Rolling Rapid Transit

The Tri-County Triangle and Area 4 (The Western Connection to Ann Arbor)

Overview

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The Regional Transit Coordinating Council (RTCC) approved a transit plan for the tri-county region in December 2008. As a step to implement part of that plan, we describe here a **110 Mile** long Rolling Rapid Transit (RRT) service which will operate on the Tri-County Triangle, connecting the cities of Detroit, Birmingham and Mt. Clemens, and many communities in between, plus "Area 4", that includes two route options: a route from downtown Detroit to Metropolitan Airport and another route that runs from downtown Detroit to Ann Arbor, with a stop at Metropolitan Airport.

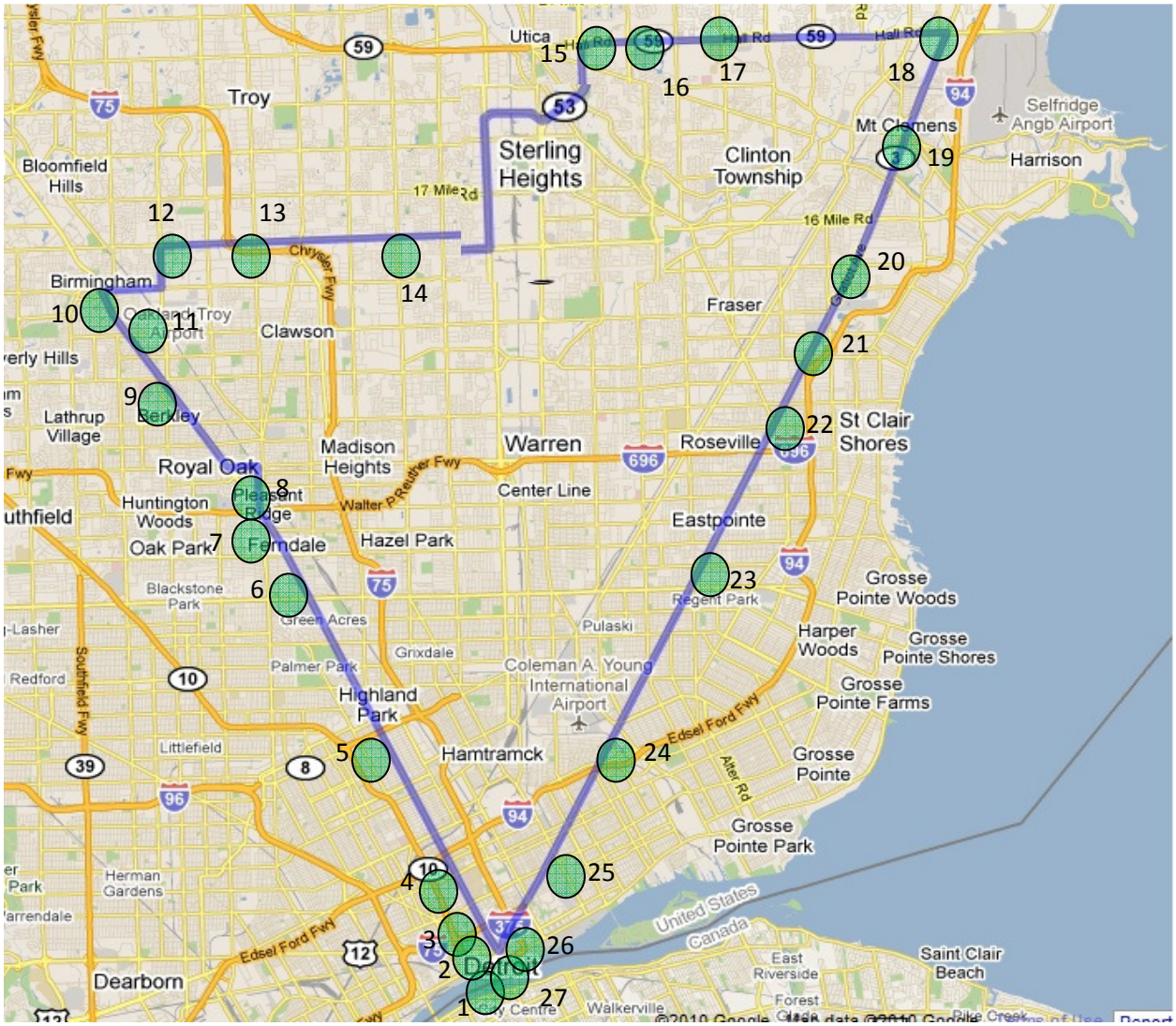
This service will feature multi-door articulated 60 foot hybrid powered rubber-tired vehicles running on streets which have been modified in various ways to improve travel time between stations. The vehicles stop on average every 2¼ miles at locations which resemble a station more than a stop. The corridor routes are designed to serve high-use destinations, densely populated housing areas, entertainment venues, employment and retail areas, and to make as many connections as possible with existing transit services. We also identify locations of possible park-and-ride lots conveniently located to facilitate transit use by motorists.

Here is a preliminary cost estimate; the basis for each estimated item is given below. We divide the route into four "legs" for purposes of analysis; in fact operationally it may make the most sense to operate the northern triangle as a bidirectional loop (for maximum ease of passengers, eliminating many transfers).

	Gratiot Arterial	**Woodward Arterial**	**Oakland-Macomb Cross-County**	**Michigan *The Western Connection***	**TOTAL**
Route Miles	23.1	17.2	22.6	47.3	**110.2**
Class A Station	$500,000	$500,000		$1,000,000	**$2,000,000**
Class B Station	$720,000	$1,200,000	$360,000	$240,000	**$2,520,000**
Vehicle Cost Allocation	$8,790,000	$6,540,000	$8,590,000	$9,200,000	**$33,120,000**
Planning	$8,800,000	$6,400,000	$8,600,000	$7,700,000	**$31,500,000**
Transitway Cost	$116,660,000	$86,860,000	$114,130,000	$102,000,000	**$419,650,000**
Total	**$135,470,000**	**$101,500,000**	**$131,680,000**	**$120,140,000**	**$488,790,000**

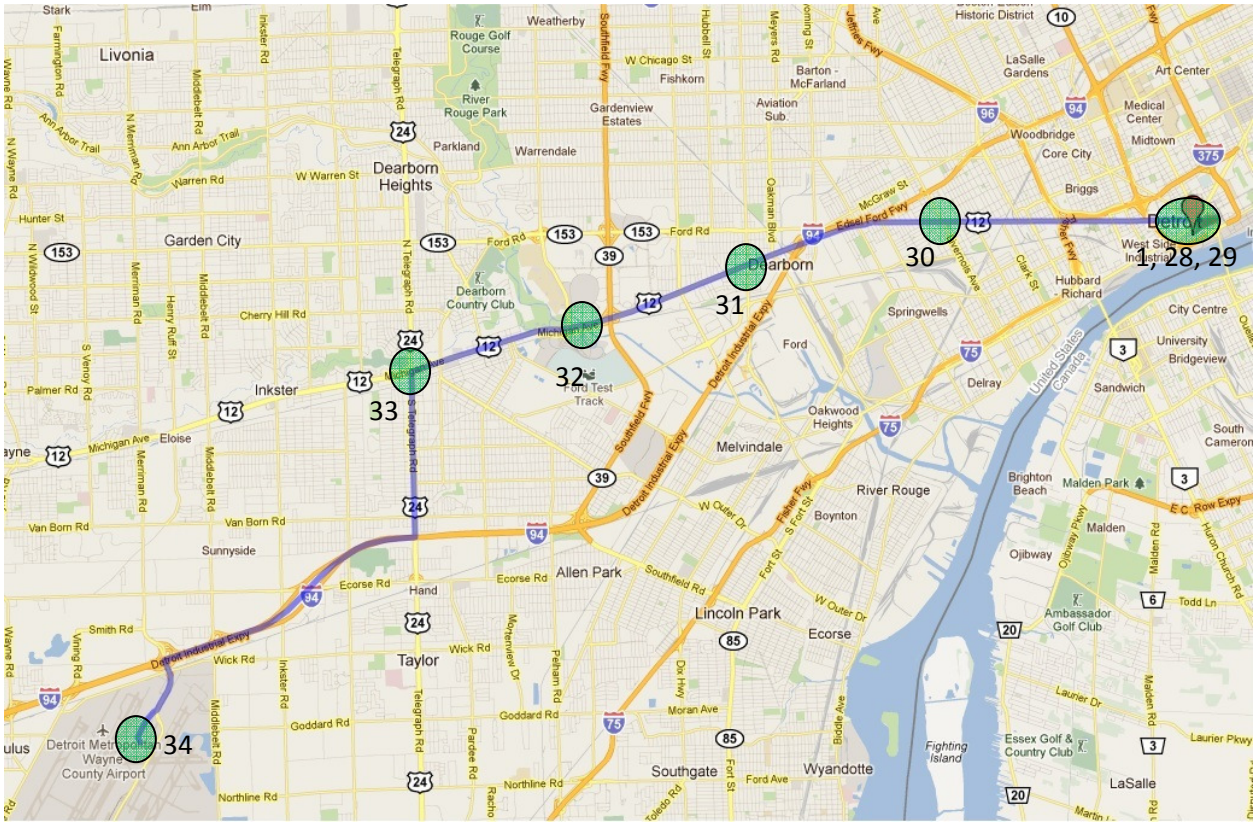
NOTE: Station costs per corridor are based on proposed station locations detailed below. Vehicle, transitway and planning costs are allocated based on corridor mileage as a percent of total route miles.

ROUTE DETAIL. Map of proposed Tri-County Triangle RRT



Station Locations		
Wayne County	**Oakland County**	**Macomb County**
1 Downtown Detroit	6 Ferndale	15 Delco
2 Foxtown	7 Detroit Zoo	16 Lakeside
3 Cultural Center	8 Royal Oak	17 Garfield
4 New Center	9 Coolidge	18 Selfridge
5 Highland Park	10 Birmingham	19 Mount Clemens
24 City Airport	11 Troy Transit Center	20 Clinton Township
25 East Grand Boulevard	12 Somerset	21 Masonic
26 Eastern Market	13 Troy Center	22 Roseville
27 Ford Field	14 Dequindre	23 Eastpointe

Map of proposed Western Connection RRT showing service from Detroit to Metro Airport
(For through service to Ypsilanti and Ann Arbor see following page.)



Station Locations
1 Downtown Detroit
28 Washington
29 Third
30 Livernois
31 Schaefer
32 Dearborn Transit Center
33 Telegraph
34 Metro Airport
35 Ypsilanti (see next page)
36 Ann Arbor (see next page)

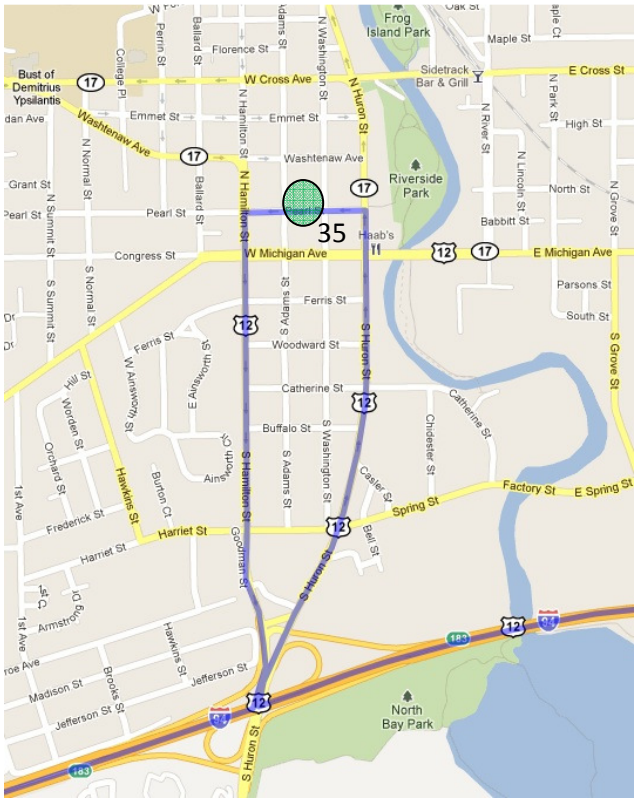
Notes: Through trips to Ann Arbor stop at stations in **boldface**. Trips westbound from Metro Airport operate via I-94. The Washington station is adjacent to the Rosa Parks Transit Center.

Services along the Area 4/Western Connection Corridor:

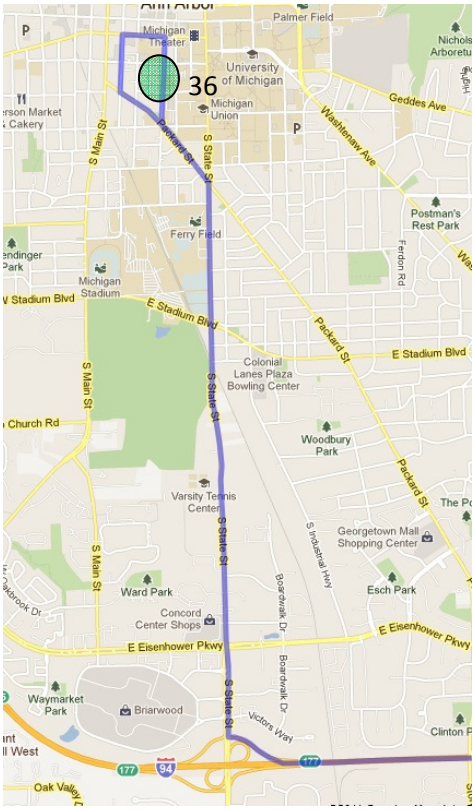
There are two services proposed to operate partly along the same corridor but with different service parameters. Some trips run between Detroit and Metro Airport; these are frequent trips and stop at eight stations including the endpoints. Less frequent trips run between Detroit and Ann Arbor via Metro Airport, and since these are much longer trips they make fewer stops, stopping only at the Downtown Detroit, Dearborn Transit Center, Metro Airport, Ypsilanti and Ann Arbor stations.

Service to Ypsilanti and Ann Arbor – Proposed Route

Service to Ypsilanti and Ann Arbor – Proposed Station Locations



Ypsilanti service – station is at Ypsilanti Transit Center



Ann Arbor service – station is at Blake Transit Center

SERVICE DETAIL.

The Downtown Detroit Station:

All downtown Detroit routes will stop at a Type A station (see below) to be constructed just to the northeast of Campus Martius Park, a location which is a short walk from many major downtown business locations, a short walk to many nearby transit connections, and a beautiful setting in which to encounter downtown. Campus Martius is an important place in Detroit's history as well, and in the middle of Campus Martius is the "datum point" for the City of Detroit, that is, the point from which the entire City was surveyed. The Western Connection RRT trips to Metro Airport stop at the Rosa Parks Transit Center to serve the many bus travelers who transfer at that point.

Headways – Triangle, and Western Connection from Detroit to Metro Airport:

Service is proposed to be every 15 minutes in each direction for the weekdays during the day (before 8 p.m.), and 20 minutes nights and weekends. Service will run from 6 a.m. to 11 p.m. weekdays and Saturdays and 7 a.m. to 8 p.m. Sundays. Service may be extended or enhanced for special events.

Headways – Area 4/Western Connection from Detroit to Ann Arbor via Metro Airport:

Service is proposed to be **once per hour in each direction from 6 a.m. to 10 p.m. weekdays** and Saturdays and 7 a.m. to 8 p.m. Sundays. Service may be extended or enhanced for special events. This service makes limited stops between Detroit and Metro Airport (see details on pages 3-4).

Vehicles:

This service will use articulated multi-door low-floor rubber-tired vehicles with features similar to light rail vehicles. Here is an example of one such vehicle.

Stations:

There will be three varieties of stations. One type we will here refer to as **Type A**, and it is a substantial enclosed and heated building which might include restrooms, vendor stalls (e.g. coffee shop or newsstand), next-vehicle information and fare media vending machines. The second type we will refer to as **Type B**, which is enclosed and heated, less substantial than Type A, does not include restrooms or vendor stalls, but does include next-vehicle information, fare media vending machines, and possibly other vending machines. The **Type C** station is at locations (such as the Troy Transit Center) where the vehicle is stopping at a station created by others, and this will include whatever amenities the property's owner/manager has chosen to include.

Fare media vending machines

Ticket vending machines will be provided at all stations and therefore the vehicles will not accept on-board fare payment, which speeds the boarding process. Vehicles on some systems spend 30% of total travel time waiting at stops for passengers to pay while boarding, and on a system such as this delays of this type will increase travel times. Stations can be configured such that boarding areas are only available to passengers with valid fare media, or other validation processes may be employed.

What makes this "rapid transit"?

Fixed Guideway: For nearly the entire route, RRT vehicles will operate in exclusive lanes, unimpeded by other traffic. This will take different forms, such as curb-separated lanes and paint-reserved lanes, based on the configuration of roads and intersections at various points along the route.

Limited Stops: Unlike local or limited service, which stops every ⅛ to ½ mile, on average the RRT stops every 2¼ miles, which improves travel times.

Rail-like vehicles and rail-like stations: Although the vehicles are rubber-tired, they have the size and configuration (and appearance) of light rail vehicles, and the stations also are more like light-rail stations than bus stops.

Traffic signal Priority: We will improve transit performance by employing transit-only lanes approaching traffic signals, and the signal controller will incorporate a transit-beneficial signal phase.

Communities Served

Communities Directly On the Route			
Wayne County	**Oakland County**	**Macomb County**	**Washtenaw Co.**
Detroit	Ferndale	Sterling Heights	Ypsilanti
Highland Park	Pleasant Ridge	Shelby Township	Ann Arbor
Dearborn	Huntington Woods	Macomb Township	
Dearborn Heights	Royal Oak	Mount Clemens	
Taylor	Berkley	Clinton Township	
Romulus	Birmingham	Roseville	
	Troy	Eastpointe	

There are an additional **39 communities** all or partly within 5 miles of the system.

Population Served

Directly serves a combined 22-community population of **1,950,000**. Approximately **2.7 million** people live within 5 miles of the system.

Transit Connections

- Detroit People Mover
- Transit Windsor
- Amtrak (Wolverine service at Detroit, Dearborn, Royal Oak and Birmingham Stations)
- MegaBus and Michigan Flyer
- Detroit-Ann Arbor Commuter Rail (when that service begins operations)
- 33 DDOT bus routes (see detail below)
- 41 SMART bus routes (see detail below)
- 15 AATA bus routes in Ann Arbor and 8 AATA bus routes in Ypsilanti
- Commercial Airline transit at Metropolitan Airport

Economic Development

Dense pockets of development have traditionally centered around permanent transportation infrastructure in the United States: First canals, then train stations, later expressway interchanges, and now, more and more, modern transit facilities. Transit systems of the type projected here – with dedicated running way, frequent service, sleek, modern vehicles, and modern, well-designed stations – have been shown to generate economic development in value ranging from 200% to 400% of the capital investment in the system. These improvements center around station locations and generally are enhanced by the community's efforts to encourage Transit-Oriented Development.

Transit-Oriented Development near the East Liberty Transit Station, Pittsburgh PA. Photo: Payton Chung.

Cost Estimating - Capital

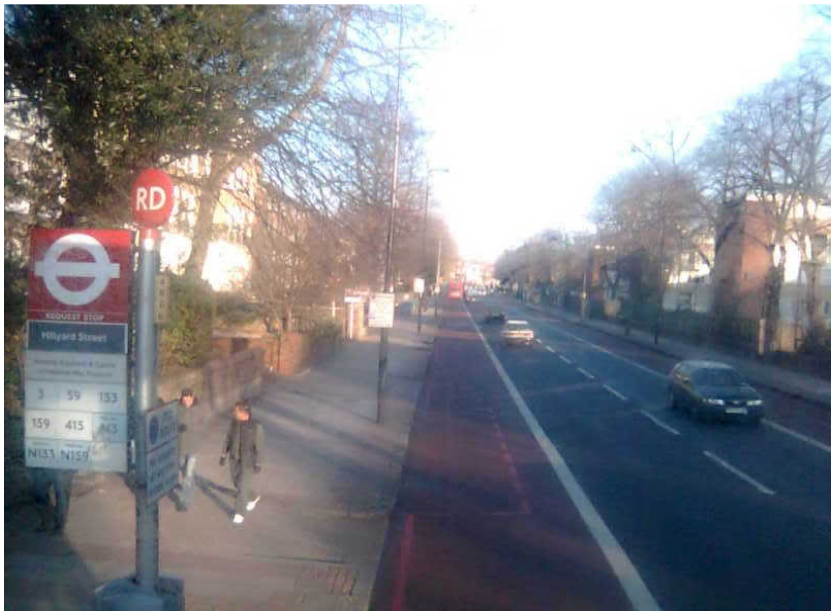
Vehicles. In order to run 15 minute headways, and include 10% more vehicles than required (to be able to handle service issues and maintenance), the number of vehicles required depends on the average speed of the vehicle. We estimate the vehicles will attain an average speed of 24 mph, and therefore **36 vehicles** are required. At a projected cost of $920,000 per vehicle, the cost of vehicles will be **$33,120,000**.

Stations. There will be a Type A station in downtown Detroit, one in the Wayne State area, one in downtown Mt. Clemens and one in Ann Arbor, and the rest are Type B, which totals 4 Type A and 63 Type B stations. If we assume a cost of $500,000 for a Type A station and $40,000 for a Type B station, then the total cost for stations is $4,520,000.

Road Improvements. The vehicles will operate on dedicated but not grade-separated transitways. Based on a study of similar systems, such as the Eugene-Springfield (OR) "Emerald Express", we project an average cost per mile for road and signal improvements of $5,050,000. This leads to a total transitway improvement cost of $419,650,000 for the entire loop. Service on the Western Connection west of Metro Airport is primarily on I-94 which does not need any improvement to support this service.

Cost Estimating - Operating

Based on the operating characteristics described above, the **gross cost** to operate this service will be approximately **$20,500,000** per year. This is based on a per-vehicle-hour cost of $123 to $124, and 3,200 vehicle-hours per week. This does not take into account fare box revenue, sale of advertising on vehicles or stations, efficiencies gained by any reduction in parallel corridor services, or any other efficiencies.



In this photo of a European transit system, the curb lane, painted red, is reserved for transit vehicles. Other systems use physical separation methods such as bollards or an interlane curb. On a long system such as what is described herein, different route segments may call for different treatments.

Appendix A: Proposed route for each segment

Woodward Corridor from Campus Martius to TTC: (route described south to north; reverse is identical) Woodward north to Washington (in Royal Oak), north to 11 Mile, west to Woodward, north to M-1 split from Woodward in Birmingham (stay on M-1), north to Maple, right Maple to TTC

Gratiot corridor from Mt. Clemens to Detroit: (route described north to south, reverse is identical) Gratiot south to Randolph south to Monroe southwest to Campus Martius to Woodward north.

Macomb-Oakland corridor from TTC to Mt. Clemens: (route described west to east; reverse is identical): From **TTC** to Maple, east on Maple, north on Coolidge, east on Big Beaver, north on Mound, East on 18½ Mile, north on M-53 Freeway, exit at M-59, east on M-59, pull in to off-street stations at stations #17, 18 and 19. South on Gratiot to downtown Mt. Clemens.

Western Connection from Detroit to Metro Airport (selected trips to Ann Arbor: (route described east to west; reverse is identical): Michigan west to Telegraph south to I-94 west to Merriman/Rogell Drive south to Metro Airport drop-off locations. Selected Trips: west on I-94, north on Huron, west on Pearl, south on Hamilton, west on I-94, north on State, northwest on Packard, north on Main, east on Liberty, south on 4th. Leaving Transit Center: south on 4th, southeast on Packard.

Appendix B: Proposed station locations

Stations:

Note: The first 27 stations are on the triangle and are numbered clockwise, from the Detroit CBD to TTC then to the Mt. Clemens CBD and finally back to Detroit. Stations 28-36 are on the Western Connection and are numbered from east to west

1 **Downtown Detroit:** location just northeast of Campus Martius Park including **Compuware** and other major employment centers. Justification: CBD, major employment center, very many connecting buses

2 **Foxtown:** Woodward at Adams/Grand Circus Park. Justification: Major entertainment center (Foxtown, Comerica Park), new residential condos very near to the north, **People Mover station** nearby

3 **Cultural Center**: Woodward at Warren. Justification: **Wayne State**, **Cultural Center**, **Medical Center**, connect to DDOT 14 Crosstown. Connect to ***crosstown ART service*** when implemented. **Possible location for a fully functional transit station.**

4 **New Center:** Woodward between Milwaukee and Grand Blvd. Justification: Major employment center, Fisher Theatre & Office building, State of Michigan Office building, Henry Ford Hospital, connect to Amtrak

5 **Highland Park:** Woodward at Manchester Parkway. Justification: Serves Highland Park; significant retail center; connection to several DDOT buses and the SMART 495 bus

6 **Ferndale:** Woodward near 9 Mile. Justification: Ferndale CBD, connection to SMART 710 bus

7 **Detroit Zoo**: Woodward at Washington. Justification: Major tourist destination, significant high-density housing development, possible park-and-ride location

8 **Royal Oak:** Washington or Sherman at **Royal Oak Transit Center.** Justification: CBD, connection to several SMART buses

9 **Coolidge:** Woodward near 13 Mile/Coolidge intersection. Justification: Major employment center (**Beaumont Medical Center**), significant retail center

10 **Birmingham:** Near intersection of M-1 and Maple. Justification: 2 blocks to CBD

11 **Troy Transit Center (TTC):** Near Maple and Eton (to be built). Justification: Connection to SMART buses and Amtrak

12 **Somerset:** Big Beaver east of Coolidge. Justification: Major retail center, conforms to transit needs identified in Troy Big Beaver Corridor Redevelopment Plan

13 **Troy Center:** Big Beaver west of Livernois. Justification: Significant employment center, near I-75 for possible park-and-ride

14 **Dequindre:** Big Beaver west of Dequindre. Justification: Retail center, connection to SMART 494 bus

15 **Delco:** M-59 just east of M-53 - At this location only one station is required and buses in both directions must access a single station, on the same side of M-59 as a park-and-ride lot. Justification: Possible park-and-ride (near M-53 freeway)

16 **Lakeside**: M-59 between Schoenherr and Hayes - At this location only one station is required and buses in both directions must access a single station, preferably within the Lakeside shopping center property. Justification: Major retail center, connection to SMART 510 bus

17 **Garfield:** M-59 near Garfield - At this location only one station is required and buses in both directions must access a single station. Justification: **Partridge Creek,** a major retail center, **Macomb Community College**, connection to SMART 550 bus.

18 **Selfridge:** Gratiot near (south of) M-59. Justification: Possible park and ride, hotel nearby, connection to SMART 560/565 buses, very close to Selfridge ANG base and access to North Macomb and St. Clair county.

19 **Mount Clemens**: Near Cass Avenue in Mt. Clemens. Justification: CBD, **Macomb county office buildings** and connection to SMART 560/565 buses

20 **Clinton Township**: Gratiot at 15 Mile. Justification: Retail center, connection to SMART 560/565 and 780 buses

21 **Masonic:** Gratiot near Masonic - Macomb Mall stop location might be used; if not, **Macomb Mall** buses should change to the location of this BRT station. Justification: Significant retail area, connection to many SMART buses

22 **Roseville**: Gratiot near 12 Mile. Justification: Retail center, connection to SMART 740 bus

23 **Eastpointe**: Gratiot near 9 Mile. Justification: Eastpointe civic center, retail area, connection to SMART 710 bus

24 **City Airport:** Gratiot at East Outer Drive. Justification: Airport; connect to DDOT 38 Plymouth-Caniff and 76 Hayes Ltd

25 **East Grand Boulevard**: Gratiot near Grand Blvd. Justification: connect to DDOT 14 Crosstown. Connect to crosstown ART service when implemented.

26 **Eastern Market:** Gratiot near Russell. Justification: Office area, Eastern Market, connect to DDOT 40 Russell.

27 **Ford Field:** Gratiot near Madison. Justification: Ford Field, WSU Medical Center, Greektown Casino, District Court

28 **Washington:** Michigan at Washington. Justification: Downtown hotels; Rosa Parks Transit Center; connection to SMART 510/515 and 560/565 buses and many DDOT bus routes.

29 **Third:** Michigan at Third. Justification: Hotel/casino and office buildings nearby.

30 **Livernois:** Michigan at Livernois. Justification: Shopping nearby; connect to DDOT 30 Livernois bus and switch to/from DDOT 37 Michigan bus for local west-side trips.

31 **Schaefer:** Michigan at Schaefer: Justification: east Dearborn retail/office area; connect to DDOT 41 Schaefer bus and switch to/from DDOT 37 Michigan bus and SMART 200 Michigan bus for local trips in Dearborn.

32 **Dearborn Transit Center:** Michigan near Southfield at new Transit Center (to be built). Justification: Connect to Amtrak and eventual Detroit to Ann Arbor Commuter Rail; many SMART and DDOT buses are planned to use this station when built.

33 **Telegraph:** Michigan at Telegraph. Justification: Retail area; connect to SMART 275 Telegraph bus. Possible park-and-ride location.

34 **Metro Airport:** Both major terminals within the airport property.

35 **Ypsilanti Transit Center:** Pearl and Washington. Not far from I-94, central city, near EMU, many AATA bus connections.

36 **Ann Arbor Blake Transit Center:** 4th and William. Near U of M campus, many AATA bus connections.

This gives a total of **36** stations on a 110 mile long system (not including the Washtenaw County service), or 1 station every 2¼ miles on average.

Appendix C: Transit Connections (DDOT, SMART and AATA)

DDOT Connections within a 2 block walk			
7 Cadillac-Harper	21 Grand River	34 Gratiot	46 Southfield
10 Chene	22 Greenfield	36 Oakland	47 Tireman
13 Conner	23 Hamilton	37 Michigan	48 Lafayette-Van Dyke
14 Crosstown	25 Jefferson	38 Plymouth	49 Vernor
15 Chicago-Davison	27 Joy	39 Puritan	53 Woodward
16 Dexter	29 Linwood	40 Russell	54 Wyoming
18 Fenkell	30 Livernois	41 Schaefer	60 Evergreen
19 Fort	31 Mack	43 Schoolcraft	76 Hayes Limited
			78 Imperial Limited

SMART Connections within a 2 block walk			
125 Fort	280 Middlebelt South	510 Van Dyke	710 Nine Mile
135 Southshore Exp	305 Grand River	515 Van Dyke Limited	730 Ten Mile
140 Southshore	415 Greenfield	530 Schoenherr	740 Twelve Mile
145 Carlysle	420 Southfield	550 Garfield	760 13/14 Mile
150 Allen-Wick	430 Main St	559 Auburn Hills - Roseville	780 Fifteen Mile
190 Taylor Flyer	445 Woodward Ltd - Blmfd	560 Gratiot	805 Grand River P&R
	465 Auburn Hills Limited	565 Gratiot Limited	830 Downriver P&R
200 Michigan	450 Woodward - Pontiac	580 Harper	851 W Blmfd - Fmgtn P&R
202 Romulus	460 Woodward - Troy	610 Kercheval-Harper	
245 Cherry Hill	465 Auburn Hills Limited	615 Kercheval-Jefferson	
255 Ford Rd Express	475 Woodward Ltd - Troy	620 Charlevoix	
275 Telegraph	494 Dequindre	635 Jefferson Express	

AATA Connections at the Transit Centers		
Ypsilanti	Ann Arbor	
3 Huron River	1 Pontiac	9 Jackson - Dexter
4 Washtenaw	2 Plymouth	12 Miller - Liberty
5 Packard	3 Huron River	13 Newport
6 Ellsworth	4 Washtenaw	15 Scio Church - W Stadium
10 Ypsilanti - Northeast	5 Packard	16 Ann Arbor - Saline Rd
11 Ypsilanti - South	6 Ellsworth	17 Amtrak - Depot St
20 Ypsilanti - Grove - Ecorse	7 South Main - East	18 Miller - University
33 EMU Shuttle	8 Pauline	

Appendix D: Rolling Rapid Transit vs. Light Rail and vs. Fixed Route Bus

In the above white paper we describe one form of enhanced transit service. Light Rail is another popular mode, so here we discuss the benefits of RRT over Light Rail. It is also useful to consider why to implement RRT vs. simply providing more fixed route bus service on the corridor. In both cases, the benefits of RRT have to do with scale and economics.

RRT vs. Light Rail:

- RRT can be built for one-fifth or less the cost of Light Rail
- An RRT system can be constructed in one-third or less of the time to construct Light Rail
- Passenger carrying capacity per vehicle is nearly identical
- Operating speed is the same

RRT vs. Fixed Route Bus Service

The fixed route bus service we have in southeast Michigan today is essential, delivering people to within walking distance of thousands of destinations. What RRT will do, which fixed route service cannot, is transport people quickly across long distances at low cost. The reasons have to do with fuel efficiency, capacity, and the effect of spacing stations far apart.

Fuel Efficiency: A hybrid articulated RRT vehicle is 30% to 50% more efficient, in fuel-use per mile traveled, than a fixed route bus operating under the same conditions. In addition, the service mode reduces fuel costs even more, since vehicles are always more fuel efficient while traveling than when stopping and starting. A fixed route bus might stop as often as every ⅛ to ¼ mile; an RRT vehicle stops on average once every 2 miles. Finally, because the RRT vehicle has higher passenger capacity, the fuel efficiency in terms of passenger-miles per gallon is much higher for RRT than it ever can be for fixed route service.

Capacity: A single driver is required for any transit vehicle, no matter the number of passengers. So in terms of labor cost, a vehicle which carries more passengers is more efficient. The RRT vehicle can comfortably transport about 100 passengers including those who stand, far more than any typical fixed-route vehicle. With increased capacity, of course, the number of vehicles required is also reduced.