

## 4. DEVELOPMENT AND EVALUATION OF ALTERNATIVES

The DTOGS project analyzed a universe of both transit technology and alignment alternatives and employed a systematic and iterative process to refine the number of alternatives for evaluation in this Alternatives Analysis (AA). This methodology is similar to the process that resulted in the system of transit corridors for development identified in the SEMCOG Regional Transportation Plan. As with the regional plan, this iterative evaluation considered factors such as traffic congestion, population and employment, proximity of major activity centers, and transit-dependent population. The DTOGS project – an AA – was structured to follow FTA New Starts guidelines and NEPA regulations. The intent was to identify a limited number of alternatives that would be refined and evaluated in this AA, resulting in the eventual selection of an LPA for detailed analysis in the PE and EIS phases.

As shown in the sections that follow, the DTOGS project used a three-tiered screening process. Screen 1 entailed a fatal flaw analysis. It identified and evaluated fourteen potential corridors for rapid transit. Screen 1 resulted in the selection of five of the original fourteen rapid transit corridors for further consideration. Screen 2 entailed a more detailed evaluation, albeit still a broad assessment of all potential alignments within the five corridors. Screen 2 also evaluated a wide range of transit modes (e.g. bus, light rail, commuter rail, and people mover). The purpose of Screen 2 was to further define the alignments and transit technologies that would meet the goals and objectives of the DTOGS project. Finally, Screen 3 – also referred from here on as the Evaluation of Alternatives – entailed a detailed definition and technical assessment of the alternatives recommended in Screen 2. Detailed technical assessment included development of conceptual design (e.g. alignment, location of transit stations), transit operating plan, ridership forecasts, and order-of-magnitude capital and operating and maintenance (O&M) costs.

This section presents the general methodology used in defining and evaluating the transit alternatives. Detailed results of each level of screening are presented in Sections 5 through 9.

## 4.1 Screen 1 – Fatal Flaw Analysis

The fatal flaw analysis identified early in the study process corridor alternatives that were improbable or impossible to finance, construct, or operate efficiently. The results of the fatal flaw analysis limited the number of corridors to those that were not cost prohibitive, have reasonable levels of ridership, and met the goals and objectives of the DTOGS project. These corridors were evaluated further in Screen 2.

The fatal flaw analysis was a two-step process. The first step divided the fourteen corridors into geographic subsectors. The second step evaluated the corridors based on the criteria listed in **Table 4-1**. The corridors were then evaluated on a five-point system for each criterion, depending on how each alternative fared against the defined criteria. A score of “Very Good” garnered five points while a “Very Poor” score garnered only one point. Additionally, with input from the DTOGS project Technical Committee, socio-economic criteria of existing population and employment were given twice the weight of other criteria in Screen 1, to emphasize the importance of having existing transit markets within a corridor.

**Table 4-1**  
**Screen 1 Evaluation Criteria**

Socio-Economic Criteria	Social Equity Criteria
Total population and density Total employment and density	Zero car households Population below poverty level Population over 65
Community Goals & Objectives Criteria	Conceptual Engineering Criteria
Consistency with corridor plans Consistency with SEMCOG plans and City of Detroit Master Plan	Potential capital cost estimate Potential right-of-way availability
Transportation Criteria	Other Factors Criteria
Number of major trip generators ADT on major roadways in corridor ADT on parallel roadways Average daily ridership on transit	Public perception Development potential Technical Committee recommendation

In summary, the results of Screen 1 recommended further analysis of five of the fourteen corridors that made up the universe of alternatives. These five corridors were Eight Mile Road, Grand River Avenue, Gratiot Avenue, Michigan Avenue, and Woodward Avenue.

## 4.2 Screen 2 – Detailed Evaluation

Results of Screen 1 evaluation recommended further analysis in Screen 2 of five corridors. The intent of Screen 2 evaluation is to identify and prioritize potential alignments and appropriate transit technologies for refinement and analysis in the Evaluation of Alternatives phase (Screen 3). Screen 2 evaluation used detailed albeit still broad criteria, relative to the fatal flaw analysis. As in Screen 1, Screen 2 evaluation criteria were established with input from the DTOGS project Technical Committee. The general categories of criteria were:

- Community Sentiment – What do the public and stakeholders say are the transit priorities in the DTOGS project area?
- Transportation – How does each alignment fit into the existing network of modes in the area?
- Development – What opportunities exist along each alignment to ensure that rapid transit improvements would be used and complement the economy of the area it serves?
- Environment – What are the potential environmental resources adjacent to each alignment that could be affected by rapid transit development?
- Conceptual Engineering – What are the potential physical requirements of rapid transit in each alignment, including cost?

### 4.2.1 First Level of Detailed Evaluation

The first level of assessment in Screen 2 identified and assessed the suitability for rapid transit implementation of all potential alignments within each corridor. The scoring scheme employed in this level was similar to Screen 1 in that each alignment was evaluated on a five-point system, depending on it fared against the defined criteria. A score of “Very Good” garnered five points while a “Very Poor” score garnered only one point. **Table 4-2** presents the criteria used to assess the suitability of each alignment based on the DTOGS project’s goals and objectives.

**Table 4-2**  
**Screen 2 Evaluation Criteria**

Community Sentiment	Land Use and Development Opportunities
Resident/neighborhood sentiment Business community sentiment	Consistency with land use patterns Proximity to developed and redevelopable land
Transportation and Mobility	Conceptual Engineering
Multimodal connectivity Accessibility Ridership	Capital cost Operating cost per revenue hour Operating costs per passenger Right-of-way availability Ability to phase construction Traffic impacts Parking impacts
Communities and Environment	
Transit dependent population Water resources Parklands and open space Cultural and historic resources	

The first level of assessment in Screen 2 resulted in nine potential alignments for further study. These alignments were then prioritized into three categories, based on each alignment’s total score. With direction from the DTOGS Technical Committee, the first and second priority alignments were recommended for further analysis. These alignments were Gratiot, Michigan, and Woodward Avenues. Additionally, four other alignments had overlapping transit markets with the higher priority roadways so they were excluded from further consideration.

Public input and discussions with the DTOGS Technical Committee, moreover, identified the segment of Woodward Avenue between downtown Detroit and Grand Boulevard as a crucial transit market to be served. Therefore, this segment of Woodward Avenue was added to the Gratiot Avenue and Michigan Avenue alignments.

#### **4.2.2 Second Level of Detailed Evaluation**

The second level in Screen 2 evaluation identified and evaluated a universe of transit technologies for consideration in the DTOGS project. This level of Screen 2 evaluation identified thirteen potential transit modes for consideration, which included bus, bus rapid transit (BRT), light rail, commuter rail, diesel multiple unit, automated guideway transit and heavy rail. The general criteria used to determine the suitability of each transit technology were:

- Capital Cost per Mile
- Running Surface
- Speed (Max/Average)
- Stop/Station Spacing
- Implementation Feasibility
- Applicability to DTOGS project area
- Public Perceptions

The second level of assessment in Screen 2 resulted in the recommendation of three transit technologies: conventional bus (currently operated by DDOT), BRT and LRT.

### 4.3 Evaluation of Alternatives

For Screen 3 – Evaluation of Alternatives – the three priority alignments were paired with transit technologies to develop alternatives which were evaluated as possible Locally Preferred Alternatives.

- **No-Build Alternatives** – The No-Build Alternatives assumes no new transit routes and only minor service enhancement (e.g. decreased headway, coordination of cross routes to enhance transfers), all existing highway and transit facilities in the DTOGS project area, plus highway improvements from the Southeast Michigan Council of Governments (SEMCOG) financially-constrained long range transportation plan and proposed short-range capital improvements. Regardless of whether the LPA for the DTOGS project is implemented, the projects associated with the No-Build Alternative would be funded and built. The FTA requires inclusion and analysis of the No-Build Alternative in the New Starts process. For the DTOGS project, given three alignments under consideration, three separate No-Build Alternatives were developed.
- **Transportation System Management (TSM) Alternatives** – Also required by the FTA as part of the New Starts process, TSM is the “best that can be done” to improve transit service in the corridor without major capital investment in new infrastructure. It considers low-cost improvements to the existing bus system to maximize the effectiveness of the system. It includes evaluating changes to the existing bus system, addition of skip-stop service, and small construction projects, such as park-and-ride facilities, costing substantially less than a fixed-guideway alternative to determine what benefits a relatively small investment could provide. Similar to the No-Build Alternatives, a TSM Alternative was prepared for each of the three alignments.
- **Bus Rapid Transit (BRT) Alternatives** – The BRT Alternatives includes all facilities associated with the construction and operations of BRT along each of the three alignments, including utility relocation, structures, and stations, as well as bus rapid transit and feeder bus operating plans. The BRT Alternative would also incorporate the elements of the No-Build and TSM Alternatives. As previously stated, the FTA’s New Starts process requires analysis of BRT alternatives.

Following are the BRT Alternative for the DTOGS project:

- Gratiot/Woodward Avenues – On Gratiot Avenue generally between Eight Mile Road and downtown Detroit, and on Woodward between downtown and New Center.
- Michigan/Woodward Avenues – On Michigan Avenue generally between Evergreen Road and downtown Detroit, and on Woodward Avenue between downtown and New Center.
- Woodward Avenue – Generally between downtown Detroit and Eight Mile Road
- **Light Rail Transit (LRT) Alternatives** – The Build Alternatives include all facilities associated with the construction and operations, including utility relocation, structures, and stations, as well as a LRT and feeder bus operating plans. The LRT Alternatives would also incorporate the elements of the No-Build and TSM Alternatives. Moreover, similar to the BRT Alternative, the LRT Alternatives applies to the following alignments:
  - Gratiot/Woodward Avenue – On Gratiot Avenue generally between Eight Mile Road and downtown Detroit, and on Woodward between downtown and New Center.
  - Michigan/Woodward Avenues – On Michigan Avenue generally between Evergreen Road and downtown Detroit, and on Woodward Avenue between downtown and New Center.
  - Woodward Avenue – Generally between downtown Detroit and Eight Mile Road

These twelve alternatives were evaluated based on the criteria shown in **Table 4-3** on the next page based on this evaluation the Locally Preferred Alternative LRT on Woodward Avenue was selected as the Locally Preferred Alternative.

**Table 4-3**  
**Evaluation Criteria**

<b>Transportation and Mobility</b>
Improve Mobility Year 2030 Daily Ridership on TSM/BRT/LRT Year 2030 Daily Ridership – Corridor Total Year 2030 Daily New Riders Year 2030 Regional Travel Time Savings Relative to No-Build Year 2030 Level of Service – Average Travel Speed for Autos (in miles per hour)
Cost Effective and Efficient Travel Options Year 2007 Order-of-Magnitude Capital Cost Year 2007 Operating and Maintenance Costs Year 2007 Operating Cost per Revenue Hour Year 2007 Operating Cost per Passenger Mile
<b>FTA New Starts Benchmark</b>
Cost Effectiveness Index (Cost per New Rider)
<b>Economic Opportunity and Investment</b>
Redevelopment Potential Transit-Oriented Development (TOD) Potential at Stations Low – Number of Stations with Low TOD Potential Medium – Number of Stations with Medium TOD Potential High – Number of Stations with High TOD Potential Year 2000 Employment within One-Half Mile of Stations Year 2007 Population within One-Half Mile of Stations (Social Compact) Parking Impacts – Number of On-Street Spaces Change in Number of On-Street Spaces Relative to TSM Percent Change in Number of On-Street Spaces Relative to TSM
<b>Communities and Environment</b>
Year 2000 Transit-Dependent Population within One-Half Mile of Stations Year 2030 Change in Annual Regional vehicle Miles Travelled (Relative to TSM) Year 2030 Change in Annual CO <sub>2</sub> Emissions, in Tons (Relative to TSM) Population Potentially Affected by Noise and Vibration within 100 feet of Alignment Chance of Affecting Natural Environment Number of Community Facilities within One-Half Mile of Station Multimodal Connections (bus routes, Amtrak Station, non-motorized trail) Consistency with Plans Right-of-Way Impacts
<b>Public Involvement</b>
Community Sentiment – Including July 2007 Scoping Meetings and March 2008 Public Meetings Alignment Preference Transit Technology Preference