. The land use mix for the Dandini Regional Center indicates that the Center is dominated by commercial uses (approximately 45 percent of the Center area) and vacant lands (approximately 40 percent of the Center area). Residential uses account for only about 4 percent of the Center area and streets account for only about 8.5 percent of the area. As this Center builds out over time, opportunities will need to be pursued to balance commercial uses with additional residential uses; however, the large amount of slopes of 30 percent or greater may constrain future maturity of this Center.

**Reno-Tahoe International Airport Regional Center**
The Reno-Tahoe International Airport (RTIA) Regional Center is a unique center that is primarily devoted to airport operations. As residential development is not compatible with airport operations, this Center is not anticipated to have any increase in residential land uses. The average parcel size in the RTIA Regional Center is over 10 acres and only 143 parcels exist in the Center. A single parcel, which contains a majority of the Reno-Tahoe International Airport is 1,131 acres and accounts for 69% of the total land area of this Center. Within the Center boundaries, there are very few intersections (approximately 24 per acre) and non-residential FAR is low 0.31 as is overall FAR at 0.083. There are approximately 3,379 employees and employment density is at 2 jobs/ac. Eleven bus stops are located within the Center boundaries; however, transit ridership per route mile is the second lowest amongst all Centers and TOD Corridors. This low return for transit ridership may be attributed to a potentially high number of trips to and from the airport being accommodated by taxis, shuttles and limousines. The land use mix for the RTIA Regional Center reflects its focus on airport operations with over 75 percent of the Center used for commercial purposes, 8 percent vacant lands, and 7 percent industrial uses. In addition to the preceding factors, height restrictions for all development within proximity to the airport, both within and outside the Center boundaries, will further inhibit typical high-density transit-oriented style development. Despite these limitations, the RTIA is a fundamental transportation node in the region. According to the RTAA, the Reno Tahoe International Airport accommodates over four million passengers per year (RTAA 2009). Ostensibly, TOD policies and implementation strategies might focus on ways to better distribute arriving passengers to their destinations throughout the region and return
departing passengers to the airport without the need for an automobile. The success of these airport-specific policies and strategies would rely heavily on the success of TOD efforts in the other Centers and Corridors across the region.

**Redfield Regional Center**
The Redfield Regional Center can also be classified as a Regional Center that is not likely to illustrate key TOD characteristics in the near future. This Regional Center is among the lowest in terms of average density (0.3 du/ac), non-residential FAR (0.21) overall FAR (0.049), intersection density (approximately 11 per square mile), and employment density (1.3 jobs/ac). The Redfield Regional Center has no bus stops and only displays ridership per route mile within its boundaries due to RTC’s intercity service from Reno to Carson City. Sixty-three percent of the lands within the Redfield Regional Center are vacant and the next highest land use in the Center is streets at 13 percent of the Center area. Given the low intersection density, the relatively high percentage of street area is likely due to the presence of the I-580/US 395 interchange and the Mt. Rose Highway which contributes to existing walkability challenges. Commercial uses account for approximately 8 percent of the Center area and residential uses account for approximately 6 percent.

**Stead Regional Center**
The Stead Regional Center is characterized by a high level of vacant parcel area (63 percent), a large average parcel size (118 acres), a very low intersection density (approximately 3 intersections per square mile), as well as a low average residential density (0.0006 du/ac) due to the existence of just 19 residential units in the whole center which are all associated with the airport. The Center further has a low non-residential FAR of 0.044 and a low overall FAR (0.001). There are only 35 total parcels in the Center and all are owned by the Reno Tahoe Airport Authority (RTAA). The parcel containing the Stead Airport hangars, taxiways, runways and large areas of undeveloped land surrounding the runways is over 1,700 acres in size and accounts for 36% of the Stead Regional Center’s total area. This Regional Center has no transit ridership or bus stops and has an approximate overall average employment of 123 jobs which leads to an employment density of 0.025 jobs/ac. The Stead Regional Center is further dominated by vacant lands and industrial uses. It is fair to assess that the Stead Regional Center will not display the key characteristics of transit-oriented development for some time.

To provide an overall picture of these characteristics, the following table summarizes the results of the analysis conducted for key TOD characteristics in the region’s Centers and TOD Corridors.
Prior to selecting policies and developing strategies to better support TOD, it is imperative to have a general understanding of conditions as they exist today. Relying on the depth of analysis contained in Appendix A, this section highlighted the relative maturity of each currently adopted Center and TOD Corridor identified in the Regional Plan. This analysis also demonstrated that TOD policies and implementation strategies cannot be a one-size-fits-all undertaking. In order to bridge the gap between planning and implementation, selecting the appropriate approach(s) is critical. By arranging the Centers and Corridors based on maturity, this section provided the initial platform for understanding which of the approaches described below might be most effective. With the general framework from Part I and the region-specific analysis from Part II in place, Part III offers a spectrum of innovative approaches being employed throughout the country to facilitate TOD implementation. With some consideration, combinations of these policy, planning, and implementation approaches may be appropriate for application in the Truckee Meadows.
PART III: APPROACHES TO ADVANCING TOD IN THE TRUCKEE MEADOWS

TOD CHALLENGES

Although transit-oriented development is becoming an increasingly popular tool across the nation as a means of providing a new housing product to meet changing lifestyle preferences, spurring economic development, and mitigating negative environmental consequences, TOD is a relatively new tool in the Truckee Meadows that is certainly more complex than traditional auto-oriented development. Transit-oriented development is often thought of in terms of its most prominent component parts including higher densities and mixed uses in proximity to transit stations. However, strictly looking at these physical characteristics of TOD detracts from the overall goal of TOD, which is to create places that function in an entirely different way from suburban auto-oriented development that has been the status quo in many communities across the country since the 1950’s. Rather than designing development and the streetscape to primarily accommodate the mobility of the automobile to the detriment of other modes of transportation, transit-oriented development requires a sophisticated streetscape that itself is an amenity and where development interacts with the streetscape to create a vibrant environment in which people are dominant.

Transit-oriented development offers the ability to create diverse and walkable, mixed-use neighborhoods that are served by high-quality multi-modal transportation systems which allow for reduced automobile usage as an alternative to suburban-style development that is characterized by few choices for housing types and transportation options. However, moving from the vision to the implementation of TOD can be a challenging process because successful TOD requires a paradigm shift not only in land use planning, but also in multi-modal transportation planning. Land use planning and decisions must embrace the integration of uses, human-scale design, street design standards that enhance walkability, and density increases to support high-quality transit services. Transportation planning and decisions must also conceptually embrace the parity of walking, bicycling, and mass transit with the private automobile. Moreover, these paradigm shifts in both land use and transportation planning must translate into decisions that complement each other. Creating these new synergies that allow for the built environment and the streetscape to interact and produce vibrant places can be impeded by a variety of barriers. Potential barriers to implementing TOD are wide ranging and include the following which are summarized below (Belzer & Autler 2002; Goodwill & Hendricks 2002; Cevero 2004):

- **Regulatory Barriers:** Regulations that establish density and FAR maximums, height limitations, lot coverage maximums, and minimum parking requirements restrict development densities necessary to support transit-oriented development and provide for excessive parking that does not create an incentive to use transit;
- **Coordination and Communication Barriers:** Some communities experience a lack of coordination and synergy between transit agencies that control when, where,
and what type of mass transit service will be provided and local governments responsible for land use decisions and many streetscape improvements;

- **Mobility Improvement Barriers:** Transit-oriented development is predicated on creating parity among all modes of transportation such that the automobile is no longer the dominant mode of transportation. However, shifting from implementing capacity improvements for the automobile to capacity improvements for all modes presents initial infrastructure investment costs and ongoing service costs for transit network expansion and additional investments in improvements for pedestrians and bicycles. Moreover, TOD also presents the “congestion conundrum” in which spot congestion can increase in certain locations but overall mobility improvements serve to regionally alleviate congestion;

- **Financing Barriers:** Although mixed-use projects characteristic of TOD are becoming more widely pursued, difficulties do exist in obtaining financing for mixed-use projects as they are perceived by lenders and investors as higher risk;

- **Existing Environment Barriers:** Often times existing land use and street patterns do not support TOD in terms of density and street connectivity. Existing development may not display connectivity and accessibility if grid street patterns are not in place and long street blocks and wide roadways are present; and,

- **Political Barriers:** In many communities there is often opposition to higher densities from surrounding residents and concurrent pressure from road-building lobbies. For TOD to become a reality, visionary political leadership is needed to champion the many benefits of TOD and make often difficult land use decisions to support higher densities and difficult transportation decisions to make innovative changes to mobility.

Like many communities, the Truckee Meadows has either experienced many of these barriers or continues to experience them. However, as a region the Truckee Meadows has a firm planning foundation in place to support TOD due to the large amounts of time and effort that have been devoted to developing both land use and transportation plans that form the basis for TOD. What follows is a brief overview of the planning components that currently are in place to support TOD.

**Planning Foundation Overview**

Since the concept of transit-oriented development was adopted into the Regional Plan in 2002, significant progress has been made by the cities of Reno and Sparks to adopt their respective Center and TOD Corridor plans and to update their associated zoning regulations. The Regional Transportation Commission (RTC) has further updated the Regional Transportation Plan (RTP) to include objectives and policies specific to the region’s identified Centers and TOD Corridors.

Focusing strictly on land use planning efforts to date, the City of Reno has adopted all of its Center and Corridor plans excepting the Western Gateway Regional Center Plan and
the City of Sparks is in the process of replacing its existing TOD Corridor Area Plan with the Sparks TOD Corridor Master Plan which includes the Sparks Downtown Center and is accompanied by updated zoning regulations. Following the framework set forth in the Regional Plan, these plans for the region’s Centers and TOD Corridors establish mixed uses, include enhanced density and floor area ratio (FAR) requirements, set forth land use and street design standards that support multi-modal transportation options, and provide incentives for development such as reduced parking requirements and density bonuses.

The supporting policies and planning tools found in these planning documents establish the foundation for successful TOD in the region as they remove potential regulatory barriers such as limitations on the mixing of uses and the specification of maximum densities, identify certain existing environment barriers, and to varying degrees identify future multi-modal improvements necessary to implement the plans. The table below presents an overview of the elements supporting TOD contained in the planning documents that have been found in conformance with the Regional Plan to-date and additional information from the zoning codes of the cities of Reno and Sparks relating to parking standards and incentives:

**Table 2: Center & TOD Corridor Plan Component Matrix**

<table>
<thead>
<tr>
<th>Center/TOD Corridor</th>
<th>Complete Streets Policy</th>
<th>BRT Route Identified</th>
<th>Ped Route Identified</th>
<th>Bike Route Identified</th>
<th>Bike/Ped Route Identified</th>
<th>Primary Vehicular Route Identified</th>
<th>Transit Stations Identified</th>
<th>Mixed Uses Allowed</th>
<th>Maximum Parking Standards</th>
<th>Density &amp; FAR Minimums</th>
<th>Incentives</th>
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As the Metropolitan Planning Organization (MPO) for Washoe County, the Regional Transportation Commission (RTC) is responsible for developing the Regional Transportation Plan (RTP) which is the region’s long-range plan for all modes of transportation and has a 30 year planning horizon. The RTP identifies the facilities, services and programs necessary to meet the region’s travel demands through the year 2040. The RTC further prepares the short-range Regional Transportation Improvement Program (RTIP) which has a five year planning horizon and specifies the highway, transit, bicycle and pedestrian projects for Washoe County. The RTIP is developed with the assistance and cooperation of state and local governments, including public works and planning officials, who develop project proposals and review the project listing developed by RTC staff. Public transportation improvements and streets and highway improvements projects included in the RTIP are prioritized separately.

The RTP sets goals, objectives, and policies for the community’s transportation system and must undergo a federal conformity determination as well as a conformity determination with the goals and policies of the Regional Plan. The goals set forth in the 2040 Regional Transportation Plan are listed below:

1. Provide for and sustain a mix of transportation modes that can meet the continuing needs for personal mobility and for the movement of goods consistent with regional goals and values;
2. Comprehensively plan for all regionally significant modes of transportation and ensure their interconnection. Coordinate with all other jurisdictions that either influence or are affected by regional transportation planning efforts;
3. Develop a balanced land-use and transportation system that minimizes the need for automobile travel and maximizes the opportunity for transportation alternatives such as public transportation and non-motorized travel modes;
4. Maintain, upgrade or develop existing and future transportation systems as a public service in a way that renders them safe, functional, flexible, environmentally acceptable and aesthetically pleasing;
5. Manage the transportation system to provide an optimum level of mobility for the greatest number of persons while insuring mobility for the transportation disadvantaged; and,
6. Improve safety in all modes through timely maintenance of existing infrastructure, development of new infrastructure, enforcement of access controls and expanded public education and awareness.

To achieve these goals, the RTP sets forth numerous objectives and policies. Some of these objectives and policies that directly relate to transit-oriented development as they advance transit network expansion and multi-modal transportation improvements are listed below. The list below is not an exhaustive summary of all objectives and policies in the RTP that support TOD, but a selection of those that support TOD through modal objectives and the planning and prioritization of multi-modal improvements.
**RTP Objectives**
- The minimum transit modal share will be 3% by 2013, 4% by 2018 and 6% by 2030 and beyond.
- Within BRT corridors, the BRT mode share will be 20% by 2020 and 30% by 2040 and beyond.
- The bicycle and pedestrian modal split will be 8% by 2013, 9% by 2018, 11% by 2030 and 12% by 2040.
- By 2013, 60% of the Bicycle Plan will be completed; by 2020, 80% of the Bicycle Plan will be completed; and by 2040, 100% of the Bicycle Plan will be completed.
- By 2013, there will be uniform policies and standards for the location and installation of sidewalks in the region adopted by local governments.

**RTP Policies**
- Prioritize street and highway funding for capacity improvements to promote in-fill development and higher intensity development along TOD corridors and within downtown, regional and emerging employment centers.
- Expansion of RTC RIDE should focus on increasing productivity consistent with the priorities for providing service listed in the Truckee Meadows Regional Plan, such as downtown centers, TOD corridors, and regional centers.
- The RTC shall provide transit service within the area served by the Primary Transit Network (PTN) that is fast, reliable, and has competitive travel times compared with the automobile (consider stop spacing, signal preemption, express bus service and other techniques).
- RTC shall work in cooperation with local governments to develop street standards that facilitate transit service by recognizing future right-of-way and operational needs, e.g., provision for bus turnouts, cross-street spacing to optimize transit stops, lane widths that can safely accommodate transit vehicles, etc.
- RTC shall work in cooperation with local and state governments to identify future transit corridors, types of services to encourage supporting land uses, pedestrian facilitates and right-of-way for exclusive transit use in limited areas.
- Focus bikeway funding on projects that have regional benefits, multi-jurisdictional, promote safety and/or that close existing gaps in the bicycle network. Develop travel-demand forecasting, data collection, user surveys for bicycle use and integrate with regional transportation planning efforts.
- Develop a Regional Bikeway Master Plan that integrates local bikeway plans and encourages connections between communities and provides consistent design standards.
- Construct bicycle lanes in accordance with the Bicycle Element whenever roads are constructed, reconstructed or rehabilitated where appropriate.
- Give funding priority to pedestrian projects that contribute to a seamless walking network with links to alternative modes/major attractions.
Pedestrian facilities that serve as alternatives to automobile travel will be given a higher priority than those pedestrian facilities that do not serve as alternatives to automobile travel.

Further defined in the 2040 RTP is the region’s Primary Transit Network (PTN) which is a framework for major investments in transit services. The PTN is distinct from other transit services in the region as it consists of routes running at 15 minute intervals or better all day and is aimed at maximizing productivity in higher density areas. Service strategies unique to the PTN include rapid transit services which offer the speed and frequency associated with rail transit, the primary locals service which offers transit service running at 15 minute intervals, and the primary express service that offers nonstop service connecting major nodes several miles apart. Currently, there are no primary express services operating and several route segments offer services running every 15 minutes. South Virginia Street has been designated the first corridor in the RTP for BRT implementation and although the 2040 RTP does note that a BRT corridor connecting Reno and Sparks is possible, as of this time, the RTP does not identify any future BRT corridors in the region through the 2040 planning horizon.

The draft 2009-2013 RTIP currently includes a number of projects that will advance transit oriented development including a transit queue jump project for 12 intersections on Virginia Street, the relocation of the bus transfer facilities in Reno and Sparks, and the implementation of bus rapid transit along portions of South Virginia Street, which is a three year demonstration project.

**Implementation Challenges Overview**

Clearly, the region has made large investments in developing land use plans that will enable higher-density, mixed-use development in the region’s Centers and TOD Corridors in the future and a transportation plan that defines modal objectives for the region and policies that over time will enhance the transit, pedestrian, and bicycle networks. However, the Truckee Meadows, like many communities, still faces barriers to moving the vision of transit-oriented development to reality. Regionally, regulatory barriers, mobility improvement barriers and existing environment barriers currently exist and present challenges to implementing transit-oriented development. Specific implementation challenges associated with overcoming these barriers can be grouped into the following three categories:

1. **The “Congestion Conundrum”:** While TOD can alleviate regional traffic congestion, increases in residential density can lead to localized spot congestion. However, potential widening of roadways to mitigate spot congestion may not be appropriate for TOD areas as they are to be walkable places in which the automobile is not the dominant form of transportation. Ultimately, increases in residential densities and their associated trips must be balanced with the need for walkable environments;
2. **Getting to Complete Streets and a Multi-Modal Transportation Network:**
Current roadway conditions favor the mobility of the automobile above other modes of transportation and land use and street patterns do not always promote connectivity and ultimately mobility. To implement transit-oriented development, a connected, multi-modal transportation network that is characterized by streetscape environments in which people are dominant and bicycling and transit are accommodated is needed. However, rights-of-way are limited in many of the region’s Centers and TOD Corridors, existing development and street patterns that limit connectivity pose challenges to constructing multi-modal mobility improvements, and parking standards may in places encourage the use of the private automobile; and,

3. **Funding Transit Operations and Mobility Improvements to the Streetscape:**
While funding is always a scarce resource and funding for transit operations and streetscape improvements are particularly limited in the current economic environment, it is worthwhile to consider various financing mechanisms currently being used elsewhere as ways to ultimately move forward with providing a multi-modal transportation network.

In spite of these implementation challenges, large opportunities remain to explore and develop additional policy, planning, and implementation approaches that advance TOD by promoting synergies between land use and transportation decisions. Approaches that conceptually support the development of the region’s Centers and TOD Corridors as diverse and vibrant walkable environments where all modes of transportation are accommodated and serve to better integrate land use and transportation planning can advance TOD implementation. Therefore the consideration of policy, planning, and implementation approaches that promote such integration can enhance the vision of transit-oriented development, planning efforts, and prioritization processes between local governments and the transportation agency such that multi-modal improvements necessary for the success of the region’s Centers and TOD Corridors occur in a targeted manner that recognizes the scarcity of time and money, but yet still strategically advances TOD.

Given that transit-oriented development is a departure from traditional auto-oriented development and requires a different approach to land use and transportation planning, it is unsurprising that new policy, planning, and implementation approaches are needed to guide TOD from concept to reality. Moreover, many other communities across the nation have faced similar implementation challenges and have responded by evaluating existing policies and tools and developing innovative approaches to advancing TOD. What follows is an examination of supportive policy, planning, and implementation approaches that are being used in other communities to address the three implementation challenges listed above.
Implementation Challenge 1: The “Congestion Conundrum” in Walkable Environments

Challenge Summary
Automobile congestion is a problem to varying degrees in many urban areas and produces negative consequences such as increased greenhouse gas emissions and delays in travel times. As a strategy to increase mobility options while reducing vehicle miles travelled, infrastructure costs associated with roadway capacity expansion, and greenhouse gas emissions, many communities have turned towards TOD. However, higher densities tend to increase spot roadway congestion. Although TOD has a greater mix of land uses and more transportation choices and therefore generates not only fewer trips, but also shorter trips, more trips per acre are generated than when compared with a traditional suburban development. For example, if a project in a TOD were to reduce trip generation by 30% from 100 trips to 70 trips, a doubling of the density over a suburban project would produce 140 trips as opposed to 100 trips with the suburban project. This overall increase in trip generation due to increased density, while positive in that 60 trips have not been added to the roadway network, can result in areas of localized congestion. For residents of TODs, this congestion may not however significantly increase delay as destinations are within much closer proximity than when compared with a suburban style development pattern where uses are segregated. Residents may experience a level of service (LOS) E or LOS F roadway which increases congestion per trip, however, their congestion per capita delay is less than their suburban counterpart that makes more trips that are of greater length (Litman 2007).

Ultimately, overall increases in trip generation are further complicated by the need for transit-oriented development to focus on pedestrians and remain walkable. Simply widening a roadway segment to add capacity in order to achieve vehicle LOS standards in a congested area is often not possible due to limited rights-of-way. Of equal importance, road widening contradicts the entire focus of transit-oriented development as widenings degrade the pedestrian environment and walkability. Moreover, LOS standards that apply only to the automobile are narrowly focused on vehicle mobility and roadway capacity and ignore the role of walking, biking, and transit as modes of transportation. Accordingly, LOS standards have been acknowledged as a barrier to increasing density and creating walkable environments. At the project level, LOS analyses that only evaluate trips generated by cars from new development do not take into account the trip reduction benefits of infill and multi-modal transportation projects which can result in the need for a developer to fund unnecessary capacity expansion for autos, intersection improvements, or parking spaces, ultimately making a project less attractive and financially feasible (Langdon 2008). LOS standards used solely for the automobile can further result in roadways that are sized to accommodate peak hour vehicle traffic, but yet are oversized for all other times of day and are difficult for other users to comfortably use (Governor’s Institute on Community Design).
Challenge Approaches

A. Examine Lowering LOS Standards in Centers and TOD Corridors

One approach to the “congestion conundrum” is to simply acknowledge that a trade-off in automobile mobility must often be made to improve the quality and capacity of other modes of transportation and ultimately provide communities with more complete and viable transportation choices such that additional regional benefits such as reduced land consumption, vehicle miles travelled, greenhouse gas emissions, reduced infrastructure costs, and increases in property values can be realized. Although this approach requires the acceptance of some congestion and the acknowledgement that traffic management in a TOD is more than just an LOS standard, it is with the knowledge that there are wide-ranging benefits to be gained by supporting transit-oriented development. Embracing this approach, the State of California adopted a law in 2002 that exempts “infill opportunity zones” from LOS standards. Infill opportunity zones are defined as areas located within 1/3 mile of a transit stop with frequent service (maximum headways of 15 minutes for at least 5 hours per day).

In the Truckee Meadows, many TOD Corridors have been designated around key arterials in the region that carry high volumes of traffic and serve to move traffic regionally. While it may not be practical to remove LOS standards from the region’s Centers and TOD Corridors, it is possible to analyze the feasibility of lowering LOS standards as a way to limit degradations to walkability through roadway widenings and focus on enhancing capacity from other modes. Although each Center and TOD Corridor in the region is unique, general issues to be considered in an assessment of the impacts of lowering LOS standards may include: right-of-way, redistribution of traffic away from Centers and TOD Corridors, congestion, prioritization of modes of transportation, availability of transit service, funding, and operational issues such as parking and access (see Appendix B for a decision tree tool to evaluate LOS and corridor improvements). Considering these issues would allow for careful consideration of trade-offs in auto mobility to improve the capacity of other modes. Moreover, an evaluation of LOS in Centers and TOD Corridors could be targeted towards those that display more maturity.

B. Examine Impact of TOD on Travel Characteristics

Another approach to the “congestion conundrum” is to carefully monitor the impact of TOD on travel characteristics such that trips reduction benefits can be integrated into congestion projections. Rather than using a private automobile for each trip, TOD allows for individuals to choose between a variety of non-automotive modes. Understanding the extent to which individuals do choose modes other than the private automobile is important component of mobility that impacts the tools used for long-range travel forecasting.
In the Truckee Meadows, the RTC Travel Forecasting Tool has been specifically developed to capture conditions unique to the Truckee Meadows and trip generation rates are based on local demographics. Trip characteristics and purposes further specifically reflect Washoe County as they are based upon the 2005 Washoe County Travel Survey Study. The current 2005 Washoe County Travel Survey Study was recently updated to replace the former Washoe County Travel Survey conducted in 1990. Monitoring the impact of TOD on travel characteristics through more frequent travel surveys could capture how travel behavior and patterns change over time with the evolution of TOD.

At the national level, a large body of research documents that reductions in trip generation are being experienced with transit-oriented development over and above Institute of Transportation Engineers (ITE) trip generation projections based on land uses. In Celebration, Florida, daily external trips were found to be 27.7% less that ITE estimates and the evening peak hour trip was found to be 31.8% less than ITE estimates (Lewis 2004). At the Pleasant Hill BART station, residential development generates 52% fewer peak period auto trips than estimated by ITE for typical residential development and office development at the station generates 25% fewer trips than typical ITE office development estimates (Belzer & Autler 2002). Although ITE has formulated auto trip reduction factors to reflect internal trip capture, these reduction factors are based on only a few mixed-use projects in Florida rather than actual TODs. In order to provide original and reliable data to aid in an update of the ITE trip generation and parking generation rates, the Transportation Cooperative Research Council (TRCP) prepared a report evaluating the performance of 17 TODs in four urbanized areas across the country. The results showed that over a typical weekday period, the 17 TOD projects averaged 44% fewer vehicle trips than that estimated by the ITE manual (Arrington & Cevero 2008).

It must be emphasized that the RTC Travel Forecasting Tool does not use ITE trip generation estimates. However, monitoring the impact of TOD on travel characteristics could provide an opportunity to further explore how trip generation rates in mixed use developments could be incorporated into the Regional Road Impact Fee (RRIF) system as the region’s Centers and TOD Corridors evolve over time. Currently, the RRIF system includes 32 land use classifications that each have trip generation rates; however, the RRIF system does not include a land use classification for mixed use development. Of the 32 land use classifications, three are from local studies, 28 are from ITE, and one is from SANDAG.

Thus beyond lowering roadway LOS standards in Centers and TOD Corridors, another approach to the “congestion conundrum” is to examine how TOD impacts travel characteristics over time in the Truckee Meadows such that any congestion reduction benefits are captured.
C. Support Policies and Tools that Incentivize Fewer Trips and Reductions in VMT

Quite apart from roadway LOS standards and improvements to traffic forecasts, there are a variety of community tools and policies that incentivize reducing vehicle trips and vehicle miles travelled (VMT) and therefore support the enhanced land use and transportation options that TOD can provide. These tools and policies include location efficient mortgages, pay-as-you-drive insurance policies, and roadway user fees that are based on VMT.

**Location efficient mortgages (LEM):** LEMs are based on the fact that households in urban neighborhoods spend less on transportation and therefore have more disposable income. Accordingly, LEMs provide home buyers with an incentive to locate in transportation efficient areas through low down payments, competitive interest rates, and flexible qualification standards.

**Pay-as-you-drive insurance policies:** Usage based insurance policies charge policyholders for the vehicle miles they travel and in essence charge individuals that travel more miles a higher price than those individuals that use modes other than the automobile for all trips and travel fewer miles. From a market perspective, the price of insurance policies with pay-as-you-drive insurance more accurately reflects the costs of providing the insurance service as crash-related claims increase as VMT increases (Litman 2001). From a public perspective, pay-as-you-drive insurance provides a monetary incentive for individuals to drive less and locate in neighborhoods that provide a range of mobility options which can reduce traffic congestion, road and parking facility costs, and environmental impacts.

**Roadway user fees:** Roadway user fees are similar to pay-as-you-drive insurance in that they are based on vehicle miles travelled and provide individuals with an incentive to make fewer vehicle trips, make shorter vehicle trips, and locate in neighborhoods that offer choices in transportation mode. In partnership with the Nevada Department of Transportation (NDOT), RTC is currently working on a pilot program to study the implementation of a distance-based user fee to fund capacity improvements as opposed to the gas tax. In fact, one policy found in the RTP is that by 2013, a pilot program to develop a transition plan to move away from fuel tax fees to fees based on VMT will be developed.

Implementing a location efficient mortgage (LEM) program and pay-as-you-drive insurance policies are both community tools that would advance transit-oriented development, but are essentially private sector decisions. Currently, LEM programs exist only in Los Angeles, Seattle, San Francisco, and Chicago as these areas have extensive transit systems. In regards to pay-as-you-drive insurance, the Nevada Division of Insurance has recently approved a rate filing from Western United Insurance Co., which does business under the name of AAA Nevada Insurance Co., which would allow for a voluntary program of usage based auto insurance ("Western
However, implementing a distance-based user fee to fund capacity improvements does fall within the public sector and is a policy change that will need political support.

Each of the aforementioned policies and tools are incredibly important as they are based on the premise that there are greater costs associated with automobile-dependant development that is located at the urban fringe. For individuals, the cost of car ownership is high and increases with vehicle miles travelled due to increased fuel costs as well as crash costs. For insurance companies, crash-related claims increase with vehicle miles travelled which makes traditional pricing schemes for insurance policies based on driver risk an ill-suited measure for pricing policies. For governments, developments located at the urban fringe require greater expenditures for roadways and municipal service infrastructure when compared to compact development that has multiple transportation options. Due to these higher costs, supporting polices that incentivize fewer trips, reductions in VMT, and location efficiency is imperative.

The table below summarizes the approaches presented to overcome the implementation challenge of managing roadway congestion in walkable environments.

Table 3: Approaches for the “Congestion Conundrum” in Walkable Environments

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<th>APPROACH</th>
<th>SUMMARY</th>
<th>TYPE</th>
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<td>Examine lowering LOS standards in Centers and TOD Corridors</td>
<td>Supportive Policy</td>
</tr>
<tr>
<td>1-B</td>
<td>Examine impact of TOD on travel characteristics</td>
<td>Planning Tool</td>
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<tr>
<td>1-C</td>
<td>Support policies and tools that provide incentives to lower automotive trips such as: • location efficient mortgages • pay-as-you-drive insurance • roadway user fees based on VMT</td>
<td>Supportive Policy</td>
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</table>
IMPLEMENTATION CHALLENGE 2: GETTING TO COMPLETE STREETS AND A MULTI-MODAL TRANSPORTATION NETWORK IN CENTERS AND TOD CORRIDORS

Challenge Summary
The establishment of a multi-modal transportation system that effectively accommodates the movement of people, cyclists, transit riders, and to a lesser extent, automobiles, is critical to the success of transit-oriented development. Conceptually, the accommodation of all roadway users through street design that enables all modes to safely utilize a street is often referred to as ‘complete streets.’ Due to the fact that each street is unique, there is no set rubric for designing a complete street; however, complete streets often have sidewalks, bike lanes or wide paved shoulders, bus lanes, easily accessible transit stops, frequent crossing opportunities, median islands and curb extensions. Although street design features can vary dramatically from urban to suburban to rural settings, all complete streets safely function for all modes. Moreover, the concept of complete streets represents a paradigm shift in thinking about mobility.

While the Truckee Meadows has developed a crucial land use and transportation planning foundation that designates a system of transit-oriented development that includes Centers and TOD corridors, includes specific plans for these areas, includes development codes that focus on the removal of regulatory barriers and incentive provision, and includes goals and policies to increase the modal share of non-automotive uses within Centers and TOD corridors, it needs to be coupled with a conceptually different approach to mobility that promotes complete streets and a multi-modal network.

Certainly there are some Centers and TOD corridors in the region that are fairly mature and have many of the attributes of transit-oriented development whereas others may take many years to develop these attributes. However, each Center and TOD corridor can benefit from new approaches to advancing multi-modal improvements whether that be in the near or long term. Many communities have already faced this challenge and developed a variety of policies and tools to advance multi-modalism. Approaches to creating a multi-modal transportation network are wide-ranging and include developing LOS standards for all modes of transportation; re-classifying streets to link them with adjacent land uses and their function for pedestrians, bicyclists, and transit; establishing modal priorities for roadways such that different roadway types provide facilities tailored to the mode which is of highest priority; analytically evaluating roadways that would benefit from innovative multi-modal improvements; establishing a prioritization system for investments in multi-modal infrastructure; and, re-evaluating the impact parking standards have on promoting multi-modalism.

Challenge Approaches
A. Reform LOS Standards
One policy approach to advancing multi-modal transportation is to reform LOS standards such that the needs for all modes of transportation are assessed and
accommodated rather than just those of the automobile. Many communities have reformed LOS standards to include standards for pedestrians, transit and bicyclists.

Florida’s Department of Transportation has established multi-modal quality/level of service standards for all modes of transportation that utilize traditional highway (automobile and truck) LOS analysis in combination with techniques to evaluate the LOS for bicyclists, pedestrians, and buses on roadways in urban areas in a manner that addresses the traveler’s perception of how well a transportation service or facility operates. For example, to measure Pedestrian LOS, the Florida DOT model utilizes the following four variables: existence of a sidewalk, lateral separation of pedestrians from motorized vehicles, motorized vehicle volumes, and motorized vehicle speeds (2002 Quality/Level of Service Handbook).

The City of Fort Collins in Colorado has also adopted multi-modal LOS standards and has linked these standards with the development review process such that development approvals are not granted for projects that do not meet LOS standards for all modes based upon facility types outlined in the City’s master streets plan (Fort Collins Multimodal Transportation Level of Service Design Manual).

If a policy choice were made in the Truckee Meadows to develop LOS standards for all modes of transportation, these standards could be applied to the entire region or specifically to the region’s Centers and TOD corridors in a manner that promotes walking, biking, and transit as viable alternatives to the automobile. Although the application of reformed LOS standards across the entire regional may support a transition of other areas in the region to TOD, they can also be targeted towards specific multi-modal districts or areas. For instance, LOS standards could be formulated for pedestrians, cyclists and transit riders and improvements to these modal facilities could be aggressively advanced whereas vehicle LOS in Centers and TOD corridors could be set at LOS F.

B. Re-Evaluate Street Classifications and Establish Mode Priorities
Other communities have chosen to make multi-modal improvements to their roadway networks by re-classifying their streets to capture the manner in which a roadway interacts with its surrounding area. This re-classification is most commonly referred to as the creation of street typologies and represents a conceptual shift in transportation planning from auto-oriented design to multi-modal design based on surrounding land uses. Acknowledging that simply using functional classifications (i.e. arterial, collector, etc.) that relate to the movement of the automobile does not promote multi-modal street design provides an opportunity to design roadways in a manner that is consistent with surrounding land uses and the needs of roadway users other than the automobile. Some communities have chosen to simply establish new street classifications that specify the multi-modal facilities that are appropriate for
each type of street whereas other communities have tied modal priority to different street typologies.

To illustrate the movement from the functional classifications of roadways to the use of street typologies, the Town of Basalt in Colorado amended its street design manual to include features such as crosswalks, transit stops, street trees, bike lanes, travel lane width, landscaped street buffers, and bike racks for different street types. Moreover, the design manual illustrates roadway cross-sections and where appropriate has multiple cross-sections for certain street types. Street types chosen include: Town Center, Neighborhood, Transitional, Alley, Light Industrial, Residential Valley, and Residential Hillside (Town of Basalt Complete Streets Manual). This approach to advancing a multi-modal network through multi-modal street design has been adopted for the entire town.

The City of Austin, Texas, has coupled the use of street typologies with the establishment of modal priorities. In working to formulate its Downtown Great Streets Master Plan, the City of Austin has identified Pedestrian Dominant Streets, Mixed Mode Streets, Rapid Transit Streets, Bicycle and Local Access Streets, Commuter Streets, and Commuter Boulevards within its downtown planning area. Not only does the plan specify exactly which streets are in each category, it also specifies the elements, or amenities, needed for each category (City of Austin website). The framework set forth in Austin’s Downtown Great Streets Master Plan is more nuanced than city-wide street typologies because it takes a very detailed look at the appropriate mode priority and associated facilities for each street in the downtown planning area.

If a policy approach were pursued to reform street classifications in the Truckee Meadows, applicability region-wide versus just in Centers and TOD corridors would first need to be determined. A region-wide approach would indicate that multi-modal street design which is sensitive to surrounding land uses is a priority for the entire region. However, an approach targeted at Centers and TOD corridors modelled after the Austin framework would allow for detailed planning of roadways in the region’s Centers and TOD corridors in a manner that establishes a clear direction regarding the dominant mode for each street and guides mobility improvement investments. Such an approach that establishes dominant modes for specific streets could also link with the decision tree tool found in Appendix B which details issues for consideration in the development of a corridor improvement plan.

C. Establish a Prioritization System for Investments in Centers and TOD Corridors
One promising approach to systematically implementing multi-modal improvements in the region’s Centers and TOD Corridors is to evaluate which segments of Centers and TOD Corridors should be targeted for enhancement in the near term versus the long term based on ranked criteria. This approach is effectively a prioritization
system for multi-modal infrastructure and place-making amenities and would help to direct not only transit infrastructure investment, but also local government investments. A prioritization system could be used in conjunction with planning tools that advance multi-modalism such as reforming LOS standards and developing street typologies that address mode priority.

The City of Boulder represents one community that has already developed a prioritization system for multi-modal investments. Responding to the designation of 10 multi-modal corridors in Boulder’s Transportation Master Plan, the City of Boulder determined that a method to implement the corridors was needed and so developed a prioritization matrix that is tailored to its efforts to expand transit service and weights the following criteria to determine which multi-modal corridor segment should be first addressed (City of Boulder web site):

- Corridor congestion
- Safety upgrade needed
- Multiple existing transit routes
- Key regional transit route
- Includes project in current CIP
- Consistent with bicycle corridor prioritization
- Contains current transit expansion project (JUMP, LEAP BOUND)
- Priority for future transit expansion
- Includes missing pedestrian links
- Serves key civic activity centers
- Serves key development or redevelopment areas
- Connectivity to other multi-modal corridors
- Connections to other greenways corridors
- Serves major multi-modal center (South Boulder, UMC, Downtown, and Table Mesa Park and Ride).

If a prioritization system were to be pursued in the Truckee Meadows, criteria would obviously need to be tailored to planning efforts, service plans, and existing conditions in the region. Moreover, spatial analyses would be needed to evaluate the current state of connectivity and walkability in order to identify existing impediments such as the lack of sidewalks, the presence of wide roadways that are obstacles to pedestrians, and disconnected street patterns.

However, the development of a prioritization system that could link the planning of the Capital Improvement Programs (CIPs) of the local governments and the RTC’s five-year RTIP would have the potential to provide a common focus for the implementation of multi-modal improvements such that investments in particular segments of Centers and TOD Corridors could be strategically timed and synergies between land use and transportation decisions could result.
D. Establish Program of Visible and Innovative Multi-Modal Improvements

There are numerous ways to implement highly visible multi-modal transportation improvements that not only serve to increase mobility for alternative forms of transportation while increasing the safety and efficiency of roadways, but also garner public support for multi-modal improvements. One such improvement that has become increasingly popular in communities across the country is the “road diet.” Road diets are intended to convert “fat” streets into roadways with fewer lanes and multi-modal improvements. Roads ideal for road diets are four lane roads that carry approximately 12-18,000 auto trips per day; however, road diets have been successful with roadways carrying up to 25,000 trips per day (Burden & Lagerwey 1999). The four lane road is reduced to three lanes (two travel lanes and a center turn lane) and bike lanes. As four lane roads often generate excessive speeds, are difficult for pedestrians to cross, and are often too narrow for bicyclists to ride comfortably, the road diet improves mobility for each of these modes with little impact to automobile volume. In many cases, carrying capacity actually increases (Burden & Lagerwey 1999). Road diets already completed in the region include Wells Avenue and Mayberry Drive.

Other highly visible cycling improvements include innovative bike facilities such as bike boxes and blue lanes. Bike boxes are designated areas at the head of a traffic lane that allow cyclists a safe and visible way to get out ahead of traffic at a signalized intersection. Boxes are designated by two pavement markings called stop bars and work by stopping the motor vehicle at the first bar so that cyclists can advance to the space between the first and second bars. Bike boxes are currently in use in cities such as Eugene and Portland. Blue lanes are colored bicycle lanes used to promote bicycle awareness at motor vehicle-bicycle conflict areas such as where traffic merges onto a roadway in which there is a bike lane. The cities of Seattle and Portland currently use blue lanes.

Systematically identifying roadways in Centers and TOD Corridors that would “qualify” for a road diet based on trips per day and intersections and roadway segments that would benefit from innovative bike facilities would allow for the investment in highly visible multi-modal improvements which would hopefully garner the support of citizens and create advocates for future multi-modal mobility improvements. While a visible program of multi-modal improvements would represent investment in mobility enhancements, it should be noted that the identification of potential road diet candidates and potential areas for innovative bike facilities is primarily an implementation tool and does not represent broader planning approach to multi-modal improvements.

E. Continually Evaluate Parking Policies

According to proponents of transit-oriented development, on-site parking is one of the single greatest impediments to the pedestrian-friendly, transit-oriented, compact
urban form punctuating TOD. At the national level, it is recognized that conventional parking standards present several stumbling blocks for the implementation of TOD. However, simple solutions exist that promote the integration of parking, compact development, and a multi-modal transportation network for the betterment of transit-oriented development.

The most common obstacle associated with parking is cost: for the user, it is usually free. As with all commodities provided to the user at no charge, there is little or no incentive to discontinue use of the free product. In areas where free on-site parking exists, there is little motivation for residents or patrons in those locations to choose walking, bicycling or transit over driving. In fact, free parking only promotes more single-occupancy vehicle trips and potentially compromises the effectiveness of other TOD policy options.

A simple solution is to charge for parking. In a study of Downtown Los Angeles commuters, Shoup (2005) observed a 20% decrease in solo driving and approximately 15% surge in transit ridership associated with an increase in parking costs at work from $0 to $5.

A second approach to better integrate parking and TOD is to re-evaluate parking location and design standards. On-site parking areas, specifically surface lots, located between a building and the street are counterproductive to the idea of creating walkable spaces. On-site surface parking areas reduce density potential on the site, alienate pedestrians in a sea of concrete and thereby dissuade pedestrian activity, and signal the primacy of the automobile over other transportation modes. Design options to alleviate the impacts of surface parking include structured parking, underground parking, clustered parking, or at a minimum the re-location of surface parking areas to the rear of buildings. Surface parking areas located behind buildings can be accessed via an alleyway or side street and do not compromise the pedestrian and transit-oriented streetscape of the main corridor or transit node. Clustering surface parking or placing parking underground or in stacked structures concentrates automobile infrastructure in select areas allowing more pedestrian and transit-focused infrastructure to develop elsewhere. Similar to the national research regarding parking and location design standards, both the cities of Reno and Sparks have adopted standards that promote a pedestrian and transit-oriented streetscape.

Additional options to surmount the challenges associated with conventional parking standards include lowering minimum parking ratio requirements, allowing for shared parking, and replacing minimum parking standards with maximum standards. These options can be used independently or in conjunction with one another.

Minimum parking standards, such as those contained in the SmartCode, developed by Duany, et al., allow for just one space per 333 square feet of retail and 1 space
per 500 square feet of office. The code also allows for an additional 30 percent reduction in parking requirements where transit is in place and provides a sharing factor matrix to determine shared parking needs among various land uses (Steuteville and Langdon 2003). Another option is to set maximum standards in select ‘transit first’ areas. A prime example of maximum standards is the mixed-use Steelyards project in Boulder, Colorado. This emerging TOD now maintains maximum parking standards of 1 space per 1,000 square feet of floor area in high priority transit areas (APA 2006).

Due to the impact parking policies can have on the incentive to use alternative modes of transportation, one approach to supporting a multi-modal transportation network is to monitor parking policies over time and continually evaluate whether or not they are adequately supporting TOD.

**Table 4: Approaches for Complete Streets and a Multi-Modal Transportation Network**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Summary</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-A</td>
<td>Develop Multi-Modal Level of Service (LOS) standards</td>
<td>Supportive Policy &amp; Planning Tool</td>
</tr>
<tr>
<td>2-B</td>
<td>Establish street typologies for roadways in Centers and TOD Corridors that: • Replace functional classifications • Also identify mode priority • Also establish multiple roadway cross-sections based on modal priority of roadway</td>
<td>Planning Tool &amp; Implementation Tool</td>
</tr>
<tr>
<td>2-C</td>
<td>Establish a prioritization system for investments in multi-modal infrastructure and place-making amenities for Centers and TODs • <strong>Prerequisite:</strong> Spatially evaluate connectivity and walkability in Centers and TOD Corridors to identify existing impediments to connectivity and walkability</td>
<td>Implementation Tool</td>
</tr>
<tr>
<td>2-D</td>
<td>Evaluate transportation network in Centers and TOD Corridors and identify streets that would benefit from innovative multi-modal improvements such as road diets, shoulder lanes for buses, and bike facilities</td>
<td>Implementation Tool</td>
</tr>
<tr>
<td>2-E</td>
<td>Continually evaluate parking policies</td>
<td>Supportive Policy</td>
</tr>
</tbody>
</table>
IMPLEMENTATION CHALLENGE 3: FUNDING TRANSIT OPERATIONS AND MOBILITY IMPROVEMENTS

Challenge Summary
Directing funds to finance a diverse transportation system is a critical element to the success of transit-oriented development due to the impact transportation investment has on land use patterns. In many parts of the United States, the automobile's dominance as a mode of travel and the continued funding and accommodation of the automobile as the primary form of travel encourages dispersed, low-density development, and the continued development of low-density development, in turn, ensures that the automobile will remain the only form of transportation that is feasible to serve dispersed, low-density development (Young 1995). Thus, while it is imperative that land use plans allow for higher-density, mixed-use development that will support transit, it is even more imperative that transit network and service expansion as well as streetscape mobility and amenity improvements be strategically directed to transit-oriented development areas for any significant shifts away from the single-occupancy vehicle to occur. This need to combine transit network expansion and streetscape improvements presents challenges to creating a new symbiotic relationship between transit-oriented development and the dominance of pedestrians, transit riders, and bicyclists as opposed to the automobile due to the need to finance not only transit network and service expansion, but also streetscape improvements.

Communities across the nation have employed funding mechanisms that target transit infrastructure improvements and operations as well as funding mechanisms that address streetscape improvements, and some funding mechanisms that address both.

Financing Approaches -Traditional

A. Local Option Transportation Taxes
The use of local option taxes (sales, property, fuel, vehicle) as revenue sources to augment declining state and federal transit funds has become an increasingly used method to finance not only transit infrastructure needs, but also day-to-day transit operations (Brown 2005). Although local option tax proceeds can offer highly visible local results, in the Truckee Meadows local option taxes may not gain the support of the local electorate as was recently seen with the failure of RTC-2 in November 2008. RTC-2 proposed to allow for a 1/8-cent increase in the sales tax to be allocated towards public transit.

B. Tax Increment Financing
Communities have also employed tax increment financing (TIF), which establishes a base-year tax level for a certain district and then allows for taxes generated above that base-year amount due to increases in property values to be used within the same district for improvement projects or services. Revenues above the base tax
level may be accumulated and used to directly fund smaller projects or the revenue stream may be leveraged to secure bond financing for larger projects to be paid off over several years. With regards to multi-modal improvements, tax increment financing is generally used for capital improvements. For example, San Francisco’s Market Street corridor between the Embarcadero and Powell Street BART stations, utilized TIF to pay for $25 million in streetscape and beautification improvements such as public squares, street furniture, and street trees (TCRP Research Results Digest 52 2002). Portland, Oregon also used $7.5 million in tax increment funds to help fund the portion of Central City Streetcar that passed through the South Park Blocks tax increment district (Johnson 2008). Currently, NRS allows for TIF to be used only for capital improvements. Enabling legislation would be needed to use TIF for both capital improvements and transit operations.

C. Benefit Assessment Districts
Benefit assessment districts, in which properties and businesses that benefit from proximity to transit are assessed an additional charge, have further been used by communities to bond for investments in TOD. Although benefit assessment districts have primarily been used to finance capital improvements, the City of Denver utilized assessments against downtown properties to finance the general operations, repairs, snow removal, and security for a transit mall (Cevero, et al. 2002). Benefit assessment financing has also been used by Minneapolis, Denver, and Portland to finance the construction of downtown bus malls (Cevero, et al. 2004). In the Truckee Meadows, the City of Reno uses benefit assessment districts for sidewalk and driveway repairs. However, NRS does allow for both capital improvements and transit operations to be funded using benefit assessment districts. Therefore benefit assessment districts could be used in specific areas such as Centers and TOD Corridors.

Financing Approaches - Non-Traditional

D. Road Pricing for Transit Funding
One more recent approach to funding transit operations is to utilize funds from road pricing to finance transit services. In San Diego, the I-15 Fas Trak has high-occupancy toll (HOT) lanes which permit non-HOVs paying an electronically charged toll to use these uncongested lanes and a portion of excess revenues are allocated towards transit. (DeCorla-Souza & Barker 2005). The concept behind allocating road pricing revenues towards transit service is to shift a greater share of the costs of automobile road travel onto the user while supporting a more sustainable form of transportation.

If road pricing that allows for revenues to be directed towards transit operations were pursued in the Truckee Meadows, pricing legislation that authorizes the inclusion of
transit operations in the cost of operating and maintaining a tolling facility would be needed. Although road pricing may be a politically unpopular measure to address congestion, it has the potential to boost transit ridership while decreasing the average cost per rider to the transit agency (Small 2005).

E. Impact Fees for Transit and Multi-Modal Improvements
Impact fees charged to new development are widely used across the country to fund roadway improvements. In the Truckee Meadows the Regional Road Impact Fee system, which is administered by RTC, collects impact fees to fund the demand for new roadway capacity generated by additional development. The use of impact fees for transit and multi-modal improvements is however much more limited. Nonetheless, some communities do utilize charges on new development to fund not only roadway capacity, but also capital investments in transit infrastructure, transit operations, and multi-modal infrastructure.

For example, the City of Seattle recognized that impact fees which only allow for the collection of fees for automobile improvements would not be adequate to meet the city’s transportation funding needs for pedestrian, bicycle, and transit improvements. The City therefore instituted a multi-modal impact mitigation program in which impact fees are calculated based on the cost of transportation improvements identified in an area-wide multi-modal transportation study. Funds received through transportation mitigation payments are earmarked specifically for projects on a predetermined list of projects (Johnson 2008).

Similarly, the City of Portland recognized that new development creates a need not only for roadway capacity increases, but also multi-modal transportation improvements. However, the transit agency in Portland did not have adequate funding to address these needs. As new development takes advantage of multi-modal capacity improvements, Portland determined that new development should contribute to funding capacity improvements for all modes and adopted a “system development charge.” Although Portland’s system development charges are not used for transit operations or rails, they are used for transit supportive infrastructure and have been used to develop multi-modal transportation projects such as right-of-way improvements needed to accommodate light rail; new shelters, lighting, and sidewalks to accommodate bus service; widening roadways to provide bicycle capacities; and a pedestrian bridge (Johnson 2008).

San Francisco further utilizes transit impact development fees to offset the impact of non-residential development on public transit. These impact fees are based on a measure of revenue hours per trip and once collected can fund capital and operating and maintenance costs associated with new transit routes, expanded transit routes, or increases in service on existing routes or capital or operating costs required to add revenue hours to existing routes (Johnson 2008).
As previously mentioned, impact fees in the Truckee Meadows are currently used solely for funding roadway capacity improvements. Changes to the impact fee system to incorporate impacts from new development on modes of transportation other than the automobile would require enabling legislation. However, such a change to the impact fee system would signal a fundamental shift in thinking about the transportation needs in the region and a commitment to funding all modes.

F. Mobility Fees

Another innovative approach to multi-modal mobility improvements is the concept of mobility fees. Mobility fees are not impact fees and focus on the provision of non-auto transportation solutions in urban areas. After formulating multi-modal transportation plans that identify needed mobility improvements, mobility fees can be used for improvements such as sidewalks, bike facilities, transit operations, and local street connections.

Although mobility fees have not yet been implemented, on June 1, 2009, legislation that removes the transportation concurrency system from dense urban areas and replaces them with mobility fees was signed into law in Florida. Working groups have already begun to examine methodologies for implementing a mobility fee and the reports of those working groups must be completed by December 1, 2009 (Bennett 2009). The outcome of how these fees are ultimately implemented will be important to monitor as mobility fees represent another innovative way to fund mobility for all modes and could potentially be used in conjunction with an existing impact fee program that reduced impact fees for development in Centers and TOD Corridors.

Table 5: Approaches for Funding Transit Operations and Streetscape Improvements

<table>
<thead>
<tr>
<th>OPTION</th>
<th>SUMMARY</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional Financing Mechanisms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-A</td>
<td>Local-option taxes (gas, sales, property)</td>
<td>Implementation Tool</td>
</tr>
<tr>
<td>3-B</td>
<td>Tax increment financing</td>
<td>Implementation Tool</td>
</tr>
<tr>
<td>3-C</td>
<td>Special assessment districts</td>
<td>Implementation Tool</td>
</tr>
<tr>
<td><strong>Non-Traditional Financing Mechanisms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-D</td>
<td>Road Pricing for Transit Funding</td>
<td>Implementation Tool</td>
</tr>
<tr>
<td>3-E</td>
<td>Impact Fees for Transit and Multi-Modal Improvements</td>
<td>Implementation Tool</td>
</tr>
</tbody>
</table>
| 3-F | Mobility Fees  
  • Add On: Reduced Vehicle Impact Fees | Implementation Tool |
PART IV: STEPS FORWARD

The policy, planning, and implementation approaches presented in Part III outline various ways that other communities have dealt with implementation challenges associated with TOD. While these approaches are not an exhaustive list of innovative ways to advance TOD, they represent regional avenues for promoting synergies between land use and transportation decisions and developing additional methods of financing multi-modal improvements. Each of the approaches presented could be pursued alone or in combination with others.

However, it must be emphasized that three critical elements are needed for any of these approaches to be successful in advancing the implementation of TOD. Without each of these elements in place, TOD is likely to remain merely a vision for years to come. These elements critical to TOD’s success in the Truckee Meadows are summarized below:

1. **Fundamental Paradigm Shift:** Moving TOD from a vision to reality requires a paradigm shift in thinking about the interaction between the built environment and mobility. TOD is about creating places that function in an entirely different way from suburban-style development that offers limited housing types and requires an automobile to access most destinations. TOD aims to create diverse and walkable, mixed-use neighborhoods that are served by high-quality multi-modal transportation systems which allow for reduced automobile usage. Land use planning and decisions must therefore embrace the integration of uses, human-scale design, street design standards that enhance walkability, and density increases to support high-quality transit services. Transportation planning and decisions must also conceptually embrace the parity of walking, bicycling, and mass transit with the private automobile. If these efforts do not complement each other, the creation of a new symbiotic relationship between transit-oriented development and the dominance of pedestrians, transit riders, and bicyclists as opposed to the automobile cannot happen. The region must be ready to make a fundamental shift away from auto-centric development towards transit-oriented development and plan for people as opposed to cars in designated areas.

2. **Political Leadership:** Visionary political leadership is needed to advocate the many benefits of TOD across multiple organizations and analyze how decisions made at both local and regional levels impact the ability of TOD to be successful in the Truckee Meadows. Leadership in this sense means making often difficult land use decisions to support higher densities and difficult transportation decisions to make innovative changes to enhance mobility. Without a conceptual and financial commitment to advancing TOD, the wide ranging benefits of TOD cannot be realized.
3. **Broad Consensus Building:** To be successful, any of the approaches presented must have broad support from affected stakeholders. If the RPGB and RTC have interest in pursuing any of the approaches presented, additional study would be needed to further examine potential implementation. As part of this process of further study, consensus building that allows for affected stakeholders to examine in more detail a particular approach, express ideas regarding the application of such an approach, clarify areas of agreement and disagreement, and develop shared strategies for potential implementation would be imperative.

One avenue for the future study of any of the approaches presented would be the creation of a staff working group that is tasked with examining how to best implement any selected approach(s). Activities of such a staff working group would vary based on the approach in question; however, general activities would include:

- Further research to develop additional materials regarding the utilization of the chosen approach(s) including but not limited to benefits, costs, implementation options, time lines, and action plans;
- The definition and formation of a stakeholder group(s);
- The development of recommendations on the benefits to the region; and
- Consensus building around strategies to implement the chosen approach(s).

For ease of reference, the tables summarizing each of the presented approaches have been replicated. A column entitled “potential mechanism” has been added to each of the tables to illustrate the many possible mechanisms for implementing these approaches.

Importantly, potential mechanisms for implementing innovative approaches to TOD are not limited to the Regional Plan. Some approaches may be advanced through a Regional Plan conformance policy that requires local government master plans include specific elements or a Regional Plan conformance policy that requires the Regional Transportation Plan include specific features or elements to be in conformance with the Regional Plan. Other approaches may best be implemented through amendments to the Regional Transportation Plan or through modifications to the RTC planning processes. Still other approaches would need enabling legislation and would therefore require advocacy by the local governments and likely RTC.

**Staff requests that the RPGB and RTC review and consider the approaches presented in the tables and first determine if there are any approaches that should be pursued for further study.** If so, staff requests that the RPGB and RTC provide direction on those approaches of highest priority, and provide direction to staff regarding the establishment of a staff working group facilitated by TMRPA.
Table 6: Approaches to the “Congestion Conundrum” and Possible Mechanisms

<table>
<thead>
<tr>
<th>APPROACH</th>
<th>SUMMARY</th>
<th>TYPE</th>
<th>POSSIBLE MECHANISM</th>
</tr>
</thead>
</table>
| 1-A      | Examine lowering LOS standards in Centers and TOD Corridors | Policy | • Directive Regional Plan policy  
|          |         |      | • RTP               |
| 1-B      | Examine impact of TOD on travel characteristics | Planning | • RTP planning process |
| 1-C      | Support incentives to lower automotive trips  
|          | • Location efficient mortgages  
|          | • Pay-as-you-drive insurance  
|          | • Roadway user fees based on VMT | Policy | • Directive Regional Plan policy  
|          |         |      | • Local government pursuit |

Table 7: Approaches to Complete Streets and a Multi-Modal Transportation Network and Possible Mechanisms

<table>
<thead>
<tr>
<th>APPROACH</th>
<th>SUMMARY</th>
<th>TYPE</th>
<th>POSSIBLE MECHANISM</th>
</tr>
</thead>
</table>
| 2-A      | Develop Multi-Modal Level of Service (LOS) standards | Policy & Planning | • Directive Regional Plan policy  
|          |         |      | • RTP               |
| 2-B      | Establish street typologies for roadways in Centers and TOD Corridors that:  
|          | • Replace functional classifications  
|          | • Also identify mode priority  
|          | • Also establish multiple roadway cross-sections based on modal priority of roadway | Planning & Implementation | • Directive Regional Plan policy  
|          |         |      | • RTP               |
| 2-C      | Establish prioritization system for investments in multi-modal infrastructure and place-making amenities for Centers and TODs  
|          | • Prerequisite: Spatial evaluation of Centers and TOD Corridors for impediments to connectivity and walkability | Implementation | • RTP  
|          |         |      | • Local Governments |
| 2-D      | Identify areas in Centers and TOD Corridors that would benefit from innovative multi-modal improvements such as road diets, shoulder lanes for buses, and bike facilities | Planning & Implementation | • Directive Regional Plan policy  
|          |         |      | • RTP               |
| 2-E      | Continually evaluate parking policies | Policy | • Directive Regional Plan policy |
### Table 8: Approaches to Funding Transit Operations and Streetscape Improvements and Possible Mechanisms

<table>
<thead>
<tr>
<th>APPROACH</th>
<th>SUMMARY</th>
<th>TYPE</th>
<th>POSSIBLE MECHANISM</th>
</tr>
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<tbody>
<tr>
<td>3-A</td>
<td>Local-option taxes (gas, sales, property)</td>
<td>Implementation</td>
<td>• Enabling legislation</td>
</tr>
<tr>
<td>3-B</td>
<td>Tax increment financing</td>
<td>Implementation</td>
<td>• Enabling legislation</td>
</tr>
<tr>
<td>3-C</td>
<td>Special assessment districts</td>
<td>Implementation</td>
<td>• Local government establishment</td>
</tr>
<tr>
<td>3-D</td>
<td>Road Pricing for Transit Funding</td>
<td>Implementation</td>
<td>• Enabling legislation</td>
</tr>
<tr>
<td>3-E</td>
<td>Impact Fees for Transit and Multi-Modal Improvements</td>
<td>Implementation</td>
<td>• Enabling legislation</td>
</tr>
</tbody>
</table>
| 3-F      | Mobility Fees  
  • Add On: Reduced Vehicle Impact Fees | Implementation | • Enabling legislation           |
REFERENCES


City of Austin Downtown Great Streets Master Plan. City of Austin website: http://www.ci.austin.tx.us/greatstreets/products.htm


US Environmental Protection Agency. 2000. Low Impact Development: A Literature Review. EPA-841-B-00-005.


APPENDIX A

CENTER AND TOD CORRIDOR ANALYSIS

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2. Overview and Regional Analysis ........................................... Page 3
3. Average Residential Density Graph ........................................Page 5
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1. MAP OF ADOPTED CENTERS AND TOD CORRIDORS

Map of Adopted Centers & TOD Corridors
As of June 1, 2009

| TOD or Center Name | | |
|-------------------|-----------------|
| Convention RC     | Reno-Tahoe Airport RC |
| Dandini RC        | South Virginia St. TOD |
| Downtown Reno Ctr | Sparks TOD |
| East 4th St. TOD  | Stead RC |
| Medical RC        | UNR RC |
| Mill Street TOD   | West 4th St. TOD |
| North Virginia St. TOD | |
| Redfield RC       | |

No warranty is made by the Truckee Meadows Regional Planning Agency as to the accuracy, reliability, or completeness of the data contained on this map. This map was intended to illustrate concepts defined in the 2007 Regional Plan and may not meet National Mapping Accuracy Standards. Additionally, the data contained in this map was developed through a digital means and may be updated without notification. For questions regarding this map or the data contained therein please call Truckee Meadows Regional Planning Agency at (775) 321-5217.
2. **OVERVIEW AND REGIONAL ANALYSIS**

With the exception of both the Western Gateway Regional Center and the Downtown Sparks Center, the region’s Downtown Centers, Regional Centers and Transit-Oriented Development (TOD) Corridors make up 14 separate and distinctive geographic areas within the Truckee Meadows Service Areas (TMSA). The Western Gateway Regional Center and the Downtown Sparks Center have yet to be defined and will ultimately change the information that is contained in this analysis.

The information presented in the tables below provides general information about the region’s Centers and TOD Corridors. This information reflects the Centers and TOD Corridors collectively by either summing or averaging the components below across all Centers and TOD Corridors.

<table>
<thead>
<tr>
<th>Total Area (SQ Miles)</th>
<th>Total Residential Units (#)</th>
<th>Total Population In All TODs and Centers (# of people)</th>
<th>Percentage of Total Population (%)</th>
<th>Total Employment (# of jobs)</th>
<th>Average Dwelling Unit Density (Per Acre)</th>
<th>Non-Residential FAR</th>
<th>Overall Average FAR *</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>28,652</td>
<td>71,630</td>
<td>17.13%</td>
<td>104,132</td>
<td>1.841</td>
<td>0.51</td>
<td>0.542</td>
</tr>
</tbody>
</table>

*Floor Area Ratio or FAR provides information on building density for a given parcel.

<table>
<thead>
<tr>
<th>Total Vacant Parcel Area (Acres)</th>
<th>Total Number of Bus Stops (#)</th>
<th>Average Year Built (year)</th>
<th>Total Transit Ridership in 2007 (# of people)</th>
<th>Average Assessed Building and Land Valuation ($)</th>
<th>Average Appraised Building and Land Valuation ($)</th>
<th>Total Area of Roads and ROW* (SQ Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,429</td>
<td>1081</td>
<td>1968</td>
<td>3,136,633</td>
<td>$423,204</td>
<td>$1,209,154</td>
<td>3.83</td>
</tr>
</tbody>
</table>

*Right Of Way or ROW is an area dedicated for public infrastructure.

The information in the tables above helps to provide a regional understanding or holistic view of the development characteristics across all of the region’s Centers and TOD Corridors as of June 1, 2009.

**METHODOLOGIES:**

The total population in the region’s Centers and TOD Corridors was calculated by multiplying the total 2008 Washoe County Assessor’s residential dwelling units located in these particular geographies by the US Census Bureau’s American Community Survey Fact Finder average household size of 2.5 persons. Using the calculated population number, staff then was able to divide this number by the 2007 Washoe County certified population estimate of 418,000 to derive the percentage of the total population in Centers and TOD Corridors.

Floor Area Ratio (FAR) is a calculation that helps to understand building density for a
given area. More specifically, for this report, FAR was calculated in two separate and distinct ways. First, the gross or overall average FAR was calculated by using the total building square feet divided by the parcel area regardless of the “use.” The FAR on each parcel was then averaged across each Center and TOD Corridor geography. The above “Average FAR” number therefore represents an average of the floor area ratios across the geographies of all Centers and TOD Corridors. This FAR calculation is represented by item 4 in this appendix entitled “Overall Average Floor Area Ratio Graph.” The second FAR calculation strictly looks at non-residential building density by only looking at parcels with a commercial building. This FAR calculation is represented by item 5 in this appendix entitled “Average Floor Area Ratio (Non-Residential Properties) Graph.” Both graphs help provide a better understanding of building density within Centers and TOD Corridors.

In order to gain an understanding of transit ridership, staff utilized yearly route ridership information provided by RTC. This information was then further refined by calculating the percentage length of a route located in a Center or TOD Corridor. The percentage was multiplied by ridership on all routes. The transit ridership was then summed for each Center and TOD Corridor. The year 2007 was the most recent ridership information available, therefore, the column in the above table represents the total transit ridership for all Centers and TOD Corridors in 2007.

The individual colors represented on the overview map on page 2 of this appendix correlate directly to the bar graph colors. Each of the following graphs provided in this appendix represents a analytical snapshot in time that increases our regional understanding of Centers and TOD Corridors.
3. **Average Residential Density Graph**

Understanding the level of residential development in Centers and TOD Corridors is critical as it provides information on the population supporting the transit network and surrounding non-residential land uses. The Regional Plan specifies that the minimum density for Downtown Centers is 30 du/ac and the overall average density for Downtown Centers is 45 du/ac. For Regional Centers and TOD Corridors, the minimum density is 18 du/ac and the average residential density is 30 du/ac.

Staff evaluated the residential density in Centers and TOD Corridors by performing a spatial analysis of the 2008 Washoe County Assessor’s dwelling unit information. Because each Center and TOD Corridor geographies are unique, staff calculated dwelling unit density per acre. Average dwelling unit density evaluates built residential units over a given parcel area. The graph below represents the results of this analysis.

It should be noted that all dwelling units located in the Mill Street TOD Corridor are condominiums located in the Grand Sierra Resort and Casino. Although residential density is high at 110 du/acre, this density must be qualified with the information that dwelling units are concentrated in only one location within the Corridor.
4. **Overall Average Floor Area Ratio Graph**

Non-residential building density is most often quantified in terms of FAR, a ratio of the gross building floor area to the total area of the parcel on which the building is physically located.

To better understand FAR in the Centers and TOD Corridors, staff performed a spatial analysis using the 2008 Washoe County Assessor’s parcel data. It is important to note that FAR was calculated for all properties within a given Center or TOD Corridor boundary regardless of the current use. This analysis is distinct from the way in which FAR is used in the Regional Plan to establish the minimum density requirements for non-residential uses, but is in its own right useful in gaining a more general understanding of overall density in the region’s Centers and TOD corridors as it incorporates both residential and non-residential uses. The graph below represents the results of this analysis.
5. **Average Floor Area Ratio (Non-Residential Properties) Graph**

Non-residential building density is most often quantified in terms of FAR, a ratio of the gross building floor area to the total area of the parcel on which the building is physically located. **Embracing the nodal concept, the Regional Plan calls for FARs of 1.5 in the region’s Downtown Centers, Regional Centers, and Station Areas. Areas located between Station Areas within a TOD corridor have a lower FAR requirement of 0.25 which serves to focus areas of higher density and intensity of use in Centers and around Station Areas.**

To better understand FAR, staff performed a spatial analysis using the 2008 Washoe County Assessor’s parcel data. This FAR analysis excludes properties with a residential use and vacant parcels. The FAR requirements set forth in the Regional Plan are illustrated in the graph below using blue text and a hashed blue line.

---

**Average Floor Area Ratio**

*Non-Residential Properties*

**FAR**

- 3
- 2.8
- 2.6
- 2.4
- 2.2
- 2
- 1.8
- 1.6
- 1.4
- 1.2
- 1
- 0.8
- 0.6
- 0.4
- 0.2
- 0

**Center or TOD Corridor**

- Downtown Reno Ctr
- Dandini RC
- North Virginia St. TOD
- Redfield RC
- Reno-Tahoe Airport RC
- Convention RC
- UNR RC
- West 4th St. TOD
- Medical RC
- East 4th St. TOD
- South Virginia St. TOD
- Sparks TOD
- Mill Street TOD
- 3.043
- 2.115
- 0.158
- 0.231
- 0.307
- 0.312
- 0.353
- 0.358
- 0.388
- 0.395
- 0.428
- 2.271
- 0.548
- 0.682

**1.5 FAR Requirement in Centers and Station Areas**

**0.25 FAR Requirement in TOD Corridors between Station Areas**
6. **AVERAGE TOTAL EMPLOYMENT GRAPH**

A key component of transit-oriented development is the mixing of residential and non-residential uses within easy walking distance of a transit stop. While higher density residential development is crucial in generating transit ridership, so too is the level of employment and density of employment to the success of transit-oriented development because high employment densities create more potential trip destinations for transit riders.

To gain insight on the total employment within Centers and TOD Corridors, staff performed a spatial analysis using the 2008 Third Quarter Nevada Department of Employment information. The information provided by the State tallies a minimum and maximum number of employees for a given business location. Therefore, staff totalled both the minimum and maximum employment numbers for all businesses within a given TOD Corridor or Center and then calculated the average of the two numbers. The graph below represents the results of this analysis.
7. Employment Density Graph

A key component of transit-oriented development is the mixing of residential and non-residential uses within easy walking distance of a transit stop. While higher density residential development is crucial in generating transit ridership, so too is the level of employment and density of employment to the success of transit-oriented development because high employment densities create more potential trip destinations for transit riders. As an analytical tool to evaluate minimum employment density to support high capacity transit service, the Puget Sound Regional Council utilizes a measure of 25 jobs/acre (as cited in TCRP 2004). This measure is illustrated in the graph below. Ultimately, Centers and TOD Corridors with high densities and intensities of employment are in essence more mature than those Centers and TOD Corridors with low employment.

Staff calculated employment density by using the 2008 Third Quarter Nevada Department of Employment information. The information provided by the State tallies a minimum and maximum number of employees for a given business location.

To better understand employment density, staff totalled both the minimum and maximum employment numbers for all businesses within a given Center or TOD Corridor and then calculated the average of the two numbers. Staff then calculated the density by dividing the averaged total # of jobs by the total area for each Center or TOD Corridor geography. The graph below represents the results of this analysis.
8. **Intersection Density Graph**

Intersection density is an important indicator of street connectivity and walkability. A high level of street connectivity is critical for transit-oriented development as connectivity provides multiple and direct routes to destinations. Centers and Corridors with higher intersection densities would be considered more accessible than those with lower intersection densities.

To understand intersection density, staff performed a spatial analysis of street intersection points located within Centers and TOD Corridors. Because each Center and TOD Corridor geography is unique, staff calculated intersection density per square mile to make the results comparable across the dissimilar geographies. This type of analysis provides an understanding of density for a given area. Greater density of intersections often times leads to greater walkability and a more intensive compact urban form. The graph below represents the results of this analysis.

![Intersection Density Graph](image-url)
9. Transit Ridership Per Route Mile Graph

Transit ridership per route mile in each Center and TOD corridor is an indicator that allows for comparison of transit ridership levels across each geographic area and illustrates which Centers and TOD Corridors currently have the highest ridership base. As Centers and TOD Corridors mature over time, increasing levels of transit ridership should be experienced.

To gain a better understanding of transit ridership, staff performed a transit ridership spatial analysis using 2007 transit ridership data provided by RTC staff. The graph below represents the results of this analysis in ridership per route mile.
10. **TOTAL NUMBER OF BUS STOPS GRAPH**

The number of bus stops serving the region’s Centers and TOD Corridors is an important component of transit service as they represent an investment in transit infrastructure. The overall number of bus stops serving the region’s Centers and TOD Corridors should increase over time as the transit network expands.

To gain insight on the total number of bus stops, staff performed a spatial analysis using RTC bus stop location information to determine the total number of bus stops located within a given Center or TOD Corridor. The graph below represents the results of this analysis.
11. Vacant Parcel Area Graph

The amount of vacant land in a Center or TOD Corridor indicates not only the amount of land that is available without an existing structure for future development, but also provides a sense of how built out a certain Center or TOD Corridor is at a specific point in time. It is fair to conclude that Centers and TOD Corridors with high proportions of vacant lands may not exhibit characteristics of transit-oriented development in the near future.

Staff performed a spatial analysis of vacant parcels using the 2008 Washoe County Assessor’s parcel data. The vacant parcel areas were summed for each of the Centers and TOD Corridors. Please note that the total area for each Center or TOD Corridor is symbolized by the white and gray bars located behind the vacant parcel total area bars. The graph below represents the results of this analysis in acres.

For further information regarding the percent vacant parcel area in each Center and TOD Corridor, navigate to the specific land use mix pie chart found as item 16.
12. **AVERAGE PARCEL AREA GRAPH**

The average parcel area in the region’s Centers and TOD Corridors is a relatively straightforward measure that provides information regarding average parcel size. Smaller parcel sizes are more common in denser areas in which parcels have already been subdivided whereas larger parcel sizes are more common in less urbanized portions of the region.

To gain an understanding of the average parcel area, staff performed a spatial analysis of the 2008 Washoe County Assessor’s parcel data. This analysis provides a look at the average parcel size in each Center and TOD Corridor. The graph below represents the results of this analysis.
13. **Total Number of Parcels Graph**

As with the average parcel area in the region’s Centers and TOD corridors, the total number of parcels is indicative of denser urban areas as opposed to less dense areas. Centers and TOD Corridors that have higher numbers of parcels are most often more urbanized areas whereas Centers and TOD Corridors with relatively low levels of overall parcels are more commonly less dense and less urbanized.

Staff performed a spatial analysis using the 2008 Washoe County Assessor’s parcel data to understand the total number of parcels within the region’s Centers and TOD Corridors. The graph below represents the results of this analysis.
14. PARCELS PER ACRE GRAPH

Similar to the analyses for average parcel size and total parcel number, the analysis of parcels per acre provides information on the density of parcels within a given Center or TOD Corridor. Higher parcel densities typically indicate a more compact urban form and conversely, lower parcel densities are associated with a less compact urban form.

To better understand the current parcel density, staff performed a spatial analysis of the 2008 Washoe County Assessor’s parcel data. The below graph represents the results of this analysis.
15. **Average Construction Year Graph**

Understanding the average construction year for each Center and TOD Corridor shows an overall characteristic of the built environment within each of these areas. Through further analysis of this data, staff could calculate the age of the residential housing stock. This type of information could then be used to make more informed policy decisions regarding future residential demands within Centers and TOD Corridors.

To gain insight on the average year built, staff performed a spatial analysis of the 2008 Washoe County Assessor’s parcel information and calculated the average building construction year from each parcel that contained a structure regardless of the current use. Staff then calculated the average construction year across all Centers and TOD Corridors and added a black dashed line to the graphic below. Staff found that the average year built was 1968, and it is show in dark blue text. The below graph represents the results of this analysis.
16. **Land Use Mix Pie Charts**

A fundamental element of transit-oriented development is a mixture of residential, commercial, and civic land uses. In general, mixed-use development promotes urban vitality, increases access for more people, and decreases dependence on the automobile for mobility. Similarly, a mixture of retail and office type uses within the commercial category will create a more diverse workforce and foster a richer urban environment. This mixing of uses allows not only for increasing amounts of non-automobile trips, but also allows for reductions in trip length as uses are within a much closer proximity to each other than when uses are segregated. While each Center and TOD Corridor in the region is unique and there is no one-size-fits-all guideline to the appropriate percentages of residential, commercial, industrial, and park uses within these areas, Centers and TOD Corridors that are dominated by one or two uses do not necessarily allow currently for synergy between uses.

Using the Washoe County Assessor’s parcel data, staff analyzed the Land Use Mix for each of the Centers and TOD Corridors. The following Land Use Mix pie charts provide insight into the amount and percentage of current land uses. The color designations on these pie charts do not correspond to the Overview Map on page 2 of this appendix. Instead, staff chose to use color designations frequently used in professional planning for the general land use classifications.
Sparks TOD Land Use Mix

Land Use Classification - Acres
- VACANT - Minor Improvements: 38
- OTHER: 78
- PARK: 160
- SINGLE FAMILY RES: 182
- VACANT: 256
- MULTI-RESIDENTIAL: 290
-工業: 365
- STREETS AND ROW: 445
- COMMERCIAL: 450

Medical Regional Center Land Use Mix

Land Use Classification - Acres
- OTHER: 6
- PARK: 6
- SINGLE FAMILY RES: 8
- VACANT: 11
- VACANT - Minor Improvements: 19
- MULTI-RESIDENTIAL: 21
- INDUSTRIAL: 32
- STREETS AND ROW: 40
- COMMERCIAL: 85
Mill Street TOD Land Use Mix

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<tr>
<th>Land Use Classification</th>
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<tbody>
<tr>
<td>MULTI-RESIDENTIAL</td>
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<td>OTHER</td>
<td>2.9</td>
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<tr>
<td>SINGLE FAMILY RES</td>
<td>7.4</td>
</tr>
<tr>
<td>VACANT - Minor Improvements</td>
<td>19.3</td>
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<tr>
<td>INDUSTRIAL</td>
<td>21.3</td>
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<tr>
<td>VACANT</td>
<td>21.9</td>
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<td>51.4</td>
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<tr>
<td>COMMERCIAL</td>
<td>168</td>
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UNR Regional Center Land Use Mix

<table>
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<tbody>
<tr>
<td>PARK</td>
<td>12</td>
</tr>
<tr>
<td>VACANT - Minor Improvements</td>
<td>27</td>
</tr>
<tr>
<td>OTHER</td>
<td>35</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
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<td>MULTI-RESIDENTIAL</td>
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<tr>
<td>SINGLE FAMILY RES</td>
<td>106</td>
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<td>VACANT</td>
<td>121</td>
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<td>STREETS AND ROW</td>
<td>127</td>
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<tr>
<td>COMMERCIAL</td>
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</table>
South Virginia Street TOD Land Use Mix

North Virginia Street TOD Land Use Mix
**Dandini Regional Center Land Use Mix**

```
Redfield Regional Center Land Use Mix
```

**Land Use Classification** - **Acres**

- **VACANT - Minor Improvements**: 3
- **OTHER**: 5
- **INDUSTRIAL**: 20
- **MULTIRESIDENTIAL**: 40
- **STREETS AND ROW**: 92
- **VACANT**: 425
- **COMMERCIAL**: 478

**Land Use Classification** - **Acres**

- **VACANT - Minor Improvements**: 3
- **OTHER**: 5
- **INDUSTRIAL**: 20
- **MULTIRESIDENTIAL**: 40
- **STREETS AND ROW**: 92
- **VACANT**: 425
- **COMMERCIAL**: 478
Stead Regional Center Land Use Mix

Land Use Classification - Acres
- OTHER: 1
- INDUSTRIAL: 1,741
- VACANT: 3,001

<table>
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<tr>
<th>Land Use Classification</th>
<th>Acres</th>
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<tbody>
<tr>
<td>OTHER</td>
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<td>1,741</td>
</tr>
<tr>
<td>VACANT</td>
<td>3,001</td>
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</tbody>
</table>

- 0.02 %
- 36.71 %
- 63.27 %