

CHAPTER



5

Planning for Future



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CHAPTER 5

Planning for Future

Planning for the future is a critical element of the comprehensive plan for Woodson Terrace. It will provide the direction for actions taken by the City to achieve the vision and goals of the community. The comments and concerns expressed during engagement activities revealed several important issues that must be considered in defining what, where, and how future development will occur in the City.

Public engagement methods used to define future development included the comprehensive plan steering committee, a public workshop, community surveys, stakeholder interviews, and focus groups discussions.

Detailed information regarding engagement activities is covered in Chapter 4. This information was the basis in planning for the future in the City of Woodson Terrace. Members of the City's appointed Comprehensive Planning Steering Committee were consulted on a regular basis in order to understand issues faced by the City and the committee's vision for the future and to apply this foundation of the plan to plan for the future.

Strength, Weaknesses, Opportunities, and Threats

A critical part of developing a comprehensive plan is to define strengths, weaknesses, opportunities, and threats (SWOT) established during engagement activities. The following SWOT characteristics were identified for the City of Woodson Terrace.

Strengths

- Central location and proximity to Clayton and Downtown St. Louis
- Well-maintained housing stock
- Close to the airport
- Good condition of roads
- Large number of hotels
- Long-term businesses and family-owned restaurants
- Public park (John. L Brown City Park)
- Dedicated city staff and prompt provision of services

Weaknesses

- Lack of diversity in terms of size and style of housing
- Absent landlords
- Landlocked (both Woodson Terrace and neighboring Edmundson)
- Inconvenient, difficult access to MetroLink
- Confusing access to and egress from I-70
- Low visibility of businesses along Natural Bridge and Woodson roads

Opportunities

- Comprehensive study I-70 corridor from Lindbergh to I-170 to provide good access to communities and airport
- Develop new commercial and mixed-use development potential on vacant and under-utilized land along Natural Bridge and Woodson roads
- Create walking/biking corridor in large right of way on Natural Bridge and Woodson roads
- Develop entertainment venues and senior living facilities
- Enlarge housing footprint by retrofitting existing stock and thus create diversified housing stock in addition to redevelopment
- Share resources between adjacent communities
- Share revenues through transportation development districts (TDD) and community improvement districts (CID)

Threats

- Economic crises affecting smaller communities
- Senior flight due to lack of assisted care facilities
- Loss of young people who do not have an attachment to the community
- Lack of diverse housing choices in terms of size and quality
- No funding to carry out a much-needed I-70 corridor comprehensive study and other infrastructure investment



Land Organization

The Future Land Use Plan for the City of Woodson Terrace will be used as a guide for decisions regarding zoning and land-use (see Map 5-1). The future land-use recommendations included in this plan were developed as a result of considerations of current land-use practices, recommendations from the Comprehensive Planning Steering Committee, comments from engagement activities, and state-of-the-art practices related to land-use and urban design principles.

The future land-use plan includes eight - land-use categories. These are shown in Future Land Use Map 5-1. These categories were chosen based on appropriateness of scale related to the study area and the conditions that exist or are likely to exist in the foreseeable future. The future land-use categories identified on Map 5-1 are listed below and discussed in detail in the subsequent sections of this chapter:

1. Low Density Residential
2. Medium Density Residential
3. Neighborhood Mixed Use
4. Community Mixed Use
5. Regional Mixed Use
6. Institutional
7. Industrial/ Utility
8. Parks and Recreation

With public input as a backdrop of information, the planning team also included market-driven information as pertinent to developing areas of the City. These areas are characterized as development districts along Natural Bridge Road and Woodson Road, where development is planned to occur. The two development districts proposed in the Future land-use plan, gateway and town center, are discussed in the following the land-use categories section.



Land-use Categories

General Principles of Development

It is critical to develop land use with the end in mind. Redevelopment is a basis for growth. It enables better utilization of space available for development and connecting those areas to core residential areas on each side of Woodson Road.

The following principles were used to develop future land-use categories and overlay districts:

- Topography and elevations:
 - Discourage development of any slope greater than 15 percent because existing terrain is essentially flat.
 - Conform public and private infrastructure to the natural contours of the sites, eliminating the need for extensive cutting, filling, or terracing.
 - Emulate the topography of the existing slope and do not shape into exaggerated slopes or flatten sites.
 - Prepare new building sites in dense areas at elevations similar to existing structures to ensure continuous façade presences
- Soils: Protect hydric soils¹ which are good for draining stormwater, and include in any site plans, since the cost of transforming hydric soils into compacted developable land is high.
- Views: Protect valuable view sheds by orienting buildings to maximize view potential.
- Historic elements: Respect and preserve when impacted by new or re-development within their surrounding area.
- Natural, social and cultural resources: Protect and preserve.
- Flora:
 - Integrate mature and native trees, as well as existing non-invasive vegetation into the proposed site plan.
 - Incorporate native plant and tree species in landscaping and avoid or remove existing invasive species.²
- Incorporate implementation planning and finance strategies into all planning concepts to assure market-driven and financeable development on a timely basis.
- Include transportation and supporting infrastructure elements in redevelopment proposals to ensure connectivity and fiscal responsibility.

¹ **Hydric soils:** Soils that are wet frequently enough to periodically produce anaerobic conditions, thereby influencing the species composition or growth, or both, of plants on those soils. Available at <http://www.dnr.state.md.us/criticalarea/glossary.html#h>, Accessed April 02, 2011.

² **Native and Invasive Species list:** Available at <http://www.grownative.org/>, <http://www.shawnature.org/nativeland/NativeLandscapingManual/ChapterThree.aspx#major> Accessed April 02, 2011

Low Density Residential

Low density residential areas represent subdivisions with residential lots of varying sizes and houses including varying design amenities (see Exhibit 5-1).

The allowable density is usually one to three units per acre, with most homes being of stand-alone design. This density encourages development of single-family homes on large lots where the City provides urban services.

Higher density homes in this category (for example, four units per acre) are located near adjacent and similar land uses such as medium-density land use. This adjacency helps create buffers for lower density homes from commercial or higher density residential. Density in low-density residential areas should not exceed 25 percent of the adjacent neighborhood density, and units are not stacked vertically. Infill of vacant parcels in existing neighborhoods should be consistent with the density and character of the neighborhood.

The following guidelines apply to this land-use development category:

- Density: one to three units per acre.
- The minimum lot size is 10,000 square feet.
- Maximum height 2.5 stories.
- Density bonuses may also be considered with the provision of public amenities.

Large subdivisions require a planned development permit and comprise planning for existing infrastructure that includes methods to upgrade street configurations, parks, and trails within redevelopment areas.

EXHIBIT 5-1: EXAMPLES OF LOW DENSITY RESIDENTIAL



Source: CH2M HILL



Medium Density Residential

This land-use category includes single-family detached housing, single-family attached housing, townhouses, duplexes, live-work units³, apartments, or condominium-style planned unit developments. More compact than low-density development, these subdivisions produce higher volumes of commuter traffic. The allowable density in this category is 4 to 12 dwelling units per acre (see Exhibit 5-2).

Modulations in density should not be abrupt. An increase of 25 percent from the adjacent density is suggested. Medium-density homes (for example, four units per acre) are recommended to be located away from the major streets and gradually merging with the low-density residential land uses described above. This land-use category, when planned appropriately, can act as an excellent buffer investment between low-density housing family and commercial developments. A mix of housing types such as stand-alone construction, zero lot lines, live-work unit duplexes, town homes, triplexes, fourplexes, courtyard, and garden type apartments or condominium units are encouraged in each neighborhood. Large subdivisions may require a planned development permit. If public amenities are provided, the City could consider awarding bonuses.

The following guidelines are suggested for medium-density residential areas:

EXHIBIT 5-2: EXAMPLES OF MEDIUM DENSITY RESIDENTIAL



Source: CH2M HILL, www.pedbikemages.com

³ The term "live-work" effectively describes accommodations that are specifically designed to enable both residential and business use. This differs from ordinary "work from home conditions" in its nature and in the intensity of business use that may be involved. While in "work from home", the work use of a unit is small scale and usually secondary to the domestic use, in a "live-work" unit amount of space devoted to the work use or that the work element is designed to accommodate more workers than just the resident and may be designed in a flexible form to encourage business expansion. Available at <http://www.rics.org/Environmental/landconsultancy/Sustainability/Sustainabledevelopment/liveworkarticle040906.html>, Accessed on April 04, 2007

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- Density of 4 to 12 dwelling units per acre allow for smaller lots within city limits.
- Maximum height of three stories may provide parking on the ground floor or within a parking garage..
- Live-work units are allowed at nodes.
- Residential units can be stacked.
- Modulations in density are gradual, not abrupt.

EXHIBIT 5-3: EXAMPLES OF NEIGHBORHOOD MIXED USE

Neighborhood Mixed Use

Commercial and retail development within this land-use category is designed to serve the surrounding residential areas. It is here that commercial, institutional, and residential land uses are mixed both horizontally and vertically. Commercial uses comprise retail stores, restaurants, offices, daycare facilities, grocery stores, drug stores, coffee and sandwich shops, dry cleaners/Laundromats, salons, daycare facilities, professional offices, medical/dental clinics, retail/gift shops, parks, churches, clubhouses, and public uses and includes public right-of-way improvements needed to ensure safe, convenient pedestrian and vehicular accessibility to economic development opportunity sites.

Individual parcels in this category should be used for a variety of compatible land uses to create a diverse urban fabric. These uses can be mixed horizontally as well as vertically.

The character of mixed-use development is planned to respond to the economic development characteristics of existing development surrounding each location in terms of building height, appropriate use, and proportion.

The following qualities apply to the neighborhood density mixed use category.

- Minimum height is 1.5 stories.
- Maximum height is four stories.
- Maximum footprint of each business is 10,000 square feet.



Source: CH2M HILL, www.pedbikemages.com

- Developments create a pedestrian-friendly, pleasing environment.
- Residential density is 4 to 10 units per acre.
- Residential use is not allowed on a ground floor.
- One row of parking in front though zero setback from the sidewalks. Extra parking areas are provided at the side or back of buildings.
- Common wall adjacency creates a continuous, undisturbed façade providing for aesthetic appeal and safety to pedestrians by limiting structure separation with drives and loading dock areas.
- Shared side and rear parking, points of entry, and exits can reduce infrastructure costs and increase efficiency in long-term management.
- Common areas and parking lots are landscaped using sustainability principles and best management practices.
- Stormwater management includes underground detention or best management practices.

Community Mixed Use

This classification includes medium-sized businesses and service establishments that serve the immediate neighborhood as well as neighboring communities. The uses allowed in this area serve Woodson Terrace and surrounding communities' day-to-day needs and attract outside transit market bases. Commercial, institutional, and residential land uses are mixed horizontally and vertically (see Exhibit 5-4).

Parcels belonging to this land use category lie along Woodson Road in the northern part of the community and can attract destination-type uses. Creation of a pedestrian-friendly environment with traffic calming devices is vital to the success of such uses.

The uses that are allowed in this category are typically lower traffic generators compared to big-box stores and regional retail developments. However, any planning for commercial areas is recommended to include careful placement of vehicular parking and possibly stacked or decked parking that is augmented by pedestrian-friendly circulation and connectivity. Thoughtful planning or supportive infrastructure adds to the desirability of mixed use areas and enhances potential for economic success for those who choose to invest in these areas.

Commercial uses include large retail stores, restaurants, offices, daycare facilities, large grocery stores, drug stores, coffee/sandwich shops, personal care, home care, spas, professional offices, medical/dental clinics, banks, clubhouses, and public uses. Institutional uses include schools, churches, hospitals and public facilities such as post offices, community centers, city hall, city-owned property, other public agencies, and other not-for-profit agencies.

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The following recommendations apply to Community Density Mixed Use.

- Minimum height is 2 stories or 30 feet.
- Lot coverage is less than 70 percent.
- Traffic calming devices attract destination-type uses and create a pedestrian-friendly environment.
- For commercial and retail parcels, plan tenant space is planned based on market-driven tenant needs, including access and visibility from pedestrian and vehicular corridors.
- Residential density is not more than 11 units per acre.
- No residential units on ground floors
- Setbacks:
 - There is zero frontage setback from the sidewalk to achieve the desired streetscape character.
 - Open seating spaces, entry steps to storefronts, flowerbeds or other landscaping along storefronts, public gathering areas, and patios used for café service are part of the structures from the zero setback
 - While zero building set back is preferred, one row of parking in front could be allowed per City approval.
- Common wall adjacency creates a continuous, undisturbed façade providing for aesthetic appeal and safety to pedestrians by limiting structure separation with drives and loading dock areas
- Parking:
 - Underground, decked, or garage parking is encouraged.
 - Shared side and rear parking, points of entry, and exits reduce infrastructure costs and increase efficiency in long-term management.

EXHIBIT 5-4: EXAMPLES OF COMMUNITY MIXED USE



Source: www.pedbikeimages.com



- Common areas and parking lots are landscaped using sustainability principles and best management practices.
- Underground detention or best management practices for stormwater infiltration is expected.

Regional Mixed Use

This classification includes large businesses and service establishments that cater to regional demands and attract traffic from out of the immediate trade area. Residential use is not allowed. Examples include entertainment venues, convention centers, theaters, offices, hotels, large retail developments, department stores, hospitals, etc. (see Exhibit 5-5). Uses allowed in this category are typically high traffic generators (compared to community density mixed use).

The parcels belonging to this land-use category are along Natural Bridge Road due to easy accessibility, highway visibility, and connectivity to transit services, all of which are vital to the success of regional density mixed use.

Planning for commercial areas or institutional uses is recommended to include careful placement easily accessible stacked or decked parking facilities. Thoughtful planning for supportive infrastructure adds to the desirability of mixed use areas and enhances potential for economic success for those who choose to invest in these areas.

The following qualities apply to regional density mixed use.

- It has highway visibility.
- Minimum height is 3 stories.
- It features a pedestrian-friendly environment with traffic calming devices
- Parking:
 - One row of surface parking in front is allowed, plus parking areas at the side or behind buildings.
 - Underground, decked or garage parking is encouraged.
 - Shared side and rear parking can reduce infrastructure costs and increase efficiency in long-term management.

EXHIBIT 5-5: EXAMPLES OF REGIONAL MIXED USE



Source: www.pedbikeimages.com



- Landscaping incorporates sustainability principles and best management practices.
- Major point(s) of ingress and egress into development include curb cuts designed to accommodate truck traffic.
- Shared points of entry and exits can reduce infrastructure costs and increase efficiency in long-term management.
- Common areas are landscaped using sustainability principles and best management practices.
- Underground detention or best management practices for stormwater infiltration is expected.

Institutional

Institutional uses typically include schools, churches, hospitals, and public facilities such as sewer and water treatment plants, stormwater facilities, post offices, community centers, city hall, city-owned property, other public agencies, and other not-for-profit agencies. Some of these operate at limited times or days, such as 9 a.m. to 3 p.m. on weekdays only.

The locations of and potential for such services are determined by the growth of the City and therefore are related to population and commercial needs of the City and region. Some of the institutional uses, such as city hall, churches, school buildings, etc. are seen as identity elements in the community. Therefore their architecture should be sensitive to density and character of the neighboring area and be seen by the community as an element of identity.

The expansion of school facilities depends on the decision of school boards based on the projected numbers for yearly enrollment and the age levels of the student body.

Planning recommendations for future expansion of institutional facilities are given below.

- Minimum height is 1.5 stories or 20 feet.
- A pedestrian-friendly environment with traffic-calming devices can be incorporated.
- Since uses are encouraged to explore shared parking facilities and points of entry and exits resulting in the reduction of infrastructure costs and efficiency in long term management of development areas.
- Parking
 - Encourages underground, decked, or garage parking.
 - Any parking associated with institutional buildings should be adjacent to or behind facilities.
 - However, one row of parking in front could be allowed per City approval.
 - Shared side and rear parking can reduce infrastructure costs and increase efficiency in long-term management.
- Shared points of entry and exits can also reduce infrastructure costs and increase efficiency in long-term management.
- Buildings are encouraged to have a zero setback from the street. However, set-back guidelines for institutional uses can be altered if the front is landscaped or provides plaza/get together areas.
- Underground detention or best management practices for storm water infiltration is expected.

Industrial/ Utility

Industrial developments typically consist of single-story structures of either tilt up or pre-engineered building quality and may include outside storage of material and equipment and employee parking. Because of their use and purpose, industrial development areas may produce conditions that are incompatible with adjacent uses. Therefore, landscaped buffer zones are often used to separate these areas from residential, retail, and commercial investments.

Truck traffic and increased customer and vendor traffic common at industrial sites are additional reasons to isolate these activities through infrastructure placement.

Current industrial uses along Woodson Road and Natural Bridge road are assumed to remain the same in future. However, these parcels generate a gap between retail uses that are expected to create a pedestrian friendly environment along Woodson and Natural Bridge roads. This gap can be lessened by creating an aesthetically pleasing pedestrian environment with landscaping and elements such as green hedges. Other recommendations associated with this category are listed below.

- Use landscaped buffers, including greenways and trails, to separate industrial areas from residential, retail, and commercial investments.
- Encourage use of low-impact design.
- Create visual interest using different textures, complementary colors, shadow lines, and shapes.
- Single-color or blank walls with little detailing should be prohibited along Woodson and Natural Bridge roads and discouraged in the interior areas.
- Use Greenscreen® or landscaping to hide any unpleasant structures or equipment along Woodson and Natural Bridge roads and in the interior areas.

Parks and Recreation

City of Woodson Terrace currently has two parks. The future land use plan does not anticipate creation of new park facilities unless a large development takes place. The following are recommended for park and recreational areas.

- Parks should be easily accessible from neighborhoods and businesses.

EXHIBIT 5-6: EXAMPLES OF INDUSTRIAL DEVELOPMENT



Source: www.pedbikeimages.com



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- Park facilities should be well maintained, in working order, and safe.
- Lawns areas should be manicured.
- Structures in parks should be sensitive to density and character of neighboring area.
- Low -impact design is encouraged.

The park on the east side of the community could be used innovatively. For example, it could include a community garden, a play area for children, an outdoor classroom, an organic school or urban farming program, or a dog park. Other recommendations for the park include the following elements.

- Improve accessibility from Guthrie Road.
- Erect signage announcing the park at the Guthrie Road entrance.
- Landscape the border and lay attractive, ADA-accessible pavement along the existing 10-foot-wide path.
- Purchase one of the properties on north or south of the existing entrance from Guthrie and create a grander entry and a few parking spots.

EXHIBIT 5-6: EXAMPLES OF SMALL PARK DEVELOPMENT



Source: www.pedbikeimages.com



Development Districts

Creation of development districts leads to concentrated efforts in key areas of the City where redevelopment will be supported by the City. These areas must be distinguishable from the rest of the adjacent community. District boundaries are carefully delineated based on five elements:

- Existing land uses
- Proposed land uses
- Availability of land
- Accessibility from the interstate highway
- Visibility from the interstate highway

While this document provides an outline to set a tone for the district character, each district—gateway and town center—needs its own design guidelines related to streetscape, site planning, building architecture, and signage (on both public and private properties) to fully realize its character and create a unified image throughout its boundaries.

To promote the small-town character of Woodson Terrace, we recommend establishing a merchants' association to represent the collective investment, coordinating advertising, promotion, and distribution of marketing materials through various media. We also recommend that the merchants' association prepare a tenant mix analyses to assure market-driven placement of new businesses and retail uses that complement existing businesses and encourage new investment.

Streetscape is an important part of the district character and is discussed in greater detail in the Local Infrastructure segment of the Future Infrastructure and Facilities section of this chapter.

Gateway District

Although the City of Woodson Terrace is accessed from both north and south of the City, most people (who come from the region or the airport) use the northern entry points. This means that visitors' first impressions come arise from viewing parcels on Natural Bridge Road.

Exhibit 5-7 shows the extent of the gateway district proposed in this area. The proposed future land uses are region density mixed and industrial.

There are three focal points in this district

- West entrance
- East entrance
- Intersection of Woodson and Natural Bridge roads

These entry points, along with building architecture and streetscape improvements, are key opportunities to distinguish this stretch of Natural Bridge Road from an otherwise uninteresting corridor when seen from I-70. This is where appropriately designed focal points, consistent gateway elements, and building architecture can establish a sense of arrival to the visitors and raise curiosity of transient traffic along I-70, ultimately attracting them to the City. Focal points or gateways have a variety of

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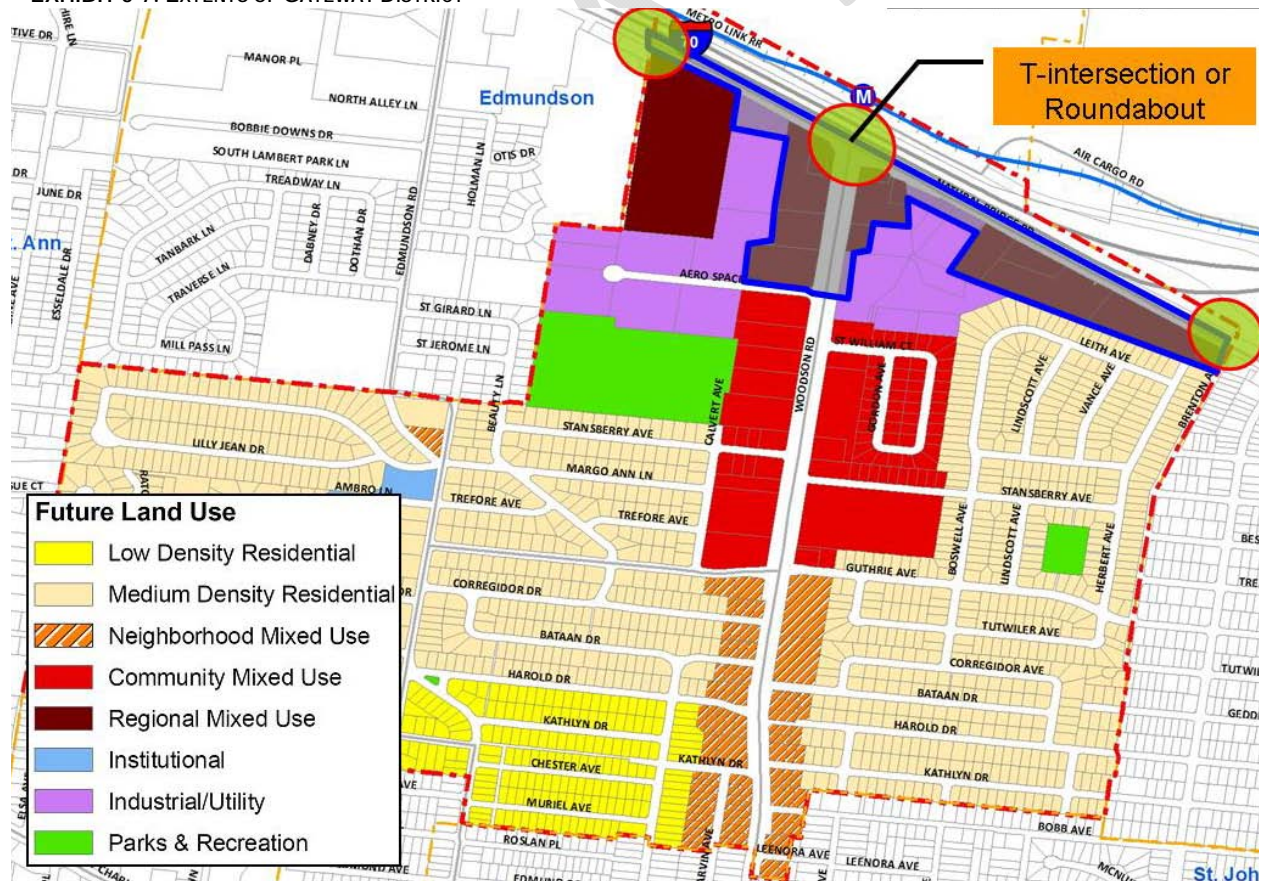
configurations and scales and can be created in various ways such as architecturally, with a monumental, or through landscaping. They should provide a unique sense of identity, transition, and anticipation and relate to the local cultural heritage.

The following recommendations relate to focal points or gateway features (see examples in Exhibit 5-8).

- Design should balance building envelope, architecture, and mass with highway visibility.
- Use landscape elements like signs, views framed by vegetation, structure, and color and lighting design to make a lasting impression on a visitor and transient traffic.
- Encourage public art as a feature of these focal points, and integrate art into streetscape and landscape concepts.
- Consider using a different type of roadway pavement at.

The intersection of Woodson and Natural Bridge roads is the most important focal point of the three points listed above and needs to be grander compared to the east and west entry points. While the current entry has been enhanced, the eastern and western gateways can also be improved to showcase this critical entry to the Woodson Road corridor. This will raise the interest and curiosity of the visitor entering from north of the City and drawing him further down Woodson Road and eventually to the Town Center District. Similarly, a person entering from south of the City will be drawn all the way to Natural Bridge Road.

EXHIBIT 5-7: EXTENTS OF GATEWAY DISTRICT



Source: St. Louis County GIS & CH2M HILL

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Two ways of increase the prominence of this intersection would be to incorporate a roundabout or an enhanced T intersection. Depending on the design, either type of intersection can result in a grand focal point and gateway for the community.

The following lists the pros and cons of both intersection types.

- Roundabouts are less pedestrian friendly compared to T-intersections as they create a continuous flow of traffic.
- The T-intersection has a clear advantage when the purpose at the intersection is economic development or to move pedestrians from one side of the road to the other.
- Since I-70 is on the opposite side of Natural Bridge Road, there is no need for pedestrians to cross at this intersection.
- Roundabouts reduce traffic delays, energy consumption, maintenance costs, and air

EXHIBIT 5-8: EXAMPLES OF GATEWAY FEATURES



Source: <http://www.pedbikeimages.org/browse.cfm>

pollution compared to traditional T-intersections.

- Roundabouts calm traffic.
- Roundabouts reduce the occurrence of accidents.
- Roundabouts limit access to an intersection, notable in relation to existing and future commercial and residential investments. Any roundabout configuration must consider public access to private property.
- Implementation of a roundabout may warrant redesign of internal circulation on adjacent property.
- Roundabouts create a focal point and give a unique identity to the community. However, landscaped areas of roundabouts are not accessible to the public. Implementation of roundabouts uses public space that could otherwise be used as plaza, outdoor dining, or just gathering space in a traditional T-intersection.

Town Center District

Availability of significant vacant underutilized land in the heart of the community can be a positive aspect of creating a town center for Woodson Terrace. The parcels belonging to the Town Center District are along Woodson Road in the central part of the community. The proposed boundaries are shown in Exhibit 5-9.

Woodson Road is accessed primarily on the north from Natural Bridge Road. Success as a town center will depend on the type of uses that are allowed along this stretch of Woodson Road. Destination-type uses such as one-of-a-kind retail stores, specialized merchandise, family-owned restaurants, farmers' market, etc., are some establishments that will thrive at this location.

A public/private partnership is desirable due to the costs associated with upgrading infrastructure and redeveloping private property within an established network of structures. Refer to The National Council for Public-Private Partnerships website <http://www.ncppp.org/> to learn more about such partnerships.

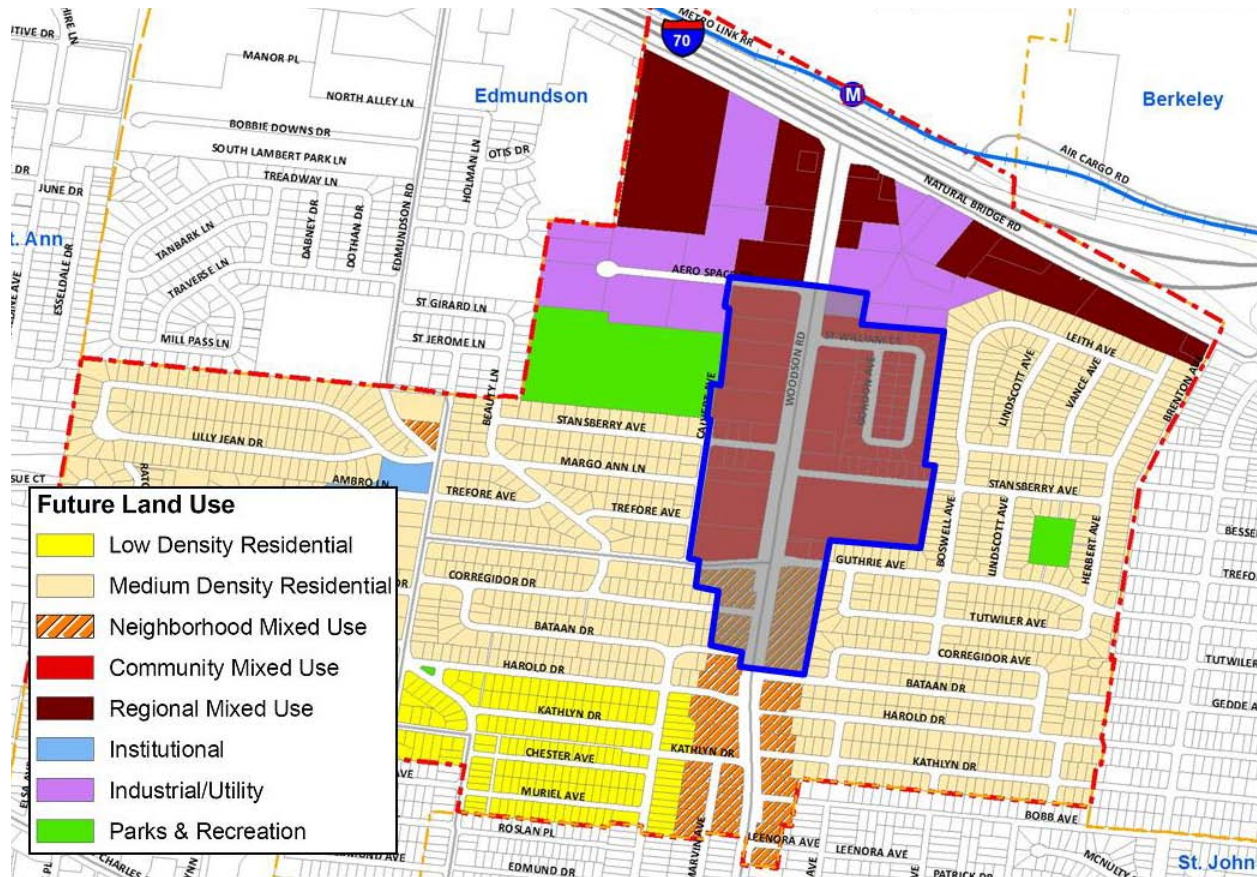
To implement redevelopment of this area, the City can facilitate preparation of a master plan⁴ for the entire district that includes an inventory of land ownership, size of parcels, and desired public enhancements and upgrades that will set this area apart from other locations in the City. A large hard paved plaza is an integral element of a town center. Such a plaza should be open to the elements, designed to encourage public activities, and be framed with small shops and restaurants. Public seating and gathering areas around fountain(s) and landscaped areas can be planned to support seasonal activities such as Fourth of July celebrations, holiday activities, parades, and private celebrations such as weddings or outdoor parties.

Permanent, lit kiosks strategically located throughout the plaza can attract attention to areas within the plaza and provide food, products, and services. Kiosks may be owned by the City and leased to vendors based on products sold, variety of products, products of interest, and informational material. The buildings that frame the plaza are ideal places for stores that sell products unique to Woodson Terrace and not found in chain stores. The town center design may include commercial uses that cater to

⁴ The town center master plan is not in current scope of study and will have to be carried out as a separate project. However the master plan shall coordinate with the comprehensive plan.

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EXHIBIT 5-9: EXTENTS OF WOODSON TERRACE TOWN



Source: St. Louis County GIS & CH2M HILL

restaurants and entertainment venues. Hotels or inns can add a distinctive quality to the area and encourage transit market participation.

Special design elements bring excitement to the tenant mix and the configuration of tenant spaces to maximize the convenience; visibility, aesthetics, and uniqueness of the district (see Exhibit 5-9). Other ways to contribute to the success of development are listed below:

- Establish design standards to encourage creation of aesthetically pleasing architecture and landscaping that respect the history of the area while adding excitement to public gathering places
- Address overall awning and signage issues to create a unified image throughout the district
- Include branding and way finding signage that sets the area apart
- Create a pedestrian friendly environment that incorporates access management and traffic-calming techniques
- Incorporate an open, visible, and accessible plaza, a vital element for the success of a town center
- Design a streetscape that is grander in its core area than the rest of the street
- Require pedestrian furniture, landscaping, and lighting along sidewalks and pathways for safety and to add an opportunity for whimsical design elements and way finding

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- Make available amenities such as public phones and restrooms
- Locate main parking areas to accommodate those driving to the area (although a corridor plan will strategically route traffic to avoid vehicular access to the plaza and will warehouse automobiles within walking distance of the plaza)
- Form a defined edge among building alignments while encouraging interesting structures, (such as patios for eating establishments and common rest areas and public gathering areas) along the sidewalk
- Combine interesting building alignments with sidewalks, rows of trees, other plantings, creative signage, and way-finding elements to create an environment for small commercial investment
- Encourage zero frontage setback from the sidewalk to achieve the above-mentioned streetscape character, however, open seating spaces, entry steps to storefronts, flowerbeds or other landscaping along the storefronts, public gathering areas, and patios used for café service are to be included as part of the structures from the zero setback
- Stipulate that ground-floor store frontage be at least 60 percent transparent and 24 inches above the sidewalk, which enables visibility into the stores and/or display windows, creates a human scale to the street characteristics, and enhances visitor interrelationship with goods and services

EXHIBIT 5-10: EXAMPLES OF TOWN CENTER FEATURES



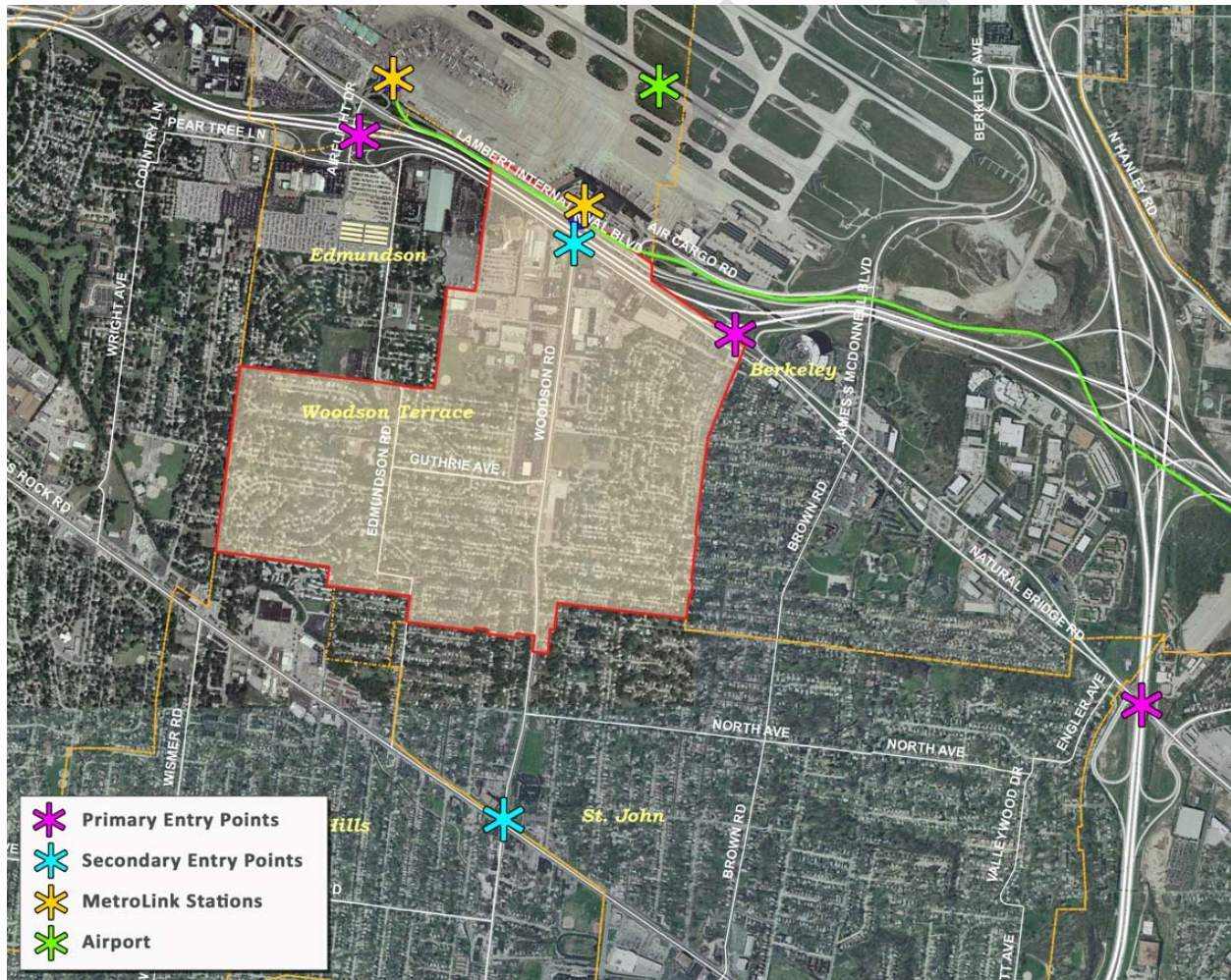
Source: <http://www.pedbikeimages.org/browse.cfm>

Future Regional Infrastructure

Transportation infrastructure is essential to market access and visibility. Infrastructure connects people and places and adds value to real estate resulting from that connectivity. Woodson Terrace is immediately adjacent to significant region-wide infrastructure including the following (see Exhibit 5-11):

- I-70
- I-170
- MetroLink
- St. Louis Lambert Airport
- Natural Bridge Road (also known as State Route 115)
- St. Charles Rock Road (also known as State Route 180)

EXHIBIT 5-11: INFRASTRUCTURE INVESTMENT AROUND WOODSON TERRACE



Source: St. Louis County GIS & CH2M HILL

Significant infrastructure investment associated with the airport makes this location ideal for redevelopment and land-use planning associated with more dense development. The desire for increased public and private investment that meets the needs of existing and future consumers accessing this area will be reliant upon this infrastructure. However, the current infrastructure configuration and access do not serve the City well. This impacts valuable land and investment in the community. Examples of these infrastructure conditions include but are not limited to the following:

- I-70 interchange at Natural Bridge (Pear Tree Lane) – This interchange terminates into a parking lot for an aging Marriott Hotel south of the highway requiring clumsy vehicular movement to access the airport north of the highway and restricting development opportunities along Pear Tree Lane.
- Terminus of MetroLink at the airport – MetroLink, located on the north side of I-70, provides no direct access to the City of Woodson Terrace
- I-70 intersection with Natural Bridge Road – This convoluted intersection east of the City makes access to the City difficult and unattractive for visitors and prospective consumers
- I-70 alignment configuration resulting in interchanges that do not serve adjacent land – Interchanges along I-70 provide little economic development benefit to adjacent property and communities between Lindbergh Boulevard and I-170. Interchanges are designed without access ramps in some cases and restricted access in several locations.

Although major infrastructure investment lies adjacent to and contiguous with Woodson Terrace, there is no direct access to any of these transportation amenities except along Natural Bridge Road. The Airflight interchange on I-70 west of Woodson Terrace in Edmundson is the only direct highway access to the City. The intersection of I-70 with Natural Bridge Road in Berkley, just east of Woodson Terrace, offers direct but confusing access to the City. Therefore, to attract public and private investment and provide long-term economic sustainability, solutions need to be developed that provide access to major infrastructure investment around the City. Without improved access, the prospect of new development will be limited and the pace of investment slowed.

The following sections describe potential solutions to infrastructure challenges.

Comprehensive I-70 Study

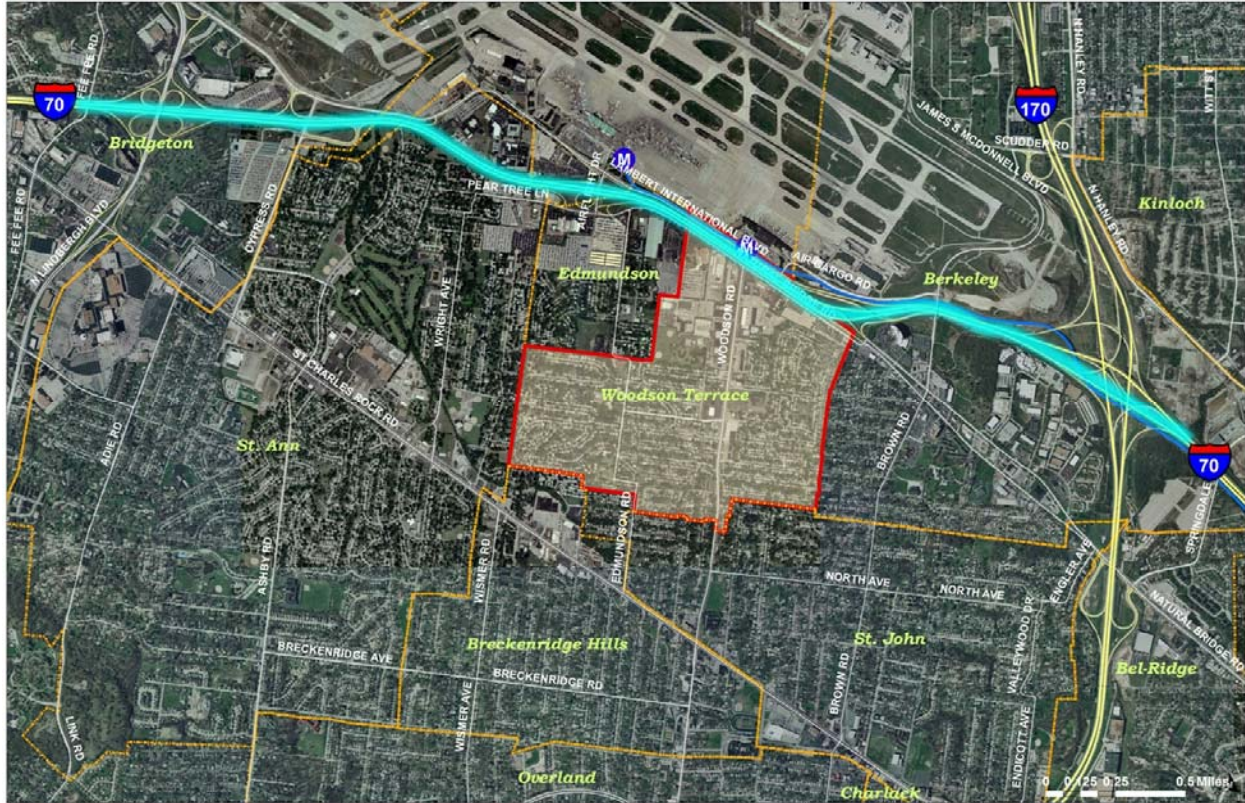
A long-term solution to solving the challenges related to access is to reconstruct I-70 and its interchanges. A comprehensive study to upgrade and update about 4 miles of I-70 between Lindbergh Boulevard east to I-170 is needed to create synergies between the transportation network and land uses along this corridor (see Exhibit 5-12). The study should recommend alignment and reconfiguration of interchanges to provide direct access to the airport and communities along this stretch of the corridor. This will foster reinvestment in the communities along I-70.

The study should also look at the possibility of raising a section of interstate between the Airflight Drive interchange and the Brown Road Bridge. This will connect Woodson Road to the airport, allowing pedestrian and vehicular access between the north and south side I-70 to and from the City of Woodson Terrace. The goal of this option is to create an aesthetically pleasing environment for pedestrians traveling from one side of the interstate to the other. Existing conditions such as elevations, soil conditions, and federal funding requirements related to highway construction and design alternatives will greatly affect such an option. The plan should be required to provide the safe, aesthetic human

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design elements of the underpass so that ceiling height, color, lighting, finish materials, way finding, and the physical environment are given serious consideration.

EXHIBIT 5-12: EXTENTS OF PROPOSED COMPREHENSIVE I-70 STUDY



Source: St. Louis County GIS & CH2M HILL

An intergovernmental agreement is recommended between the cities of Edmundson and Woodson Terrace to plan and redevelop the I-70 interchange at Natural Bridge Road (Pear Tree Lane). It should include new investment, land-use optimization, and improved access for both communities. This planning may coincide with the phased development plan associated with consolidation of land and increased density along Natural Bridge Road.

Although the I-170 and Natural Bridge intersection east of the City provides access to Woodson Terrace, that access is convoluted and indirect. Natural Bridge traffic that wishes to continue to Woodson Terrace must stop, turn left, and then turn right onto Natural Bridge Road. For visitors outside the immediate vicinity, this movement is confusing and not easily navigated.

EXHIBIT 5-13: EXAMPLE OF PEDESTRIAN-FRIENDLY, LIGHTED UNDERPASS



Source: <http://flicker.com/>



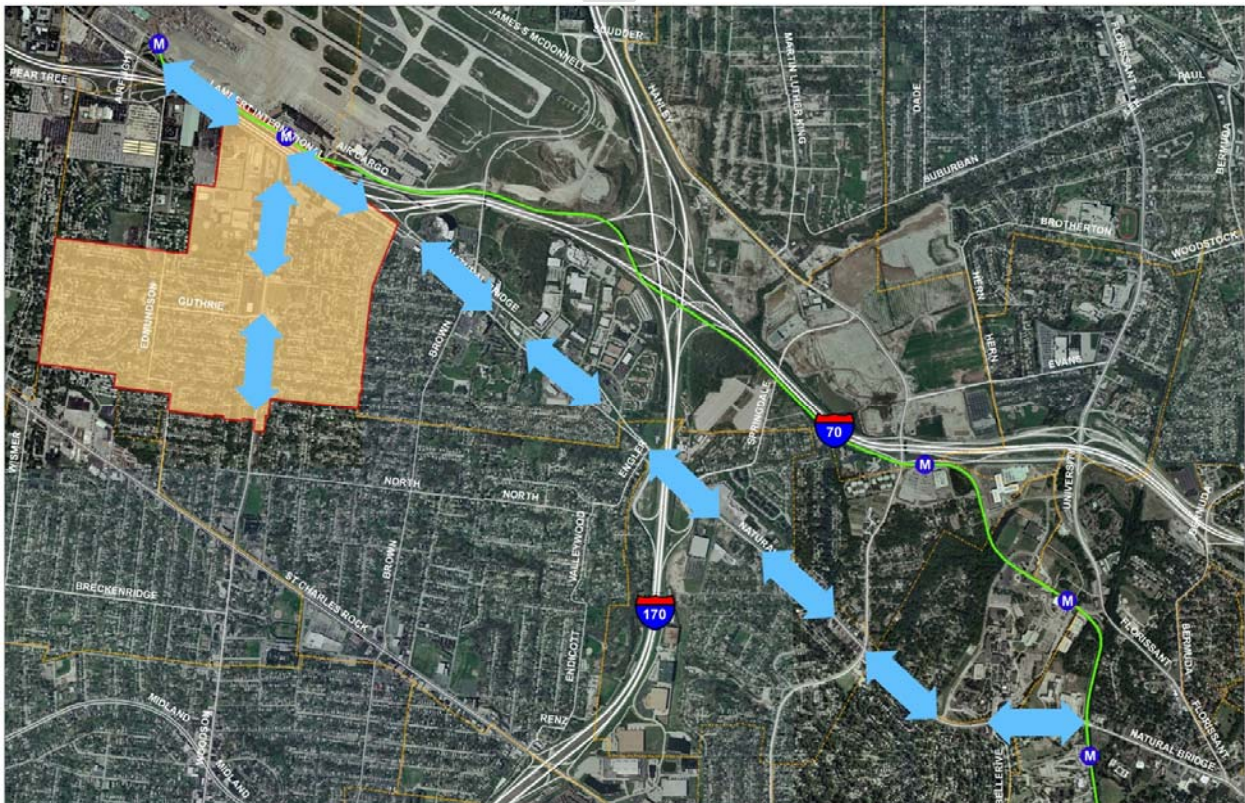
The realignment of I-70 and interchange designs that acknowledge and encourage economic development—in association with interstate redesign between Lindbergh Boulevard and I-170—would help create long-term economic stability for the City as well as the entire region.

I-70 is listed as one of the projects under “Tier 1 corridor study project” in the East West Gateway’s Regional Transportation Plan 2040. The plan suggests carrying out an interchanges and corridor study of I-70 corridor from I-170/ Hanley to I-270. Hence, any study should coordinate with East West Gateway Council of Governments. The area should be considered in the HUD Area Planning lead by East West Gateway Council Of Governments (EWGCOG).

MetroLink Shuttle

MetroLink is a regional light rail transit (LRT) system serving core city and county areas of the St. Louis region in Illinois and Missouri. It is vital to creating jobs and developing economic opportunities for the region and it will continue to be valuable in the future. Running north of I-70 to serve the airport, the MetroLink alignment has no direct connection to Woodson Terrace south of the highway. A long-term solution may include a MetroLink shuttle service extending south from the existing MetroLink station and extending along Natural Bridge Road to the University of Missouri – St. Louis (UMSL) MetroLink station on Natural Bridge Road (see Exhibit 5-14) and connect the airport with cities and businesses south of I-70, as well as the wider community along Natural Bridge Road to the east. Connection to the UMSL station location reinforces businesses along Natural Bridge Road and can increase airport hotel patronage.

EXHIBIT 5-14: PROPOSED SHUTTLE ROUTE CONNECTING METROLINK STATIONS, WOODSON ROAD, AND NATURAL BRIDGE



Source: St. Louis County GIS & CH2M HILL



As part of this solution, consideration should be given to working with Metro to establish a station at Woodson Road at which Metro can create a comfortable and accessible station for transferring MetroLink and bus passengers. The station may be designed to accommodate some small retail tenants such as coffee and newspaper shops and restaurants that can serve the transfer station as well as adjacent hotels and businesses. There may also be an opportunity for reciprocal parking on a temporary basis due to large surface parking fields now located in this area. As parking needs increase, they may generate another market for parking garage investment.

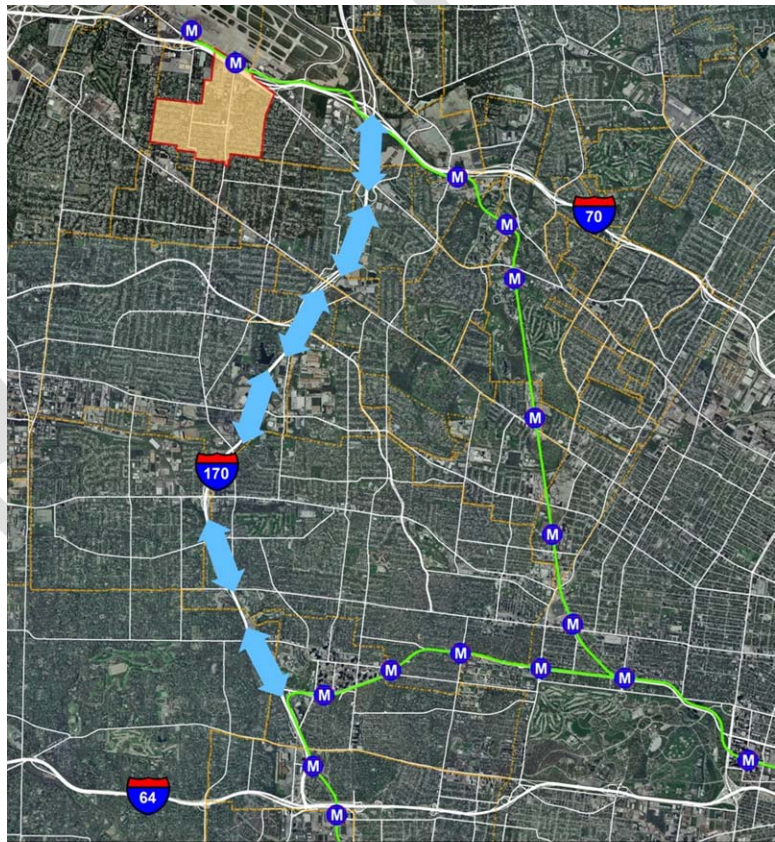
MetroLink

The Metro long-term plan features a proposed route along the I-170 corridor (see Exhibit 5-15). This extension provides MetroLink benefits and access to Woodson Terrace while increasing MetroLink travel options between the airport and Clayton.

The economic impact of linking Clayton and the airport includes providing MetroLink service to dense employment bases along Natural Bridge Road and I-170. Examples of the employment base include but are not limited to the following:

- Woodson Terrace businesses, which lack immediate access to regional infrastructure
- World Parkway industrial park at the intersection of I-70 and I-170, an industrial development and employment center
- Cities of Bel-Ridge and Charlack intersecting I-170 at Natural Bridge Road and St. Charles Rock Road, which respectively lack access and job creation and redevelopment that MetroLink contributes to the market
- Cities of Overland and Vinita Park area at Page Avenue and I-170, home to one of the largest concentration of office/warehouse developments in the region
- University City and Olivette at Olive Boulevard, which experiences limited and/or aging commercial development at its interchange with I-170
- University City at Delmar and the City of Clayton at Ladue Road, which are experiencing aging and/or unrealized economic development areas of opportunities

EXHIBIT 5-15: PROPOSED METROLINK ROUTE ALONG I-70



Source: St. Louis County GIS & CH2M HILL



The market impact associated with extending MetroLink along this alignment is significant and adds long-term planning strength to future MetroLink connections to the Airport and North County. This proposed extension, approximately 8 miles long, can link the City to major transit infrastructure and increase economic development opportunities in the City. In view of the amount of underutilized land in the City, the increased market exposure thanks to transit linkage would make the City an appealing location for new mixed-use investment.

Lambert St. Louis Airport Shuttle

Lambert St. Louis Airport represents a significant market enhancement to the City's economic planning and implementation development process. The airport provides market potential through the traveling public, employees at the airport, military facilities, and Boeing Company. The capture of these potential markets, local and transient, depends on access and visibility. A shuttle service to serve hotels, motels, and existing and future commercial and retail development in Woodson Terrace is a viable solution to the present lack of access. A shuttle service, incorporated into the day-to-day operation- of various businesses along Natural Bridge Road, the airport, the military installation, and Boeing provides an opportunity for merchants' promotions and increased market communication between the north and south sides of I-70. This shuttle service can be scheduled to coordinate with car rental businesses such as Alamo and National car rentals, to existing bus lines, commercial needs (such as lunchtime schedules), and MetroLink schedules. Such a solution could lay the foundation for a long-term shuttle connection to the proposed Normandy shuttle service. (A shuttle connection to destinations in the Normandy area is proposed as a part of Natural Bridge Great Streets project spearheaded by East West Gateway).

Creative Signage-St. Charles Rock Road

St. Charles Rock Road is located south of the Woodson Terrace city limits and is a major, secondary east/west corridor in the region. Historic development patterns and road configurations at the intersection of Woodson Road and St. Charles Rock Road provides no significant economic signal for consumers to proceed northward on Woodson Road to access commercial options in the City.

An intergovernmental agreement is recommended between the City of Woodson Terrace and the City of St. John that will provide for creative signage announcing activities (shopping, entertainment, shuttle service) along Woodson Road, in both the north part of St. John and in Woodson Terrace. Effective signage will serve to attract daily travelers and visitors to an area (Woodson Terrace commercial development) that may otherwise be bypassed due to lack of visibility and/or knowledge of activities in the City.

In summary, Woodson Terrace is located adjacent to significant regional infrastructure investment. However, due to historic development patterns and modifications to infrastructure to accommodate major airport improvements, the community has been left with limited access to this infrastructure. In order to plan for future development and the optimization of land uses and values in the community, access to infrastructure should be enhanced, and connections to the airport and MetroLink should be improved. Any developments that are planned or will occur within the City should be considered short-term solutions to real growth potential and realization that will result from major infrastructure upgrade and enhancements to the I-70 corridor between Lindbergh Boulevard and I-170, expansion of MetroLink

to the south, and implementation of an efficient and timely shuttle service to move people around within the local market.

Bus Routes, Schedules, and Stops

There are businesses along Woodson Road and Natural Bridge Road that will benefit from more frequent bus service. The bus line that currently serves Woodson Road is The Route 66 Metro bus connects the MetroLink station to St. Charles Rock Road in this region. However, in this region it makes only three trips from 6:00 am to 7:30 am and three trips from 3:30pm to 6:00pm, and there is no night-time or weekend service.

At stakeholder interviews at Columbia College, many students expressed concerns with the lack of bus service for those taking evening classes. This makes access difficult for students who don't own cars.

There are two bus shelters in the City; both are on Natural Bridge Road. One is located near the Hilton Hotel along Natural Bridge Road, and the other is just east of Woodson Road. As discussed in the existing conditions report, bus stops located as close as 400 feet from one another (the optimum being 650 and 900 feet) slows service significantly.

A request by the City and college to Metro regarding a study of bus stop locations and period of service to better serve Woodson Road should be initiated as soon as practical. Schedule adjustments should also be requested, and be complemented by new bus stop enhancements and improved public environments at stop locations.

Regional Bike Master Plan

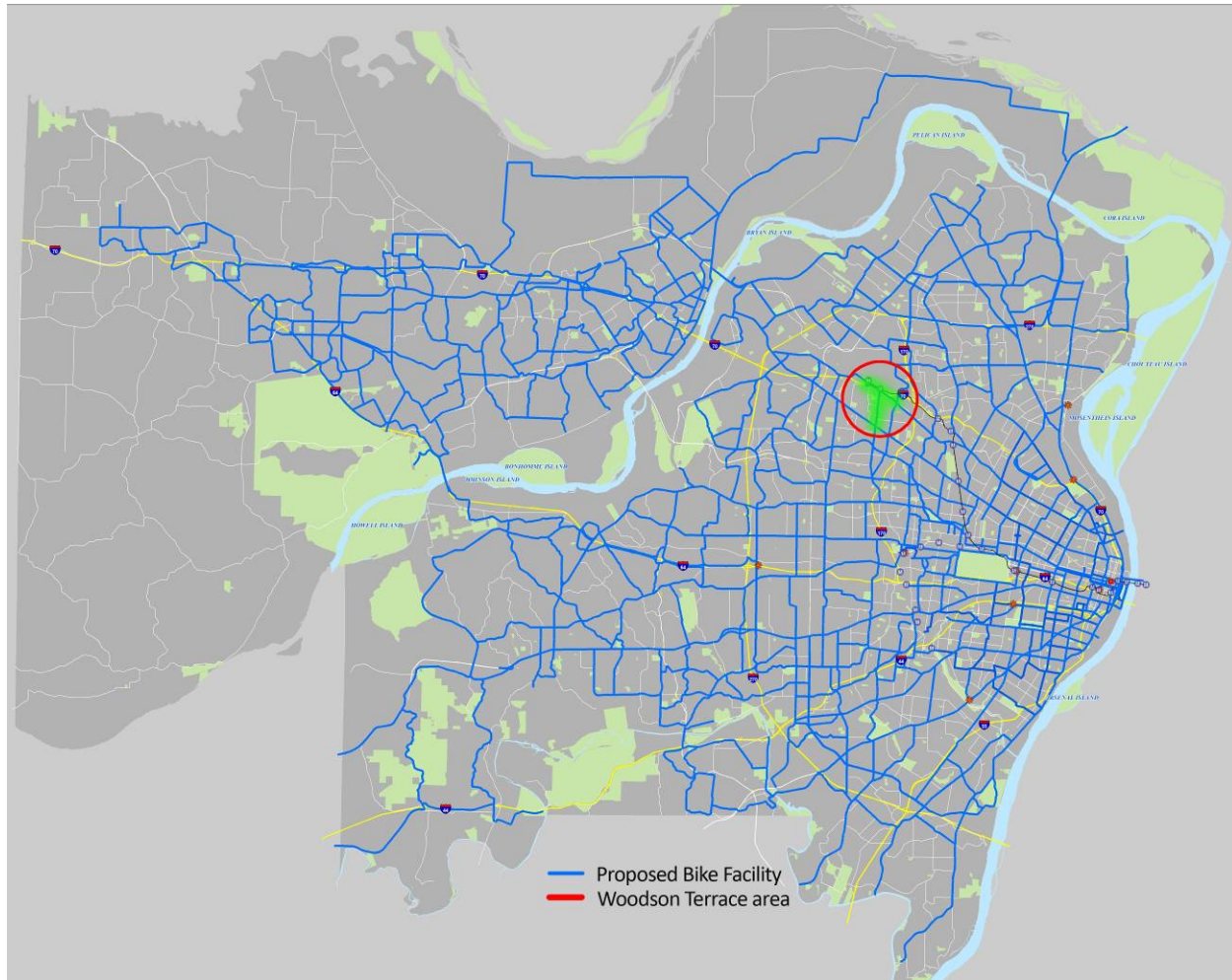
In 2009, the Great Rivers Greenway (GRG) Board of Directors allocated resources to fund the Regional Bicycle Plan for St. Louis County, City of St. Louis, and the urbanized communities of St. Charles County. Close to 100 municipalities are located within the planning area. In 2010, consultants began to develop a regional bicycle plan.

The primary purpose of the plan is to provide a coordinated vision for accommodating and encouraging bicycling as a viable transportation mode in the region. One of the main goals is to create a fully interconnected, seamless, and safe bicycle facility network that connects areas within the Great Rivers Greenway jurisdiction. The plan focuses primarily on roadways classified as collectors and arterials, although local roadways are also considered where necessary. More than 1,000 miles of appropriate bicycle facilities have been proposed depending on existing width of the roadway and speed of vehicles and with the input from the public, St. Louis and St. Charles Counties, MoDOT, the City of St. Louis, the East-West Gateway Council of Governments, Metro, advocacy organizations, and municipalities within the plan area.

The proposal calls for bicycle lanes along Woodson Road and Natural Bridge Road in City of Woodson Terrace, ultimately resulting in a bicycle connection with the entire region (see Exhibit 5-16). A variety of federal, state, and local funding sources have been identified in the plan for pedestrian and bicycle facility enhancements. The planning process is expected to complete by June 2011. More information

regarding the plan can be found on <http://www.greatrivers.info/Default.aspx> and <http://stlbikeplan.com/>.

EXHIBIT 5-16: PROPOSE BICYCLE MASTER PLAN NETWORK



Source: St. Louis County GIS, Great Rivers Greenway District & CH2M HILL

Future Local Infrastructure

Map 5-2 shows future infrastructure upgrades within Woodson Terrace city limits. They include the following:

- Improvements along Natural Bridge Road
- Improvements along Woodson Road
- Improvements in other locations
 - New roadway development to connect Natural Bridge Road with industrial area in the west of the City
 - Improvements along Guthrie
 - Improvements along streets leading to Woodson Road
 - Residential neighborhoods
- Utilities and stormwater drainage have also been discussed under this segment.

General Guidelines for Commercial Corridors

Natural Bridge Road and Woodson Road are the two commercial corridors in the City. Both corridors will benefit greatly from streetscape improvements connected to the future land-use plan. Development of these roadway corridors should achieve the following:

- Reflect the character of Woodson Terrace
- Allow for a comfortable and safe pedestrian experience
- Contribute to economic vitality in the City by retaining existing businesses and attracting new business
- Be functionally complete, providing a balance of modal choice
- Preserve and improve infrastructure
- Create an attractive place that promotes social activity
- Integrate green technologies into the design and construction

Well designed, attractive, and inviting streets are vital to achieving the above goals. And while the architecture, massing, and type of buildings may vary from parcel to parcel a continuous well designed streetscape becomes a unifying factor and creates a lasting impression on people using the corridor.

Street design in Woodson Terrace development corridors should focus on efficient parking, access, and circulation. An effective design provides for the safe, efficient, convenient, and functional movement of multiple transportation modes both on and off the street. It should incorporate ingress and egress, circulation, and parking locations on property immediately adjacent to the corridor. Additionally, effective street design minimizes pedestrian, bicycle, and vehicle conflicts and provides for alternate modes of transportation, including public transit, sidewalks, and trails.

The following are standards and suggestions can go a long way toward for improving Woodson Road and Natural Bridge Road.

- Follow ADA standards to ensure handicap accessibility to all public improvements along Woodson and Natural Bridge Roads.

- Make sidewalks at least 6 feet wide, though 8 feet is preferred. Patterned and shaped (for example, curvilinear) sidewalks help break the monotony of sidewalk design and reduce the perception of excessive length. Such patterns and shapes can also become an identity element for neighborhoods. Use of permeable pavers and other green materials such as rubber sidewalks are recommended for consideration.
- Specify street furnishings that maintain consistency along the corridor. Examples include benches, planters, recycling/trash containers, functional and decorative lighting, bicycle racks, bollards, and water fountains.
- Make planting strips at least 5 feet wide (if they are to be provided as part of the streetscape design), which is enough to grow trees between street and sidewalk. Tree grates or tree wells are other options that can be used for planting trees where sidewalk is adjacent to the curb lines.
- Use environmentally sensitive native plant and tree varieties wherever possible. Such plants and trees create water-conserving landscape patterns and need little to no maintenance once established.
- Space trees to provide shaded canopies over sidewalks.
- Screen unsightly equipment or larger parking areas that can be directly viewed from Woodson or Natural Bridge Roads using garden walls, decorative fencing, hedges, berms, or other landscaping treatment and such that it does not interfere with the total aesthetic appeal of the corridor.
- Select and install streetlights so they promote perceived safety and security of pedestrians and do not create light pollution in adjacent neighborhoods. Maintain proper spacing between luminaries and set backs from curb edges to ensure consistent lighting of roadway and pedestrian areas.
- Provide features such as emergency telephone boxes to promote safety
- Encourage use of excess land on or off public right of way for the placement of information points, outdoor seating, or art on or off public right of way.

Natural Bridge Road

Natural Bridge Road is a gateway to the community. Building architecture, gateway elements, and overall street design are important elements of creating a lasting impression on residents and visitors to the City. Vertical gateways instantly attract attention, but an aesthetically pleasing, pedestrian-friendly, and functional street is needed to retain that attention and encourage repeated visits to the community. Gateway elements are critical to Natural Bridge Road and these elements are directly related to land uses outlined for future land use categories. Exhibits 5-17 & 5-18 show conceptual street design section that may function well in this corridor.

The approximate right of way available along Natural Bridge Road is 80 feet with development to be located on the south side and I-70 on the north side of the corridor. The corridor is separated from the interstate by a fence and the street has wide shoulders on both sides. The conceptual section in Exhibit 5-17 proposes a two-lane roadway with bike lanes. The south side of the corridor shows a continuous 10-foot pedestrian realm, part of which can be used for outdoor seating/dining for development. Separating the sidewalk from the bicycle lane is a bio-swale with native plantings and street trees. Because of the presence of the interstate highway and resulting lack of pedestrian activity, sidewalks are not needed on the north side of corridor. Instead, the available space is used to create a landscaped

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buffer that includes a bio-swale. This buffer is periodically interrupted to provide space for bus stops/shelters (see Exhibit 5-18). A mid-block crosswalk should be included at these locations for transit access.

EXHIBIT 5-17: PROPOSED CONCEPT ALONG NATURAL BRIDGE CORRIDOR

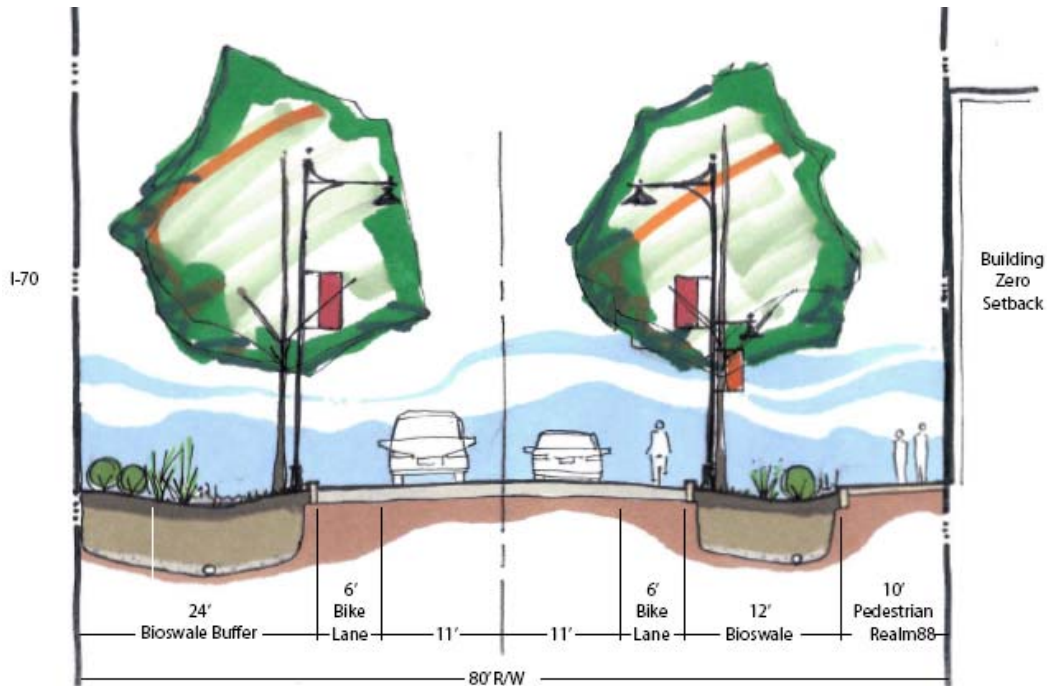
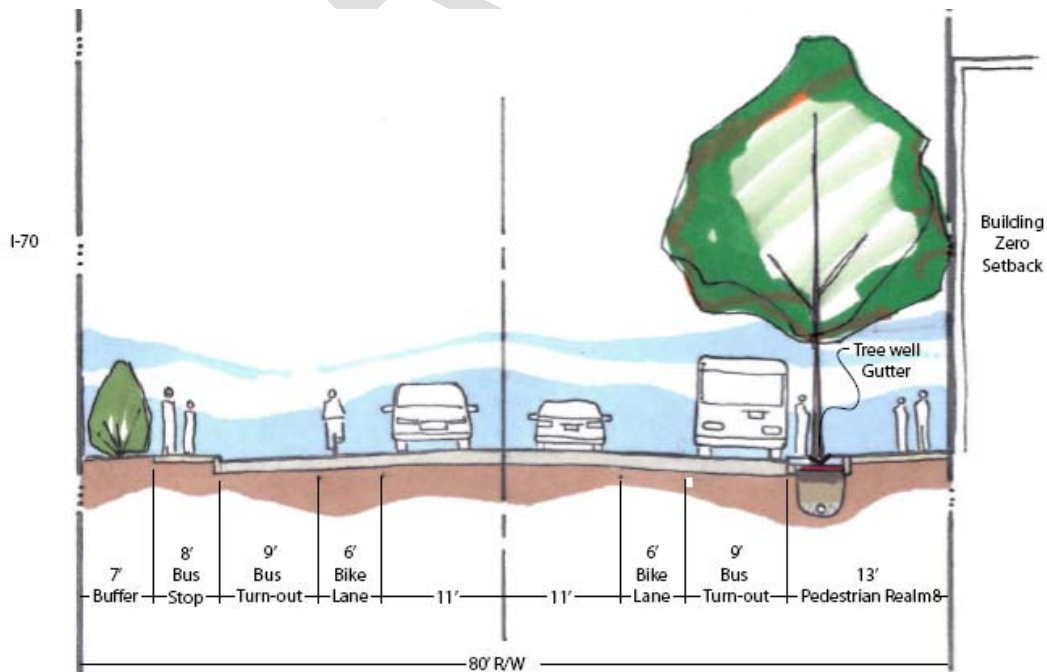


EXHIBIT 5-18: PROPOSED CONCEPT ALONG NATURAL BRIDGE CORRIDOR



Source: CH2M HILL

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Woodson Road

Woodson Road is another major commercial corridor running in the City. It runs north-south and acts as a collector street for neighborhoods on the east and west sides of the community. Similar to Natural Bridge Road, Woodson Road acts as a gateway to travelers entering the City from the south. Presently, this is a four-lane roadway with turn lanes at Guthrie, and mountable curbs to shoulders used as sidewalks. Large portions of right of way are green space that acts as a buffer between the roadway and parking lots, but does not serve any supporting purpose for development. The total available right of way along Woodson Road is approximately 140 feet wide.

EXHIBIT 5-19: PROPOSED CONCEPT-1 ALONG WOODSON ROAD

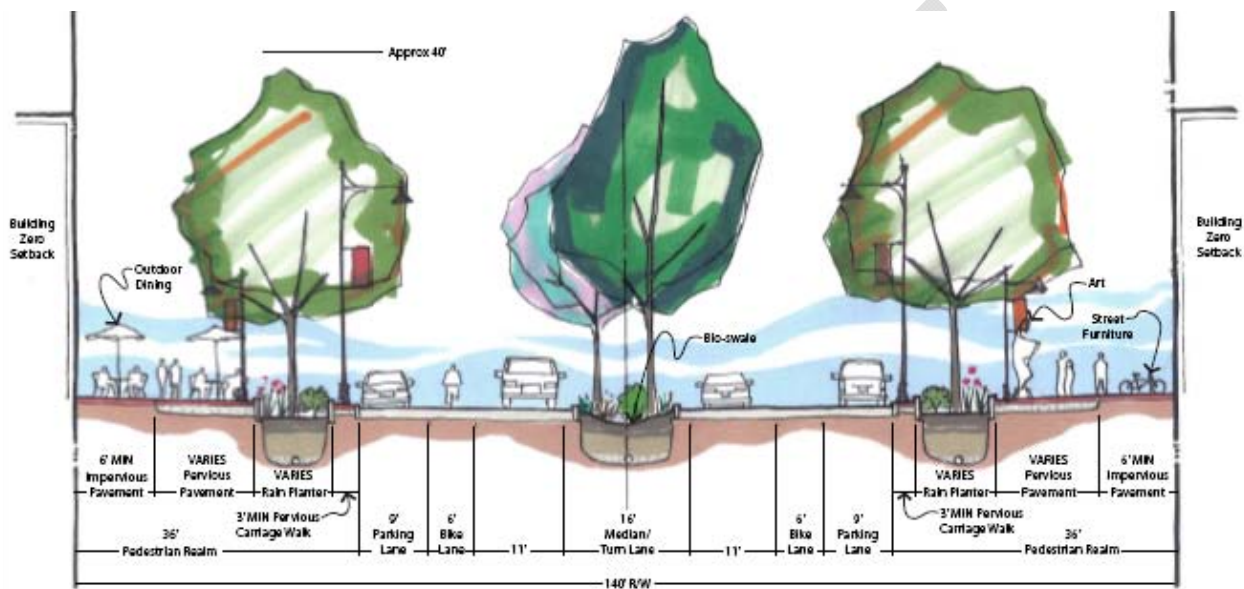
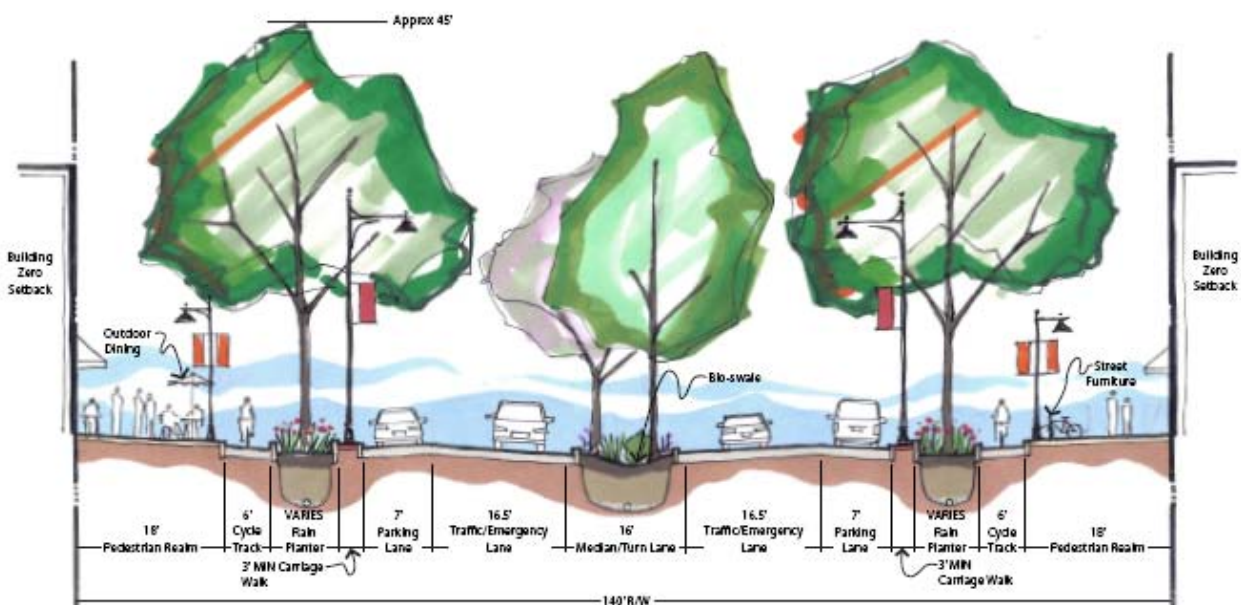


EXHIBIT 5-20: PROPOSED CONCEPT-2 ALONG WOODSON ROAD



Source: CH2M HILL

MoDOT is resurfacing Woodson Road, adding bicycle lanes by narrowing travel lanes, and adding space adjacent to the gutter areas. This is a short-term improvement that will enhance the corridor for bicycles, as well as enhance safety for pedestrians by adding another buffer between motorists and pedestrians.

Approximately 9,000 cars travel on Woodson Road every day. This low traffic volume, along with wide travel lanes and a wide-open feel to the corridor, encourages motorists to speed through this section of the corridor. This discourages pedestrian use and impacts access to businesses along this corridor. The roadway is a candidate for elimination of one travel lane in each direction and addition of a center turn lane that will allow landscape opportunities, pedestrian refuge areas, and ability of left-turn traffic to move out of through travel lanes. This is commonly referred to as a “road diet.”

Two road-diet concepts are proposed for this corridor along Woodson Road:

- Concept 1 (see Exhibit 5-19) proposes a two-lane roadway separated by a median. The median uses a bio-swale with native plantings and trees. Bicycle lanes and on-street parking is provided on both sides of the corridor. Thirty-six feet of pedestrian realm can provide for a variety of activities including outdoor seating, street furnishings, and places for art, planting strips, and street trees.
- Concept 2 (see Exhibit 5-20) proposes a cycle track (buffered bike facility) as opposed to a bike lane adjacent to traffic and wider traffic lanes (13 feet) to allow for emergency vehicles.

Improvements in Other Locations

- Create a roadway connection with sidewalks from Natural Bridge Road to Industrial Drive on the west side of the Hilton Hotel (see Map 5-2). Such a connection can improve access to the industrial area of the City and divert truck traffic destined for the industrial court away from Woodson Road.
- Add sidewalks and bike facilities (shared lane markings) on Guthrie Road. Guthrie (west of Woodson Road) is one of the few roads that has right of way (36 Feet) for such facilities. This section can easily accommodate 6 feet sidewalk on both sides of the road. However, the roadway narrows east of Woodson Road (26 Feet). Nevertheless, a 5 feet sidewalk could be accommodated on the north side of the road. The proposed sidewalk facility will connect the John L Brown Park on the west of the community to the little park in the east. Shared lane markings are proposed for bicycles on Guthrie. East of Woodson Terrace, in the City of Berkley, Guthrie connects to Brown Road, which is one of the routes in the Regional Bicycle Master Plan. Thus, these improvements would connect to the regional network of bicycle facilities.
- Add sidewalk connections into adjacent neighborhoods where street activities will increase on Woodson Road to ensure pedestrian safety (see Map 5-2). Accommodations on streets leading to Woodson Road should be at least a parcel depth from the development.
- Make sidewalks part of the street design in larger developments such as the low-density residential development area and town center development area identified in the Future Land Use Map (see Map 5-1).

Utilities

Installing utilities (including electrical and telephone services) underground or placing them in an alley assures the safety and aesthetic integrity of the entire marketplace by eliminating unsightly wires crisscrossing vehicular and pedestrian ways. Although underground utilities may add greater expense to construction costs associated with initial design and installation, the long-term benefits are worth considering when planning new streetscape environments. Revitalization of any market includes “reinventing” market conditions and physical space. Success associated with revitalization relies on creating a safe environment and aesthetic elements that make local and regional visitors comfortable and interested in returning to experience the corridor. The elimination of overhead lines and power poles adds to the clean, unobstructed ambiance of major commercial corridors.

Stormwater Management

Low-impact development (LID)⁵ techniques that allow neighborhoods to develop in a sustainable fashion are to be encouraged and incentivized by the City. LID is an approach to site design and stormwater management that seeks to maintain the site’s pre-development rates and volumes of runoff, which is accomplished through the minimization of impervious cover; strategic placement of buildings, pavement, and landscaping; and the use of small-scale distributed runoff management features that are collectively called integrated management practices (IMPs).

The management features suggested here relate to water-control methods such as bio-retention areas, permeable paving, vegetated roofs, and use of native planting that may be appropriate for consideration in certain parts of the City.

Bio-retention

Bio-retention is an integrated stormwater management practice that uses the chemical, biological, and physical properties of plants, microbes, and soils to remove or retain pollutants from stormwater. These retention areas are usually designed as shallow depressions with planting soil mix and a variety of plant material. These retention areas are usually designed as a conveyance system. Applications include the following:

- Individual lots for rooftops, driveways, and other site-impervious surface infiltration
- Shared facilities located in common areas
- Land areas within loop roads and cul-de-sacs
- Shared public alleyways
- Landscaped areas in parking lots
- Right of ways- medians and sidewalk areas
- Common landscaped areas in apartment complexes or other multi-family housing locations
- Integration into garden areas
- Integration into large institutional facilities such as hospitals, large industrial sites, airports, and university campus sites

⁵ **Low Impact Development (LID):** Refer <http://www.epa.gov/owow/nps/lid/> for detail information on site development using Low impact techniques. Accessed April 02, 2011.

Permeable Paving:

- Permeable paving is the preparation of site surfaces that accommodate pedestrian, bicycle, and vehicular traffic while allowing infiltration, treatment, and storage of stormwater. These methods are applicable to various levels of development and may be applied as a standard for the City associated with stormwater maintenance and overall aesthetics.
- Water immediately penetrates and is stored underneath porous pavement. After being filtered, it either infiltrates the soil or is released into the city pipe system. Porous pavement is low maintenance and its life-cycle cost is comparable to conventional pavement. Examples include porous asphalt, porous concrete, decorative permeable pavers, and grass pave.

Vegetated Roofs

Roofs occupy 30 percent of surface area in urban environments. Green roofs use light-weight materials that capture and/or slow rainwater. The water is absorbed, evaporates, or is filtered before leaving the roof. Green roofs can last three times longer than conventional roofs and also can be enjoyed as gardens.

Native Plant Species

Native plants are those that originated in a given geographic area without human involvement or arrived there without human intervention. By contrast, non-native plants (also called alien, exotic, or non indigenous plants) owe their presence in a given geographic area to intentional or unintentional human involvement.

- Besides helping manage stormwater runoff, native plant species offer the following features.
- Needs low level of maintenance
- Requires less water
- Replenishes groundwater
- Conserves soil
- Does not require application of fertilizer
- Resists destructive insects and disease
- Survives harsh winter weather
- Supports a variety of wildlife