

2.0 INTRODUCTION

This chapter describes the framework for the Hudson-Bergen Light Rail (HBLR) Route 440 Alternatives Analysis. It begins with an overview of the process and criteria used to assess alternatives. It then describes the development and refinement of a long list of alternatives. The following chapters of this report describe the evaluation of these alternatives as well as the recommended Locally Preferred Alternative.

2.1 ALTERNATIVES DEVELOPMENT PROCESS

Previous land use and development plans for the western waterfront neighborhood have identified transit improvements that would benefit the area. However, for New Jersey Transit (NJ TRANSIT) to be eligible for the Federal Transit Administration's (FTA's) Major Capital Investments (New Starts/Small Starts) Program, as a first step, a "rigorous and objective" evaluation of alternatives following FTA's guidance and procedures must be undertaken. The alternatives analysis process consists of three steps: 1) project initiation; 2) develop and refine alternatives; 3) evaluate alternatives and select a locally preferred alternative.¹ **Figure 2-1** illustrates the process undertaken for the HBLR Route 440 Alternatives Analysis, and the steps of the process are described below:

- **Project Initiation:** The first phase—study initiation—introduces the project to FTA and the public. This step involves the development of a scope of work for the study, preparation of the Project Initiation Package, and presentation of the Project Initiation Package to FTA and the public.
- **Develop and Refine Alternatives:** The second phase, development and refinement of alternatives, consists of conceptual engineering of the modes and alignments to be studied as well as the development of technical methodologies to be employed for the forthcoming evaluation. This step ensures that all participants in the process, including the public, are in general agreement with the alternatives and analytical methodologies to be undertaken. This step also includes a preliminary screening of alternatives to identify options that show little promise in meeting the project's goals and objectives.
- **Evaluate Alternatives and Select Locally Preferred Alternative:** The analysis, evaluation, and final refinement of alternatives phase encompasses much of the technical work for the alternatives analysis. The technical methodologies developed in the previous phase are

¹ Federal Transit Administration, [www.fta.dot.gov: http://www.fta.dot.gov/planning/newstarts/planning_environment_3010.html](http://www.fta.dot.gov/planning/newstarts/planning_environment_3010.html). Accessed January 28, 2011.

employed to assess the transportation, social, environmental, and financial benefits and impacts of each alternative.

The final step involves preparation of an alternatives analysis study report and selection of a locally preferred alternative. The report summarizes the work undertaken in the prior phases of the study, compares the results of the alternatives evaluation, and identifies the locally preferred alternative to carry forward into environmental review.

2.2 EVALUATION CRITERIA

Performance measures were developed to evaluate alternatives consistent with the goals and objectives identified in Chapter 1, “Background and Planning Context.” These measures are generally qualitative and allow for a comparison of the order of magnitude benefits and detriments of each option for the Proposed Project. In certain cases, one performance measure correlates to multiple project objectives, and certain objectives have been defined by more than one performance measure. **Table 2-1** shows the project’s objectives and the corresponding performance measures developed during the study initiation phase.

Subsequent to the Project Initiation phase, NJ TRANSIT undertook detailed analysis of the alternatives. Through this process, it was concluded that certain evaluation criteria identified in **Table 2-1** could be replicated with more readily available data or could be discarded altogether. For example, the measures for how effectively an alternative serves existing and future residents of the western waterfront are encompassed in a detailed ridership forecast; therefore, NJ TRANSIT determined that additional measures such as distance of new residences from new stations would be duplicative and would not further inform the decision-making process. Furthermore, the alignments of the short list of alternatives are similar, meaning that some measures are the same for all of these alternatives; thus, these measures were considered ineffective in demonstrating the relative differences in alternatives. Finally, the study area itself is urbanized and has limited natural features and open space; consequently, these environmental factors are not applicable for evaluating the differences in the alternatives.

This evaluation considers a baseline (No Action) condition against which the benefits and detriments of each alternative are weighed. Some alternatives could be implemented more quickly than others, but the evaluation must compare alternatives against a consistent baseline. For purposes of this study, the baseline condition reflects land use, social and demographic conditions, and transportation services in 2035. The 2035 horizon year is consistent with the region’s long-range transportation plan, incorporates the planned completion of Bayfront and the New Jersey City University (NJCU) West Campus, and is a reasonable timeframe for implementation of all of the alternatives under consideration.

**Table 2-1
Performance Measures**

Goal / Objective	Performance Measure
<i>SUPPORT EXISTING AND PROPOSED DEVELOPMENT IN THE WEST SIDE COMMUNITY</i>	
Improve access to existing destinations in the study area	Number of residents and employees within ¼ mile of proposed stations or bus stops Travel time
Increase ridership on HBLR system	Projected ridership
Support the Bayfront Redevelopment Plan	Bayfront residents and employees within ¼ mile of proposed stations or bus stops
Support the New Jersey City University Master Plan	Distance between stations or bus stops and planned NJCU development Change in transit mode share for NJCU area
Support the planned redevelopment of Route 440	Required changes to Route 440 alignment or plans to accommodate proposed alternative
<i>MINIMIZE EFFECTS ON EXISTING AND PROPOSED HBLR OPERATIONS</i>	
Provide improved transit access continuing from the existing West Side Avenue terminal	Number of residents and employees within ¼ mile of proposed stations or bus stops
Avoid substantial compromises to existing HBLR timetables	Predicted run time between existing West Side Avenue terminal and Hoboken Terminal Modeled passenger loading to capacity ratio between existing West Side Avenue terminal and Hoboken Terminal before and after extension
Minimize capital and operating and maintenance costs	Increase in vehicle fleet requirements and maintenance facilities Increase in NJ TRANSIT annual operating and maintenance costs
Implement within a reasonable timeframe	Construction duration
Accommodate other planned systemwide HBLR capital improvements	Requirements for changes to systemwide capital improvements
<i>MINIMIZE ADVERSE EFFECTS ON THE BUILT AND NATURAL ENVIRONMENT</i>	
Avoid property acquisition to the maximum extent feasible	Number of negatively affected properties Number of full or partial property acquisitions required
Avoid, minimize, or mitigate adverse impacts on historic resources	Number of impacted historic or cultural resources
Minimize encroachment on view corridors	Number of properties with negatively impacted view corridors
Maintain access to existing and future residences and businesses in the study area	Increase in residents and employees within ¼ mile of proposed stations or bus stops Changes in vehicular access to residential and commercial structures
Reduce vehicular congestion, emissions, and noise	Transit and auto mode share split to and from study area Number of properties with adverse noise impacts Predicted vehicular congestion along major corridors Change in number of auto trips
Avoid impacts to Route 440 operations to the extent feasible	Predicted traffic impacts along Route 440 and adjacent roadways
Minimize construction impacts to the extent feasible	Number of properties impacted by proposed construction Duration and type of predicted construction impacts
Avoid impacts on parklands, open space, natural features and coastal waters	Number and type of impacts to parklands, open space, natural features, or coastal waters

2.3 ALTERNATIVES DEVELOPMENT

2.3.1 OVERVIEW

The alternatives development process aims to identify the most suitable mode, alignment, and logical termini for proposed transit service.

2.3.1.1 MODE

The existing and proposed development in the western waterfront area described in Chapter 1, "Background and Planning Context," is approximately a mile or less from the existing HBLR terminus at the West Side Avenue Station. Given this short distance, it would be impractical to introduce a new mode (i.e., heavy rail, automated guideway transit, or commuter rail) to provide extended transit service to Route 440. Therefore, the alternatives analysis is limited to the practical transit modes for this extension, which are light rail (extended HBLR service) and new or enhanced bus service, including Bus Rapid Transit (BRT).

2.3.1.2 ALIGNMENT

On-street routings are considered for bus alternatives. The specific streets for these routings and the location of stops were determined based on the location of major population generators. Logical routes of travel for bus service were developed between the existing HBLR system and the new and existing development in the study area.

The potential alignment for fixed guideway (light rail) alternatives considers both on-street and off-street routes, including the potential for a viaduct across Route 440. Considerations in developing preferred alignments include compatibility with the existing HBLR infrastructure, design requirements with respect to right-of-way, track layout, stations, and property impacts. On- and off-street alignments east of Route 440 are concentrated in the area between Claremont and Culver Avenues. Options for alignments at and along Route 440 depend on the potential terminal for the fixed guideway service. As shown in **Figure 2-2**, the fixed guideway alignment could travel across Route 440 in a westerly direction toward Bayfront. The alignment could also turn and travel northward or southward on either the east side or the west side of Route 440.

2.3.1.3 LOGICAL TERMINI

The HBLR West Side Avenue Station, located in the east part of the study area, provides convenient transit access to points east, north, and south. Therefore, it is considered the logical eastern terminal for bus and fixed guideway (light rail) options that extend transit service west to and potentially west of Route 440.

Three options are considered for the western terminal of new fixed guideway transit service—Bayfront, Society Hill, and Lincoln Park. The Bayfront option would extend service to or across Route 440 near the intersection of Culver Avenue. The Society Hill option would extend service westward to Route 440 near the intersection of Culver Avenue and then southward to Society Hill. The Lincoln Park option would result in transit service westward to Route 440 near the intersection of Culver Avenue and then northward along Route 440 toward Lincoln Park. For the alignments to Society Hill and Lincoln Park, routings on either the east or west sides of Route 440 were studied.

2.3.2 INITIAL LIST OF ALTERNATIVES

Based on the parameters described above for mode, alignment, and logical termini, the Project Initiation Package identified a number of build alternatives. Two modes are considered—bus/BRT and light rail—with each having multiple options for the alignment and termini. As part of the alternatives analysis, NJ TRANSIT also examined a No Action Alternative.

2.3.2.1 NO ACTION ALTERNATIVE

The No Action Alternative reflects a 2035 baseline condition without transit enhancements and serves as the baseline condition for comparison of alternatives. The No Action Alternative reflects the continuation of existing transit operations in the study area, including HBLR service to West Side Avenue Station and bus routes operated both by NJ TRANSIT and by private operators. The No Action Alternative also assumes that the Bayfront and NJCU West Campus developments are completed and that the planned enhancement of Route 440 is finished or substantially under way.

2.3.2.2 TSM ALTERNATIVES

The alternatives analysis process requires examination of a Transportation System Management (TSM) Alternative. Consistent with FTA alternatives evaluation procedures, TSM Alternatives are lower cost solutions to improve mobility without the capital costs incurred by a build alternative. For this study, the TSM Alternative includes enhancements to existing bus service or introduction of new bus service that will serve existing and future destinations within the study area and improve connectivity to the existing HBLR terminal at West Side Avenue.

2.3.2.3 BRT ALTERNATIVE

The BRT Alternative includes enhanced technologies to improve the efficiency of existing and proposed bus routes in the study area. BRT can include traditional bus vehicles with signal pre-emption or other techniques to reduce travel time; it can also include fixed guideway and exclusive bus-only alignments. The relatively short distance between the West Side Avenue Station and the potential termini for new transit service would reduce the effectiveness of a separate BRT right-of-way. Therefore, the BRT Alternative includes BRT elements such as new vehicle types, fare collection, signal priority, and stop/station types that could improve run times and reduce delays without a fixed guideway system.

2.3.2.4 LIGHT RAIL ALTERNATIVES

The light rail alternatives would extend HBLR service westward from West Side Avenue Station. As shown in **Table 2-2**, there are both alignment options and terminal options for this new fixed guideway service. The initial phase of the alternatives analysis identified 10 alternatives for extended light rail service within the study area. All of these light rail alternatives include a station stop at or near Bayfront. As shown in the table, some of the alternatives would also extend beyond Bayfront to provide additional station stops.

Table 2-2
Initial List of Light Rail Alternatives

Alternative No.	Grade	Alignment	
		From West Side Avenue to Route 440	From Route 440 to West Terminal
1: HBLR to West Terminal at Bayfront			
1A	Elevated	Off-Street	Off-Street
1B	Street level	Street Running	Street Running
2: HBLR to West Terminal at Society Hill			
2A	Elevated	Off-Street	West side of Route 440
2B	Elevated	Off-Street	East side of Route 440
2C	Street level	Street Running	West side of Route 440
2D	Street level	Street Running	East side of Route 440
3: HBLR to West Terminal at Lincoln Park			
3A	Elevated	Off-Street	West side of Route 440
3B	Street level	Off-Street	East side of Route 440
3C	Street level	Street Running	West side of Route 440
3D	Street level	Street Running	East side of Route 440

2.3.3 ALTERNATIVES SCREENING AND REFINEMENT

Following the Project Initiation phase, the preliminary long list of alternatives was subjected to an initial “fatal flaw” evaluation to eliminate from further consideration any alternatives that were impracticable and therefore did not warrant development of conceptual design information.

2.3.3.1 FATAL FLAWS ANALYSIS

2.3.3.1.1 BRT Alternative

A bus alternative was developed that was intended to serve the same market as an extension of HBLR into the Bayfront development. This Bayfront HBLR Shuttle Alternative would provide direct shuttle service between Bayfront and the West Side Avenue Station. It would incorporate some features that are typical of BRT service, to clearly identify this service as connected to HBLR and to enhance passengers’ experience.

Where relevant, BRT service generally involves some of the following attributes:

- Separate right-of-way to avoid conflicts with and delays caused by operations on roadways shared with other vehicular traffic;
- Off-board fare collection to speed loading of buses at stops;
- Limited, high capacity stops with shelters;
- Premium amenities (e.g., on-board wi-fi service, “seated load” scheduling, more comfortable seating, etc.);
- Low-floor buses to speed loading of buses at stops; and
- Unique service “branding” such as bus vehicles painted in a manner specific to the BRT route.

Because service from the West Side Avenue Station would be only a short-haul service, some of the above attributes or amenities would not be suitable for the route. For example, the use of a separate, dedicated right-of-way between Bayfront and the West Side Avenue Station would require property acquisition and construction of a viaduct above Route 440, which are similar infrastructure requirements as extension of the HBLR system. The capital cost of this new structure would be better suited to extension of light rail service than to operation of a short-haul shuttle bus service.

The BRT Alternative for this study would operate more like a specialized shuttle with certain BRT attributes, which would most likely include off-board fare collection, high capacity stops with shelters, low-floor buses, and unique branding. However, premium amenities would not be practical for BRT in this case since the route would be short and the cost of these elements would outweigh their potential benefit. Therefore, a BRT alternative was not considered practical and was not carried forward.

A more extensive BRT system that would improve access between the western waterfront and areas outside the study area, such as downtown Jersey City, is outside the scope of this study and would conflict with its purpose and need. As noted in Chapter 1, “Background and Planning Context,” the purpose and need for the Project is to provide direct transit access between the western waterfront and the existing HBLR system at West Side Avenue Station. To meet that purpose and need, this study includes the objectives of providing improved transit access continuing from the existing West Side Avenue terminal and increasing ridership on the HBLR system. A BRT alternative that would provide service between the western waterfront and destinations outside the study area, such as downtown Jersey City, would not meet these objectives and would result in service that competes with the existing HBLR system rather than enhancing it. Furthermore, private bus companies already provide service between the study area and downtown Jersey City.

While BRT is not suitable as an alternative for this study, it is being evaluated by the Route 440 Study. This service could operate via Route 440 between the study area and parts of Jersey City not presently served by HBLR (i.e., Journal Square). Such a service would serve different travel markets than are contemplated by this study, but it is envisioned that a BRT along Route 440 would complement the transit access improvements intended by this study.

2.3.3.1.2 At-Grade Crossing of Route 440 (Alternatives 1B, 2C, and 3C)

Alternatives 1B, 2C, and 3C (see **Table 2-2**) would cross Route 440 at-grade. In a memorandum dated May 5, 2010, NJ TRANSIT and its project team identified fatal flaws in an at-grade, light rail crossing of Route 440 and recommended that such alternatives be eliminated from further consideration.

The memorandum identified that there is no precedent for an at-grade, light rail crossing of a major urban boulevard such as that planned along Route 440. There would also be some concerns related to the technical feasibility of designing appropriate physical protection of the crossing. The required length of crossing gates could potentially require a substantial reconfiguration of lane groupings and medians proposed by the Route 440 Study. Moreover, the heavy traffic volumes, high truck traffic percentages, and Route 440 speed limit make the feasibility of a safe at-grade crossing questionable.

Nonetheless, if a safe at-grade crossing could be practically designed, each HBLR train set would experience a delay of at least 21 seconds at every crossing. More critically, the installation of an at-grade crossing would require all vehicles on Route 440 to stop for 70 seconds while HBLR vehicles cross, which would result in unacceptable queuing, delay, and failing roadway service levels on Route 440. Thus, an at-grade crossing would be in direct conflict with the desires of Jersey City for making major improvements to Route 440 and would impair the overall operation of the HBLR system. As such, Alternatives 1B, 2C, and 3C were eliminated from further consideration.

2.3.3.2 REFINED LIST OF ALTERNATIVES

Following completion of the Project Initiation Package, additional alignment options were identified that also appeared to meet the project’s purpose and need and these were added to the list of alternatives. These include two new alternatives that extend HBLR service to Bayfront: one that has two stations (Alternative 1C) and another that extends to the east side of Route 440 with a pedestrian walkway across Route 440 to connect Bayfront and the new terminal (Alternative 1D).

In addition, the alternatives to Society Hill and to Lincoln Park were modified to include two stations. As described below, the alignment of the alternatives to Society Hill and Lincoln Park extend more than a mile from the West Side Avenue Station. It was decided that these alternatives should include an intermediate stop that could potentially better serve the proposed Bayfront and New Jersey City University (NJCU) West Campus developments.

Table 2-3 is the refined list of light rail alternatives, including the alternatives defined in the Project Initiation Package that were not eliminated during the fatal flaw review (see Section 2.3.3.1.2) and the alternatives that were identified following completion of the Project Initiation Package. These alternatives are described in Chapter 3, “Long List of Alternatives.”

**Table 2-3
Refined Long List of Light Rail Alternatives**

No.	Terminal	Alignment	New Stations
1: HBLR—Bayfront			
1A	Bayfront	Elevated, off-street	One—Bayfront
1C	Bayfront	Elevated, off-street	Two—Route 440 and Bayfront
1D	Route 440 (east side)	Elevated, off-street	One—Route 440
2: HBLR—Society Hill			
2A	Society Hill west of Route 440	Elevated, off-street	Two—Bayfront and Society Hill
2B	Danforth Avenue east of Route 440	Elevated, off-street	Two—Carbon Place and Danforth Avenue
2D	Danforth Avenue east of Route 440	At-grade, on-street	Two—Carbon Place and Danforth Avenue
3: HBLR—Lincoln Park			
3A	Communipaw Avenue west of Route 440	Elevated, off-street	Two—Hudson Mall and Communipaw Avenue
3B	Communipaw Avenue east of Route 440	At-grade, off-street	Two—Claremont Avenue and Clendenny Avenue
3D	Communipaw Avenue east of Route 440	At-grade, on-street	Two—Claremont Avenue and Clendenny Avenue