BEST: Gratiot Avenue

Tier 1 Analysis: Mode Selection

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REGIONAL TRANSIT AUTHORITY OF SOUTHEAST MICHIGAN

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1 Introduction

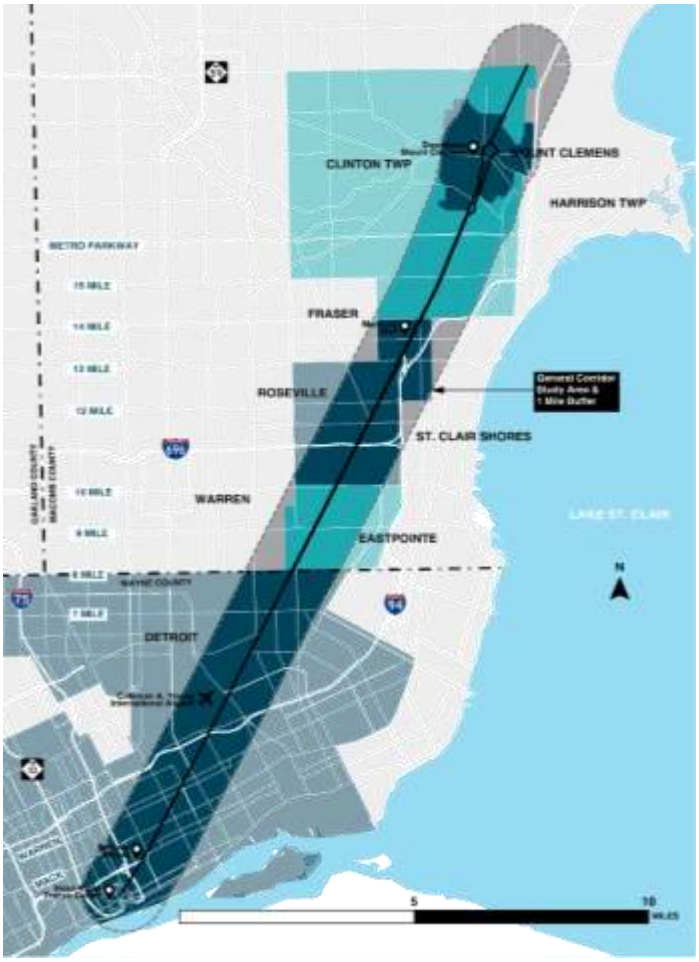
1.1 Project Description

The Building Equitable Sustainable Transit (BEST): Gratiot Avenue Corridor Study represents a crucial early step in the development of enhanced transit along Gratiot Avenue. This 12-month study is being led by the Regional Transit Authority of Southeast Michigan (RTA); it includes the development and evaluation of multiple rapid transit alternatives between Downtown Detroit and M-59 (Hall Road). The study area spans the 23-mile Gratiot Avenue corridor that serves portions of Wayne and Macomb counties. BEST: Gratiot Avenue was initiated in April 2015 and the selection of a Locally Preferred Alternative (LPA) is anticipated in March 2016.

The corridor communities along Gratiot Avenue include five cities and townships in Wayne and Macomb Counties:

- Clinton Township
- Detroit
- Eastpointe
- Mount Clemens
- Roseville

FIGURE 1-1. STUDY AREA



The study area includes a two-mile wide buffer centered on Gratiot Avenue, as represented in Figure 1-1. The study features a multi-phase, iterative alternative development and evaluation process supported by input from study's Advisory Committee. Committee membership is comprised from all of the municipalities, counties, transit agencies and other key institutional stakeholder. The process is also supported by extensive public engagement activities. Upon completion of the alternatives analysis, the RTA Planning and Service Coordination Committee will recommend the Locally Preferred Alternative (LPA) to the RTA Board of Directors (Board) for adoption. The LPA will be the transit investment alternative that best meets the Purpose and Need for the project (as defined in this report) is competitive for Federal Transit Authority (FTA) New/Small Starts capital funding. It will consist of a mode, an alignment, generalized station locations, and associated modifications to the existing system to support the LPA. The RTA Board will submit the LPA to the Southeast Michigan Council of Governments (SEMCOG), the region's Metropolitan Planning Organization, for adoption into its 2040 Regional Transportation Plan for Southeast Michigan.

The study is scheduled for completion in the spring of 2016.

1.2 Summary of Project Purpose and Need

The purpose of this study is to identify the most feasible alternative(s) for high-capacity rapid transit along the Gratiot Avenue corridor from Downtown Detroit to Mount Clemens and M-59 (Hall Road). The objectives are to provide additional mobility options for both dependent and choice transit users, improve transit capacity and reliability, support ongoing economic development efforts within the region, encourage additional investment along the corridor, and connect with other rapid transit corridors that have been identified.

1.2.1 NEED #1 – IMPROVE AND INCREASE MOBILITY OPTIONS ALONG THE CORRIDOR

Transit along the Gratiot Avenue corridor serves several population segments that are currently dependent on transit for their daily mobility needs. The current fixed routes along the corridor are operating at or near capacity and operated by two different transit providers: Detroit Department of Transportation (DDOT) and the Suburban Mobility Authority for Regional Transportation (SMART). The gaps in service coverage, both in terms of area of coverage and in frequencies of these fixed routes, create a less viable travel option among other transit sensitive population groups that could benefit from a frequent, reliable one seat ride.

1.2.2 NEED #2 – PROVIDE FREQUENT, RELIABLE, ONE-SEAT TRANSIT SERVICE THAT GENERATES ADDITIONAL TRIPS AND ATTRACTS NEW RIDERS TO TRANSIT

There are two main transit routes along Gratiot Avenue, one includes DDOT Route 34 which operates from Downtown Detroit to 8 Mile Road and the other is SMART Route 560 which provides service between 23 Mile Road in Macomb County and Downtown Detroit. In addition, SMART Route 565 is a commuter route service that has three morning inbound and three afternoon outbound trips. The function of these routes, both individually and as a system, can be inefficient and lack the ability to compete with automobiles.

1.2.3 NEED #3 - STIMULATE ECONOMIC DEVELOPMENT ALONG THE CORRIDOR

The Gratiot Avenue corridor within the City of Detroit has been hit hard during the last fifteen years, resulting in population loss along the Gratiot Avenue corridor and in the cities of Detroit and Mount Clemens. Nationally, rapid transit investment has been shown to increase economic development within a corridor by $3-4 dollars for every $1 dollar spent (American Public Transit Association - Public Transportation: Moving America Forward, 2010). A transit investment in the corridor will assist in increasing the economic development along this corridor.

1.2.4 NEED #4 - RETAIN AND ATTRACT PEOPLE OF ALL AGES TO THE AREA BY INCREASING THE QUALITY OF LIFE

The communities along the Gratiot Avenue corridor have lost approximately 26 percent of their population during the last fifteen years. Studies have shown that adding enhanced transit along a corridor, with the placement of stations in strategic locations will retain and attract more people to a corridor.

1.2.5 NEED #5 - DEVELOP A TRANSIT SYSTEM THAT IMPROVES CONNECTIVITY BETWEEN ORIGINS AND KEY DESTINATIONS, INCLUDING MAJOR REGIONAL EMPLOYERS

There are many significant destinations along Gratiot Avenue between Downtown Detroit and M-59 (Hall Road) which could be better served by improved transportation options, including major employers, downtown districts, major shopping centers, recreational, educational, medical facilities, and community services.

2 Goals and Objectives

Table 2-1 presents the goals and objectives that were developed in response to public and stakeholder input gathered throughout the first phase of the planning process along with technical analysis that examined the current and future conditions of the Gratiot Avenue Corridor.

TABLE 2-1. BEST: GRATIOT GOALS AND OBJECTIVES

GOAL	OBJECTIVE
Provide a reliable alternative to driving	Improve on-time performance and frequency of service
Provide transportation options for people that cannot drive or do not have access to a car	Increase transit accessibility
Stimulate economic development along the corridor	Provide transit service that can influence more mixed-use development along the corridor
Retain and attract people of all ages to the area	Provide flexible, reliable transportation options
Provide a service that is competitive with vehicular travel times	Improve transit travel times and speeds within the study area
Provide one-seat transit service between Macomb County and Detroit during the mid-day	Reduce the number of transit trips that require a transfer
Develop a transit system that improves connectivity between origins and key destinations, including major regional employers	Provide convenient and accessible transit service to activity centers
Improve safety for all users along the corridor including those using transit, non-motorized, and vehicular	Identify improvements at high crash locations and separate modes where feasible, provide a system with security features at stations
Reduce traffic congestion within the region	Provide additional transit options that are competitive with the automobile to promote a mode-shift
Develop a rapid transit system that is economically viable for the region	Provide transit service that can be constructed, operated and maintained at low costs
Provide a transit service that is integrated with a multi-modal transportation network	Provide connections to non-motorized facilities that are along or cross the corridor and design a system that can enhance the non-motorized experience along Gratiot Avenue

3 Overview of Project Process and Evaluation Criteria

In order to evaluate the different transit modes and alignment options and identify the appropriate mode-alignment pairings that will define the detailed alternatives, the BEST: Gratiot Avenue study will follow a three-step method:

The first step ("Tier 1: Fatal Flaw Analysis") is an assessment of each mode relative to overall implementation viability. This will be a pass-not pass analysis which is described in this document. This step could also include an assessment of alignment alternatives. The Gratiot Corridor does not have any parallel corridors that would serve the same market and therefore this level of analysis will focus solely on mode.

The second step ("Tier 2: Detailed Evaluation") is an assessment of the mode(s) that passed the Tier 1 Analysis. Alignment/station options will be developed and evaluated. A separate document will detail the methodology and evaluation for those options.

The third step will result on the identification of the Locally Preferred Alternative (LPA). The alternative(s) that fare(s) best against the detailed criteria in the second step will be further refined in the third step ("Tier 3: Refine the LPA"). The LPA document will detail this evaluation.

The evaluation criteria associated with each step combine quantitative and qualitative performance measures. The Tier 1 phase will apply fewer and broader measures, including information from previous corridor/area studies, than Tier 2. The Tier 2 phase will apply more and finer performance measures and will identify the Preferred Alternative(s); the third step will evaluate the Preferred Alternative(s) against Federal New Starts criteria to determine the LPA. This three-step process will result in the identification of an LPA that not only meets locally-identified project purpose and needs, but is also eligible and competitive for federal funding.

Table 3-1 presents the evaluation criteria that will be used during the three steps of alternative evaluation. Note that each successive step builds upon the criteria from the previous step, ensuring a consistent rating throughout.

TABLE 3-1. BEST: GRATIOT EVALUATION CRITERIA

GOAL	TIER 1: FATAL FLAW ANALYSIS (QUALITATIVE)	TIER 2: DETAILED EVALUATION (QUALITATIVE AND QUANTITATIVE)	TIER 3: REFINE THE LPA (QUALITATIVE AND QUANTITATIVE)
Provide a reliable alternative to driving	Reliability / Improve on-time performance	Service Plan Opportunities Transit travel time	Congestion relief*
Provide transportation options for people that cannot drive or do not have access to a car	Social Equity / Accessibility	Proximity to/number of zero car and transit dependent households	Mobility improvements*
Stimulate economic development along the corridor	Economic development potential	Land use and economic development opportunities	Economic development* Land use*
Retain and attract people of all ages to the area	Flexibility / Reliability	Service Plan Opportunities Transit travel time Connections to multi-modal systems	Economic development*
Provide a service that is competitive with vehicular travel times	Potential for Mode Shift	Transit travel times Ridership	Congestion relief*
Provide one-seat transit service between Macomb County and Detroit during the mid-day	Frequency	Service Plan Opportunities	Mobility improvements*
Develop a transit system that improves connectivity between origins and key destinations, including major regional employers	Local and Regional Connectivity	Connections to key origins and destinations along corridor Connections to Transit Centers and other routes	Mobility improvements*
Improve safety for all users along the corridor including those using transit, non-motorized, and vehicular	Safety / Security	Safety impacts to transit, non-motorized and vehicular Security enhancements	Mobility improvements*
Reduce traffic congestion within the region	Potential for Mode Shift	Potential for reduction in traffic congestion	Environmental benefits* Congestion relief*
Develop a rapid transit system that is economically viable for the region	Cost to Build, Operate and Maintain	Cost to Build, Operate and Maintain Cost effectiveness Community Support	Financial capacity analysis* Cost effectiveness*
Provide a transit service that is integrated with a multi-modal transportation network	Multi-modal connectivity	Connections to non-motorized system Existing and Potential Walkability	Environmental benefits* Congestion relief*

*consistent with FTA New Starts/Small Starts criteria

4 Tier 1 Evaluation Process

The Tier 1 evaluation process is structured to assess the application of various modes along the Gratiot Avenue corridor The Tier 1 analysis will follow a two-phase process:

1. Define the various modes along the corridor

2. Evaluate the different modes given the evaluation criteria

This initial screening is intended to be high-level and qualitative based on physical and operating parameter of each mode and how that mode would operate along the corridor. A series of evaluation criteria have been developed to access each mode's ability to meet the stated goals and objectives, which is tied to the purpose and need. Each mode will be evaluated against the criteria and rated as "pass" or "not pass."

The performance of the mode against the evaluation criteria will then be aggregated and an overall assessment of "pass" or "defer" assigned to each mode. A mode that receives two or more "not pass" rankings will be assigned an overall assessment of "defer." An overall assessment of "defer" means that the overall mode does not meet the stated purpose and need of this study and will not be carried further as an option. However, any mode that is deferred at this time may meet the needs of future studies. The modes that "pass" will be carried forward into the Tier 2 Detailed Definition and Evaluation Phase of the project.

The evaluation criteria for the Tier 1 Analysis and their relationship with the goals of the project are shown in Table 4-1.

TABLE 4-1. PROJECT GOALS AND TIER 1 EVALUATION CRITERIA

GOAL	RELIABILITY / IMPROVE ON-TIME PERFORMANCE	SOCIAL EQUITY / ACCESSIBILITY	ECONOMIC DEVELOPMENT POTENTIAL	FLEXIBILITY	POTENTIAL FOR MODE SHIFT	FREQUENCY	LOCAL AND REGIONAL CONNECTIVITY	SAFETY/SECURITY	COST TO BUILD, OPERATE AND MAINTAIN	MULTI-MODAL CONNECTIVITY
Provide a reliable alternative to driving	✓				✓					
Provide transportation options for people that cannot drive or do not have access to a car		✓		✓			✓			
Stimulate economic development along the corridor			✓	✓						
Retain and attract people of all ages to the area	✓	✓		✓		✓	✓			✓
Provide a service that is competitive with vehicular travel times	✓				✓					
Provide one-seat transit service between Macomb County and Detroit during the mid-day		✓		✓		✓	✓			
Develop a transit system that improves connectivity between origins and key destinations, including major regional employers							✓			✓
Improve safety for all users along the corridor including those using transit, non-motorized, and vehicular								✓		
Reduce traffic congestion within the region					✓					
Develop a rapid transit system that is economically viable for the region									✓	
Provide a transit service that is integrated with a multi-modal transportation network							✓			✓

5 Modes under Evaluation

Upon initiation of the study, several modes were considered for the Gratiot Avenue corridor. Several modes were rejected early on due to large right-of-way impacts or costs that are not feasible at this time. These include heavy rail (subway) and an extension of the Detroit People Mover. Other modes that appeared technically feasible are described in Table 5-1.

TABLE 5-1. COMPARISON OF RAPID TRANSIT MODES

FEATURE	COMMUTER RAIL	LIGHT RAIL	STREETCAR	BRT PREMIUM	BRT	EXPRESS BUS	NO BUILD
Maximum Peak Hour Directional Capacity	10,000-20,000	4,000	1,500 (mixed traffic)	2,000	1,350	500	1,350
Highest Operating Speed	55 mph	30-55 mph	20-45 mph	30-55 mph	25-40 mph	30-65 mph	15-30 mph
Trips Served	Commuter/longer distance; primarily peak direction	All trips/short to medium distance; bidirectional	All trips/short distance; bidirectional	All trips/short to medium distance; bidirectional	All trips/short to medium distance; bidirectional	Commuter/longer distance; primarily peak direction	All trips/short to medium distance; bidirectional
Service Frequency	Frequent in peak; infrequent in off-peak	Frequent- 10 minutes in peak; 15-20 in off-peak	Frequent- 10 minutes in peak; 15-20 in off-peak	Frequent- 10 minutes or better in peak; 10-15 in off-peak	Frequent- 10 minutes in peak; 15-20 in off-peak	Frequent in peak; infrequent or not provided in off-peak	Varies from 10 minutes peak to 90 minutes off-peak
Corridor Length	20-80 miles	10-20 miles	2-5 miles	5-20 miles	5-20 miles	10-30 miles	1-20 miles
Station Types	Enclosed stations, covered platforms, shelters; level or high floor boarding	Defined stations with amenities; level boarding	Defined stations with amenities; level boarding	Defined stations with amenities; level boarding	Defined stations with limited amenities	Concrete pads, benches, shelters	Concrete pads, benches, shelters
Station Spacing	Every 2 to 5 miles	Every 1 to 2 miles	Every ¼ to ½ mile	Every ½ to 1 mile	Every ½ to 1 mile	Every 2 to 5 miles	1,000 ft. – ¼ mile
Type/Length of Vehicle	Single of bi-level cars, 170-230 ft. each, 1,200 ft total (6 car train)	Modern styling, 100 ft. each, 100-400 ft. total (1 to 4 car train)	Modern or historic replica, 66 ft. each, 66-130 ft. total (1 to 2 car train)	Single vehicle, 40 ft. standard to 65 ft. articulated, with premium styling	Single vehicle, 40 ft. standard to 65 ft. articulated, with potential premium styling	Single vehicle, 40 ft. standard-45 ft. over-the-road	Single vehicle, 40 ft. standard; 60 ft. articulated

FEATURE	COMMUTER RAIL	LIGHT RAIL	STREETCAR	BRT PREMIUM	BRT	EXPRESS BUS	NO BUILD
Propulsion System	Diesel or electric	Electric, some diesel versions available	Electric	Diesel, hybrid, CNG, some electric versions available	Diesel, hybrid, CNG, some electric versions available	Diesel, hybrid, CNG, some electric versions available	Diesel, hybrid, CNG, some electric versions available
Running Way	Rail tracks, exclusive for commuter rail or shared with freight rail	Separate guideway, exclusive lanes on street, some mixed traffic with signal priority	In mixed traffic, exclusive lanes on street	More than 50% in separate guideway, exclusive lanes on street; signal priority	Less than 50% in separate guideway, mixed in traffic or bus-only lanes; may have signal priority	HOV lane, shoulder lane in limited circumstances, mixed traffic	In mixed traffic
Fare Payment	Off board	Off-board	Off-board	Off-board	Off board or on-board	On-board; some off-board options	On-board
Cross Section Requirement	60 ft. for separated 2-track corridor, up to 70 ft. at stations	28 ft., up to 50 ft. at stations (separate guideway)	28 ft., up to 50 ft. at stations (separate guideway), 11-12 ft. lane on street	32 ft, up to 55 ft. at stations	11-12 ft. lane on street; additional 10 ft. at stations	12 ft., up to 55 ft. at stations (separate guideway)	11-12 ft. lane
Technology	Real time vehicle info, mobile apps, wi-fi	Real time vehicle info, mobile apps, wi-fi	Real time vehicle info, mobile apps, wi-fi	Real time vehicle info, mobile apps, wi-fi	Limited Real time vehicle info, mobile apps, wi-fi	Limited Real time vehicle info, mobile apps	Limited Real time vehicle info, mobile apps
Example							
	Detroit (proposed)	Minneapolis	Cincinnati	Cleveland	Grand Rapids	Sacramento	Detroit

For this evaluation, Premium BRT would be mostly in dedicated guideway located in the middle of the roadway, separated from traffic, have dedicated stations with level boarding in the middle of the roadway, and signal priority. BRT would be mostly located in the curb lane, mixed with traffic, with stations located on the sidewalk, with little or no signal priority.

6 Tier 1 Evaluation Criteria and Results

Table 3-1 previously featured a description of the evaluation criteria used in the Tier 1/ Mode Selection phase. Individual subsections below describe the evaluation criteria, describe a methodology in the evaluation, and conduct an evaluation. A summary of the results of the evaluation is included in Chapter 7 of this report.

6.1 Reliability / Improve on-time performance

6.1.1 SCREENING METHODOLOGY

These evaluation criteria consider how the mode can improve on-time performance over the current system. Systems that typically have dedicated guideways have better on-time performance and reliability than those that operate in mixed traffic. In addition, traffic control also influences travel time and reliability. As such, modes such as Commuter Rail and Light Rail transit are more reliable than the other modes. Bus rapid transit and streetcar systems can either have dedicated guideways or can be mixed in with traffic. Express bus along Gratiot Avenue would operate in mixed traffic.

6.1.2 DATA SOURCES AND REFERENCES

The Transportation Research Board (TCRP) Transit Capacity and Quality of Service Manual, 3rd Edition, was used as a reference in determining reliability by mode. Table 6-1 summarizes those modes within the corridor that could have dedicated guideway systems.

TABLE 6-1. TYPE OF GUIDEWAY SYSTEM BY MODE

MODE	TYPE OF SYSTEM
No Build	Mixed in traffic
Express Bus	Mixed in traffic
BRT	Mostly mixed in traffic with some dedicated guideway
Premium BRT	Mostly dedicated guideway with some mixed in traffic
Streetcar	Mostly dedicated guideway with some mixed in traffic
Light Rail	Mostly dedicated guideway with some mixed in traffic
Commuter Rail	All dedicated guideway

6.1.3 SCREENING THRESHOLDS

The following thresholds were used to identify each mode as “pass” or “not pass”:

- Pass = mode can have dedicated guideway systems
- Not Pass = mode is completely mixed in traffic

6.1.4 SCREENING RESULTS

The results of the evaluation are shown in Table 6-2; Express Bus did not pass.

TABLE 6-2. RELIABILITY EVALUATION

MODE	PASS/ NOT PASS	REASONING
Express Bus	Not Pass	Modes in mixed traffic
BRT	Pass	Modes/Systems with less than half dedicated guideways
Premium BRT	Pass	Modes/Systems with more than half dedicated guideways
Streetcar	Pass	Modes/Systems with more than half dedicated guideways
Light Rail	Pass	Modes with more than half dedicated guideways
Commuter Rail	Pass	Mode with more than half dedicated guideways

6.2 Social Equity / Accessibility

6.2.1 SCREENING METHODOLOGY

All persons should be afforded equal access to transportation infrastructure. This evaluation factor recognizes that options supportive of equal access are beneficial to all potential users. The factor evaluates the location of the alternative and stations along the corridor to ensure that the alternative does not unfairly favor one group while causing disservice to another group. There is great diversity in transit users along Gratiot Avenue in terms of economic, cultural and racial backgrounds that can benefit from all types of transit. In the Tier 2 analysis, this criterion will evaluate where the route is proposed along the corridor and also where the potential stations will be located. As part of this analysis, most of the routes and stations are generally along Gratiot Avenue; however the Commuter Rail option is located west of the corridor and would have fewer stations and is mostly within industrial areas. The Streetcar mode would likely have more stations than the Light Rail and BRT modes. The Express Bus mode would have fewer stations.

6.2.2 DATA SOURCES AND REFERENCES

This analysis will rely on the average distance between stations by mode as shown in Table 5-1 and reiterated in Table 6-3. In addition, it will also take into account the location of the mode within the corridor. Table 6-3 summarizes the station spacing and location of mode within the corridor by mode. Most of the modes would be located along Gratiot Avenue with the exception of one mode. The closest possibility for Commuter Rail within the corridor is located one mile west of Gratiot Avenue without having to build a dedicated heavy rail line. This rail corridor is in a more industrialized area and further from the residential located along Gratiot Avenue.

TABLE 6-3. MODE STATION SPACING AND LOCATION

MODE	STATION SPACING	LOCATION WITHIN CORRIDOR
No Build	Every 1/8 to 1/2 mile	On Gratiot
Express Bus	Every 2 to 5 miles	On Gratiot
BRT	Every ½ to 1 mile	On Gratiot
Premium BRT	Every ½ to 1 mile	On Gratiot
Streetcar	Every ¼ to ½ mile	On Gratiot
Light Rail	Every 1 to 2 miles	On Gratiot
Commuter Rail	Every 2 to 5 miles	1 mile west of Gratiot

6.2.3 SCREENING THRESHOLDS

The following thresholds were used to identify each mode as “pass” or “not pass”:

- Pass = Stations every one mile or less and located along corridor
- Not Pass = Stations more than one mile apart or located off of the corridor

6.2.4 SCREENING RESULTS

The results of the evaluation are shown in Table 6-4; Express Bus and Commuter Rail did not pass.

TABLE 6-4. SOCIAL EQUITY/ACCESSIBILITY EVALUATION

MODE	PASS/ NOT PASS	REASONING
Express Bus	Not Pass	Stations are greater than two miles
BRT	Pass	Stations every mile or less and located along the corridor
Premium BRT	Pass	
Streetcar	Pass	
Light Rail	Pass	
Commuter Rail	Not Pass	Stations are greater than two miles and mode is not located along Gratiot Avenue

6.3 Economic Development Potential

This factor captures the potential economic development growth along the corridor related to the transit investment.

6.3.1 SCREENING METHODOLOGY

Each of the modes under consideration have been previously constructed and operated in communities around the country. Based on case study research, the demonstrated ability of each of the modes to generate economic development is shown below in Table 6-5.

A recent American Public Transportation Association (APTA) report (Economic Impact of Public Transportation Investment 2014 Update), found that for every dollar spent on public transportation there is a $4 economic return. A recent study published by the Institute for Transportation and Development Policy titled More Development for Your Transit Dollar: An Analysis of 21 North American Transit Corridors found that high level Bus Rapid Transit leverages more transit-oriented development investment than Light Rail Transit or streetcars. Though mixed traffic BRT systems share similar economic development benefits; the benefits tend to vary more along the lines of the nature of the system.

In addition to catalyzing development within a corridor and station areas, rapid transit also has the ability to generate broader economic impacts through increased connectivity to employment opportunities. Rapid transit investment can connect corridor residents with jobs that improve their financial position and stability, which contributes to overall economic growth. While each of the modes under consideration reach the major employment centers throughout the corridor, the service types associated with the alternatives (frequent/all-day versus commuter/peak hour) serve different employment markets. Frequent/all-day service is more likely to support a greater diversity of workers (traditional 9-to-5, shift,

weekend) than commuter/peak (which is oriented towards connecting workers to traditional 9-to-5 jobs in very high-density employment centers). Since most of the modes are along Gratiot Avenue, a comparison in mode can only be done by comparing access to jobs along those modes along Gratiot Avenue and those along the Commuter Rail line. Given that station locations with commuter rails are typically between two to five miles, access is reduced compared to those along Gratiot Avenue. In addition, the Commuter Rail corridor is mainly industrial with low employment density. Modes with higher number of stations would have higher access to jobs while those with a lower number of stations would have lower access.

Lastly, improved transit along a corridor can increase property values, which is another indicator of improved economic development within a study area. A study published by the American Public Transportation Association (APTA) and the National Association of Realtors titled The New Real Estate Mantra Location Near Public Transit (March 2013) looked into how property values near public transit was impacted by the recent recession. The study found that Light Rail, BRT and Streetcar transit sheds outperformed those of Commuter Rail. Generally, it has been found that systems that have permanence along a corridor outperform those that are mixed in with traffic. Table 6-5 summarizes the impact that each mode typically has on property values

6.3.2 DATA SOURCES AND REFERENCES

This analysis will rely on case study research (including the Cleveland Health Line BRT, the MAX mixed-traffic BRT in Kansas City, the Portland Streetcar, and Dallas' DART light rail system) of each mode's demonstrated ability to catalyze economic development in communities around the country.

TABLE 6-5. DEMONSTRATED ECONOMIC DEVELOPMENT IMPACTS

MODE	IMPACTS ON OVERALL ECONOMIC DEVELOPMENT	ACCESS TO JOBS	IMPACT TO PROPERTY VALUES
No Build	Low	Medium	Low
Express Bus	Low	Low-Medium	Low
BRT	Low-Medium	Medium	Medium
Premium BRT	High	Medium	High
Streetcar	High	Medium-High	High
Light Rail	High	Medium	High
Commuter Rail	Medium	Low	Low-Medium

6.3.3 SCREENING THRESHOLDS

Each of the impacts (economic development, access to jobs, and impact to property values) shown in Table 6-5 will be given a "pass" or "not pass".

- Pass = alternatives that score a "medium" or higher
- Not Pass = alternatives that score a "low-medium" or lower

Those modes that have two or more "pass" will receive an overall "pass", all others will receive an overall "not pass".

6.3.4 SCREENING RESULTS

Table 6-6 summarizes the overall evaluation of impact to economic develop by mode. There were two modes that did not pass, these included Express Bus and Commuter Rail. The reasoning behind the not passing of Commuter Rail is due to the location which limits access to jobs and has a lower potential to increase to property values.

TABLE 6-6. ECONOMIC DEVELOPMENT EVALUATION

MODE	ECONOMIC DEVELOPMENT PASS/NOT PASS	JOBS ACCESS PASS/NOT PASS	PROPERTY VALUE PASS/NOT PASS	OVERALL PASS/NOT PASS
Express Bus	Not Pass	Not Pass	Not Pass	Not Pass
BRT	Not Pass	Pass	Pass	Pass
Premium BRT	Pass	Pass	Pass	Pass
Streetcar	Pass	Pass	Pass	Pass
Light Rail	Pass	Pass	Pass	Pass
Commuter Rail	Pass	Not Pass	Not Pass	Not Pass

6.4 Flexibility

6.4.1 SCREENING METHODOLOGY

A transit system that can more easily divert from the main route to reach other major destinations has an added benefit, which adds utility of the service. This evaluation criterion also evaluates how easily the route could be changed in the future if there are additional developments along or close to the corridor. It also takes into account how existing routes along the corridor, or that intersect with the corridor can be integrated in any new alternative. This ranges from being able to transfer easily from one transit system to another transit system or the ability to share resources (stations or dedicated lanes). The ability of an option to work together with exiting transit systems is beneficial.

6.4.2 DATA SOURCES AND REFERENCES

This analysis will rely on whether a mode will or will not be able to divert from its route. Those modes that are on rails will not be able to divert and are therefore less flexible. Also, those modes that are able to share resources also have an added benefit, this includes whether or not stations/stop locations can be shared or minimize transfers between other systems. Table 6-7 summarizes the mode flexibility.

TABLE 6-7. MODE FLEXIBILITY

MODE	UTILIZES RAIL	OTHER SYSTEMS CAN UTILIZE GUIDEWAY OR STATIONS
No Build	No	Yes
Express Bus	No	Yes
BRT	No	Yes
Premium BRT	No	Yes
Streetcar	Yes	Yes
Light Rail	Yes	Yes
Commuter Rail	Yes	No

6.4.3 SCREENING THRESHOLDS

The following thresholds were used to identify each alternative as “pass” or “not pass”:

- Pass = Mode is not on a rail and other systems can utilize
- Not Pass = Mode is on a rail and/or other systems can’t utilize

6.4.4 SCREENING RESULTS

Table 6-8 summarizes the overall evaluation of flexibility of a mode. There were three modes that did not pass, which included all of the rail modes.

TABLE 6-8. FLEXIBILITY EVALUATION

MODE	FLEXIBILITY PASS/NOT PASS	REASON
Express Bus	Pass	Route can be very flexible, other systems can utilize it
BRT	Pass	
Premium BRT	Pass	Route can be somewhat flexible, other systems can utilize it
Streetcar	Not Pass	Route is not flexible and other systems can use it
Light Rail	Not Pass	
Commuter Rail	Not Pass	Route is not flexible and no other systems can use it

6.5 Potential for Mode Shift

6.5.1 SCREENING METHODOLOGY

The potential for mode shift has been an emerging evaluation criterion over the last ten years. This factor considers the potential for vehicular drivers to shift from automobiles to another form of transportation, such as transit, bicycling or walking. A modal shift occurs when one mode (i.e. transit) has a comparative advantage over another mode (i.e. vehicular). Often times this advantage occurs when there is a decrease in travel time, but can also include factors such as reduction in stress or increase in productivity. Light Rail systems typically have greater mode shift compared to BRT or streetcar systems. Also, systems that have a travel time advantage over vehicular traffic also have a larger mode shift. For example, a system that has a dedicated guideway has a greater mode shift compared to one that is mixed in with general traffic lanes.

6.5.2 DATA SOURCES AND REFERENCES

Studies have shown that the higher amount of transit service along a corridor causes a shift in mode from vehicular to transit[1]. According to an American Public Transportation Association (APTA) report, it was found that adding a rail mode had a higher percentage of mode shift (47%) as compared to a bus mode (26%). This is also an indicator of ridership performance. Commuter rail and light rail were found to have the highest mode shift due to its reliability, as compared to Streetcars which have less of a shift in automobile mode due to their short length and frequent stops. Those modes that have more reliability and are in dedicated guideways, such as Premium BRT, have a higher mode shift than those that are mixed in with traffic. Table 6-9 summarizes the criterion and impact to mode shift.

[1] http://www.apta.com/resources/reportsandpublications/Documents/Economic-Impact-Public-Transportation-Investment-APTA.pdf

TABLE 6-9. DEMONSTRATED MODE SHIFT

MODE	IMPACT TO MODE SHIFT
No Build	Low
Express Bus	Low
BRT	Medium
Premium BRT	Medium-High
Streetcar	Medium
Light Rail	High
Commuter Rail	High

6.5.3 SCREENING THRESHOLDS

The following thresholds were used to identify each alternative as “pass” or “not pass”:

- Pass = alternatives that score a “medium” or higher in mode shift
- Not Pass = alternatives that score a “low-medium” or lower in mode shift

6.5.4 SCREENING RESULTS

Table 6-10 summarizes the mode shift evaluation, those modes that can be in exclusive guideways passed, while those that were mixed in traffic (Express Bus) did not pass.

TABLE 6-10. MODE SHIFT EVALUATION

MODE	MODE SHIFT PASS/NOT PASS	REASON
Express Bus	Not Pass	Demonstrates a smaller percentage of mode shift (26%)
BRT	Pass	Demonstrates a larger percentage of mode shift (47%)
Premium BRT	Pass	
Streetcar	Pass	
Light Rail	Pass	
Commuter Rail	Pass	

6.6 Frequency / Convenience

6.6.1 SCREENING METHODOLOGY

This factor considers both frequency and convenience, which is how often and when the mode will operate. An increase in frequency over the current transit frequency was expressed by the public to be a key consideration. Convenience considers the “one-seat” service or if the rider has to transfer from one route to another route along Gratiot Avenue between M-59 (Hall Road) to Downtown Detroit. Currently, a transfer is required between these two points during non-peak periods and weekends. A system that provides a one-seat service between M-59 (Hall Road) and Downtown Detroit is preferred over a system that requires a transfer. Transferring is both a convenience and a travel time factor, as transferring adds to a rider’s overall travel time. At this evaluation level, most of the modes in this evaluation are assumed to provide the same frequency and one-seat service. However, Express Bus and Commuter Rail are expected to operate less frequently.

6.6.2 DATA SOURCES AND REFERENCES

Given that service plans have not been developed for this level of analysis and will be developed once ridership estimates have been developed, frequency can be a difficult measure to evaluate in this stage of analysis. The current ridership of the corridor is approximately 12,000 passenger on an average day. Half of those passengers are on DDOT and the other half are on SMART. Given that the Express Bus and Commuter Rail is expected to operate with fewer stations, ridership would not be high enough to warrant all day service. Also, given that the Commuter Rail would be located somewhat off the corridor, ridership is expected be lower as well given the lower population density and employment density. It is expected that the frequency would be as follows given the potential ridership. Table 6-11 summarizes the expected frequency.

TABLE 6-11. EXPECTED FREQUENCY BY MODE

MODE	FREQUENCY OF SERVICE
No Build	Some Frequent / Some All-Day
Express Bus	Commuter / Peak Hour
BRT	Frequent / All-Day
Premium BRT	Frequent / All-Day
Streetcar	Frequent / All-Day
Light Rail	Frequent / All-Day
Commuter Rail	Commuter / Peak Hour

6.6.3 SCREENING THRESHOLDS

The following thresholds were used to identify each alternative as “pass” or “not pass”:

- Pass = alternatives that have frequent and all-day service
- Not Pass = alternatives that only have a commuter or peak hour service

6.6.4 SCREENING RESULTS

Table 6-12 summarizes the evaluation of the expected frequency by mode. Express Bus and Commuter Rail would be expected to be commuter type service and not have service throughout the day. As such, this would cause those who want to travel between Macomb County and Detroit to transfer at 8 Mile Road in the mid-day and on weekends.

TABLE 6-12. FREQUENCY EVALUATION

MODE	FREQUENCY PASS/NOT PASS
Express Bus	Not Pass
BRT	Pass
Premium BRT	Pass
Streetcar	Pass
Light Rail	Pass
Commuter Rail	Not Pass

6.7 Local and Regional Connectivity

6.7.1 SCREENING METHODOLOGY

Regional connectivity is an important measure to ensure that potential alignments maximize connections to existing and planned transit services and transportation infrastructure to facilitate access to key destinations within the corridor and throughout the region. For this assessment, regional connectivity was measured in terms of the connectivity between an alternative and elements of the regional transportation network, including the transit network, transit centers, intercity bus service, and the passenger rail network.

To assess an alternative's ability to maximize regional connections, the study team assessed the proximity and connectivity of each mode to these transportation network elements, as defined below. A mode will "connect" to the regional transportation system if it intersects or connects to the following:

- One or more existing transit centers or major transfer points, which include:
    - Rosa Parks Transit Center
    - Amtrak (Detroit)
    - 8 Mile Road (includes DDOT Route 17)
    - Macomb Mall
- One or more stops along existing transit routes that exceed 1,000 route boardings per average weekday, these include:
    - DDOT Route 10 – Chene
    - DDOT Route 14 – Crosstown (Warren)
    - DDOT Route 31 – Mack
    - DDOT Route 32 – McNichols
    - DDOT Route 34 – Seven Mile
    - DDOT Route 48 – Van Dyke & SMART Route 510/515 – Van Dyke
    - SMART Route 710 – Nine Mile
    - SMART Route 740 – Twelve Mile
- One or more intercity bus stops that do not already coincide with other stops (other than those routes already on Gratiot), these include:
    - DDOT Route 12 – Conant
    - DDOT Route 13 – Conner
    - DDOT Route 40 – Russell
    - SMART Route 580 – Harper
    - SMART Route 550 – Garfield (crosses at 14 Mile)
    - SMART Route 730 – Ten Mile
    - SMART Route 760 – 13/14 Mile (crosses at 13 Mile)
    - SMART Route 780 – Fifteen Mile & SMART Route 610 – Kercheval-Harper

Table 6-13 summarizes which modes would potentially stop at each transit center, major transfer point, or other major or minor route. It is assumed that Express Bus and Commuter Rail would have stops every three miles. BRT, Premium BRT, and Light Rail would have stops every one mile and Streetcar would have stops every ½ mile.

TABLE 6-13. POTENTIAL STATION LOCATIONS BY MODE

STOP	EXPRESS BUS	BRT/PREMIUM BRT	STREETCAR	LIGHT RAIL	COMMUTER RAIL
Transit Centers or Major Transfer Points					
RPTC	X	X	X	X	
Amtrak					X
8 Mile Road	X	X	X	X	X
Macomb Mall	X	X	X	X	X
Major Routes					
DDOT 10			X		
DDOT 14	X	X	X	X	
DDOT 31		X	X	X	
DDOT 32		X	X	X	X
DDOT 34		X	X	X	
DDOT 48 & SMART 510/515	X	X	X	X	X
SMART 710		X	X	X	
SMART 740	X	X	X	X	X
Minor Routes					
DDOT 12			X		
DDOT 13		X	X	X	
DDOT 40		X	X	X	
SMART 580		X	X	X	
SMART 550			X		
SMART 730		X	X	X	
SMART 760			X		
SMART 780 & SMART 610		X	X	X	

6.7.2 DATA SOURCES AND REFERENCES

Geographic Information System (GIS) data to support this analysis was sourced from SEMCOG and Google Maps. Table 6-14 summarizes the number of stops.

TABLE 6-14. MODE CONNECTIONS

MODE	TRANSIT CENTER/TRANSFER STOPS	MAJOR ROUTE STOPS	MINOR ROUTE STOPS	TOTAL STOPS
No Build	3	8	8	19
Express Bus	3	3		6
BRT	3	7	5	15
Premium BRT	3	7	5	15
Streetcar	3	8	8	19
Light Rail	3	7	5	15
Commuter Rail	3	3		6

6.7.3 SCREENING THRESHOLDS

A threshold of ten for total stops was utilized to determine those which modes would pass and not pass. This threshold is arbitrary and was merely used in order to distinguish a difference between the modes.

Ideally, the higher the number of total stops, the better the mode. The following thresholds were used to identify each alternative as “pass” or “not pass”:

- Pass = alternatives that “connect” to ten or more of the transportation network elements
- Not Pass = alternatives that “connect” to nine or fewer of the transportation network elements

6.7.4 SCREENING RESULTS

The results of the evaluation are shown in Table 6-15; Commuter Rail and the Express Bus options did not pass.

TABLE 6-15. CONNECTIVITY EVALUATION

MODE	CONNECTIVITY PASS/NOT PASS
Express Bus	Not Pass
BRT	Pass
Premium BRT	Pass
Streetcar	Pass
Light Rail	Pass
Commuter Rail	Not Pass

6.8 Safety / Security

6.8.1 SCREENING METHODOLOGY

Safety and security cover a broad variety of factors and has different meanings for different individuals. FTA requires that for every new rapid transit system that is added, a Safety & Security Management Plan (SSMP) be developed. As part of this evaluation process, safety and security relates to how each type of mode can facilitate safety and security. A system that can have increase safety and security measures would be better than those that keep the status quo. A system that has dedicated stations would have a more enhanced safety and security system. In addition, a system that has a dedicated guideway would be safer than one that is shared with traffic. Regardless of any mode, a SSMP will be developed.

6.8.2 DATA SOURCES AND REFERENCES

This is a qualitative assessment depending on the type and location of the stations and whether or not there would be dedicated guideways for each mode.

TABLE 6-16. STATION AND GUIDEWAY TYPE BY MODE

MODE	TYPES OF STATIONS	LOCATION OF STATION	GUIDEWAY TYPE
No Build	Existing transit stops	Side of roadway	Mixed in traffic
Express Bus	Could be paired with existing transit stops or have dedicated stations	Parking lot or side of road	Mixed in Traffic
BRT	Could be paired with existing transit stops or have dedicated stations	Side of roadway	Mixed in Traffic/Dedicated Guideway (less than 50%)
Premium BRT	Dedicated Stations	Middle of roadway	Mostly Dedicated
Streetcar	Dedicated Stations	Side/Middle of roadway	Mostly Dedicated
Light Rail	Dedicated Stations	Middle of roadway	Mostly Dedicated
Commuter Rail	Dedicated Stations	Side of dedicated trackway	Dedicated

6.8.3 SCREENING THRESHOLDS

The following thresholds were used to identify each alternative as “pass” or “not pass”:

- Pass = alternatives that have dedicated stations and in mostly dedicated roadways
- Not Pass = alternatives that may not have dedicated stations and could be mixed in traffic

6.8.4 SCREENING RESULTS

The results of the evaluation are shown in Table 6-17; the Express Bus and BRT options did not pass. Again, for this evaluation, BRT would be mostly located in the curb lane, mixed with traffic, with stations located on the sidewalk, with little or no signal priority. Express Bus would also have station located on the curb and would likely be mixed in with traffic. Both of these modes did not pass due to the stations being located curbside and would not be separated or fully enclosed, decreasing security. In addition, these modes would likely be mixed in with traffic which causes more interaction with general traffic increasing the likelihood of crashes.

TABLE 6-17. SAFETY/SECURITY EVALUATION

MODE	SAFETY/SECURITY PASS/NOT PASS
Express Bus	Not Pass
BRT	Not Pass
Premium BRT	Pass
Streetcar	Pass
Light Rail	Pass
Commuter Rail	Pass

6.9 Cost to Build, Operate and Maintain

6.9.1 SCREENING METHODOLOGY

Capital cost entails the initial investment needed to get a new transit system up and running. The cost factor weighs heavily in the ability of the region to implement the system. Capital costs include designing the system and building infrastructure to support the system. Depending on the type of mode chosen, the capital cost can include the stations, overhead catenary systems, vehicle storage and maintenance facilities, vehicles, new traffic signals, and right-of-way acquisition. Capital cost is higher with those involving rail compared to those without rail.

The long-term cost of the transit system entails the continual investment needed to maintain infrastructure and the cost for operation of the system after the capital cost investment has been made. This cost factors in such items as maintaining the stations, the vehicles, operators for the system and the vehicles, roadway or trackway maintenance, station security, as well as others. The cost to maintain a fixed rail system is higher than BRT due, in part, to overhead catenary systems and vehicle storage and maintenance facility. However, Streetcar and Light Rail vehicles can last longer than BRT vehicles. Newer technologies are more equipped in bridging the gaps between life cycle costs between rail and BRT.

In this level of evaluation, only capital costs based on national averages will be considered. A more detailed estimate of capital and operating and maintenance cost will be more detailed and evaluated in the next level of evaluation.

6.9.2 DATA SOURCES AND REFERENCES

Typical capital costs per mile were sourced from the transit capital projects that are included in the FY 2015 Annual Report of Funding Recommendations for the FTA's New/Small Starts Program. The range and average capital costs shown in Table 6-18 reflect the costs reported by all of the projects by mode, with extreme cost outliers excluded. The capital costs for Commuter Rail was not sourced from the FTA because of recent and ongoing capital investment in commuter rail vehicles and track upgrades, the per-mile capital cost reflects the low end of 2015 FTA commuter rail project costs.

The broad range of costs demonstrates the variability that can result from design, engineering and construction decisions. This range does, however, still enable a high-level qualitative analysis to determine which modes are not considered to be financially viable within the context of the BEST: Gratiot Avenue corridor study.

TABLE 6-18. CAPITAL COSTS BY MODE

MODES	AVERAGE CAPITAL COST PER MILE	RANGE OF CAPITAL COST PER MILE
No Build	>$1,000,000	Up to $1,000,000
Express Bus	>$3,000,000	Up to $3,000,000
BRT	$5,000,000	$2,000,000 - $11,000,000
Premium BRT	$22,000,000	$11,000,000 - $35,000,000
Streetcar	$49,000,000	$48,000,000 - $53,000,000
Light Rail	$124,000,000	$60,000,000 - $188,000,000
Commuter Rail	$2,500,000	$2,500,000 - $30,000,000

6.9.3 SCREENING THRESHOLDS

The following thresholds were used to identify each alternative as “pass” or “not pass”:

- Pass = alternative’s capital costs at or below 500,000,000
- Not Pass = alternative’s capital cost above $500,000,000

6.9.4 SCREENING RESULTS

The length of the corridor for the Commuter Rail option is 21 miles between M-59 (Hall Road) and the Amtrak Station in New Center and 22 miles between M-59 (Hall Road) and Eastern Market. For the purposes of this analysis, a value of 22 miles will be utilized. The length of all other modes is 23 miles along Gratiot Avenue between M-59 (Hall Road) and Downtown Detroit.

The results of the analysis are shown in Table 6-19, and reflect the costs associated with fixed guideway modes that would require significant new infrastructure investment: Premium BRT, Streetcar, and Light Rail exceeded the $500,000,000 threshold (sometimes by billions of dollars); Commuter Rail, BRT and Express Bus passed. As previously discussed, elements of BRT and Premium BRT can be combined in a way that meets service objectives while remaining under the $500,000,000 threshold.

TABLE 6-19. CAPITAL COST EVALUATION

MODE	AVERAGE CAPITAL COST PER MILE	LENGTH OF ALTERNATIVE (MILES)	ORDER-OF-MAGNITUDE ALTERNATIVE COST ESTIMATE	PASS / NOT PASS
Express Bus	$3,000,000	23	$69,000,000	Pass
BRT	$5,000,000	23	$115,000,000	Pass
Premium BRT	$22,000,000	23	$506,000,000	Not Pass
Streetcar	$49,000,000	23	$1,127,000,000	Not Pass
Light Rail	$124,000,000	23	$2,852,000,000	Not Pass
Commuter Rail	$2,500,000	22	$57,500,000	Pass

6.10 Multi-modal Connectivity

6.10.1 SCREENING METHODOLOGY

For the purposes of screening alignments relating to multi-modal connectivity, each mode was analyzed for proximity to Regional Bicycle and Pedestrian Corridor, Local Corridors, and sidewalks. A buffer of 1,000 feet was created around each alternative to determine the proximity. Regional trails were weighted twice as much as the bikeways because trails serve both pedestrians and bicyclists and they tend to provide longer connections than many on-street bikeways. At this level of analysis, sidewalk accessibility and walkability will not be evaluated due to almost complete network of sidewalks within the study area. The Tier 2 analysis will evaluate walkability near station locations.

It is assumed that station locations for Express Bus and Commuter Rail would be every three miles at major locations. Station locations for BRT, Premium BRT, and Light Rail would be every mile. Streetcar stations every half mile. Table 6-20 illustrates how each mode would interact with the non-motorized network. Regional Bicycle and Pedestrian Corridors include Gratiot Avenue (as a regional corridor), the Clinton River Trail, Freedom Trail, Conner Creek Greenway, Midtown Greenway and the Dequindre Cut. Local Corridors include 12 Mile Road, 8 Mile Road, 7 Mile Road, Chalmers Road, McNichols Road, Houston Whittier Street / Dickerson Avenue, E Outer Drive, Harper Avenue, Shoemaker Street, Van Dyke Avenue, Grand Boulevard, Warren Avenue, Forest Avenue, Mt Elliott, Mack Avenue, and Vernor Highway/St. Aubin Avenue.

TABLE 6-20. MULTI-MODAL CONNECTIVITY

STOP	EXPRESS BUS	BRT/PREMIUM BRT	STREETCAR	LIGHT RAIL	COMMUTER RAIL
Regional Bicycle and Pedestrian Corridors					
Gratiot Avenue	X	X	X	X	
Clinton River Trail		X	X	X	
Freedom Trail	X	X	X	X	X
Conner Creek Greenway		X	X	X	
Midtown Greenway		X	X	X	
Dequindre Cut		X	X	X	
Local Corridors					
12 Mile	X	X	X	X	X
8 Mile	X	X	X	X	X
7 Mile		X	X	X	
Chalmers		X	X	X	
McNichols		X	X	X	X
Houston Whittier			X		
E Outer Drive		X	X	X	X
Harper		X	X	X	
Shoemaker		X	X	X	
Van Dyke	X	X	X	X	X
Grand	X	X	X	X	
Warren	X	X	X	X	
Forest	X	X	X	X	
Mt Elliott		X	X	X	
Mack		X	X	X	
Vernor / St. Aubin		X	X	X	

6.10.2 DATA SOURCES AND REFERENCES

The Bicycle and Pedestrian Travel Plan for Southeast Michigan: A Plan for SEMCOG and MDOT's Southeast Michigan Regions was used to check for existing and planned improvements, and the City of Detroit Non-motorized Plan was sourced. Table 6-21 summarizes scoring given that Regional Bicycle and Pedestrian Corridors score twice as much as Local Corridors.

TABLE 6-21. MULTI-MODAL SCORING

MODE	REGIONAL BICYCLE AND PEDESTRIAN CORRIDORS	LOCAL CORRIDORS	TOTAL CONNECTIONS
No Build	12	16	28
Express Bus	4	6	10
BRT	12	15	27
Premium BRT	12	15	27
Streetcar	12	16	28
Light Rail	12	15	27
Commuter Rail	2	5	7

6.10.3 SCREENING THRESHOLDS

A threshold of 20 for total connections was utilized to determine those which modes would pass and not pass. This threshold is arbitrary and was merely used in order to distinguish a difference between the modes. Ideally, the higher the number of total connections, the better the mode. The following thresholds are proposed to identify each alternative as “pass” or “not pass”:

- Pass = modes that has a multi-modal score of 20 or more
- Not Pass = alternatives that has a multi-modal score of 19 or less

6.10.4 SCREENING RESULTS

Table 6-22 shows the results of the multimodal connectivity screening process. The Express Bus and Commuter Rail modes not passed mainly due to their number of station locations.

TABLE 6-22. MULTI-MODAL EVALUATION

MODE	PASS/NOT PASS	REASON
Express Bus	Not Pass	Too few station locations along Gratiot Avenue that connect or near to multi-modal corridors
BRT	Pass	Located along Gratiot Avenue and most station locations are located at or near to multi-modal corridors.
Premium BRT	Pass	
Streetcar	Pass	
Light Rail	Pass	
Commuter Rail	Not Pass	Not along Gratiot Avenue and too few station locations that connect or near to multi-modal corridors

7 Results of the Tier 1 Evaluation

The results of the Tier 1 evaluation are shown in Table 7-1. Alternatives with two or more “not pass” overall ratings will be removed from further definition and evaluation in subsequent phases of the study.

TABLE 7-1. RESULTS OF THE TIER 1 EVALUATION

CRITERIA	EXPRESS BUS	BRT	PREMIUM BRT	STREETCAR	LIGHT RAIL	COMMUTER RAIL
Reliability / Improve on-time performance	Not Pass	Pass	Pass	Pass	Pass	Pass
Social Equity / increase accessibility	Not Pass	Pass	Pass	Pass	Pass	Not Pass
Economic Development Potential	Not Pass	Pass	Pass	Pass	Pass	Not Pass
Flexibility	Pass	Pass	Pass	Not Pass	Not Pass	Not Pass
Potential for Mode Shift	Not Pass	Pass	Pass	Pass	Pass	Pass
Frequency	Not Pass	Pass	Pass	Pass	Pass	Not Pass
Local and Regional Connectivity	Not Pass	Pass	Pass	Pass	Pass	Not Pass
Safety / Security	Not Pass	Not Pass	Pass	Pass	Pass	Pass
Cost to Build, Operate and Maintain	Pass	Pass	Not Pass	Not Pass	Not Pass	Not Pass
Multi-model connectivity	Not Pass	Pass	Pass	Pass	Pass	Not Pass

8 Findings and Recommendations

As indicated in Chapter 5, each of the modes was evaluated against each of the evaluation criteria on a pass or not pass basis. A mode that receives two or more “not pass” rankings will be assigned an overall assessment of “defer.” An overall assessment of “defer” means that the overall mode does not meet the stated purpose and need of this study and will not be carried further as an option. However, any mode that is deferred at this time may meet the needs of future studies. The modes that “pass” will be carried forward into the Tier 2 Detailed Definition and Evaluation Phase of the project.

Table 8-1 summarizes the overall rating of each of the modes.

TABLE 8-1. ALTERNATIVES FOR THE DETAILED DEFINITION AND EVALUATION OF ALTERNATIVES

MODE	OVERALL ASSESSMENT	REASON FOR DEFERRAL
Express Bus	Defer	• Would not improve on-time performance • Would not improve accessibility • Would not improve economic development • Low potential for mode shift • Would not provide a one-seat ride all day • Would not improve local and regional connectivity • Lower improvement in safety and security • Would not improve connections to other modes
BRT	Pass	--
Premium BRT	Pass	--
Streetcar	Defer	• Would not have flexibility • High capital cost to serve the entire corridor
Light Rail	Defer	• Would not have flexibility • High capital cost to serve the entire corridor
Commuter Rail	Defer	• Would not improve accessibility • Would not improve economic development • Would not have flexibility • Would not provide a one-seat ride all day • Would not improve local and regional connectivity • High capital cost to serve the entire corridor • Would not improve connections to other modes

Based on this evaluation, ***BRT and Premium BRT*** will be moved on as the chosen modes along the Gratiot Avenue corridor. Additional route alignments, station locations, and runningway will be evaluated further in the Tier 2 analysis. The detailed definition of alternatives will be documented under separate cover, and will address the aspects below. At this planning level, the type of information developed can still be relatively high-level and focused on comparison and order of magnitude. During the environmental review phase, there will be more refined information with preliminary engineering which will utilize some base mapping and utility surveys. As the project continues, more information will be refined and detailed. The following topics will be outlined in greater detail in the subsequent Detailed Definition of Alternatives report and Tier 2 Evaluation Report:

- Station locations: with review of accessibility, walkability, social equity, connections to other transit facilities for each location
- Routes within Mount Clemens: location either along Gratiot and/or within Downtown Mount Clemens with evaluation of impacts to traffic, parking, non-motorized and transit travel time
- Runningway: location within the roadway with evaluation of impacts to traffic, parking, non-motorized and transit travel time
- Service plan and operations: recommended operations of the new service as well as changes to other bus services surrounding and around the corridor
- Capital cost: cost to build the system based on station locations, routes, and runningway
- Operating and Maintenance Cost: cost to operate and maintain the system as well as any changes to other routes
- Ridership estimates: for the new service as well as to the system as a whole and underlying bus service along the corridor