

Light Rail Transit on Woodward Avenue in Detroit, Michigan

An analysis of two proposed alignments

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Introduction

Over the past several decades, many U.S. cities have built light rail transit (LRT) systems connecting downtown centers with city and suburban neighborhoods (Garrett 2004). New LRT systems can represent a significant increase in service over traditional city bus networks because these electric train systems feature a smoother ride and typically operate at faster speeds. However, not all LRT systems are created equal: specific characteristics such as stop spacing and right-of-way (ROW) separation are strongly related to station accessibility and operating speeds (Vuchic 2007). Furthermore, new rapid transit developments have the potential to shift scarce transit dollars away from low-income and transit-dependent populations in central cities in order to attract new suburban customers, as was found to be the case in Los Angeles (Eng 2009). Planners must take care to design systems for both efficiency and equity, so that unjust transfers of services do not occur.

The Federal Transit Administration (FTA) recently committed to fund a light rail transit system on Woodward Avenue in Detroit, Michigan. The Woodward Light Rail project is the result of an unlikely coalition between the Detroit Department of Transportation (DDOT) and a consortium of private businesspeople who had originally planned to build their own streetcar system entirely with private money. The project, now in the environmental impact assessment phase, is considering

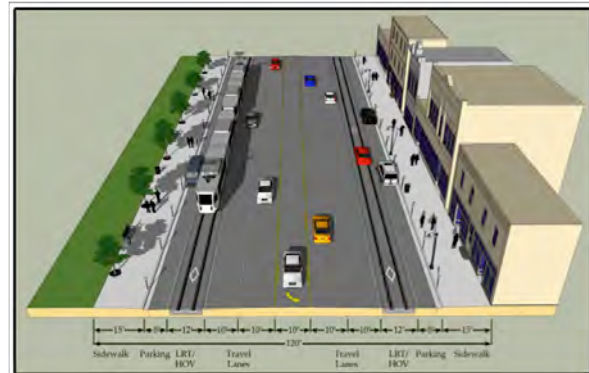


Figure 2: Cross-Section of Operating Option B: Curb-Running/Mixed Traffic
Source: Woodward Light Rail Project and Parsons Brinkerhoff 2010 (Woodward Light Rail Project 2011).

two rail alignment options for the section between Downtown and the northern city limits. Option A would operate in a separated ROW in the center of the street (see Figure 1), while Option B would operate at the curbside, mixed in traffic for a portion of the alignment (see Figure 2). This paper examines the differences between the two proposed alignments and the efficacy of the project concept as a whole, finding that the project will serve broad public interests and that Option A will provide the best combination of safety, speed, and cost.



Figure 1: Cross-Section of Operating Option A: Median-Running/Traffic Separated
Source: Woodward Light Rail Project and Parsons Brinkerhoff 2010 (Woodward Light Rail Project 2011)

Background

On August 2nd, 2010, U.S. Secretary of Transportation Ray LaHood announced that the Federal Transit Administration would help fund a new LRT system on Woodward Avenue in Detroit, Michigan (Shea 2010a). The line will be the City's first modern rapid transit system outside of Downtown (the previous attempt 30 years before produced only a 3-mile downtown circulator, the Detroit People Mover), running almost the complete length of Woodward Avenue from Downtown to the State Fair Grounds near the city limits (9.3 miles). As currently planned, the LRT line will not extend north into neighboring suburbs, much to the chagrin of regional rail transit advocates (Shea 2010a, Shea 2010c).

Prior to Secretary LaHood's announcement,

there were two competing plans for the development of a Woodward LRT line: one by a consortium of wealthy business owners and foundations known as M1-Rail, and a second by DDOT. M1 had intended to build a 3.4-mile “streetcar-style” system running at curbside from Downtown to Detroit’s New Center district, where it would connect to Amtrak service and a proposed commuter line to Ann Arbor, Michigan (Shea 2010b, Shea 2008). The M1 consortium planned to build the line using only private funds in order to bypass the lengthy federal funding process (Shea 2010b). M1’s plan called for thirteen stops: five Downtown, and eight between Downtown and the New Center district (Shea 2008).

DDOT had a competing plan for more extensive LRT service on Woodward, extending from Downtown through the New Center and onward to the State Fair Grounds. The DDOT plan called for LRT service running in a dedicated median outside of downtown, and only five stops between Downtown and the New Center district (DDOT 2007). After much negotiation, and a special congressional approval to use the \$125 million private investment as part of the local match required to qualify for federal funding, DDOT and M1 merged their plans under FTA guidance (Shea 2010c). The merged plan will consider both options (curbside, and median-running) for the Woodward LRT mainline alignment (Woodward Avenue Light Rail Transit Project 2010). The required environmental impact study is currently in progress, and

part of this process is a decision as to which mainline option will be selected for the final design. Figures 3 and 4 show the two proposed LRT alignments, as identified in the project’s Scoping Booklet (Woodward Avenue Light Rail Transit Project 2010). The study is also considering multiple downtown alignments, but this analysis focuses only on the portion of the alignment extending outward from Downtown.

Comparison of Mainline Options

There are two important differences between the services proposed under mainline Options A and B: stop spacing and traffic separation. Both options propose the same alignment from the State Fairgrounds to Grand Blvd. (New Center). However, the spacing of transit stops between Grand Blvd. and Foxtown/Stadium (Downtown) is much shorter under Option B. Option B calls for seven stops with an average spacing of 550 meters, while Option A calls for only four stops with average spacing of 975 meters. Option B also requires that trains run at curbside, mixed with traffic south of the New Center station. Option A is identical to the alignment originally proposed by DDOT (DDOT 2007), while Option B appears to represent the planned alignment of the private M1 consortium. Although similar in most respects, the two proposals are different enough to result in significantly divergent outcomes. Option B will allow slightly more of the residents who live between New Center and Foxtown



Figure 3: Woodward Light Rail Mainline Design Option A. Source: Woodward Light Rail Scoping Booklet, p. 8



Figure 4: Woodward Light Rail Mainline Design Option B. Source: Woodward Light Rail Scoping Booklet, p. 9

to access a stop within walking distance. However, Option A will provide greater safety for pedestrians and motorists, faster operating speeds, and lower operating costs.

Walking Distance Coverage Area

The closer stop spacing of Mainline Option B will result in a larger coverage area, but this will not translate to a significant gain in the number of residents who live within walking distance of an LRT stop. Transit agencies use a variety of distances to calculate the walking distance service area of a transit stop, with 600 meters and 800 meters (1/2 mile) being fairly common (O'Sullivan and Morrall 1996). Figure 5 shows that Option A provides good coverage for all properties directly abutting Woodward Avenue between New Center and Downtown (as shown by the shaded areas), but leaves some significant gaps between stations in the neighborhoods just a few hundred meters from Woodward. Option B, with closer stop spacing, expands the total area within walking distance of a transit stop as shown in Figure 6, but is less efficient because many coverage areas overlap significantly. The coverage gains of Option B as compared with Option A are minimal. As shown in Table 1, overlaying walking distance areas with 2000 census blocks reveals that, as compared with Option A, Option B would increase the number of residents within a 600-meter walking distance by only 5%, and by only 2% within an 800-meter walking distance. There also appears to be no substantive difference in basic population or household demographics in the additional areas covered by the Option B station alignment.

Pedestrian and Motorist Safety

Under Mainline Option B, transit vehicles would move to curbside south of the New Center station, resulting in slower operating speeds and reduced safety for both motorists and pedestrians. In its 1996 report, *Integration of Light Rail into City Streets*, the Transit Cooperative Research Program (TCRP) examined the crash statistics of ten North American LRT systems. The report concluded that:

“Median LRT operations in shared rights-of-way are preferable to side-aligned LRT operations. This alignment choice places the LRT tracks where road users most expect them, minimizes the impact on driveways and curb access, and provides recovery areas for errant pedestrians. Further, it readily allows left-turn lanes to be integrated into the overall right-of-way design. Side-aligned LRT operations in shared rights-of-way may result in diminished motorist and pedestrian expectancy, especially where minor cross streets are unsignalized and driveway access across the LRT is allowed. This type of side-aligned LRT operation creates an environment that may not be fully recognized by motorists and pedestrians and thus can contribute to confusion and accidents.” (Transit Cooperative Research Council 1996).

Another benefit of median-running LRT operation is that pedestrians boarding or alighting the transit vehicle need only cross half the roadway width and deal with traffic traveling in just one direction before reaching the sidewalk. In curbside operation, northbound passengers traveling to a destination on the west side of the street (and vice-versa) must cross the entire roadway width, including two sets of LRT tracks and multiple motor vehicle lanes traveling in both directions (Transit Cooperative Research Council 1996). The median-running LRT alignment (Option A) would also benefit non-transit-riding pedestrians when crossing Woodward, by providing refuge medians at station crossings.

Operating Speed

Either mainline option would result in significant gains in transit operating speed on Woodward compared with the existing bus service, but Option A provides the best performance. Average LRT operating speed is a function of stop spacing and the roadway speed limit (Vuchic 2007, 132-135). In general, systems with 400-meter stop spacing are limited to 30 KPH or lower operating speeds, 800-meter spaced systems to just over 40 KPH, and 1,200-meter spaced systems to around 55 KPH, assuming that speed limits allow (Vuchic 2007, 135). Trains operating mixed with traffic are further limited and generally do not exceed 20 KPH (Vuchic 2007, 311). With the close stop spacing of Option B, and assuming an average operating speed of 18 KPH when operating in mixed traffic, travel time from the State Fairgrounds to Foxtown would be 25 minutes, a 22% reduction when compared with the existing bus service. Option A is likely to result in faster operating speeds due to wider stop spacing and the more exclusive ROW. Total travel time from the State Fairgrounds to Foxtown for Option A would take only 18 minutes. This represents a further 28% reduction as compared with Option B and a 44% reduction as compared with the existing #53 bus service, which currently provides a scheduled 32-minute trip from the State Fairgrounds to Foxtown during normal weekday working hours (DDOT 2007).

Operating Costs

Mainline Option A is likely to result in lower operating costs than Option B. As transit vehicle speeds increase, fixed-route operating costs are likely to decrease because the same frequency of service can be achieved using fewer vehicles and drivers. In the case of Woodward Avenue, the current DDOT service operates on 8-minute headways for much of the day, requiring 12 buses and drivers operating concurrently. Mainline Option B would require approximately nine vehicles and drivers to maintain the same level of service, and Option A would require only six. The inverse relationship between speed and operating costs is a win-win for both transit riders and transit agencies. Furthermore, if LRT allows DDOT to reduce the cost of

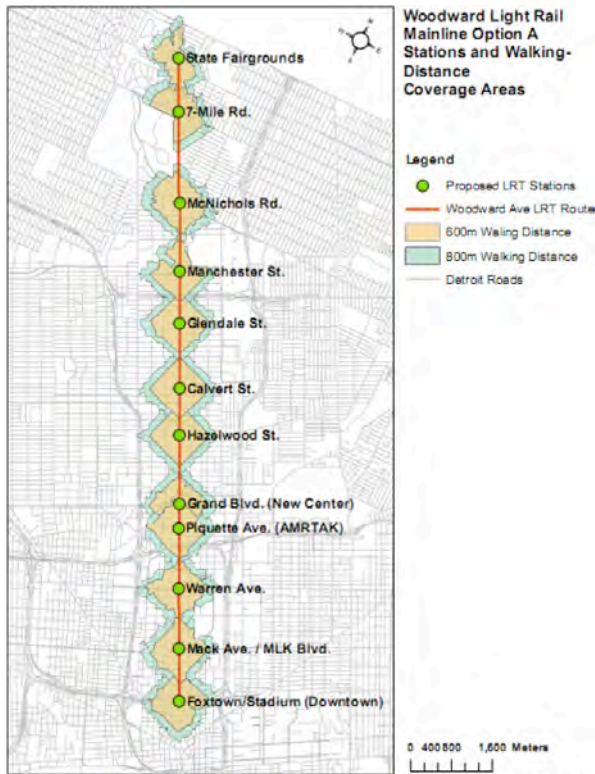


Figure 5: Woodward LRT Mainline Option A Station and Walking Distance Area
 Sources: Census 2000 TIGER Line Files obtained via ESRI, Woodward Light Rail Scoping Booklet
 Created by: Kevin McCoy, 2010

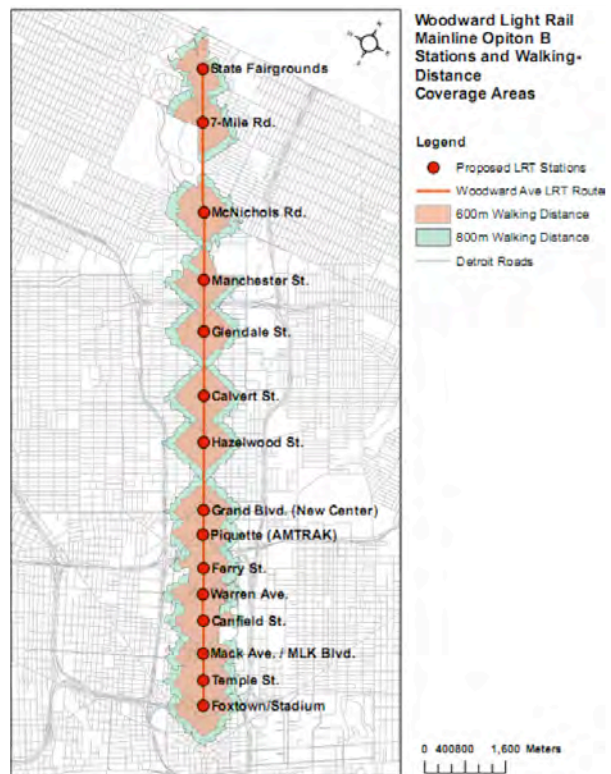


Figure 6: Woodward LRT Mainline Option B Station and Walking Distance Area
 Sources: U.S. Census 2000 TIGER Line Files obtained via ESRI, Woodward Light Rail Scoping Booklet
 Created by: Kevin McCoy, 2010

providing service on Woodward, it is possible that some of these funds, vehicles, and drivers could be redirected to other transit corridors where service is currently less frequent.

Implications

The City of Detroit is the only city in the U.S. of comparable size without a functional rapid transit system (Williams 2011). Yet, Detroit has high proportions of transit-dependent residents, and the area surrounding Woodward Avenue is no exception. In 2000, 35% of the residents living within 800 meters of Woodward Avenue were in poverty, and 42% of housing units in these same neighborhoods did not have a vehicle available at home (U.S. Census 2000). It is essential that planners and advocates for LRT consider the needs of the transit-dependent population first. At the very least, they must ensure that new transit developments aimed at attracting riders who currently have access to private vehicles (often called “choice riders”) do not come at the expense of those who rely heavily on transit. Happily, the Woodward Light Rail project meets these criteria because transit-dependent residents, nearby property owners, and suburban commuters can all benefit in both the short and long term.

Low-income and transit-dependent people living near Woodward Avenue stand to benefit somewhat from the Woodward Light Rail project in the short term because it represents an increase in service as compared to the current bus line. Those who are already using the bus will experience significantly reduced travel times, particularly under Mainline Option A. However, the LRT will be an incremental improvement over existing service, not a dramatic one. It is not likely to bring suburban job centers within easy reach or significantly expand access to distant services. This is especially true because the LRT system stops at the city limits (although riders will be able to transfer to the suburban bus system).

The long-term benefits to low-income and transit-dependent persons could be more significant if, as the system’s planners and benefactors hope, the LRT system is a catalyst for economic growth and reinvestment (DDOT 2007, 9.3). Detroit residents could see their transportation costs reduced through the benefits of proximity. Jobs, services, and other destinations that are currently distant or inaccessible via transit may locate along the Woodward corridor and significantly increase access to opportunities. This effect may not even be limited to Detroiters who live within walking distance of the transit line, because the existing bus network will link to

the LRT, and because some needed services are virtually absent within the 139-square mile city. Furthermore, if the system is extended into Oakland County, it will significantly expand access to suburban jobs and services. Because most of the matching funds required for federal funding will come from private sources, the Woodward LRT project largely avoids redistributing funds that could be used to strengthen the existing bus service that many Detroit residents rely on. In fact, as discussed above, the LRT could potentially improve bus service indirectly by freeing up drivers and vehicles formerly needed for the #53 bus service on Woodward.

The private M1 consortium has committed \$125 million to the development of the Woodward LRT project (Shea 2008), and their generosity will be rewarded. While theirs is a philanthropic gift, it is important to remember that the wealthy businesspeople involved in the consortium also stand to benefit from a Woodward LRT line. Many of the public faces of the M1 consortium are major property owners along Woodward Avenue, including some of Detroit's most prominent names (Shea 2008). Rail transit systems tend to have a significant positive effect on real estate values in close proximity. A 2002 study found that commercial land in a Santa Clara County, California business district increased in value by as much as 120% in less than ten years as a result of a rail transit investment (Cervero and Duncan 2002). It seems reasonable to expect that the businesspeople behind the M1 consortium will receive some return on their investment in the form of increased rents, profits from the sale of land, public prestige, and new development opportunities. Of the two mainline options, Option B would likely maximize the economic development potential of the land between the

New Center and Downtown by providing closer access to more parcels along the line than Option A. This is likely why M1 pushed to include Option B in the scoping process under the combined plan. M1 would also benefit from an expansion of the LRT into the Oakland County suburbs. Much of the development potential of the LRT comes from providing middle-class Oakland County residents with more attractive ways to access the city, particularly for entertainment, events, and commuting to work.

Suburban residents who live close to Woodward Avenue will not gain substantially from the Woodward LRT project, but even they will receive some benefits. Both mainline options are consistent with the Regional Transit Coordinating Council plan for rapid transit in the Detroit region, which was adopted by Wayne, Oakland, and Macomb counties, as well as the City of Detroit in 2008 (Shea 2010a). Nevertheless, the plans currently under consideration for Woodward Avenue stop short of the Oakland County border. This is in part because the cost estimates for extending the LRT three miles further north to 11-Mile Road in Royal Oak exceed the estimates for the entire section currently under consideration, and no source of funding has been identified for the local match required to receive federal funding (Shea 2010c). Another barrier to expansion is that suburban residents' property taxes do not contribute to DDOT's operating budget, as Detroit residents' taxes do (Shea 2010c). The problems associated with extending the Woodward line into Oakland County highlight the fractured nature of the region's transit system, as well as the lack of a regional transit authority (Shea 2010a). Perhaps the development of LRT on Woodward could spur the necessary political will to form a more integrated system for providing transit service in

	Total Population	White Population (% of total)	Minority Population (% of total)	Population of Residents 0-17 or 65+ year of Age (% of total)	Total Households	Owner-Occupied Households (% of total)	Renter-Occupied Households (% of total)
600m Walking Distance							
Mainline Option A	35140	5239 (15%)	29901 (85%)	12392 (35%)	15353	3170 (21%)	12183 (79%)
Mainline Option B	36816	5606 (15%)	31210 (85%)	13570 (37%)	16287	3224 (20%)	13063 (80%)
Increase in coverage from A to B	1676	367	1309	367	934	54	880
Percentage increase within coverage area from A to B	5%	7%	4%	4%	6%	2%	7%
800m Walking Distance							
Mainline Option A	47038	6412 (14%)	40626 (86%)	16143 (34%)	20631	4326 (21%)	16305 (79%)
Mainline Option B	47960	6541 (14%)	41419 (86%)	17159 (36%)	21123	4358 (21%)	16765 (79%)
Increase in coverage from A to B	922	129	793	1016	492	32	460
Percentage increase within coverage area from A to B	2%	2%	2%	6%	2%	1%	3%

Table 1: Population and Household Statistics of Census Blocks Within Walking Distance of Proposed Transit Stops
Source: U.S. Bureau of the Census, 2000

the Detroit region. Regardless, suburban residents can still expect to gain from the Woodward LRT project. Suburban commuters will be able to park their cars at the State Fairgrounds station and ride the Woodward LRT downtown to avoid expensive parking fees and roadway congestion.

Recommendation and Conclusion

Of the two mainline options currently under review, Option A is the better choice. While Option B does provide slightly increased coverage of neighborhood areas, and shorter walking distances to stops may make real estate development more attractive, these benefits are rather small or uncertain. Option A is the better choice because it is superior for pedestrian and motorist safety, provides significantly decreased travel times, and has the greatest potential to lower transit operating costs. The Woodward LRT project will result in significant short and long-term benefits to the city and the region. Concerns about the redistribution of transit funding to benefit wealthy suburbanites are moot because the proposed LRT line will not extend into the suburbs, and because much of the local funding will come from private donors. The project has great potential to spur economic development along the corridor, which would confer benefits to both private landowners and to city residents, who will experience increased access to jobs and services. Although the planned LRT will not initially extend beyond the city's borders, some suburban residents will still enjoy the benefits of park-and-ride access to the LRT system. It is also possible that desires to see the LRT system expanded could help foster the political will necessary to form a regional authority for transit service and to raise new revenues for financing regional transit investments. Furthermore, the Woodward Light Rail project could become a model for cooperation between local, state, federal, and private stakeholders.

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