ConnectGreaterWashington – Land Use Alternatives

Summary of Scenario A

Introduction

In 2015, WMATA planners asked "what if the region's future growth was used to fulfill the expectations of regional plans such as *Region Forward* and *Place + Opportunity*? Would WMATA benefit? Would the region?"

We hypothesized that changes to local jurisdictions' and/or the region's approach to development, such as where to guide future jobs and population, and adding more transit-supportive policies could allow the region to better use the transportation system we already have rather than require us to spend tens of billions on new transportation projects. We developed three different scenarios (A, B, and C) to vary land use and policies that affect demand, but did not add anything to the transportation system beyond the projects in the region's 2013 Constrained Long-Range Plan and Metro2025, such as the Purple Line, Potomac Yard Metro, and full eight-car trains on Metrorail. The remainder of this post talks only about *Scenario A*. Scenarios B and C will follow in separate posts.

Scenario A, entitled Efficient Transit, had the goal of increasing ridership on all segments of the Metrorail system, while minimizing the potential for overcrowding on any segment in the system. Essentially, we wanted to balance use of Metrorail across the region, which meant maximizing the intensity of use at activity centers and station areas, increasing reverse commute opportunities, and increasing the opportunity for shorter trips, which are more likely to be made walking, biking, or on transit. The below post highlights the inputs, results and key findings from Scenario A, which had a no-build scenario, as well as three iterations called Scenario *A Prime*, *A1*, and *A2*.

- *Scenario A Prime:* Used the region's adopted forecast and added transit-supportive policies to encourage transit ridership including: better bike/pedestrian access; lower reverse peak-direction fares on Metrorail; and increased park and ride capacity at Metrorail stations on lines that are not crowded (e.g. Largo and New Carrollton).
- *Scenario A1:* Kept each jurisdiction's job and population growth totals from the adopted forecast, but shifted growth forecasted to take place after 2020 to activity centers within each jurisdiction that have high-capacity, high-frequency transit. It used the same transit-supportive policies as *A Prime*.
- *Scenario A2:* Kept the region's job and population growth totals from the adopted forecast, but shifted growth forecasted to take place after 2020 across jurisdictional boundaries to activity centers that have high-capacity, high-frequency transit where

transit is not already at capacity. It used the same transit-supportive policies as *A Prime* and *A1*.

Potential Benefits to the Region From Scenario A Results

The benefits inherent in these approaches are staggering. Key results are listed below, but if you'd like to geek out, a more detailed description of *Scenario A* and its iterations is provided further on in the post along with the modeling results.

Summary of *Scenarios A Prime, A1, and A2*:

- **Changing parking, fares, and walkability without addressing land use (*Scenario A Prime*) did very little.** Transit ridership, vehicle miles traveled (VMT), Metrorail's operating subsidy, transit and road congestion, access to jobs and people primarily stayed the same as the status quo results in 2040.
- **Growing smarter within each jurisdiction (*Scenario A1*) did improve many of the transit-specific measures but also added to transit crowding and made traffic worse.** Transit mode share, Metrorail and all transit ridership, and the Metrorail operating subsidy improved. However, crowding on transit (which in many places is already overcrowded today) did increase somewhat. Additionally, because *Scenario A1* did not change the future growth in jurisdictions without high-capacity, high-frequency transit (e.g. the non-Compact jurisdictions such as Prince William County, Frederick County, etc.) nor did it change the quantity of jobs and households within a Compact jurisdiction (just the location), long distance trips still remained. That means that congestion on highways increased as well as the amount of time it took to travel between major activity centers.
- **Growing smarter as a region (*Scenario A2*) vastly improved the region across almost all measures.** Transit ridership, VMT, mode share, number of jobs accessible within a 45 minute commute of households, and highway travel times and congestion all moved for the better. But most notably, the Metrorail subsidy became a surplus. **Yes, Metro *made money*.** And it happened even with a reduction in fares for some types of trips. However, the crowding on Metrorail and on other transit modes drastically increased and on some segments was not possible to serve without significant transit capacity expansion (e.g. new rail lines). Good news is that the annual surplus generated could pay for this expansion.

Other Major Takeaways:

- **Land use changes are absolutely critical to affecting transportation outcomes.** Changing small policies to simply encourage more transit ridership isn't enough to make better use of the transit system we have nor does it change many of the regional measures such as mode share, ridership, and traffic congestion.

- **Growing smarter in each jurisdiction is a step towards getting more people on transit, but it does not help balance the use of Metro or drastically improve its operating or fiscal positions.** It just adds more people to the most crowded parts of the system, such as the Orange and Silver Lines west of Rosslyn. Additionally, if people and jobs are still widely separated across the region, road congestion and VMT will increase.
- **The region doesn't need to implement major sticks (e.g. cordon charge) to get people to use transit.** Locating jobs and housing in mixed use areas near transit and increasing walkability in those areas makes a huge difference in the propensity of residents to take transit.
- **Growing smarter across the region still requires transit capacity improvements, especially in the region's core.** Metrorail's capacity is constrained in key places, especially at the two Potomac River crossings. However, the increased ridership and revenues that come from growing smarter in the region could provide the funding needed to make expansion possible.
- Overall, **creating a purely balanced passenger load on Metrorail across the system is difficult** considering that most of the land use that will exist in 2040 is fixed as it is on the ground now or is in the development pipeline. **But starting to address the current imbalances in development now places the region on the right trajectory.**

2040 Metrorail Peak Period Passenger Loads

Below are the forecasted 2040 Metrorail peak period passenger loads in the peak direction. *Red indicates segments with crowded conditions and dark and light green indicate those segments that are under capacity. As you can see, light green segments are spread across the system - that is, we have a lot of excess capacity on Metrorail even in the peak period and the peak direction. Scenario A* attempted to eliminate the red and increase demand on the green segments, especially those in light green.

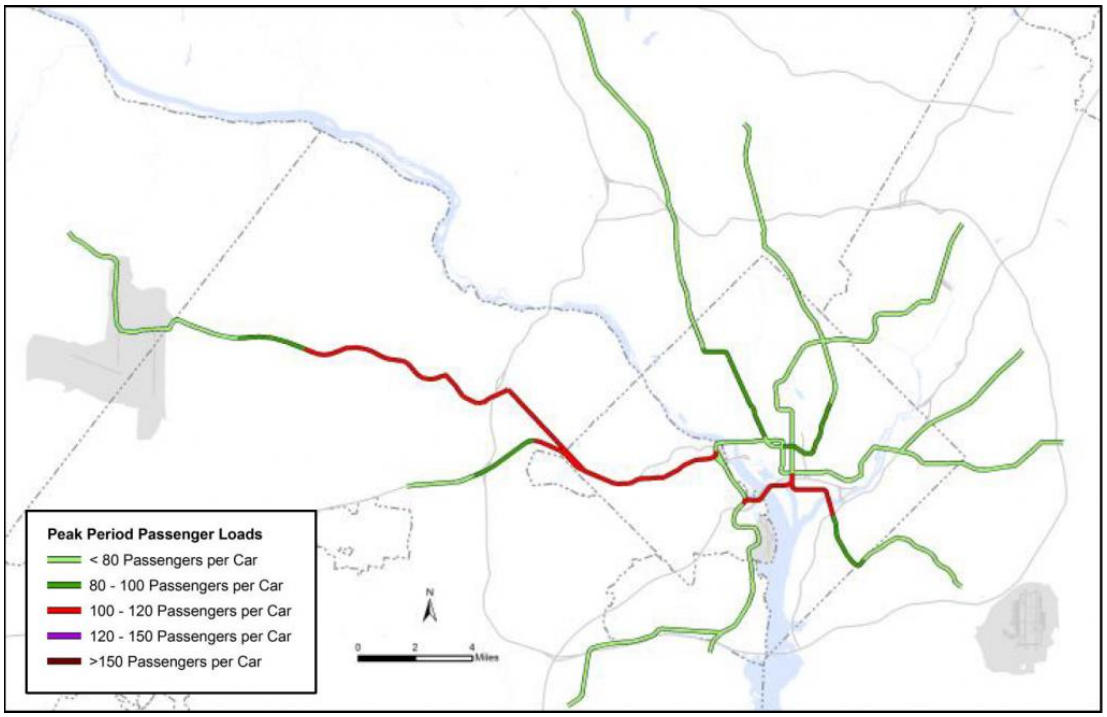

Figure 1: Forecasted 2040 Peak Period Passenger Loads

Definitions of Scenarios A Prime, A1, and A2

Within Scenario A, the team developed three different scenarios to test different land use changes. These are defined as *A Prime, A1, and A2* and are shown below.

- *A Prime* kept the adopted regional forecast exactly as developed by local jurisdictions and the Metropolitan Washington Council of Governments, but added some transit-supportive policies to the travel demand model such as a reduction in certain fares, increasing walkability, and expand park and ride at certain stations.
- *A1* kept the jurisdictions' job and population totals as proposed in the regional forecast, but guided the future growth to activity centers within each jurisdiction that had high-capacity high-frequency transit. The same transit-supportive policies from *A Prime* were added. Essentially *A1* enabled each jurisdiction to grow smarter, shifting their anticipated growth to activity centers with good transit. Note that if a jurisdiction does not have high-capacity, high-frequency transit, no changes to their land use were made.
- *A2* kept the region's job and population totals as proposed in the regional forecast, but guided the future growth across jurisdictional and state boundaries to activity centers that had high-capacity high-frequency transit. This is what enabled the region to grow smarter, adding jobs and population where transit capacity exists. The same transit-supportive policies in *A Prime* and *A1* were modified as well.

It's a lot to digest, so the below graphic attempts to show the differences in land use, while also highlighting the policies that were changed across all *A Scenarios*.

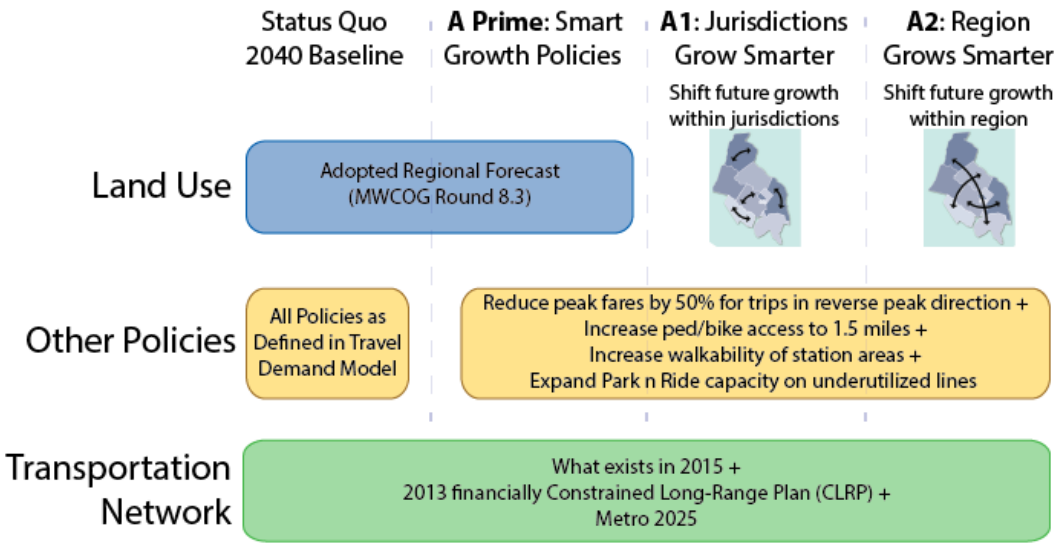

Figure 2: Approach for Building Scenario A to Make Transit More Efficient

Land Use and Development Changes

Part Two of the series provided the basics of our approach, but to summarize, we:

- Only analyzed changes to forecasted growth beyond 2020, which is beyond the typical development pipeline and does affect what is on the ground today;
- Placed jobs and/or population at the 86 activity centers that have or will have high-capacity transit by 2040; and
- Stayed true to the kinds of places that these activity centers are today: unique, interesting, and attractive places to live and work that should stay that way.

This was completely based on an average density calculated based on each place type identified in MWCOG's Place+Opportunity report (pdf), a document which each jurisdiction has already embraced. Across all iterations of *Scenario A*, we focused on increasing the mix of uses in the activity centers and encourage reverse commutes. That means that we guided future jobs to activity centers that were primarily residential and guided future population to areas that were primarily employment.

In total, for *Scenario A1*, we guided 35,000 households and 30,000 jobs that are forecast to appear between 2020-2040 to station areas. In total, for *Scenario A2*, we guided 322,200

households and 712,300 jobs that are forecast to appear between 2020-2040 to station areas. Below, from left to right, are images that show:

(1) The forecasted land use density for 2040 (note this is the same density for *A Prime* since land use did not change in this scenario);

(2) Change in total land use in *Scenario A1* that results from growing smarter within a jurisdiction; and

(3) Change in total land use in *Scenario A2* that results from growing smarter as a region.

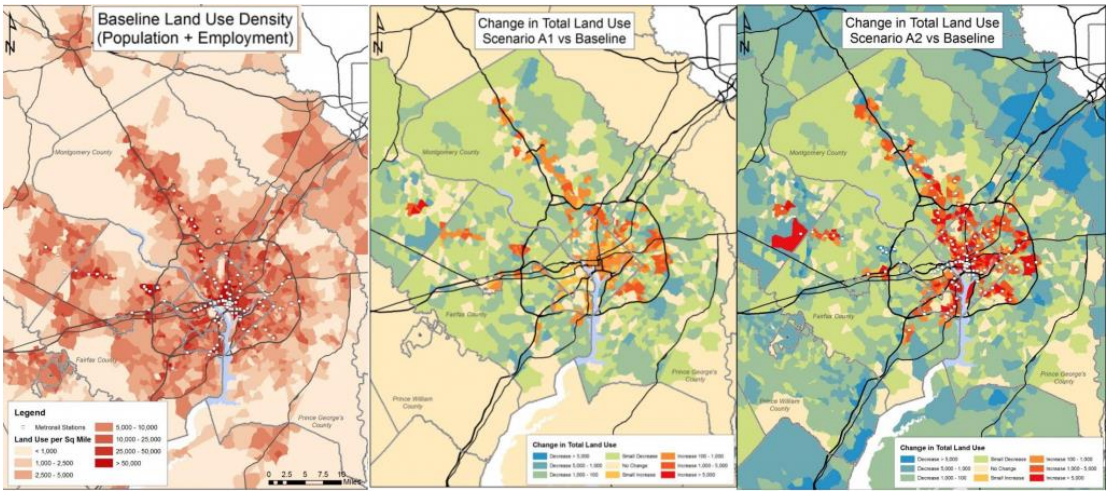

Figure 3: A Scenarios: Changes in Total Land Use between A Prime, A1, and A2

Demand Policies Modified in Travel Demand Model

To increase overall use of Metro, but reduce it where crowding exists and boost demand where capacity exists, we modified the below transit-supportive policies in the travel demand model. You'll note that all of these policies in *Scenario A* are "carrots" to encourage transit ridership. There are no "sticks" to discourage driving a car. We simply attempted to make station areas and activity centers more transit friendly.

- Walkability and Bicycle Access: As we know, many Metrorail stations have poor pedestrian and bicycle access between the station and surrounding development. To increase ridership, we increased the variable that represents the walkable environment around stations by the same percentage as the changes to land use at that station. We also increased bike and pedestrian access to occur within a 1.5 mile radius, up from the 1 mile radius in the standard model.

- Reverse Peak Direction Fares: We wanted to increase the potential for reverse commuting and ridership on underutilized segments, so we decreased fares for those trips by 50 percent.
- Parking Costs and Access Time: We wanted these two variables to be in line with changes to land use. So as the densities in activity centers around transit changed, the parking costs and access time also changed by the same percentage.
- Selective Expansion of Park and Ride Capacity: We expanded park and ride capacity at stations located on lines that were underutilized. Essentially that meant that longer-distance riders could find parking at stations on the Shady Grove, Glenmont, Greenbelt, Largo, and New Carrollton branches of the system, but not at Vienna and Wiehle Avenue.

Modeling Results

The key takeaways are above, but we've provided results of key measures from the 25+ measures of effectiveness that were analyzed.

Measure of Effectiveness	Compared to	2010	2040 Base Constrained*	2040 Base Unconstrained*	A Prime	A1	A2
Daily Vehicle Miles Traveled	2010	170,307,284	194,821,896	194,146,210	194,032,108	215,174,844	171,454,047
Change to Metrorail Operating Subsidy	2040 Constrained		$ 440,600,000	$ 345,696,953	427,062,115	$ 383,799,082	$ (269,278,340)
Increase in Compact Property Tax Revenues	2040 Base (Same)				No Change	(12,458,641)	1,560,161,892
Households	2040 Base (Same)		1,339,301	1,339,301	1,339,301	1,382,656	2,562,499
Highway Travel Times for 13 different O-D pairs	2010	552.12	642.26	619.42	615.47	854.62	516.21
Total Congested Person Miles Traveled Autos	2040 Base Constrained		30,028,837	30,715,845	29,728,591	45,773,785	21,271,488
Actual Daily Transit Mode Share	2040 Base Unconstrained	6.20%	6.9%	7.7%	7.4%	8.4%	14.5%
Daily Metrorail Ridership (Unlinked Boardings)	2040 Base Unconstrained		1,445,234	1,546,251	1,606,207	1,866,861	2,645,895
Daily Transit Ridership (Including Metrorail)	2040 Base Unconstrained		2,535,368	2,659,302	2,729,688	3,194,659	4,473,525
Person Hours Traveled on Congested Metrorail Vehicles >= 100 Passengers per Car during the Peak	2040 Base Unconstrained		1,398	41,629	42,319	47,599	221,098
Peak Metrorail Transfers at Seven Main Transfer Stations	2040 Base Unconstrained		234,665	268,178	256,935	313,224	444,654
Person Hours Traveled on Congested Buses >=45 Paasengers per Bus during the Peak	2040 Base Unconstrained		36,216	39,150	37,831	54,938	78,542

* Because the region has has only fully funded Metro's State of Good Repair needs, but not expansion needs associated with running the longest possible trains and station improvements, the region travel forecasting model constrains the capacity of Metrorail beyond 2020. This is calculated by running the model for 2020 to estimate Metrorail demand. For all future years, the model is run and all Metrorail demand in excess of the 2020 demand is reallocated to the highway network. As part of this study, WMATA also modeled the unconstrained demand - that is, what is the actual demand for Metrorail if expansion were funded by the region.

Lowest Performing Iteration Highest Performing Iteration

Figure 4: Scenario A Key Results

If you've made it this far, congratulations! What struck you as interesting? Any key conclusions that you noted? Any follow up questions on our analysis?