Appendix A Land Use Analysis Technical Memorandum

Greater RVA Transit Vision
Plan Land Use Analysis
Memo September 1, 2016

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Purpose of the Land Use Analysis

The purpose of the land use analysis portion of the Greater RVA Transit Vision Plan process was to:

- Educate stakeholders about the relationship between land use and transportation, and the types of land uses that support a high-quality transit investment.
- Evaluate existing land use policies and plans.
- Determine the extent to which current and planned future land uses in the region will support a high-quality transit system. Make recommendations for how land uses and land use policies can change to support the region's vision for future transit.

This evaluation process was applied to the nine jurisdictions (Town of Ashland; City of Richmond; and the Counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, and Powhatan). The results of the analyses were used to guide and evaluate transit alternatives, and provide policy recommendations to the region and individual jurisdictions. Along with the transit propensity analysis and other elements of the planning study, the land use analysis helped the team understand the existing and future conditions that could influence transit ridership and supportive development within the region.

Relationship between Transit and Land Use

While developing the regional transit vision, it was necessary to consider not only the current land uses and zoning, but also growth projections and the community's long-term land use and urban design goals.

Different densities of people and land use patterns support different types of transit. Generally, the denser the activity (i.e., the more people living and working) in an area, the more advanced the transit system that can be supported. More advanced transit options typically have higher quality facilities and more frequent service.

The design of the built environment also influences the viability of transit. In addition to an active transit system and a well-connected street network, transit-oriented development has the following characteristics:

- Destinations: Shops, jobs, public spaces, medical facilities, and other activity hubs.
- Pedestrian-scale design: Comfortable and spacious sidewalks, with buildings close to the street and parking lots in the back.
- People: Enough people for businesses to flourish and for public transit to run frequently.
- Mixed uses: A variety of land uses in the same area (housing, retail, schools, parks, offices, etc.)

• Parks and public spaces: Plenty of public places to meet, gather, and play.

• Complete streets: Streets designed to provide safe access for people biking, walking, taking the bus, and driving.

Transit-oriented development is a type of Multimodal Center. The Multimodal Center concept is central to the DRPT *Multimodal System Design Guidelines* (2013), which serve as the centerpiece for this land use analysis methodology. Multimodal Centers are areas that offer easy access for people traveling by train, bus, bike, or foot. They typically include:

• Localized centers of activity and development density
• Focused activity around transit stations (current or future)
• A walkable, well connected street network with sidewalks
• A mix of uses (live, work, play, shop)

Multimodal Centers can be large or small, in response to their context. For example, within the study area, Ashland, West Broad Village, and Downtown Richmond can all be considered Multimodal Centers.

Multimodal Centers are important because they:

• Create efficient conditions to walk, bike and take transit,
• Boost transit ridership and minimizes the impacts of traffic,
• Provide a mix of housing, jobs, shopping and recreation,
• Create value for the public and private sectors, and
• Promote a sense of community.

Multimodal Corridors move people and goods between and within Multimodal Centers. These roadways accommodate multiple modes in a variety of ways that help to determine whether the corridor is a through corridor or a placemaking corridor. Through corridors generally connect multimodal centers, while placemaking corridors connect areas within multimodal centers. There are several types of corridors (Table 1), as outlined in the DRPT *Multimodal System Design Guidelines* (2013). A corridor is defined as a through corridor or a type of placemaking corridor based on characteristics such as speed, modes accommodated and how, and land uses.

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Table 1: Types of Multimodal Corridors

Type of Corridor	Description	Through Corridor	Multimodal Through
Corridor 5	Higher speed corridor that connects multiple activity centers.	Placemaking Corridors	
Transit Boulevard	Highest overall capacity and most transit supportive. Dedicated lanes for transit.		
Boulevard	Highest multimodal capacity.		
Major Avenue	Highest density of destinations, intensity of activity, and mix of modes.		
Avenue	Balance between building access and collection of vehicle and pedestrian traffic.		
Lower speed roadways. Local Street	Lowest amount of activity, with slowest speeds and highest		

access.

Process and Elements

The land use analysis approach was rooted equally in data analysis, evaluation of land use plans/policies and zoning requirements, and iterative agency engagement. At a high level, the two major elements that were assessed under the policy analysis were density of activity and design (in terms of both existing and future planned/required elements of the built environment).

i. Agency Coordination

The planning team began the study by meeting with agency staff from each jurisdiction to understand the existing conditions, the transit and land use vision, and anticipated development areas in each community. The team met with staff again (via phone) later in the process to review draft findings related to transit-supportive land use plans and zoning. The iterative coordination was important to ensure that the team and the staff had a full and shared understanding of the goal and purpose of existing policies, and were aware of all land use planning efforts within each jurisdiction.

ii. Activity Density Analysis (2012, 2025, 2040)

To begin the assessment of future land use patterns within the study area, the team looked at projected activity density throughout the region. Activity density is a measure of the concentration of development. It is calculated by adding together population and employment numbers or projections for a certain year, then dividing by acreage of the area being examined. In this case, the areas were individual Traffic Analysis Zones (TAZ's). The TAZ data comes from the "Socioeconomic Data Report for the 2012 Base Year and 2040 Forecast Year" (approved April 2, 2015), for which socioeconomic projections (including employment and population estimates) were developed by local governments and the Richmond Regional TPO.1 The team used the methodology described in the 2013 DRPT Multimodal System Design Guidelines to analyze 2012 ("existing"), 2025, and 2040 projected activity density as a way to understand the region's future expectations for Multimodal Districts and Centers.

[1] More information can be found here: http://www.richmondregional.org/TPO/socioeconomic.htm

a. Relationship between Activity Density and Supportable Transit Mode

Different levels of development can support different types of transit investments. By differentiating between different types of Multimodal Center types, it is possible to create a relationship between activity density (current and future) and the corresponding level of transit investment that can likely be supported. Generally, higher development densities within these Multimodal Centers can support higher levels of transit investments. Table 2 and the associated graphic present information from the *DRPT Multimodal System Design Guidelines* that relates activity density to specific transit modes, and defines the different types of multimodal centers.

Table 2: Multimodal Center Types and Supportable Transit Investment Based On Activity Density

Multimodal Center Type	Activity Density (Jobs + People / Acre)	Supported Transit Investment
P-6 Urban Core	70.0 or more	Light Rail

Transit (LRT)/Rail P-5 Urban Center 33.75 to 70.0 Bus Rapid Transit (BRT)/LRT P-4 Large Town or Suburban Center 13.75 to 33.75 Express Bus P-3 Medium Town or Suburban Center 6.63 to 13.75 Fixed Route Bus P-2 Small Town or Suburban Center 2.13 to 6.63 Demand Response P-1 Rural or Village Center 2.13 or less Demand Response SP Special Purpose Center Varies Varies Source: DRPT Multimodal System Design Guidelines, 2013
Adapted from: DRPT Multimodal System Design Guidelines, 2013

b. Activity Density in the Region

Figures 1-4 shows the activity density for 2012, 2025, and 2040, with activity density levels coded to match the Multimodal Center types, as listed in the table above. Activity is expected to increase throughout the region from 2012 to 2040; however, much of the growth is concentrated in the City of Richmond and the Counties of Chesterfield and Henrico. Most of the study area has activity levels equal to that of a rural or village center, or small town or suburban center, both of which are generally associated with a demand response transit system. As the projections progress from 2012 to 2040, it appears that more areas of the region will have activity levels that can support express bus, BRT, LRT, or rail.

To better understand where the TAZ projections show an increase in activity in the next 20 or more years, the team looked at a map of change in activity density between 2012 and 2040. Figure 5 shows the change in activity density, with darker shades indicating larger changes. These areas include the area south of Rocketts Landing (between the James River and Route 5), Brandermill, Short Pump, Mechanicsville, and the airport area. Though these are some of the areas expecting the greatest amount of change, they are not necessarily the areas with the highest levels of activity density in the future. In addition, there is potential for growth in other areas, particularly if there are changes in policy to encourage development.

8 Figure 1: Projected Activity Density (2012)

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9 Figure 2: Projected Activity Density (2025)

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10 Figure 3: Projected Activity Density (2040)

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11 Figure 4: Projected Activity Density (Comparison of 2012, 2025, 2040) 2012 2025

12 Figure 5: Change in Activity Density

(2012 to 2040)

13 iii. Policy Analysis—Land Use Plans and Zoning Codes In order for development to support high-quality transit investments, the land use patterns must have several key characteristics. These characteristics are generally directed by each jurisdiction's development. Recognizing that transit supportive land use planning requires more than just adequate levels of activity density, the team conducted a policy analysis to understand the current framework for development (Figure 6). The team reviewed future land use plans (including comprehensive plans and small area plans) and zoning codes for each of the jurisdictions within the study area, and documented the extent to which these allow and encourage other key elements of transit supportive development.

Figure 6: Policy Analysis Process

The criteria used to determine if the zoning and planned land use support transit-oriented development included requirements or support for:

- A mix of uses (office, retail, industrial, residential), particularly a vertical mix of uses
- Density (more than one story)
- Sidewalks, and pedestrian-oriented and -scaled development
- Buildings pulled up to the street and/or parking behind buildings or structured parking
- Stated goal of supporting transit

Once an initial list of transit-supportive policies was compiled, the team reviewed the list with jurisdiction staff, who suggested revisions to the list based on policy interpretation or intention. Table 3 displays the final results of the land use and zoning policy analysis.

Determine which land use types and zoning categories meet the criteria for transit-supportive development

Focus on key areas in the region for more detailed analysis

Use the findings to shape the development and evaluation of alternatives

Map these areas to show where there is transit-supportive zoning and future land use

Coordinate with jurisdictions to refine the land use and zoning findings

14 Table 3: Results of Land Use and Zoning Policy Analysis Transit-Supportive Land Use Categories Transit-Supportive Zoning Categories Henrico County UMU (Urban Mixed Use) Urban Mixed Use TND (Traditional Neighborhood Development) Chesterfield County Community Mixed Use C-3 (Community Business) Regional Mixed Use C-4 (Regional

Business) Residential Mixed Use Mixed Use Corridor Neighborhood Mixed Use Office/Residential Mixed Use City of Richmond Downtown Future Development B-4 and B-5 (Central Business) Downtown General Urban Area B-6 and B-7 (Mixed-use Business) Downtown Urban Center Area CM (Coliseum Mall) Downtown Urban Core Area DCC (Downtown Civic and Cultural) Community Commercial I (Institutional) Mixed Use OS (Office Service)
RF and RF-2 (Riverfront) RP (Research Park) R-63 and R-73 (Multimodal Urban Residential District) Town of Ashland Mixed Use- Historic Downtown PSC (Planned Shopping Center District) Mixed Use- England Street North POB (Planned Office-Business) MU- England Street South Hanover County Multi-Use Land Use MX (Mixed Use District) Commercial Land Use Planned Business Land Use New Kent County Village Courthouse Development District Economic Opportunity Charles City County Development Center None Goochland County Flexible-Residential MPUD (Mixed Planned Unit Development) Prime Economic Development Area Powhatan County Village Center VC (Village Center District)
VC-PD (Village Center Planned Development District) CHSC (Courthouse Square Center District)
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15 The following maps show how the transit-supportive areas are distributed throughout the jurisdictions. Figure 7 gives a full and zoomed-in version of transit-supportive land use policies (with those areas outlined in red), and Figure 8 shows where transit-supportive zoning currently exists (in purple). There are far more areas within the region that currently have transit-supportive land use policies and plans than have transit-supportive zoning in place, particularly outside of the core of the region. The black circles highlight areas where there is a concentration of transit-supportive land use and zoning policies. As shown in Figure 5, there are several corridors in Chesterfield County that have transit-supportive zoning, but these areas are not connected into the City of Richmond, which lacks transit-supportive zoning in most areas south of the River.

Figure 7: Transit-Supportive Future Land Use Areas

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16 Figure 8: Existing Transit-Supportive Zoning Areas

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17 ### iv. Visualizing Land Use Change and TOD

The team focused in on two intersections to further the land use analysis and visualize the type of transit- oriented development that could occur, based on existing land use and zoning policies. Small area plans and visualizations help communities understand the potential for future development to support a

transit investment. The results are conceptual and further studies will be required before stations are defined and specific plans are approved.

Each of the two small area plans shows an area within approximately a 1/2 mile radius of an intersection, as one-quarter to one-half mile is typically an acceptable walking distance for an individual to access a transit station, assuming that the walking environment is comfortable and inviting. The plans demonstrate how a transit-oriented environment could develop within these areas.

a. A Multimodal Center at West Broad St. and Dominion Blvd. The small area plan (Figure 9) and visualization (Figure 10) for the West Broad and Dominion intersection shows how it the area could develop to create pedestrian-friendly access to a future transit station while maintaining current automobile capacity. The vision is consistent with current Henrico County development codes for this area in terms of the types of uses and built environment shown. It contains of mix of uses in a walkable environment, with buildings pulled up to generous, shaded sidewalks.

Figure 9: West Broad St. and Dominion Blvd. – Existing Conditions and Small Area Plan

Figure 10: West Broad St. and Dominion Blvd. – Visualization

b. A Multimodal Center at Hull Street and Cowardin Ave. (Route 1) The small area plan (Figure 11) and visualization (Figure 12) for the Hull and Cowardin intersection show how it could develop to create pedestrian-friendly access to a future transit station. They emphasize preservation of the area's historic resources and is consistent with City of Richmond development codes. While they show a mix of uses on Hull and Cowardin south of Hull, the vision preserves the single family residences and shows how new infill development could step down in scale as it approaches these areas.

Figure 11: Hull Street and Cowardin Ave. – Existing Conditions and Small Area Plan

Figure 12: Hull Street and Cowardin Ave. – Visualization

Findings and Next Steps

i. Findings

Overall, the land use analysis shows that transit-supportive development is possible under existing land use and zoning policies. These policies should be enhanced and applied strategically to create a robust and comprehensive long-term implementation plan for the region.

ii. Policy Recommendations

Policy recommendations for each of the recommended corridors primarily emphasize the following concepts:

- Collaborate with neighboring jurisdictions to prioritize corridors for TOD investment, and create a shared corridor master plan vision.
- Develop corridor-specific land use plans that direct future development into Multimodal Centers around future transit stations.
- Adopt policies that will require or incentivize development to occur in a pattern that will support efficient transit service.
- Invest in safe and comfortable pedestrian and bicycle facilities for access to all future transit stations.

As discussed in earlier sections of this memo, Multimodal Centers have varying levels of density, depending on the frequency and quality of transit service to be provided on the corridor. In general, higher densities of development are required for higher quality, more frequent service. However, all Multimodal Centers have similar design characteristics:

- Localized centers of activity and development density
- Focused activity around transit stations (current or future)
- A walkable, well connected street network with sidewalks
- A mix of uses (live, work, play, shop)

The following section highlights specific findings and associated land use recommendations for each of the jurisdictions in the greater Richmond region. Land use recommendations are organized according to the corridor recommendations. Each corridor recommendation includes a multimodal corridor designation, using the DRPT Multimodal System Design Guidelines (2013), and specific direction for appropriate next steps in order to create a land use pattern that will support the short and long term transit vision. (More details about each type of transit recommendation can be found in Table 4). Please note that all phasing suggestions are subject to further studies.

Table 4: Phasing Details

COMPONENT Transit Service Type
Less advanced More advanced
Limited Stop Service Enhanced Local Service BRT
Stations Standard stations Curbside, bus arrival info,
simple shelters 23 Curbside, bus arrival info, off-board fare collection; simple shelters; level boarding at curb or median; substantial shelter structures
Intersections No major investments; possible corridor signal coordination if not present
No major investments; possible corridor signal coordination if not present
Bus priority and adaptive signals to improve speed; queue jump lanes where warranted with no dedicated lane
Stop spacing Infrequent stops at
targeted activity nodes
Stops at targeted activity nodes, >1 mile spacing overall
Average ¾ mile apart, closer in major activity centers
Buses Enhanced Bus Branding Enhanced Local Branding Branded buses, standard size or articulated buses
Frequency 20 or 30 minutes all day (responsive to land use)
15 or 20 minutes all day 5 or 10 min in peak; 10
or 15 in off-peak
Dedicated Lanes None None As appropriate in higher-
density and high- demand areas
Where the activity density analyses show that the corridor will be insufficiently high to support transit, a corridor has been designated as a “lower productivity corridor” or “medium productivity corridor.” (More details about this analysis can be found in other sections of the report.) For these, potential redevelopment sites have been listed in the following section. It is recommended that the jurisdictions investigate these sites as potential ways to increase productivity and support transit in the future.
Recommendations below are split into two sections, with one each for urban and rural jurisdictions. A summary of all recommendations can be found in Table 5.
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Table 5: Transit Recommendation Summary

Corridor Transit Recommendations
2040
Broad Street BRT, increased frequency and dedicated lanes
Midlothian BRT (dedicated lane to Providence Rd)
Cary/Main/Patterson BRT (Dedicated lane downtown to Harrison)
Hull Street BRT (no dedicated lanes in Chesterfield)
Mechanicsville Turnpike BRT (no dedicated lanes in Hanover)
Staples Mill Corridor Enhanced Local (15 min)
Route 1 to Ashland Enhanced Local (20 min)

Airport via Route 60 Enhanced Local (or BRT) (20 min)
Jefferson Davis Highway to Chester 24 Enhanced Local (20 min) URBAN JURISDICTIONS

a. Henrico County Recommendations

Broad Street
2040 Transit Recommendation Multimodal Corridor Designation
BRT, partially dedicated lanes Transit Boulevard
Land Use Recommendations: 2040 activity densities will likely support BRT, but current land use plans and zoning do not encourage or envision transit-supportive urban design patterns along most of the corridor. Recommendations:
• Develop a comprehensive vision plan for transit-oriented development on the Broad Street corridor, linking the Willow Lawn and Short Pump areas. Build on the vision already established for the Innsbrook area.
• Begin with a focus on the low-density strip commercial shopping centers lining Broad Street, which offer tremendous opportunity for future mixed-use, pedestrian oriented development to support a transit investment.
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- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Cary/Main/Patters
on

2040 Transit Recommendation Multimodal Corridor Designation

BRT, no dedicated lanes Boulevard/Major Avenue

Land Use Recommendations: 2040 activity density projections show transit supportive levels of development east of Regency Square; however, comprehensive plans and zoning do not generally support a transit-oriented design vision (other than one small area near Regency Square). Recommendations:

- Develop a comprehensive vision plan for transit-oriented development on the Cary/Main/Patterson corridor.
- Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential. This includes shopping center parcels at Quioccasin/N. Parham, and the large single-owner office parks and apartment complexes along Three Chopt Road.
- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Route 1 to
Ashland

2040 Transit Recommendation Multimodal Corridor Designation

Enhanced Local (20 min) Boulevard

Land Use Recommendations: 2040 activity density projections show low densities from I-95 to Virginia Center Commons, with the exception of the Brooke Road/I-95 intersection. This small area shows a node of future growth supported by both UMU and TND plans. Recommendations:

• In coordination with the City of Richmond and Hanover County, determine the vision and priority for transforming station areas on the corridor into a transit-supportive land use pattern.

• Limited Stop and Enhanced Local service requires less density than a full BRT investment; however, it also benefits significantly from pedestrian and bicycle facility investments that allow riders to easily and safely access stations. At a minimum, develop a pedestrian and bicycle plan to efficiently link corridor developments to future transit stations.

Mechanicsville Turnpike (Low Productivity Corridor)
2040 Transit Recommendation
Multimodal Corridor Designation
BRT, dedicated lanes Transit Boulevard

Land Use Recommendations: 2040 activity density projections show very low densities, and comprehensive plans and zoning ordinances do not support a future transit-supportive land use vision. Land uses lining the Turnpike between I-64 and the Chickahominy River are primarily very low density strip commercial development and auto-related industries. Recommendations:

• In coordination with the City of Richmond and Hanover County, determine the vision and priority for transforming the corridor into a transit supportive land use pattern.

• Enhanced Local Service requires less density than a full BRT investment; however, it also benefits significantly from pedestrian and bicycle facility investments that allow riders to easily and safely access stations. At a minimum, develop a pedestrian and bicycle plan to efficiently link corridor developments to future transit stations in the short-term. Over the longer-term, promote higher concentrations of development around the station areas.

• To enhance productivity, emphasize redevelopment opportunities on very large, single-ownership parcels, or groups of parcels, that create significant TOD redevelopment potential. Examples of potential sites are provided below.

1. Henrico Plaza (4000 Mechanicsville Turnpike)
▪ Large parcel (~26 acres)
▪ Underutilized
▪ Land use plans and zoning are not transit-supportive
▪ Projected 2040 density is low (1.9 jobs + people/acre) 2. Northeast Plaza Shopping Center (3000 Mechanicsville Turnpike)
▪ Large parcel (~17 acres)
▪ Underutilized
▪ Land use plans and zoning are not transit-supportive
▪ Projected 2040 density is low (4.8 jobs + people/acre)

Airport via Route 60 (Low Productivity Corridor)
2040 Transit Recommendation Multimodal Corridor Designation
Enhanced Local (or BRT) (20 min) Avenue/Transit Boulevard

Land Use Recommendations: 2040 activity density projections show low to very low densities along the Route 60 corridor to the airport. Future land use plans and zoning codes do not

support a transit- oriented land use future. Recommendations:
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• Work with other jurisdictions to further evaluate the purpose of the transit connection to the airport, and shape the service for that end (service for employees and/or service for travelers).

• Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

• Consider redevelopment opportunities along the corridor to enhance productivity, beginning with large single-ownership parcels that can more easily redevelop into transit-supportive land use patterns. Examples of potential sites are provided below. 1. Williamsburg Rd at Charles City Rd (SE Quadrant)

- ▪ Large parcel (~9 acres plus several out parcels)
- ▪ Underutilized
- ▪ Land use plans and zoning are not transit-supportive
- ▪ Projected 2040 density is low (5.8 jobs + people per acre) 2. Williamsburg Rd at Millers Lane (3302 Williamsburg Rd)
- ▪ Large parcel (~12 acres)
- ▪ Underutilized
- ▪ Land use plans and zoning are not transit-supportive
- ▪ Projected 2040 density is relatively high (9.3 jobs + people per acre) 3. Williamsburg Rd at Coxson Rd (5203 Williamsburg Rd)
- ▪ Small parcel (~4.7 acres)
- ▪ Underutilized
- ▪ Land use plans and zoning are not transit-supportive
- ▪ Projected 2040 density is relatively high (11 jobs + people per acre)

b. Chesterfield County Recommendations

Midlothian

2040 Transit Recommendation Multimodal Corridor Designation BRT, partially dedicates lanes Major Avenue/Transit Boulevard

Land Use Recommendations: 2040 activity density projections show medium to low densities, and the comprehensive plans show limited support for transit-oriented development on this corridor. Zoning codes, on the other hand, show tremendous opportunity on this corridor, with the community business, neighborhood business, general business, corporate office, and several residential zoning categories represented throughout. Recommendations:

- Develop a comprehensive vision plan for transit-oriented development at key focus areas on the corridor, for example at the Spring Rock Green Shopping Center, Chesterfield Town Center, and Midlothian Village.
- Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential.

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• Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Hull Street (Low Productivity Corridor)

2040 Transit Recommendation Multimodal Corridor Designation

BRT, no dedicated lanes Boulevard/Major Avenue

Land Use Recommendations: 2040 activity density projections show very low densities on this corridor. The comprehensive plan, however, shows significant support for transit-supportive development along the corridor. The zoning code shows some support. Recommendations:

• Establish a vision for transit-supportive development nodes on the corridor. The 2013 Hull Street Corridor Revitalization Plan recommends several key locations and provides suggested small area redevelopment plans. Adopt these concepts into the Comprehensive Plan. They include:

1. Goodes Bridge Square (2900 block Hull Street – south of Hull)
    - ▪ Small parcel (~5 acres)
    - ▪ Underutilized
    - ▪ Land use plans and zoning are not transit-supportive
    - ▪ Projected 2040 density is low (4.8 jobs + people per acre) 2. Property between Bryant & Stratton and Pocoshock Square
    - ▪ Small parcel (~3 acres)
    - ▪ Underutilized
    - ▪ Land use plans are transit-supportive, zoning is not
    - ▪ Projected 2040 density is low (7.5 jobs + people per acre) 3. Property immediately east of Bryant & Stratton
    - ▪ Large parcel (~31 acres)

- Underutilized
- Land use plans and zoning are transit-supportive

- Projected 2040 density is low (7.5 jobs + people per acre) 4. Mount Gilead Boulevard
  - Large parcel (~18 acres)
  - Underutilized
  - Land use plans and zoning are transit-supportive
  - Projected 2040 density is low (3.4 jobs + people per acre)

• Investigate additional sites not included in the 2013 Hull Street plan that hold potential for redevelopment to enhance productivity.

5. Oxbridge Square Shopping Center and neighboring parcels (Hull Street Rd and Courthouse Road – SE quadrant)
   - Large set of parcel (~31 acres, including 11 and 13 acre parcels)
   - Underutilized
   - Land use plans are transit-supportive, zoning is not

- ▪ Projected 2040 density is low (4.5 jobs + people per acre) 6. Genito Crossing Shopping Center (11130 Hull Street Road)
    - ▪ Large set of parcel (~30 acres, including a 14 acre parcel)
    - ▪ Underutilized
    - ▪ Zoning is transit-supportive, land use is not
- ▪ Projected 2040 density is low (6.8 jobs + people per acre) 7. Hancock Village (14500 Hancock Village St)
    - ▪ Large set of parcel (~70 acres, including 17, 21, & 27 acre parcels)
    - ▪ Underutilized
    - ▪ Zoning is transit-supportive, land use is not
    - ▪ Projected 2040 density is low (4 jobs + people per acre)

• Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Jefferson Davis Highway to Chester (Low Productivity Corridor)

2040 Transit Recommendation	Multimodal Corridor Designation	Enhanced Local (20 min)	Boulevard

Land Use Recommendations: 2040 activity density projections show very low densities along the corridor. Future land use plans currently show very little support for transit-supportive development, however, the zoning conditions generally would allow mixed-use development nodes. Recommendations:

• Progress current small area/corridor planning for Jefferson Davis Highway, and include recommendations to support transit-supportive development nodes along the corridor.

• Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential. Examples include:

1. Bellwood Drive-In Flea Market (9201 Jefferson Davis Hwy)

- Large parcel (~20 acres)
- Underutilized
- Land use plans and zoning are not transit-supportive
- Projected 2040 density is low (2.4 jobs + people per acre)

2. Breckenridge/Bermuda Shopping Center (12806 Jefferson Davis Hwy)

- Large parcel (~31 acres)
- Underutilized
- Land use plans and zoning are transit-supportive
  - Zoning: Community Business (C-3)
  - Future Land Use: Regional Mixed Use
- Projected 2040 density is low (3.7 jobs + people per acre)

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- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

c. City of Richmond Recommendations

Broad Street

2040 Transit Recommendation Multimodal Corridor Designation

BRT, increased frequency and dedicated lanes Transit Boulevard

Land Use Recommendations: Continue to progress the current BRT land use and transit planning vision, which supports transit-oriented development.

Cary/Main/Patterson

2040 Transit Recommendation Multimodal Corridor Designation

BRT, dedicated lanes downtown to Harrison Transit Boulevard

Land Use Recommendations: 2040 projections show very high activity densities planned for the downtown area, as well as comprehensive plans for transit-supportive development east of I-195. West of I-195, density projections are somewhat lower, and comprehensive plans are no longer supportive of mixed-use redevelopment; however, these areas are largely established residential neighborhoods and are unlikely to significantly redevelop. Recommendations:

- Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Route 1 to

Ashland

2040 Transit Recommendation Multimodal Corridor Designation Enhanced Local (20 min) Boulevard

Land Use Recommendations: 2040 projections show medium activity density along this corridor. The comprehensive plan largely does not support future transit-oriented development, and the zoning code offers little support. Recommendations:
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• Develop a comprehensive vision plan for transit-oriented development at key focus areas on the corridor, for example in the many older industrial lots or large, aging shopping center plazas that line the corridor.

• Begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential.

• Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Jefferson Davis Highway to Chester (Low Productivity Corridor)

2040 Transit Recommendation Multimodal Corridor Designation Enhanced Local (20 min) Boulevard

Land Use Recommendations: 2040 projections show medium to low activity density along the corridor. Comprehensive plans and zoning show limited support. Recommendations:

• In collaboration with Chesterfield County, develop a comprehensive vision plan for transit-oriented development at key focus areas on the corridor, for example in the many older industrial lots or large, aging shopping center plazas that line the corridor.

• To enhance productivity, begin with a focus on the very large, single-owner parcels that create significant TOD redevelopment potential. Example sites include:

1. Warehouse site (north of Kern St and Jefferson Davis Hwy)
    - Large parcels (~11 acres)
    - Underutilized
    - Land use plan is transit-supportive, zoning is not
    - Projected 2040 density is low (2.7 jobs + people per acre)
2. Parking site (Jefferson Davis Hwy and State Route 647)
    - Large parcel (~13 acres)
    - Underutilized
    - Land use plan is partially transit-supportive, zoning is

not

▪ Projected 2040 density is low (6.3 jobs + people per acre)

• Ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor. Begin by emphasizing locations for future transit stations.

Mechanicsville Turnpike

2040 Transit Recommendation Multimodal Corridor Designation

BRT, dedicated lanes Transit Boulevard

Land Use Recommendations: 2040 projections show medium activity density along the corridor. This, however, is a short segment of the overall corridor that primarily extends into Henrico and Hanover Counties. Most the Richmond portion is single family homes that are unlikely to redevelop.

Hull Street

2040 Transit Recommendation Multimodal Corridor Designation

BRT, dedicated lanes Transit Boulevard

Land Use Recommendations: 2040 projections show medium activity density along the corridor. The 2013 Hull Street Corridor Revitalization Plan is an adopted plan that shows nodes of transit-supportive development throughout the corridor; however, there is very little zoning support. Recommendations:

• Proceed with the Hull Street Corridor Revitalization Plans. Locate transit stations that correspond with these mixed-use node locations.

• Consistent with the Revitalization plan, ensure safe pedestrian and bicycle facilities, including wide sidewalks and well-marked crosswalks and pedestrian signals, throughout the corridor.

d. Hanover Recommendations

Route 1 to Ashland

2040 Transit Recommendation Multimodal Corridor Designation

Enhanced Local (20 min) Boulevard

Land Use Recommendations: 2040 projections show extremely low density of development between VCC and Ashland. Service on this section of the corridor will likely have few, if any, stops between Henrico and Ashland. Current land uses are primarily very low density service and repair shops. The focus should be on a future transit node and station in Ashland (see later description).

Mechanicsville Turnpike (Low Productivity Corridor)

2040 Transit Recommendation Multimodal Corridor Designation

BRT, no dedicated lane Boulevard
Land Use Recommendations: 2040 projections show low density development along this corridor, with slightly higher densities in the historic village of Mechanicsville, and the area just east of I-295. Numerous opportunities exist for redevelopment of shopping centers on this corridor into a transit-supportive development node, though the zoning is not currently supportive. Recommendations:
Greater RVA Transit Vision Plan Land Use
Analysis Memo

- Plan for at least one future transit-oriented development node along this section of the corridor, to include a mix of uses, as well as a park-and-ride. A potential site includes:
    1. Mechanicsville Shopping Center
        - Small parcel (~6 acres), with 36 undeveloped acres on an adjacent parcel
        - Underutilized
        - Land use plans and zoning are not transit-supportive
        - Projected 2040 density is low (4.9 jobs + people/acre)
- Ensure safe and comfortable pedestrian and bicycle access to the future station locations, including wide, buffered sidewalks, and well-marked, signalized street crossings.

e. Ashland Recommendations

Route 1 to Ashland

2040 Transit Recommendation Multimodal Corridor Designation

Enhanced Local (20 min) Boulevard

Land Use Recommendations: The Town of Ashland is preparing a plan for future redevelopment along England Street, in the vicinity of this transit corridor. Although 2040 projections show low levels of development density, the town should direct that future development to occur in a transit-supportive urban design pattern. For example, buildings can be pulled up to the streets, parking can be located in the rear, and streets can be designed for safe pedestrian and bicycle access. The plan for England Street should focus this type of transit-supportive development around the future transit station. Safe and comfortable pedestrian and bicycle access should be provided to this station area.

RURAL JURISDICTIONS

Residents of the rural counties will be able to access end stations on many of the corridors identified in this report for park and ride service. Dispersed land use patterns make demand

responsive, paratransit, and some local fixed route service most efficient and appropriate for these communities. This conclusion can be re-evaluated over time as land use patterns change and nodes of concentrated transit-supportive development emerge.

f. Goochland Recommendations Land Use Recommendations: A transit station at Short Pump (in Henrico) would serve Goochland residents coming from the west. Should an activity node, generating potential riders, emerge further west, the region may consider extension of this line into Goochland County. A possible location would be the West Creek area.

g. Powhatan Recommendations Land Use Recommendations: A transit station at the 288 intersection (in Chesterfield) would serve Powhatan residents coming from the west. Should an activity node, generating potential riders, emerge further west along Midlothian/Route 60 in the future, the region may consider extension of this line into

 Powhatan County. Similarly, as mixed-use development nodes continue to emerge at 711 and 288, this may be considered for a future transit service extension.

h. New Kent Recommendations Land Use Recommendations: Transit stations at the Richmond International Airport and along the Mechanicsville Turnpike will likely serve residents of New Kent County.

i. Charles City Recommendations Land Use Recommendations: The transit station at the Richmond International Airport will likely serve residents of Charles City County.

iii. Next Steps Critical next steps in the land use planning process will be:

• Test alternative land use scenarios to understand the changes that will have the most significant impact on transit viability in the Richmond region, and help identify the corridors that will be most likely to succeed in the short-, mid-, and long-terms.

• Set priorities for corridor master plan studies and changes to land use plans. These priorities can be informed by the land use scenario analysis, evolving transportation demands, as well as coordination with neighboring jurisdictions.

• Continue to educate all stakeholders about the relationship between land use density, transit-oriented urban design, and high-quality transit investments so that the appropriate policies can be adopted that will achieve the community's long-term vision and transportation needs.

Appendix B Transit Propensity Technical Memorandum

Transit Propensity Analysis Technical Memorandum

The RRTVP process employed a detailed transit propensity analysis that is used to identify locations that are transit deficient and as a basis for future transit recommendations. The analysis used a multi-factor model that utilizes the most recently available census and employment data. This data is used to identify where in the region there currently exists the highest propensity for transit, or in other words, where ridership is likely to be the highest. It uses a myriad of factors that encompass the types of trip that would be made by not only transit dependent populations, but those who may have other transportation options as well but would use transit if it was convenient. It includes six base layers that can be combined including:

- Transit oriented populations
- Commuter populations
- Destinations (retail, medical, educational)
- Workplace (employment)
- Educational populations
- Low-income populations

The transit propensity analysis was used to identify areas throughout the Richmond region that have a need and are viable for new or additional transit services. The six propensity base layers that were developed focus on where transit oriented populations live, where commuters live, where low-income populations live, where students and student aged populations live, locations of where people work and locations where people make trips not related to employment (destinations). The following sections describe this analysis, and the results in more detail, focusing on identifying the areas with high propensity and little or no existing transit service.

Transit-Oriented Population Propensity

The Transit Oriented Population propensity is used to identify where high densities of population can be found, as well as focusing on where transit dependent populations live. The population and households census categories highlight where higher densities of population can be found to support transit, while the age, income, vehicle ownership and persons with disabilities census categories identify transit dependent

populations that need transit.

In addition to the core of Richmond, the analysis found areas of high Transit Oriented Populations in many of the medium density suburban areas of greater Richmond including Short Pump, Glen Allen, Mechanicsville, Meadowbrook, Chester, Brandermill, and Midlothian (see Figure 1). These areas have very little existing transit service. Within the City of Richmond, the analysis found areas of high Transit Oriented Populations in a wide variety of areas including to the southwest along Midlothian Pike and Hull Street, to the south along Jefferson Davis Hwy, to the east towards the airport, throughout the north side, and westward between Broad Street and the river (see Figure 2). These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this

analysis. There is a pocket of high Transit Oriented Propensity north of the city limits along the Staples Mill Rd corridor that has no service.

Figure 1 Transit-Oriented Propensity (Region)

Figure 2 Transit-Oriented Propensity (Regional Core)

Commuter Propensity

The Commuter Propensity is used to identify where persons with jobs reside. The employment data identifies where persons eligible for work or those who are currently employed live, and the commute mode category (census) incorporates where commuters reside and also isolates the number of transit specific commuters.

Very similar to the transit propensity analysis the Commuter Propensity found areas of high commuter populations in the suburban areas of greater Richmond including Short Pump, Glen Allen, Mechanicsville, Meadowbrook, Chester, Brandermill, and Midlothian (see Figure 3). These areas have very little existing transit service with only a few express routes reaching out

beyond the core and into these areas. Within the City of Richmond, the analysis found areas of high commuter populations in a wide variety of areas including to the southwest along Midlothian Pike and Hull Street, to the east towards the airport, throughout the north side, and westward between Broad Street and the river (see Figure 4). These areas have relatively good transit service, though the frequency of service does not

always meet the need represented by this analysis. There are also several pockets of high Commuter Propensity that have no existing transit service to the north of downtown (along Staples Mill Rd beyond city limits) and northwest of the downtown (along Chamberlayne Ave.).

Figure 3 Commuter Propensity (Region)

Figure 4 Commuter Propensity (Regional Core)

Destination Propensity

The Destination Propensity is used to identify where typical non-work transit trips are made, which commonly include retail, medical, and school trips. The retail, medical, school, and public administration census categories use the number/density of employees as measurements based on the assumption that more workers correlate to more general utilization at a location.

Although similar to the Transit and Commuter Propensity analysis the Destination Propensity identified additional areas that show high concentrations of destinations in the suburban areas of greater Richmond including Short Pump, Glen Allen to Ashland, Mechanicsville, Meadowbrook along Iron Bridge Rd, along the 288 and 10 in the south, along Hull Street Rd to

Brandermill, and in the Midlothian area (see Figure 5). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found areas of high concentrations of destinations but with a definite concentration westward along Broad Street and between Broad Street and the river (see Figure 6). These areas have relatively good transit

service, though the frequency of service does not always meet the need represented by this analysis. There are also pockets of high Destination Propensity beyond the city limits that have no existing transit service to the north of downtown along Staples Mill Rd and Brook Rd.

Figure 5 Non-Work Destination Propensity (Region)

Figure 6 Non-Work Destination Propensity (Regional Core)

Work Propensity

The Work Propensity is used to identify areas where employment centers are located. This category factors in the number of employees and density of employees by location.

Very similar to the Destination Propensity the Work Propensity identified additional high concentrations of destinations in the suburban areas of greater Richmond including Short Pump, Glen Allen to Ashland, Mechanicsville, Iron Bridge Rd and 288, along the 288 and 10 in the south, Brandermill, and in the Midlothian area (see Figure 7). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found a wide range of areas with high

Work Propensity but with the highest concentration northwestward along Broad Street and between Broad Street and the river (see Figure 8). Other concentrations exist along major arterial corridors and in the area around the airport. These areas have relatively good transit service, though the frequency of service does not always meet the need

represented by this analysis. There are also pockets of high Workplace Propensity beyond city limits that have no existing transit service to the north of downtown along Staples Mill Rd.

Figure 7 Workforce Propensity (Region)

Figure 8 Workforce Propensity (Regional Core)

Education Propensity

The Educational Index is used to identify where college/university students reside. The College/University Attendance census category identifies where persons who are currently enrolled in college live. The College/University Age category incorporates where college-aged persons live to account for those who are eligible to enroll in a program.

The Education Propensity shows high density in most of the same areas mentioned previously. High concentrations of Education Propensity existing in Short Pump, Glen Allen to Ashland, Mechanicsville, I- 64 east of I-295, along New Market Rd to the southeast, Meadowbrook, along the 288 and 10 in the south, Brandermill, Tuckahoe along Patterson Ave, and in the Midlothian

area (see Figure 9). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found a wide range of areas with high Education Propensity but with the highest concentration northwestward along Broad Street and between Broad Street and the river (see Figure 10). Other concentrations exist along major arterial

corridors and in the area around the airport. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There are also pockets of high Education Propensity beyond city limits that have no existing transit service to the north, west, and southeast of the downtown.

Figure 9 Education Propensity (Region)

Figure 10 Education Propensity (Regional Core)

Low-Income Populations

The Low-Income data is used to identify where concentrations low-income populations reside. The census category allows us to show the number of low income persons per square mile. This census category is defined as population for who poverty status can be determined. The Low-Income census data shows high density in most of the same areas mentioned previously. High concentrations of Low- Income populations exist in Short Pump, Mechanicsville, between Meadowbrook and Chester, in Brandermill, and in the Midlothian area (see Figure 11). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found a wide range of areas with concentrations of low-income

populations (see Figure 12). These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There are pockets of low-income populations beyond city limits that have no existing transit service to the north of downtown (along Staples Mill Rd and Hilliard Rd) and west of the downtown (Bon Air).

Figure 11 Low Income Populations (Region)

Figure 12 Low Income Populations (Regional Core)

All-Day Propensity

The All-Day Propensity is a combination of four propensities, grouping the attractor propensities (where people work and make destination trips) and generator propensities (where commuters and transit- oriented populations live) and averaging them to create an All-Day Propensity. This data illustrates the areas most likely to have high trip creation/attraction all day long thus lending themselves to more high capacity/frequency service.

Not surprisingly the All-Day Propensity shows high density in most of the same areas

mentioned previously. High concentrations exist in Short Pump, Glen Allen to Ashland, Mechanicsville, Meadowbrook to Chester, Brandermill, and in the Midlothian area (see Figure 13). These areas have very little existing transit service with only a few express routes reaching out beyond the core and into these areas. Within the City of Richmond, the analysis found a wide range of areas with high All-Day Propensity but with the highest concentration northwestward along Broad Street and between Broad Street and the river (see Figure 14). Other concentrations exist along major arterial corridors and in the

area around the airport. These areas have relatively good transit service, though the frequency of service does not always meet the need represented by this analysis. There is one pocket of high All-Day Propensity just north of downtown and outside of the city limits along the Staples Mill Rd corridor that has no service.

Figure 13 All Day Propensity (Region)

Figure 14 All Day Propensity (Regional Core)

The propensity analysis provides information on where in the region there currently exists the highest propensity for transit and where these areas exist with no, little, or insufficient transit service. This information was combined with land use analysis and public and stakeholder feedback to develop initial recommendations.

REGIONAL TRAVEL DEMAND ANALYSIS

Once the transit propensity analysis is complete it was combined with regional travel demand model data to understand demand between high propensity areas of the region. The VDOT Regional Travel Model was developed to estimate and forecast travel flows throughout the Greater Richmond region. Within this project, it was used as a source of origin-destination data and was analyzed to understand residents travel patterns within the region.

Traffic Analysis Zones (TAZs) that correlate to high propensity areas are first combined. Then, trip flows between these grouped TAZs are evaluated, in effect isolating the flows between high propensity areas. The number of trips and type of trips assists in understanding both the intensity of demand and type of demand. This allows the study team to develop more targeted recommendations by matching appropriate services to the demand, both geographically in level of service (span and frequency). Bi- directional trip flows were evaluated for both 2012 and 2040. The following bullets summarize the methodology and how the results are utilized:

- Methodology: Aggregate model trip flows between TAZ groups (travel sheds) that relate to high propensity
- Understand total demand between high propensity areas
- Understand different types of demand between high propensity areas
- Assists in developing more target recommendations
- All-day fixed route

- Commuter
- High capacity transit

The travel model data is broken out by different trip types which include: home based work, home based other, home based school and non-home based trips. All of the trip types were combined to establish a baseline for travel throughout the day that was reviewed as it is, that is, not limited to high propensity areas. Additionally, the home based work trips were analyzed separately to visualize how the travel patterns differ in the peak hours. Furthermore, all trip types between multiple propensity types that produce all day demand were also isolated for use in identifying potential high-capacity corridors. The following sections discuss the results of this analysis for both 2012 and 2040.

Base Year (2012) Flows

The analysis of the base year (2012) model data found clusters of high volume flows, of all the different trip types, within several different areas throughout the study area (see Figure 15 and Figure 16). The highest flows are observed in the Downtown core, Short Pump/Innsbrook area, Midlothian Turnpike, and near the airport. On the periphery significant flows are seen in the following areas: Chester, Mechanicsville, Ashland, Brandermill, and Powhatan. Within the urban core the most prominent flows are east-west, with a high level of trip activity along the Broad Street corridor between Downtown and Short Pump/Innsbrook. Overall the primary activity is along the I-64 corridor and the northern portion of I-295. In general, most of the flows are relatively short and concentrated in a few distinct areas. Finally, the urban core depicts a high concentration of flows that are generally short in nature.

The home based work trip flows (see Figure 17 and Figure 18) showed a preponderance of trips from all areas into the Downtown core. The notable exception was a high level of home based work trips to the Short Pump/Innsbrook area. There are small clusters flows evident on the west end of the Midlothian Turnpike and around the airport as well, but relative to the aforementioned flows they are very minor.

High travel flows between high propensity areas (see Figure 19) were found predominantly in two locations: the Downtown core and the Short Pump/Innsbrook area. These are areas that generate demand for many different types of trips throughout the day. Two additional areas did show up to a lesser degree in this analysis as well, the western portion of the Midlothian Turnpike and the corridor between Downtown and the airport. The flows illustrated in Figure 5, depicting high all-day trip demand, are used as a starting point for identifying potential high-capacity corridors.

Figure 15 - 2012 Travel Flows, All Trip Types

Figure 16 - 2012 Travel Flows, All Trip Types, urban core area

Figure 17 - 2012 Travel Flows, Home Based Work Trips

Figure 18 - 2012 Travel Flows, Home Based Work Trips, urban core area

Figure 19 - 2012 Travel Flows Between High All-day Propensity Areas Only

Forecasted Year (2040) Flows

The analysis of the forecasted model year, 2040, showed not only an increase in flows, but an increase in flows between a greater diversity of areas, and an increase in longer distance flows (see Figure 20 and Figure 21). Generally speaking, there is

much more variation in the location of the flows, and a much greater degree of dispersal throughout the region. So under existing conditions the largest flows are highly concentrated in a few areas, but in the future the model predicts that this will no longer be the case. Generally, this is reflective of where the model is predicting growth of both jobs and population in the future.

The 2040 home based work trip flows (see Figure 22 and Figure 23) also show a significantly altered pattern when compared to existing conditions. Whereas under existing conditions the model shows most flows to the Downtown core or Short Pump/Innsbrook, in the future these flows are much more widely dispersed. In addition to these two locations the following areas are expected to have a high level of home-based work flows in the future: Midlothian Turnpike, west of Brandermill, south of the airport, Mechanicsville, Ashland, and the industrial park area east of Chester. This largely due to the model responding to the expectation of significant increases in population on the periphery, or in some cases, an increase in the number and density of jobs at a given location.

High travel flows between high propensity areas (see Figure 24) were found in the same locations as seen in 2012. The flows are still predominantly in two locations: the Downtown core and the Short Pump/Innsbrook area. These are areas that generate demand for many different types of trips throughout the day. Two additional areas did show up to a lesser degree in this analysis as well, the western portion of the Midlothian Turnpike and the corridor between Downtown and the airport. Differences between 2012 and 2040 were observed, including an increase in intensity of trip flows around the western portion of the Midlothian Turnpike, an increase in minor trip flows along the Midlothian Turnpike and into downtown, and an increase in intensity between downtown Richmond and the neighborhoods directly to the south across the river.

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