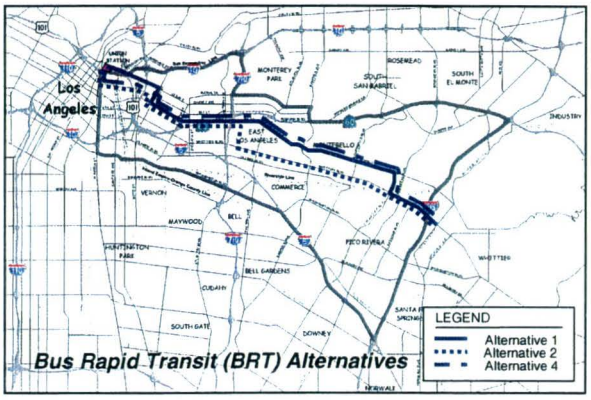

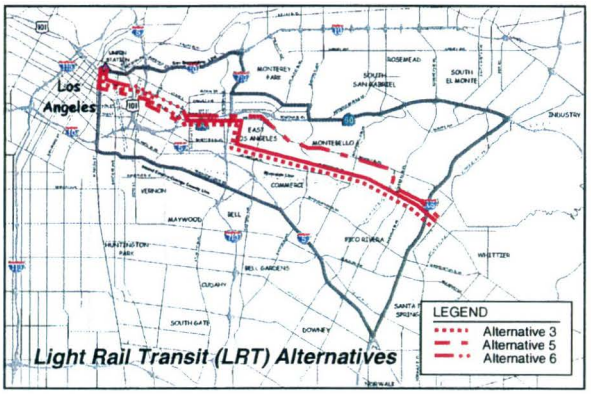

Eastside Transit Corridor Study

Los Angeles, California

Re-Evaluation/ Major Investment Study (MIS)

Draft Executive Summary

Prepared for:
Los Angeles County
Metropolitan Transportation Authority

Prepared by:
Eastside Corridor Transit Consultants

February 24, 2000

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I. Need for Action

Description of the Study Corridor

The Eastside Corridor study area extends from Alameda Street in Central Los Angeles east through the Boyle Heights community in the City of Los Angeles and the City Terrace, Belvedere and East Los Angeles communities of unincorporated Los Angeles County. South and east of the East Los Angeles area, the corridor study area includes major portions of the cities of Montebello, Pico Rivera and Commerce, and areas that include portions of Monterey Park, Downey, Santa Fe Springs and Whittier (Figure 1).

Regional Context

Work on planned Eastside and Westside extensions of the Metro Red Line subway was suspended by the Los Angeles County Metropolitan Transportation Authority (MTA) in January 1998 due to financing difficulties. The MTA Restructuring Plan adopted in May 1998 called for the MTA to study "viable and effective options" for all parts of Los Angeles County, with an emphasis on the corridors in which rail projects has been suspended. Within the Eastside and Westside corridors, this necessitated the examination of alternative fixed guideway options to the heavy rail subway projects.

Based on the results of the November 1998 draft Regional Transit Alternatives Analysis (RTAA Study), the MTA Board approved the concept of a rapid bus plan in March 1999, which included a rapid bus demonstration project on the Eastside. The Board also reaffirmed its commitment to fund fixed guideway transit improvements beyond rapid bus in the suspended rail corridors. The Board subsequently authorized the preparation in June 1999 of this Re-Evaluation/Major Investment Study and Draft and Final Supplemental Environmental Impact Statement/Environmental Impact Report (SEIS/SEIR) for the suspended Metro Red Line Eastside Transit Corridor Project.

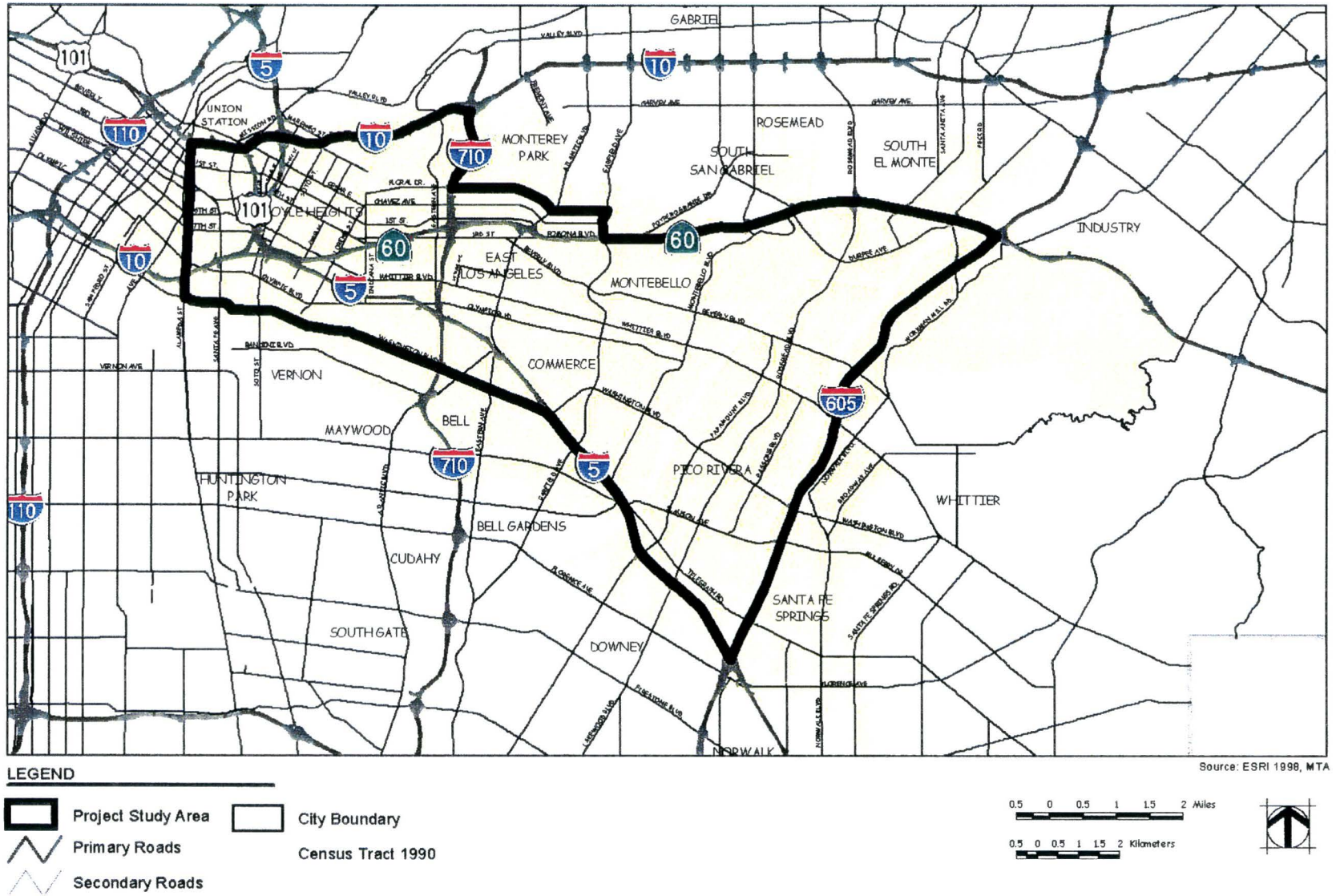
Roadway Conditions

The Eastside Corridor study area is served by several freeways that connect to neighboring communities and other parts of the Southern California metropolitan region.
Freeways include the San Bernardino Freeway (I-10), the Long Beach Freeway (I-710), the Santa Ana Freeway (I-5), Pomona Freeway (SR-60), and US-101 Freeway.

The major arterial and neighborhood collect streets include:

- East-West – Cesar Chavez Avenue, 1st Street, 4th/3rd Streets, Beverly Boulevard, Whittier Boulevard and Olympic Boulevard

- North-South - Soto Street, Eastern Avenue, Atlantic Boulevard, Garfield Avenue, Montebello Boulevard, and Rosemead Boulevard. The older western sections of the corridor (Boyle Heights and East Los Angeles) have narrower streets and greater levels of congestion than the more suburban eastern section (Montebello and Pico Rivera).



Eastside Transit Corridor Study

Project Study Area

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Figure 1

Transit Systems

The Eastside Corridor has one of the most extensive networks of bus routes in the County. The corridor's transit routes generally follow a grid pattern and include many express and local routes and one limited service route. Six public agencies operate bus services in the Eastside Corridor. The include:

- Los Angeles County Metropolitan Transportation Authority
- Montebello Transit
- Whittier Transit
- Norwalk Transit
- City of Monterey Park
- City of Commerce

Most of the heavily used routes are those that run in an east-west direction. Severe overcrowding occurs regularly on many of these routes during peak periods. Although north-south travel is constricted into two main through bus lines on Soto and Atlantic, the predominant flow of transit passengers in the corridor is in an east-west direction.

Community Factors

The Eastside Corridor study area contains a low-to moderate-income population, which is expected to grow by over 25 percent to 625,000 in 2020. The Eastside corridor contains a dense concentration of households, particularly in the western portion of the study region.

Access to employment opportunities is one of the major mobility problems that affect Eastside Corridor residents. The 1990 Census analysis of the study area work force revealed a breakdown of home-based work trips generated from the Eastside Corridor area. Nine percent of work trips were destined for the Los Angeles CBD, 36 percent for areas north and west of the CBD, 13 percent for the South Bay region of the County, 24 percent for locations within the corridor and 18 percent for areas in the remainder of the County.

Forecast date for the year 2020 show an increase in the number of trips generated in the Eastside Corridor study area as the population grows. The forecast results indicate that there will be less reliance on the Los Angeles CBD and a greater number of trips being made to other sub-areas of the Los Angeles region. Thereby increasing the need for Eastside residents to have quality transit service to all parts of the region.

Goals and Objectives

The goals and objectives of the Eastside Transit Corridor Study have been developed out of the extensive corridor and systems planning studies carried out over the past ten years, including the Eastside Alternative Analysis/DEIS/DEIR process and public reviews leading to selection of the Locally Preferred Alternative.

Based on these planning and community involvement activities, the following goals and objectives were developed. They are based on established transportation and land use goals and objectives of the major government jurisdictions along the corridor, including the City of Los Angeles and the County of Los Angeles. These goals and objectives will be utilized in the development and evaluation of Eastside Corridor transit alternatives.

1. Improve access and mobility for residents, employees, and visitors to the Eastside Corridor.
2. Support land use and development goals as stated in the City of Los Angeles and County of Los Angeles plans.
3. Achieve local consensus by ensuring that the process is responsive to the community and policy-makers.

4. Provide a transportation project that is compatible with and enhances the physical environment wherever possible.
5. Provide a transportation project that minimizes adverse impact on the community.
6. Provide a transportation project that is reasonably within budget constraints for both capital and operating expenses.

Mobility Problem Summary

Travel demand forecasts prepared by SCAG and the MTA over the past decade have identified the need for major transit improvements in the Southern California region, especially in Los Angeles County, to meet the mandates of the Federal Clean Air Act and address the increasing mobility needs of the region. Current freeway and surface arterial street facilities cannot be expanded sufficiently to handle the forecasted demand for mobility. The latest regional forecasts for the year 2020 estimate that person trips will increase by over 40 percent in the region and by almost 30 percent in Los Angeles County.

All major freeways serving the Eastside Corridor area are currently operating above their design capacities during peak periods and for significant durations during the off-peak periods. No major improvements to existing freeways in the study area are identified in the current SCAG Regional Transportation Plan except for the extension of the I-710 freeway north to Pasadena. During previous project scoping and community meetings, residents of the Eastside Corridor expressed their desire for improved transit services because many are transit-dependent and need improved access to the region's educational, employment and cultural opportunities. Current meetings with Eastside Corridor elected officials have confirmed the need for improved transit service and connections to the regional system, especially in light of community initiatives for revitalization, employment opportunities, and economic development on the Eastside.

The Role of the Re-Evaluation/MIS

Two objectives of this Re-Evaluation/MIS study are to (1) develop alternatives to the Suspended Project, and (2) to identify the corridor long term transportation needs to be addressed in the MTA Long Range Plan. This Re-Evaluation/MIS Report will provide the public and MTA Board of Directors the technical information needed in order to make an informed decision related to selecting an alternative or alternatives that satisfy the needs of the Eastside Corridor. The selected alternatives will then be subject to the next phase of analysis which is the preparation of a Supplemental Draft Environmental Impact Statement/Supplemental Draft Environmental Impact Report (SDEIS/SDEIR).

Based on the SDEIS/SDEIR the MTA Board of Directors could select the Eastside fixed guideway project that would be subject to Preliminary Engineering and Final Environmental Impact Statement/Final Environmental Impact Report (FEIS/FEIR). The final actions before final design and construction could begin would be a Record of Decision by the Federal Transit Administration and an agreement on a financing plan between the FTA and LACMTA. The above process from the time a decision is make by MTA on this Report until a Record of Decision and financing plan is agreed upon would be approximately eighteen months to two years. After that time final design and subsequent construction activities could begin.

II. Alternatives Considered

Screening and Selection Process

The first task undertaken to select alternatives for the study was to compile and review all alternatives identified in prior studies for any of the three modes identified for the Eastside: Bus Rapid Transit (Busway), Light Rail Transit and Heavy Rail Transit.

The following six studies were identified:

1. Regional Transit Alternatives Analysis, November 1998, MTA.
2. East Los Angeles Study for 1st District, October 1998, ACG Environments.
3. 1998 RTP Transit Restructuring Evaluation, East Los Angeles, Transit Corridor Technical Report, July 1998, SCAG.
4. Los Angeles East Side Extension, FEIS/FEIR, September 1994, MTA.
5. Route 10/60 Corridor Preliminary Planning Study, June 1993, MTA.
6. Los Angeles Eastside Corridor, AA/DEIS/DEIR, April 1993, MTA.

From these six studies, as well as from input from the public and staff, 47 alternatives were identified. The goal was to reduce the alternatives to eight fixed guideway alternatives for analysis along with the three potential modes. In addition to studying the eight fixed guideway alternatives, the study team was charged with studying a No-Build alternative as well as an alternatives consisting of Transportation System Management (TSM) techniques.

The process of "scoping" was also undertaken pursuant to Federal and local environmental procedures. Working in cooperation with the Federal Transit Administration (FTA), the Federal Notice of Intent was published on August 13, 1999 and the California Notice of Preparation on August 10, 1999. Interested individuals, organizations and agencies were invited to provide input in the selection of alternatives as part of the scoping process. Included at this stage were meetings conducted in the most impacted communities in the Corridor.

Working closely with MTA staff, the study team developed a list of 32 criteria by which each of the alternatives could be assessed. After applying the criteria to the 47 alternatives, 15 alternatives were selected for further consideration. These 15 were subsequently reduced to the eight alternatives to be studied based on considerations of the prior studies, the need to include all three fixed guideway modes and the identification of logical termini points.

Once the eight alternatives were identified, the criteria and measures that would be used in making the analysis were developed. The major categories of criteria were:

1. Costs
2. Effectiveness or Transportation System Performance
3. Efficiency or Cost-Effectiveness
4. Potential Environmental Issues and Concerns
5. Environmental Justice Issues
6. Community Consensus

Description of Each Alternative

The following description of each Alternative provides additional background information on the thorough process that went in to each Alternative selection. Of the eight fixed guideway alternatives, three alternatives (1, 2, and 4) are exclusively Bus Rapid Transit (BRT), three alternatives (3, 5, and 6) are exclusively Light Rail Transit (LRT), and two alternatives (7 and 8) are hybrids using Red Line Heavy Rail Transit (HRT) from Union Station connecting to either LRT or BRT technologies for the

remainder of the Corridor to Whittier and Norwalk Boulevards. Figures 2, 3, and 4 show the eight alternatives grouped by the three categories of BRT, LRT, and HRT/Hybrid alternatives. All the alternatives have the same termini; Union Station on the west and Whittier and Norwalk Boulevards on the east. In addition, a No Build and Transportation System Management (TSM) Alternatives are required by local and Federal regulations in order to compare the eight fixed guideway alternatives. The description of each of the these baseline alternatives are also presented.

Alternative 1 – BRT on Cesar Chavez, 4th, 3rd, Beverly and Whittier

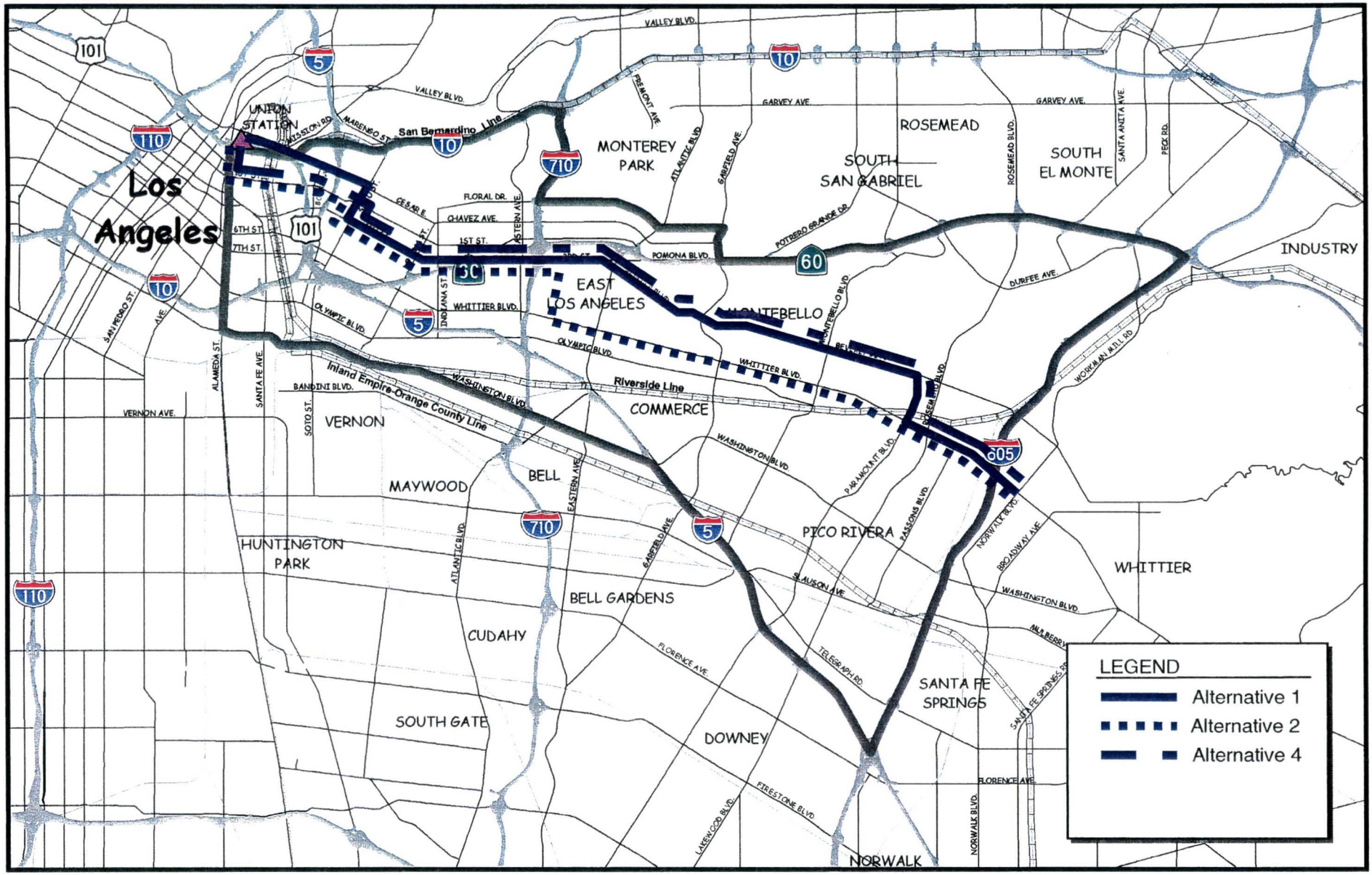
This alternative introduces the BRT mode to the Eastside Corridor. The following discussion is applicable to all BRT oriented alternatives and not just to Alternative 1. The BRT fixed guideway concept would dedicate a travel lane on the chosen alignment that is adjacent to the parking lane and would provide for generally BRT stations on the far side of intersections. All BRT concepts would operate on existing arterial streets and would require the removal of one general purpose travel lane in each direction. That travel lane would be reconstructed and converted to a dedicated Bus Rapid Transit fixed guideway.

The operation of the BRT will be a new and unique operating and traffic arrangement for the Eastside Corridor alignments. Both local buses and BRT buses (dedicated service route along the bus lane as well as special BRT routes serving areas adjacent to the dedicated bus lane) would operate in the dedicated Bus Rapid Transit Lane. The BRT and local buses would stop at the special BRT Stations shown (usually a far bus stop). The BRT Station stop (approximately 180 feet long) would entail extending the sidewalk the width of the parking lane so that the buses would not have to leave the dedicated lane when loading and unloading passengers. The buses will make other stops between the BRT Stations and would move to the curb lane just as they do today. It is also assumed that the buses operating on these dedicated lanes will have traffic signal preemption to allow them to operate at the posted speed limits between stops. It is expected that from 30 to 75 buses would operate in one direction in the peak hours depending on the location within the Eastside Corridor (less buses per hour the further east you go). The BRT buses would be completely a new style (40' to 60') attractive bus. These new style buses are much more attractive to the neighborhoods, easier to load (low floor accessibility), and would met MTA's clean fuel policy.

Automobiles and delivery vehicles will operate in a much different fashion than they do now. Parking spaces will be enlarged to make parking easier. It is expected that a number of on-street spaces will be lost with these alternatives and replacement parking would have to be provided within the immediate area. The frequency of parking entries and exits may eventually affect the operating speed of the dedicated bus lane. Over time more off-street parking may have to be developed to maintain a quality operation on the dedicated bus lane.

Private vehicles making right turns must move into and cross the dedicated bus lane as they approach the intersection. Also when turning onto the dedicated bus lane portion of the street the driver will need to be sure to enter into the proper travel lane which will not be the standard right lane. It is also expected that the streets with the dedicated bus lane will become more "transit" oriented and through traffic will be reduced and directed to other streets within the corridor. On the narrower streets left-turns may have to be restricted at certain intersections during portions of the day (peak morning and evening periods) because of the lack of space for a dedicated left turn pocket. The reduction of one traffic lane in each direction will impact the level of service and possible ease of access to commercial businesses and other public activities. It is expected over time that traffic would re-orient itself because most of the streets in the western portion of the Eastside Corridor have some available capacity and might accept more traffic and still be acceptable.

Alternative 1 is the first of three exclusive BRT alternatives identified for study. The alignment of Alternative 1 is shown in Figure 2. Alternative 1 is approximately 13.2 miles long with 18 stations from



Eastside Transit Corridor Study

Bus Rapid Transit Alternatives

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Figure 2

1st/Alameda through Union Station and to Whittier and Norwalk Boulevards via Cesar Chavez, Soto, 4th, 3rd, Beverly, Paramount and Whittier.

The BRT operating plan is designed to maximize the use of the dedicated bus lane and to optimize the operating characteristics and flexibility of a bus system operation. The operating plan was also designed to provide an equivalent capacity to the LRT at-grade alternatives that are being studied. The BRT operating plan for this Alternative and the other BRT alternatives is comprised of three components. These are:

1. A major BRT Trunk lane operating between Whittier/Norwalk Boulevards and 1st/Alameda with 4 minute peak service and 10 minute off-peak service;
2. Ten BRT connecting routes operating with 15 minute peak service and 30 minute off-peak service – these routes provide a one-seat ride for example from Washington/Rosemead (BRT Connector Route 3) to all points west of Whittier/Rosemead; and
3. Local bus connecting routes to all stations along the BRT line. The BRT running time using dedicated bus lane with stops at each station is estimated to be 34 minutes from Whittier/Norwalk to 1st/Alameda.

The Wilshire/Whittier Rapid Bus line is included in this and all the Build alternatives, but the peak period service frequency has been reduced to 7 minutes and the off-peak frequency to 12 minutes.

Alternative 2 – BRT on Alameda, 1st, 4th, 3rd, Arizona and Whittier

Alternative 2 is the second of three exclusive BRT alternatives identified for the study. The alignment of Alternative 2 is shown in Figure 2. Alternative 2 is approximately 13.1 miles long with 19 stations from Union Station and to Whittier and Norwalk Boulevard via Alameda, 1st, Soto, 4th, 3rd, Mednik, Arizona and Whittier.

The BRT operating plan is designed to maximize the use of the dedicated bus lane and to optimize the operating characteristics and flexibility of a bus system operation. The operating plan was also designed to provide an equivalent capacity to the LRT at-grade alternatives that are being studied. The BRT operating plan for this Alternative and the other BRT alternatives is components. These are:

1. A major BRT Trunk line operating between Whittier/Norwalk Boulevards and Union Station with 4-minute peak service and 10-minute off-peak service;
2. Ten BRT Routes operating with 15-minute peak service and 30 minute off-peak service – these routes provide a one-seat ride for example from Washington/Rosemead to all points west of Whittier/Rosemead; and
3. Local bus connecting routes to all stations along the BRT line. The BRT running time using the dedicated bus lane with stops at each station is estimated to be 35 minutes from Whittier/Norwalk to Union Station.

The Wilshire/Whittier Rapid Bus line is included in this and all Build alternatives, but the peak period service frequency was reduced to 7 minutes and the off-peak frequency to 12 minutes.

Based on the assumed operating plans described above the number of buses per hour in the peak direction on the dedicated bus lane would vary from 24 buses at Passons and Whittier to approximately 77 buses at 1st and Chicago.

Alternative 3 – Light Rail Transit (LRT) on Alameda, 1st, 4th, 3rd, Arizona and Whittier

This alternative introduces the Light Rail Transit (LRT) mode to the Eastside Corridor. The following discussion is applicable to all LRT oriented alternatives and not just Alternative 3. The LRT fixed

guideway concept would operate in a dual track configuration in the center of the selected streets and provide what are called low platform center station arrangements. LRT is electrically powered (similar to the Long Beach Blue Line and the Green Line) and receives its electric power from overhead power lines within the street right-of-way. All the LRT concepts would operate at-grade (street level) on existing arterial streets (or in a subway for a portion of Alternative 6) and would require the removal of one general purpose travel lane in each direction. This design configuration would allow for the retaining of a majority of the on street parking on arterial streets. The center section of all arterial streets on the LRT route would require major reconstruction in order to accommodate the LRT.

The operation of the LRT will be a new operating and traffic arrangement for the Eastside Corridor alignments but is not new to transit users in Los Angeles County and is similar to existing operations throughout the United States and the world. LRT Station would entail constructing a 270 foot long platform (allows for a maximum of 3-car trains) along with pedestrian walkways to allow for safe passage to crosswalks for arriving and departing passengers.

The LRT operating speeds for the Eastside Corridor would be much different than are speeds on other light rail lines currently in operation in Los Angeles. Because of the placement of the LRT track and stations at-grade in arterial streets, the maximum speed of operation would be limited by the street speed limit (varies from 25 to 35 mph) with a 35 mph maximum speed allowed under all circumstances by State PUC regulations. Based on experience with the Long Beach Blue Line operations, the lower speed at-grade operation has less fatalities than high-speed (55 mph) operations even though the number of minor accidents are greater with the in-street operations proposed for the Eastside Corridor alternatives.

The LRT is assumed to operate at 5-minute frequencies in the peak periods and at 12-minute frequencies in the off-peak periods and stop at all stations. Because the individual cars can be "trained" together, the train lengths can vary from 1 to 3 cars depending on the demand and the time of day. The LRT vehicle proposed would be a completely new style (low floor LRT vehicles) rail vehicle for Los Angeles. In addition, local buses with local stops would continue to operate along the same arterial streets as the LRT but would be at lower service frequencies. This will allow transit patrons to access areas that are not directly serviced by the LRT station stops.

Automobiles and delivery vehicles will operate in a much different fashion than they do now. In order to maximize the safety of the LRT operation and to minimize private vehicles conflicts with the LRT trains, it is recommended that left turns and crossings of the LRT train track be limited and possibly restricted to only major intersecting streets where advanced traffic and train control systems can be implemented. Between major intersections, a 6-inch curb next to the travel lane would protect the LRT track section and therefore driveways and minor or secondary streets would be limited to right-turns in and out. Private vehicles would not be able to make left-turns across the LRT tracks or cross from one side to the other. Private vehicles left turns at designated intersections would be controlled and all safety measures would be taken.

As discussed with the BRT mode concept, it is also expected that the streets with the LRT mode concept will become more "transit" oriented, and through traffic will be reduced and directed to other streets within the corridor. On the narrower streets left-turns may have to be restricted at certain intersections during certain portions of the day (peak morning and evening periods) because of the lack of space for a dedicated left turn pocket. The reduction of one traffic lane in each direction will impact the level of service and possibly ease of access to commercial businesses and other public activities. It is expected over time that traffic would re-orient itself because most of the streets in the western portion of the Eastside Corridor have some available capacity and might accept more traffic and yet maintain acceptable levels of service.

Alternative 3 is the first of three exclusive LRT alternatives identified for study. The alignment is shown in Figure 3 and is approximately 12.8 miles long with 19 stations from Union Station to Whittier and Norwalk Boulevard via Alameda, 1st, Soto, 4th, 3rd, Mednik, Arizona and Whittier.

The LRT operating plan for this Alternative and other LRT alternatives is comprised of two components. These are (1) the LRT operating line between Whittier/Norwalk Boulevards with 5 minute peak service and 12 minute off-peak service; and (2) local bus connecting routes to all stations along the LRT line. The LRT running time while making stops at each station is estimated to be 32 minutes from Whittier/Norwalk to Union Station.

Based on the assumed LRT operating plan described above the number of trains per hour in the peak direction on the LRT track would be 12 and in the off-peak would be 5.

Alternative 4 – Bus Rapid Transit (BRT) on Alameda, 1st, 4th, 3rd, Beverly and Whittier

Alternative 4 is the third of three exclusive BRT alternatives identified for study. The alignment of Alternative 4 is shown on Figure 2. Alternative 4 is approximately 13.0 miles long with 19 stations from Union Station to Whittier and Norwalk Boulevards via Alameda, 1st, Soto, 4th, 3rd, Beverly, Paramount and Whittier. The BRT operating plan is deigned to maximize the use of the dedicated bus lane and to optimize the operating characteristics and flexibility of a bus system operation. The operating plan was also designed to provide an equivalent capacity to the LRT at-grade alternatives that are being studied. The BRT operating plan for this Alternative and the other BRT alternatives is comprised of three components. These are:

1. A major BRT Trunk line operating between Whittier/Norwalk Boulevards and Union Station with 4-minute peak service and 10-minute off-peak service;
2. Ten BRT Routes operating with 15-minute peak service and 30-minute off-peak service – these routes provide a one-seat ride for example from Washington/Rosemead to all points west of Whittier/Rosemead; and
3. Local bus routes to all stations along the BRT line. The BRT running time using the dedicated bus line with tops at each station is estimated to be 34 minutes from Whittier/Norwalk to Union Station.

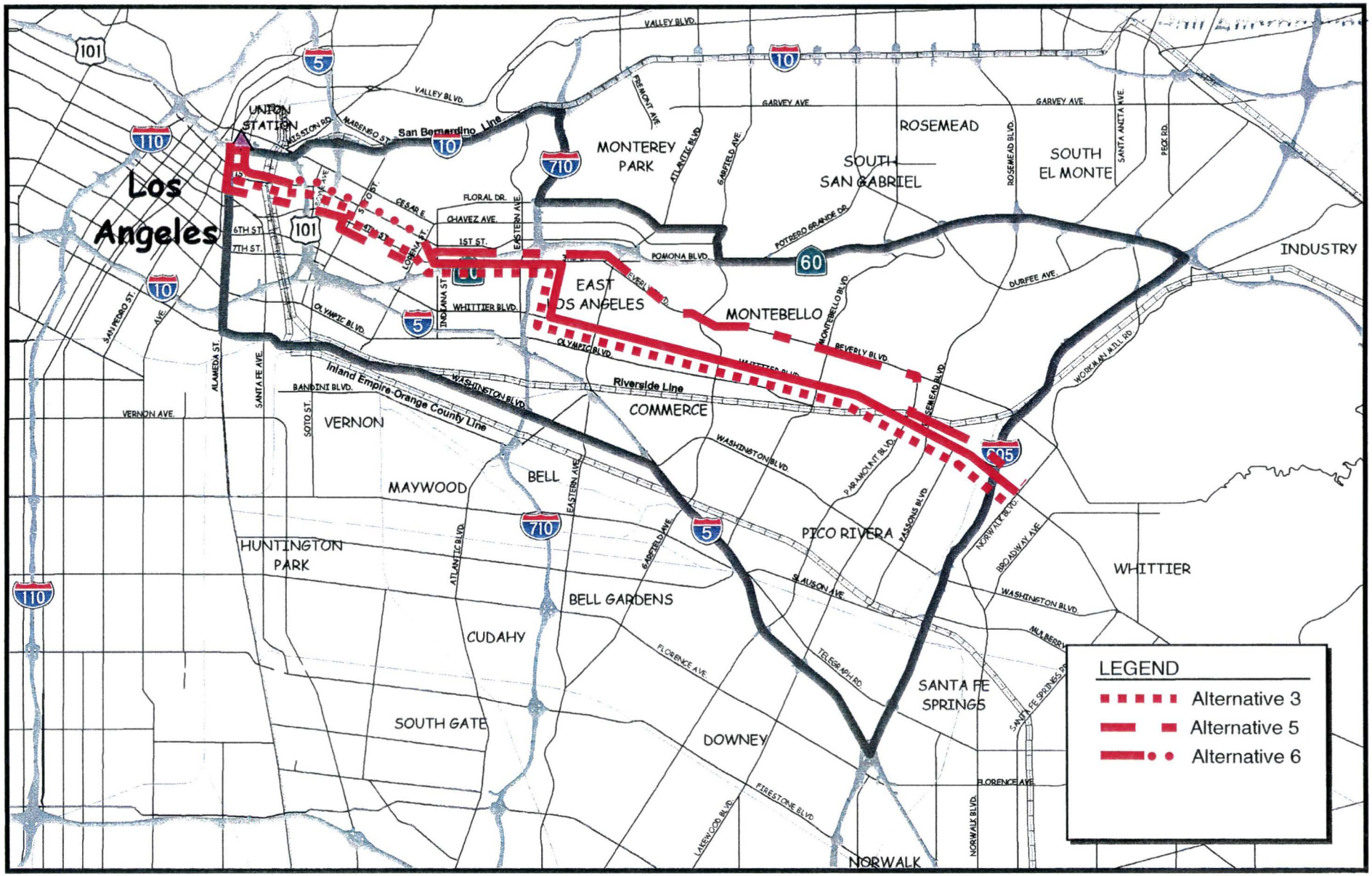
The Wilshire/Whittier Rapid Bus line is included in this and all Build alternatives, but he peak period service was reduced to 7 minutes and the off-peak frequency to 12 minutes.

Based on the assumed operating plans described above the number of buses per hour in the peak direction on the dedicate bus lane would vary from 24 at Passons and Whittier to approximately 77 at 1st and Chicago.

Alternative 5 – Light Rail Transit (LRT) on Alameda, 1st, 4th, 3rd, Beverly and Whittier

Alternative 5 is the second of three exclusive LRT alternatives identified for study. The alignment is shown in Figure 3. Alternative 5 is approximately 12.6 miles long with 19 stations from Union Station to Whittier and Norwalk Boulevards via Alameda, 1st, Soto, 4th, 3rd, Beverly, Paramount and Whittier.

The LRT operating plan for this Alternative and the other LRT alternative is comprised of two components. These are (1) the LRT operating line between Whittier/Norwalk Boulevards with 5 minute peak service and 12 minute off-peak service; and (2) local bus connecting routes to all stations along the LRT line. The LRT running time with making stops at each station is estimated to be 32 minutes from Whittier/Norwalk to Union Station.



Eastside Transit Corridor Study

Light Rail Alternatives

Eastside Corridor Transit Consultants

Figure 3

Based on the assumed LRT operating plan described above the number of trains per hour in the peak direction on the LRT track would be 12 and in the off-peak would be 5.

Alternative 6 – Light Rail Transit (LRT) on Alameda, 1st, Indiana, 4th, 3rd, Arizona and Whittier

Alternative 6 is the third of three exclusive LRT alternatives identified for study. The alignment is shown in Figure 3. Alternative 6 is approximately 12.6 miles long with 16 stations from Union Station to Whittier and Norwalk Boulevards via Alameda, 1st, Indiana, 4th, 3rd, Mednik, Arizona, and Whittier.

Alternative 6 is significantly different from the other at-grade LRT and BRT exclusive alternatives in that a subway or underground section is assumed below 1st Street from just west of the I-5 Freeway to Lorena. An undergound station is assumed at 1st/Boyle and a partially underground station is assumed at 1st/Lorena. The LRT underground stations are approximately 2/3rds the size of the Metro Red Line underground stations (270 foot platforms versus 450 platforms) that had been proposed as part of the previous Locally Preferred Alternative and the Suspended Project for the Eastside communities.

This alternative was chosen for comparison to and analysis with other LRT alternatives because of the potential impacts of an at-grade LRT operation through the most dense and narrow street areas of Boyle Heights. This alternative does reduce the number of stations in Boyle Heights significantly from 5 to 3.

The LRT operating plan for this Alternative and the other LRT alternatives is comprised of two components. These are (1) the LRT operating line between Whittier/Norwalk Boulevards with 5 minute peak service and 12 minute off-peak service; and (2) local bus connecting routes to all stations along the LRT line. The LRT running time with making stops at each station is estimated to be 29 minutes from Whittier/Norwalk to Union Station.

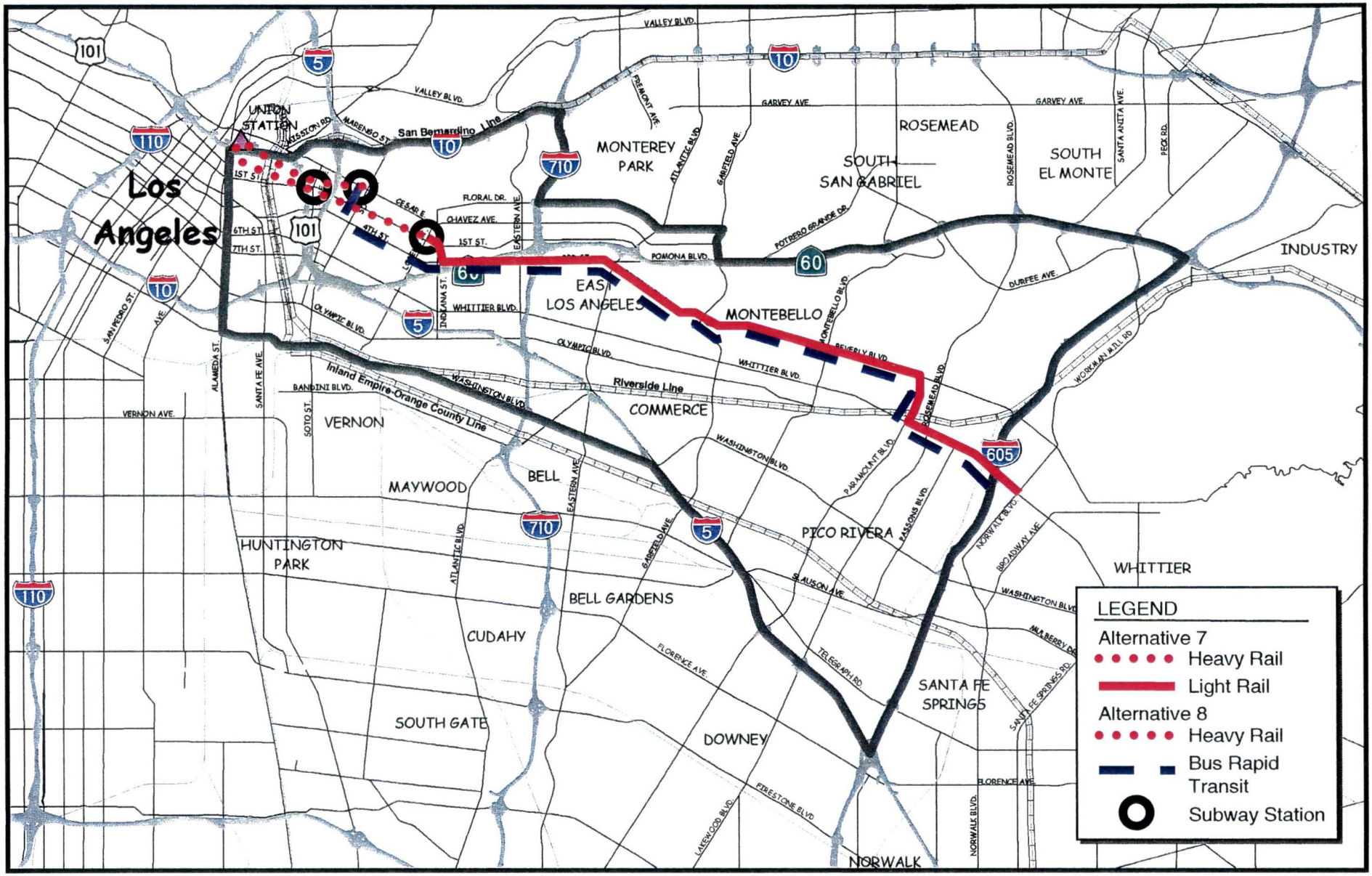
Based on the assumed LRT operating plan described above the number of trains per hour in the peak direction on the LRT track would be 12 and in the off-peak would be 5.

Alternative 7 – Heavy Rail Transit (HRT) – Union Station to 1st/Lorena and Light Rail Transit on 1st, Indiana, 4th, 3rd, Beverly and Whittier

Alternative 7 is the first of two hybrid modal fixed guideway alternatives for the Eastside Corridor. This alternative combines two modes: (1) Heavy Rail Transit that is an extension of the current Metro Red Line mode and technology from Union Station to the Eastside Corridor; and (2) At-grade Light Rail Transit that is the same as described in Alternatives 3, 5 and 6.

The first component of the Alternative 7 is the extension of the Metro Red Line in subway from Union Station to 1st/Lorena with subway stations at 1st/Boyle and 1st/Lorena. These are two of the stations that were part of the suspended project and substantial right-of-way has been purchased at those sites for access to the station and other related construction activities. At 1st/Lorena, the transit patron would proceed to grade level and access a LRT vehicle to continue the trip to Whittier/Norwalk Boulevards. This Alternative is being evaluated similar to Alternative 6 to assist in the judging the impacts of at-grade fixed guideway operations through Boyle Heights. This Alternative as well as Alternative 8 does not provide any access to the Little Tokyo/Arts District community as the other six alternatives do.

The alignment is shown on Figure 4 and is approximately 11.9 miles long with 15 stations. The Heavy Rail Transit subway component beginning at Union Station is approximately 2.6 miles long with two subway stations as an extension of the two operating Red Line subway lines. The Light Rail Transit component is approximately 9.3 miles long with 12 stations. The LRT alignment from 1st/Lorena would use Indiana, 4th, 3rd, Beverly, Paramount and Whittier.



Eastside Transit Corridor Study ***Hybrid Transit Alternatives***

Eastside Corridor Transit Consultants

Figure 4

The Heavy Rail Transit operating plan assumes the extension the Red Line operation to the Eastside. The operating plan would provide direct service on two lines from 1st/Lorena to the North Hollywood station and to the Wilshire/Western station. Each Line would operate with 4-minute peak service and 8 minutes off-peak service. This operation would provide for a Red Line train to leave the Eastside community at 1st/Lorena every 2 minutes in the peak and every 4 minutes in the off-peak.

The Light Rail Transit operating plan would provide 5-minute peak service and 12 minute off-peak service between 1st/Lorena and Whittier/Norwalk Boulevards. Local bus connecting routes to all stations along the Heavy Rail Transit and Light Rail Transit segments would be provided similar to those shown in Alternatives 3, 5 and 6. Based on the assumed LRT operating plan described above the number of trains per hour in the peak direction on the LRT track would be 12 and in the off-peak would be 5. The total combined travel time from Whittier/Norwalk to Union Station would be approximately 28 minutes.

Alternative 8 – Heavy Rail Transit – Union Station to Chavez/Soto and Bus Rapid Transit on Soto, 4th, 3rd, Beverly and Whittier

Alternative 8 is the second of the two hybrids model fixed guideway alternatives for the Eastside Corridor. This alternative combines two modes: (1) Heavy Rail Transit that is an extension of the current Metro Red Line mode and technology from the Union Station to the Eastside Corridor, and (2) At-grade Bus Rapid Transit that is the same as described in Alternatives 1, 2 and 4.

The first component of Alternative 8 is the extension of the Metro Red Line in subway from Union Station to Chavez/Soto with subway stations at 1st/Boyle and Chavez/Soto. These are two of the stations that were part of the suspended project and substantial right-of-way that has been purchased at these sites for access to the stations and other related construction activities. This Alternative is being evaluated similar to Alternative 6 to assist in judging the impacts of at-grade fixed guideway operations through Boyle Heights. This Alternative as well as Alternative 7 does not provide any access to the Little Tokyo/Arts District community as the other six alternatives do.

Alternative 8 is approximately 12.3 miles long with 18 stations (Figure 4). The Heavy Rail Transit subway component beginning at Union Station is approximately 1.1 miles long with two subway stations as an extension of the two operating Red Line subway lines. The Bus Rapid Transit component is approximately 11.2 miles long with 15 stations. The BRT alignment from Chavez/Soto would use Soto, 4th, 3rd, Beverly, Paramount and Whittier.

The Heavy Rail Transit operating assumes the extension of the Red Line operations to the Eastside. The operating plan would provide direct service on two lines from Chavez/Soto to the North Hollywood station and to the Wilshire/Western station. Each Line would operate with 4-minute peak service and 8 minute off-peak service. This operation would provide for a Red Line train to leave the Eastside community at Chavez/Soto every 2 minutes in the peak and every 4 minutes in the off-peak. The total combined travel time from Whittier/Norwalk to Union Station would be approximately 33 minutes.

The BRT operating plan for this Alternative is comprised of three components. These are (1) a major BRT Trunk line operating between Whittier/Norwalk Boulevards and Chavez/Soto with 4 minute peak service and 10 minute off-peak service; (2) Eight BRT connecting routes operating with 15 minute peak service; and (3) local bus connecting routes to all stations along the BRT line. Based on the assumed operating plans described above the number of buses per hour in the peak direction on the dedicated bus lane would vary from 24 at Passons and Whittier to approximately 62 at Chavez/Soto.

No Build

The No Build Alternative as defined by FTA should represent the baseline case consisting of existing and committed elements of the region's transportation plan, excluding the proposed fixed guideway transit investments for the study corridor. The No Build Alternative was defined for all three corridor studies to be the same and includes all highway and transit projects and operations that the region and MTA expect to be in place by the year 2020. These include improvements to the local bus systems and the completion and operation of the Red Line to North Hollywood, the Pasadena Blue Line to Sierra Madre Villa in Pasadena, and the Centerline Rail Project in central Orange County.

The forecast year is 2020 for all the alternatives and SCAG's current demographic forecasts for that year were used in all the analyses. This provides for comparisons and consistency to the current Regional Transportation Plan efforts conducted by SCAG.

The existing transit fare structure was also retained for the MIS study to allow for comparative analysis of the alternatives and to be consistent with regional planning efforts by SCAG.

Transportation System Management (TSM)

The Transportation System Management (TSM) Alternative is defined by the Federal Transit Administration (FTA) as the no build alternative plus lower cost transit capital and operational improvements that are intended to enhance the performance of the transportation system within the study corridor. Compared with the "build" alternatives the TSM Alternative should be a relatively low cost approach to addressing the transportation problems. It should be represent the best that can be done to improve transit mobility in the corridor without the construction of major new transit facilities.

The TSM alternative for the Eastside Corridor includes additions in bus service frequencies to the major east-west and north-south existing transit routes as well as the implementation of the Whittier/Wilshire Rapid Bus line from Whittier and Garfield (Montebello) to Colorado and Ocean (Santa Monica). This Rapid Bus Line has been approved for implementation in June 2000 and would provide a combined operating frequency of 1.75 minutes during the peak periods and 5 minutes during the off-peak periods. There are 24 stops along the route with six on the stops within the Eastside Corridor study area. This service would provide a strong linkage (no transfers) between a portion of the Eastside Corridor study area to Downtown, Mid-Wilshire, and the far westside of Los Angeles.

Increased service frequencies (lower headways) are assumed for MTA Routes 30/31 (Pico/1st/Floral), 65 (Olympic/Indiana/Gage), 250/251 (Soto), 253 (Evergreen/Euclid), 254 (Lorena), 255 (Rowan), 256 (Ford/Eastern), 258/259 (Arizona/Eastern), 262 (Garfield), 265 (Paramount), 266 (Rosemead), and improvements to services operated by Commerce, Montebello, and Whittier.

In addition the two Metro Red Lines (North Hollywood to Union Station and Wilshire/Western to Union Station) were assumed to operate 4 minute frequencies in the peak and 8 minute frequencies in the off-peak. This would provide 2-minute peak frequencies between Vermont/Wilshire and Union Station. This is almost twice the level of service provided today. This service frequency for the Metro Red Line would stay the same for the eight build alternatives in order to properly compare the proposed fixed guideway transit investments in the Eastside Corridor.

III. Transportation Issues and Analysis

Introduction

This section begins by summarizing the major transportation issues associated with each alternative according to the evaluation criteria that was considered. The major observations of the comparative evaluation of the alternatives are next presented. In the event that it is decided to construct the project in phases, a comparison of the potential traffic and parking impacts of two smaller segments of each alignment is also presented. The two segments are: Union Station to Lorena Street and Union Station to Atlantic Boulevard. No ridership forecasts were prepared for the two smaller segments; therefore, the criteria focus only on the traffic and parking impacts. Table 1, found at the conclusion of this section, consists of a matrix that compares the criteria considered for each alternative throughout the total length of each alignment (Union Station to Norwalk Boulevard). Table 2 compares the criteria for each alternative for the portion of the study area between Union Station and Lorena Street, and Table 3 presents this information for the section of the study area between Union Station and Atlantic Boulevard.

Comparison by Alternative

No-Build Alternative

Implementation of the No-Build Alternative would result in the lowest ridership (1,985,936 daily regional transit trips and 149,100 daily such trips within the Eastside Transit Corridor) of all of the alternatives. With regard to numbers of congested roadway segments, this alternative ties with the TSM Alternative and LRT Alternative 7 for the fewest congested segments (12). Congestion is defined as any segment operating at a level of service LOS E or F. It also results in the fewest congested intersections (5). The No-Build Alternative would not require displacement of any existing on-street parking spaces.

TSM Alternative

The second lowest daily patronage would be achieved with implementation of the modest transit improvements associated with the TSM Alternative (2,005,798 regional trips and 165,300 corridor trips). Although this alternative would produce 19,862 new regional transit trips each day as compared to the No-Build Alternative, it would still produce 7,383 fewer new trips than the build alternative with the lowest ridership (BRT Alternative 2) and 14,470 fewer new trips than the alternative with the highest patronage (Heavy rail/LRT Alternative 7). With regard to congested roadway segments, this alternative ties with the No-Build and LRT Alternative 7 for the fewest congested (12). It ties with Alternatives 3 and 8 for the second fewest congested intersections (6). Like the No-Build Alternative, the TSM Alternative would not require displacement of any existing on-street parking spaces.

Alternative 1

BRT Alternative 1 ranks second to last of the build alternatives with regard to regional ridership (2,014,520 daily trips) and ties with Alternative 2 for lowest corridor ridership (174,500 daily trips). However, it still creates 28,584 additional regional trips over the No-Build Alternative and 8,722 additional regional trips over the TSM Alternative. Of the build alternatives, Alternative 1 results in the second fewest fixed guideway boardings within the corridor (11,500 daily).

Alternative 1 ties with Alternatives 4 and 6 regarding numbers of congested roadway segments (13). All three alternatives have one more congested segment than the No-Build and TSM Alternatives and

Alternative 7. Alternative 1 also ties with Alternatives 2, 4, 5, and 7 in the numbers of congested intersections (7) ranking third behind the No-Build and TSM Alternatives, respectively.

This alternative may result in the loss of 339 on-street parking spaces to accommodate the stations. The stations are the only areas where on-street parking would be removed for any of the build alternatives. This alternative ranks in the middle range of all build alternatives in terms of numbers of spaces lost. As with all of the BRT alternatives, the losses are more or less spread throughout the study area in the vicinity of all of the stations and are not concentrated in any particular location.

Alternative 2

BRT Alternative 2 produces the lowest daily ridership of the build alternatives (2,013,181 regional trips and 174,500 corridor trips). However, it still creates 27,245 additional trips over the No-Build Alternative and 7,383 new trips over the TSM Alternative. It ranks sixth with regard to fixed guideway boardings within the corridor (12,400 each day), but it results in the most boardings of the alternatives employing only BRT.

This alternative ranks worst with regard to congested street segments (16). Alternative 1 ties with Alternatives 1, 4, 5, and 7 in the numbers of congested intersections (7) ranking third best behind the No-Build and TSM Alternatives, respectively.

A total of 365 on-street parking spaces may be lost in the vicinity of the stations throughout the study area. This alternative ranks third highest in number of spaces lost.

Alternative 3

LRT Alternative 3 ranks mid-range with regard to patronage compared to all of the build alternatives. Of the alternatives employing LRT, it produces the lowest daily ridership (2,017,685 regional trips and 178,700 corridor trips). A comparison to the No-Build and TSM Alternatives reveals that Alternative 3 produces 31,749 and 11,887 more daily transit trips, respectively. It creates 17,000 fixed guideway boardings which also ranks it mid-range of all the build alternatives, but lowest of the alternatives employing LRT.

This alternative ranks next to worst with regard to congested street segments (15). However, Alternative 3 ties with the TSM Alternative and Alternative 8 for second least numbers of congested intersections (6).

On-street parking losses are ranked highest of all the alternatives (402 spaces). For all of the LRT alternatives, station parking impacts would be concentrated at station locations in Boyle Heights, and fewer parking losses would be required at the other stations as compared to the BRT alternatives.

Alternative 4

BRT Alternative 4 ranks sixth with regard to daily patronage compared to all of the build alternatives. However, it produces the highest ridership of the alternatives that employ only BRT (2,014,992 regional trips and 174,900 corridor trips). It results in an additional 29,056 regional transit trips each day compared to the No-Build Alternative and 9,194 more such trips than the TSM Alternative. Alternative 4 ranks lowest with regard to daily fixed guideway boardings (11,300).

This alternative ties with Alternatives 1 and 6 regarding numbers of congested roadway segments (13). All three alternatives have one more congested segment than the No-Build and TSM Alternatives and

Alternative 7. It also ties with Alternatives 1, 2, 5, and 7 in the numbers of congested intersections (7) ranking third behind the No-Build and TSM Alternatives, respectively.

A total of 352 on-street parking spaces may be lost, ranking Alternative 4 about middle range in terms of losses. Like the other BRT alternatives, the losses are more or less spread throughout the study area in the vicinity of all of the stations and are not concentrated in any particular location.

Alternative 5

LRT Alternative 5 ranks second highest in terms of daily ridership producing 2,019,707 regional trips and 180,350 corridor trips. It results in an additional 33,771 regional trips each day compared to the No-Build Alternative and 13,909 more such trips than the TSM Alternative. This alternative also ranks second highest in daily fixed guideway boardings (18,000).

This alternative ties with Alternative 8 ranking them both third fewest in numbers of congested roadway segments (14). It also ties with Alternatives 1, 2, 4, and 7 in the numbers of congested intersections (7) ranking them third behind the No-Build and TSM Alternatives, respectively.

On-street parking losses are ranked second highest of all the alternatives (396 spaces). For all of the LRT alternatives, station parking impacts would be concentrated at station locations in Boyle Heights, and fewer parking losses would be required at the other stations as compared to the BRT alternatives.

Alternative 6

LRT Alternative 6 consists of a mostly at-grade alignment with a subway segment through a portion of Boyle Heights. It ranks third highest in terms of daily ridership producing 2,018,185 regional trips and 179,550 corridor trips. Compared to the No-Build and TSM Alternatives, Alternative 6 creates an additional 32,249 and 12,387 daily transit trips, respectively. It also results in the third largest number of daily fixed guideway boardings (17,800).

This alternative ties with Alternatives 1 and 4 regarding numbers of congested roadway segments (13). All three alternatives have one more congested segment than the No-Build and TSM Alternatives and Alternative 7. However, Alternative 6 has the highest numbers of congested intersections (8) of any of the alternatives. It results in three more congested intersections than the No-Build Alternative, which has the fewest such intersections. Note that the level of service analysis (LOS) that was used to evaluate congestion for the roadways and intersections does not take into account pedestrian safety issues and potential parking conflicts associated with a surface LRT or BRT system running through the narrow streets in Boyle Heights. The subway segment of Alternative 6 eliminates the need to remove lanes along Soto Street (the street segment most severely impacted by a surface transit system in Boyle Heights) and provides a subway profile through most of that community also minimizing potential pedestrian safety problems. Boyle Heights contains the highest pedestrian activity within the study area.

A total of 236 on-street parking spaces may be lost in the vicinity of the stations ranking it second in terms of lowest such losses of the build alternatives. Like the other LRT alternatives, the parking impacts would be concentrated at station locations in Boyle Heights, and fewer impacts would occur at the other stations as compared to the BRT alternatives.

Alternative 7

This hybrid alternative consists of a heavy rail subway segment and an at-grade LRT segment. Alternative 7 achieves the highest daily patronage of all of the alternatives (2,020,268 regional trips and 180,750 corridor trips). Compared to the No-Build and TSM Alternatives, this alternative produces 34,332 and 14,470 additional trips each day, respectively. It also creates the highest daily fixed guideway boardings (18,700).

With regard to congested roadway segments, this alternative ties with the No-Build and TSM Alternatives for the fewest congested (12). It also ties with Alternatives 1, 2, 4, and 5 in the numbers of congested intersections (7) ranking them third behind the No-Build and TSM Alternatives, respectively. As noted in the discussion of Alternative 6, the LOS analysis that was used to evaluate congestion for the roadways and intersections does not take into account pedestrian safety issues and potential parking conflicts associated with a surface LRT or BRT system running through the narrow streets in Boyle Heights. Like Alternative 6, the subway segment of Alternative 7 eliminates the need to remove lanes along Soto Street (the street segment most severely impacted by a surface transit system in Boyle Heights) and provides a subway profile through most of that community also minimizing potential pedestrian safety problems.

Alternative 7 requires the least loss of on-street parking (172 spaces). Like the other LRT surface alternatives, the parking impacts would be concentrated at station locations in Boyle Heights, and fewer impacts would occur at the other stations as compared to the BRT alternatives. Of the LRT alternatives, Alternative 7 has the lowest losses in Boyle Heights because of the tunneled segment that traverses a portion of that community.

Alternative 8

This hybrid alternative consists of a heavy rail subway segment and an at-grade BRT segment. Alternative 8 ranks fifth highest in terms of daily ridership (2,015,967 regional trips and 177,150 corridor trips). Compared to the No-Build and TSM Alternatives, this alternative produces 30,031 and 10,169 additional daily trips, respectively. Alternative 8 also creates the fifth highest daily fixed guideway boardings (14,000). Note that this alternative results in the highest ridership and fixed guideway boardings of any of the alternatives employing BRT.

Alternative 8 ties with Alternative 5 ranking them both third fewest in numbers of congested roadway segments (14). However, Alternative 8 ties with the TSM Alternative and Alternative 3 for second least numbers of congested intersections (6).

Alternative 8 ranks third in fewest number of parking spaces lost (320). The spaces would be lost in the vicinity of the BRT stations throughout the study area and are not concentrated in any particular location.

Conclusions

The major observations of the alternatives being considered with regard to ridership, traffic impacts, and parking losses are discussed below.

Ridership

In terms of ridership, the BRT alternatives (Alternative 1, 2, 4, as well as Alternative 8 which also includes a heavy rail subway segment) result in the lowest ridership of the build alternatives. However, Alternative 8 achieves the highest ridership of those alternatives employing BRT. Although BRT Alternative 2 has the lowest ridership of any of the build alternatives, it still produces more daily regional

transit trips than the No-Build and TSM Alternatives (an additional 27,245 and 7,383 such trips, respectively). The heavy rail/LRT hybrid Alternative 7 has the highest ridership of any of the alternatives producing 34,332 more regional trips than the No-Build Alternative and 14,470 more trips than the TSM Alternative. Alternative 7 also produces 7,087 more regional trips than the build alternative with the least ridership (Alternative 2). Within the corridor, the build alternatives also result in increased daily transit trips as compared to the No-Build and TSM Alternatives. The increases over the No-Build Alternative range from 25,400 trips for Alternatives 1 and 2 to 31,650 trips for Alternative 7. A comparison to the TSM Alternative shows the numbers of daily corridor trips increase by 9,200 under Alternatives 1 and 2 and by 15,450 under Alternative 7.

Like total daily transit trips, the BRT alternatives result in the fewest fixed guideway boardings, while the rail alternatives have the highest boardings. Of the BRT alternatives, Alternative 8 produces the highest number of daily boardings (14,000); however, as previously noted, this alternative also includes heavy rail subway along a portion of its alignment. Even with the heavy rail segment, 3,000 to 4,700 fewer daily boardings are expected with Alternative 8 as compared with any of the other rail alternatives. The heavy rail/LRT Alternative 7 results in the highest number of boardings (18,700), and a comparison with the alternative having the lowest boardings (BRT Alternative 4) shows that Alternative 7 would produce 7,400 more boardings each day.

Traffic

The major findings regarding potential impacts on roadways and intersections are presented below.

Roadways

As a rule, traffic impacts where lanes are reduced on arterial streets would be greater than the impacts that occur on other streets where lanes are not removed for the proposed transit systems in Alternatives 1 through 8. A good example of this is Soto Street between 1st and 4th Streets where the level of service (LOS) degrades from D in the No-Build and TSM Alternatives to LOS F in Alternatives 1 through 5 and 8. In Alternatives 6 and 7, where a subway segment replaces the need to remove lanes of traffic on Soto, Soto Street remained at LOS D. Due to the lack of through north-south arterials in Boyle Heights and the existence of many east-west alternate routes, there is a far greater traffic impact on Soto Street (the principal north-south arterial in Boyle Heights) than on the east-west streets when lanes of traffic are removed on these arterials. East-west arterials, such as Cesar Chavez Avenue in Alternative 1, and 1st and 4th streets in Alternatives 2 through 8, are impacted more when combined with pedestrian safety and parking impacts in the narrow streets of the community. LOS degraded from LOS A in the No-Build and TSM Alternatives to LOS B in the alternatives where lanes were removed for these streets. A degradation from LOS A to LOS B is not an impact that is significant for traffic.

Although the traffic LOS calculations reveal a minor degradation in traffic conditions (or none at all) with the introduction of a transit system within street rights-of-way, it is important to recognize the conditions of the streets in Boyle Heights. Street widths in Boyle Heights are very narrow (most have a curb-to-curb width of 60 feet) and only allow for one lane of traffic in each direction when light rail or a busway occupy the remaining two traffic lanes. Besides adversely affecting intersections where turning movements are permitted, LOS will be degraded due to the maneuvering of motorists wishing to park in the on-street parking spaces along the streets where a BRT or LRT system will be running. Significant delays could be realized when there is conflict between through traffic and traffic wishing to use on-street parking spaces. These two operational problems are exacerbated by the narrow conditions of the streets in Boyle Heights.

Pedestrian safety is another concern, especially in areas with narrow street rights-of-way. The introduction of a new transit system will realign traffic rights-of-way closer to the pedestrian realm.

Boyle Heights has the greatest pedestrian activity of any of the communities along the Eastside Corridor. The proximity of pedestrians to potentially fast-moving traffic poses a safety threat, especially at station locations. There are six such situations in LRT Alternatives 3 and 5. There are only two of these situations at station locations in Alternative 6, and only one such situation in Alternative 7. The enhanced pedestrian safety of Alternatives 6 and 7 is a direct result of their containing subway segments through Boyle Heights. A simple LOS calculation does not take into account the issues of parking and pedestrian safety in Boyle Heights.

From a LOS analytical perspective, the East Los Angeles community incurs greater traffic impacts than those in Boyle Heights because of the elimination of alternative east-west streets east of Atlantic Boulevard. As was true for Boyle Heights, the issue of pedestrian safety must be recognized in the Whittier Boulevard business corridor west of Atlantic Boulevard where the street is narrow. At the screenline east of Atlantic Boulevard, LOS deteriorates significantly on streets where lanes were removed in the build alternatives. Whittier Boulevard goes from LOS B in the No-Build Alternative to LOS F in Alternatives 2, 3, and 6 where lanes were removed. Beverly Boulevard in the No-Build Alternative already operates at LOS F. When traffic lanes are removed in Alternatives 1, 4, 5, 7, and 8, the volume to capacity (V/C) ratio increases from approximately 1.02 to 1.57, which constitutes a serious worsening of LOS F on Beverly. The other build alternatives have Beverly Boulevard operating at an LOS F that is comparable to that found in the No-Build Alternative. North-south arterials in the East Los Angeles area do not have their service levels degraded by any significant amount in any of the build alternatives. Because the streets are wider in the areas of the corridor east of Indiana Street, pedestrian safety issues are of lesser concern. Traffic will not be using the far curb lanes where street space is occupied for a light rail station in Alternatives 3, 5, 6, and 7.

Because there are a lesser number of alternative surface arterials there, the eastern portion of the Eastside Corridor experiences greater traffic impacts on Beverly and Whittier Boulevards. Traffic impacts increase as one moves west to east through the cities of Montebello, Pico Rivera, and Whittier Boulevard. At the screenline west of Montebello Boulevard, Beverly Boulevard operates at LOS F and Whittier Boulevard operates at LOS D in the No-Build and TSM Alternatives. When traffic lanes are removed from Whittier Boulevard in Alternatives 2, 3, and 6, the street operates at LOS F with a V/C ratio of approximately 1.32. When lanes are removed from Beverly Boulevard in Alternatives 1, 4, 5, 7, and 8, the LOS F significantly worsens from a V/C ratio of approximately 1.36 to 2.31. At the screenline west of Rosemead Boulevard in the City of Pico Rivera, both Beverly and Whittier Boulevards operate at LOS F in the No-Build and TSM Alternatives. Each build alternative worsens the LOS F on Whittier Boulevard from a V/C ratio of approximately 1.34 to 1.69. In each of the build alternatives, Washington Boulevard appears to pick up some of the traffic from Whittier Boulevard. Washington Boulevard is a southern alternative arterial street to Whittier Boulevard. Washington Boulevard operates at LOS E in the No-Build and TSM Alternatives and operates at LOS F in all eight build alternatives. Most north-south arterial streets in the Montebello/Pico Rivera area of the Corridor are not impacted in any of the build alternatives. In Alternatives 1, 4, 5, 7, and 8 where lanes are removed from Paramount Boulevard in Pico Rivera, there is a significant degradation of service (LOS A to F). Paramount Boulevard declines from LOS A in the No-Build and TSM Alternatives to F in those alternatives.

Whereas the removal of lanes in each of the alternatives in the Boyle Heights and East Los Angeles areas generally results in a minor shift in traffic volumes and a minor degradation of service that is not of great significance except for Soto Street, the removal of lanes on major arterial streets in the eastern portion of the Eastside Corridor (east of Atlantic Boulevard) results in a significant degradation of service. Alternatives 6 and 7 have the least impact on traffic in Boyle Heights because they are in a subway through this area and do not remove lanes from Soto Street as do the other alternatives. These two alternatives also remove lanes on Whittier Boulevard instead of Beverly Boulevard east of Arizona Avenue, which creates less of a traffic impact than those alternatives that remove lanes on Beverly

Boulevard. Alternatives 6 and 7 also minimize pedestrian safety problems in the Boyle Heights community by their providing a subway profile through most of the community. The narrowness of the streets in Boyle Heights combined with curbside traffic lanes, intersection delays, and parking conflicts makes the traffic and pedestrian impacts greater than those we can measure through a simple level of service analysis.

Table 1 summarizes the numbers of congested street segments by alternative. Comparison of the build alternatives shows that the highest number of congested roadway segments (16) would occur under Alternative 2, while the fewest (12) would occur under Alternative 7. The No-Build and TSM Alternatives both would have 12 congested street segments, and Alternative 7 is the only build alternative that does not increase that number.

Intersections

Most of the intersection analysis focuses on the western portion of the study area (west of Atlantic Boulevard) due to the limited traffic count data available in the eastern portion of the study area. Of the 14 intersections evaluated, the No-Build Alternative would result in five intersections operating at an unacceptable LOS (i.e., LOS E or F). The TSM Alternative would result in six intersections operating at an unacceptable LOS. Of the eight build alternatives, Alternatives 3 and 8 would have the least number of intersections (6) operating at an unacceptable LOS, and Alternative 6 would have the greatest number of intersections (8) operating at an unacceptable LOS.

Parking

With regard to on-street parking losses, the highest losses would be associated with LRT Alternatives 3 and 5 (approximately 400 spaces in both cases). As with all of the LRT alternatives, most of the impact would be concentrated in Boyle Heights (282 spaces lost under either alternative). Alternative 7 would have the least impact on parking in Boyle Heights (58 spaces lost) because the subway segment extends through a large portion of Boyle Heights; it also has the least overall impact on parking throughout the study area (172 spaces lost). Alternative 8 has the second lowest impact in Boyle Heights (73 spaces lost) because of the subway segment and the BRT at-grade configuration from Chavez/Soto to 4th/Indiana. Of the subway alternatives, LRT Alternative 6 has the highest impact in Boyle Heights (116 spaces lost). This is because of the requirements for the LRT at-grade configuration in the narrow street rights-of-way in Boyle Heights. Alternative 6 would result in somewhat higher losses than the two at-grade BRT Alternatives 2 and 4 in Boyle Heights (105 spaces lost under each alternative).

Comparison of Alternatives by Shorter Segments

Union Station to Lorena Street

Table 2 summarizes the traffic and parking impacts for this segment of the alternatives. Of the roadway segments evaluated for congestion, the alternatives range from two segments (No-Build Alternative) to four segments (Alternatives 2, 4, 5, and 6) that would be congested. With regard to congested intersections, the No-Build Alternative would have the fewest (2) while Alternatives 2, 4, 5, and 6 would have the most (4).

As previously noted, the LOS analysis used to evaluate congestion does not take into account pedestrian safety issues and potential parking conflicts associated with a surface LRT or BRT system running through the narrow streets in Boyle Heights. The subway segments of Alternatives 6 and 7 eliminate the need to remove lanes along Soto Street (the street segment most severely impacted by a surface transit system in Boyle Heights) and provides a subway profile through most of that community also minimizing

potential pedestrian safety problems. Boyle Heights contains the highest pedestrian activity within the entire study area.

In terms of impacts on existing on-street parking, no spaces would be lost under the No-Build or TSM Alternatives. Of the build alternatives, Alternative 7 would result in removal of the fewest spaces (58), while Alternatives 3 and 5 would require displacement of the highest number of spaces (282 each). All of the other alternatives range from 73 to 116 spaces removed, depending on the alternative selected for comparison.

Union Station to Atlantic Boulevard

The traffic and parking impacts for this segment of the alternatives are presented in Table 3. The numbers of congested roadway segments range from three segments (No-Build and TSM Alternatives and Alternatives 6 and 7) to five segments (Alternatives 2 through 5 and 8). Alternative 1 had four congested segments. With regard to congested intersections, the No-Build Alternative had the fewest (4), while Alternative 6 had the most (7).

As previously noted, the LOS analysis used to evaluate congestion does not take into account pedestrian safety issues and potential parking conflicts associated with a surface LRT or BRT system running through the narrow streets in Boyle Heights and a portion of Whittier Boulevard in East Los Angeles. As just noted, the subway segments of Alternatives 6 and 7 eliminate the need to remove lanes along Soto Street and provide a subway profile through most of that community also minimizing potential pedestrian safety problems. The at-grade alignments of Alternatives 1, 4, 5, 7, and 8 all avoid the narrow roadway section of Whittier Boulevard, while Alternatives 2, 3, and 6 do not.

In terms of impacts on existing on-street parking, no spaces would be lost under the No-Build or TSM Alternatives. Of the build alternatives, Alternative 7 would again result in removal of the fewest spaces (94), while Alternative 3 would require displacement of the highest number of spaces (330). Alternative 5 has slightly fewer space removal requirements (318) than Alternative 3. All of the other alternatives range from 151 to 209 spaces removed, depending on the alternative selected for comparison.

TABLE 1
COMPARISON OF ALTERNATIVES – TRANSPORATION ISSUES
(Union Station to Whittier/Norwalk)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
	Ridership									
Regional Daily Transit Trips	1,985,936	2,005,798	2,014,520	2,013,181	2,017,685	2,014,992	2,019,707	2,018,185	2,020,268	2,015,967
Corridor Daily Transit Trips	149,100	165,300	174,500	174,500	178,700	174,900	180,350	179,550	180,750	177,150
Corridor Daily Fixed Guideway Boardings	N.A.	N.A.	11,500	12,400	17,000	11,300	18,000	17,800	18,700	14,000
Daily New Transit Trips compared to the No Build	N.A.	19,862	28,584	27,245	31,749	29,056	33,771	32,249	34,332	30,031
Daily New Transit Trips compared to the TSM	N.A.	N.A.	8,722	7,383	11,887	9,194	13,909	12,387	14,470	10,169
	Traffic									
Number of congested intersections	5	6	7	7	6	7	7	8	7	6
Number of congested street segments[1]	12	12	13	16	15	13	14	13	12	14
	Parking									
On-street parking spaces displaced	0	0	339	365	402	352	396	236	172	320

1Assumes an approximate one-mile segment based on the screenline analysis.

TABLE 2
COMPARISON OF TRAFFIC AND PARKING IMPACTS OF THE ALTERNATIVES
(Union Station to Lorena Street)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Number of congested intersections	2	3	3	4	3	4	4	4	3	3
Number of congested street segments[1]	0	0	1	1	1	1	1	0	0	1
On-street parking spaces displaced	0	0	92	105	282	105	282	116	58	73

1Assumes an approximate one-mile segment based on the screenline analysis.

TABLE 3
COMPARISON OF TRAFFIC AND PARKING IMPACTS OF THE ALTERNATIVES
(Union Station to Atlantic Boulevard)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Number of congested intersections	4	5	6	6	5	6	6	7	6	5
Number of congested street segments[1]	3	3	4	5	5	5	5	3	3	5
On-street parking spaces displaced	0	0	170	209	330	183	318	164	94	151

1Assumes an approximate one-mile segment based on the screenline analysis.

IV. Environmental Issues

Introduction

This section begins by summarizing the major environmental issues associated with each alternative according to the evaluation criteria that was considered. The major observations of the comparative evaluation of the build alternatives are next presented. Table 4, found at the conclusion of this section, consists of a matrix that compares the criteria considered for each alternative throughout the total length of each alignment (Union Station to Norwalk Boulevard). In the event that it is decided to construct the project in phases, a comparison of two smaller segments of each alignment is presented in Tables 5 and 6. Table 5 compares the criteria for each alternative for the portion of the study area between Union Station and Lorena Street, and Table 6 presents this information for the section of the study area between Union Station and Atlantic Boulevard.

Comparison by Alternative

No-Build Alternative

The No-Build Alternative assumes that no project would be constructed and would result in no impacts with regard to the following: acquisition of additional property to accommodate park-and-ride facilities; increases of impacts on the visual environment, noise/vibration, wetlands, floodplains, cultural and paleontological resources, parks and recreation facilities, and utilities; potential for liquefaction or inundation from possible dam failures during an earthquake; and potential to encounter pre-existing contaminated sites during construction.

The No-Build Alternative also would not create opportunities, beyond those currently projected for the region, for additional short-term jobs during construction and permanent jobs once the transit system becomes operational. It also has no effect on the plans and policies of the local communities and would maintain the status quo in this regard. Opportunities for enhanced mobility and access to low-income and minority areas as well as to some of the existing redevelopment and special revitalization zones in the study area also would be foregone. The air quality impacts of the No-Build Alternative would be greater than any of the build alternatives with respect to anticipated criteria pollutant/precursor emissions from volatile organic compounds (VOC), carbon monoxide (CO), and particulate matter (PM_{10}). However, there would be some decreases in nitrogen oxides (NO_x) emissions as compared to three of the eight build alternatives. This alternative ranks mid-range with respect to carbon dioxide (CO_2, a greenhouse gas) emissions.

TSM Alternative

This alternative involves an increase in the frequency of bus service only and the addition of bus routes in the study area. Construction of additional facilities would be minimal. Therefore, the TSM Alternative would also result in no additional impacts in most of the same categories cited for the No-Build Alternative. There may be slight increases in noise levels in locations where bus service is substantially increased.

Some short-term jobs would be created due to construction of the minimal facilities associated with this alternative. However, it is estimated that more than four times as many short-term jobs would be created with implementation of the lowest cost build alternative and more than fourteen times as many such jobs would be created with the highest cost build alternative. Some permanent jobs would also be created to support the additional bus service, but the number of such jobs would be 2.5 to 3.5 times less depending on the build alternative selected for comparison. Also, the TSM Alternative would have little effect on

the plans and policies of the local communities and would maintain the status quo in this regard. Enhanced mobility and access to low-income areas, minority areas, and existing redevelopment and special revitalization zones would likely be provided in the vicinity of some of the increased bus service; however, not to the extent offered under any of the build alternatives. With regard to air quality, the TSM Alternative results in the highest criteria pollutant/precursor emissions and also in CO_2 emissions of any of the alternatives under consideration.

Commonality of the Build Alternatives

Some of the environmental issues evaluated would be the same for all of the build alternatives. All are generally compatible with the local plans and policies of the surrounding communities. The only potential conflict noted would be in the vicinity of the Whittier/Norwalk Station at the eastern terminus. The City of Whittier General Plan's land use designation near the proposed transit station is for single-family residential, greenspace, and general commercial along Whittier Boulevard. Future amendments or revisions to the general plan could consider modifications to the land use designations to allow intensification of land use in the area. The unincorporated Southwest Whittier Community has no adopted community plan at this time. However, the zoning in the vicinity of the station is for low-density residential uses. To promote compatibility with the proposed transit station, the County of Los Angeles could modify zoning patterns, as appropriate, when a community plan is prepared.

At this time, it appears that none of the build alternatives would require the displacement of any residences or businesses for the alignments or stations. There is a possibility that additional land may be needed to accommodate the cut-and-cover process of constructing the heavy rail station box area at 1st/Boyle (Alternatives 7 and 8) and at 1st/Lorena (Alternative 7). This will be further investigated if one of these alternatives is selected and when its design is further refined. No additional land will be needed in the subway station areas of LRT Alternative 6. All build alternatives will require additional land for park-and-ride facilities. This is discussed in more detail below. With regard to transportation-related energy consumption, there are no substantial differences between any of the build alternatives. However, all will have somewhat lower energy requirements than the TSM Alternative ranging from 32,424 (Alternative 8) to 243,321 (Alternative 6) fewer BTUs per year. In terms of barrels of oil saved annually as compared to the TSM Alternative, the build alternatives range from 243,321 barrels saved (Alternative 6) to 32,423 barrels saved (Alternative 8).

All of the build alternatives will serve several (from seven to ten depending on alternative) existing redevelopment or special revitalization zones. This is discussed in more detail below. An improved transit system could assist in the revitalization of these projects by providing improved access and mobility. All build alternatives will also serve minority and low-income populations and will result in an increase in numbers of transit trips in the corridor, but to somewhat varying degrees. All alternatives would also result in creation of additional jobs; visual and noise impacts unless mitigation is provided; and utility impacts. Again, there are differences in the extent of impacts anticipated depending on the alternative selected.

Although about 35 to 43 percent of all the alignments is designated as having a potential for liquefaction based on generalized liquefaction hazard maps, results of prior site-specific investigations indicate that the potential for liquefaction along all the alternative alignments is low to very low. Because prior investigations did not address subsurface conditions at the Rio Hondo area, the liquefaction potential of this area will require evaluation. However, because all the alignments are at grade and have similar segment lengths across the Rio Hondo area, comparative analyses to select a preferred alternative will likely not be influenced by the liquefaction potential of the Rio Hondo area. Accordingly, liquefaction has not been included as a criterion for the selection of the preferred alternative.

In addition, all alignments would be in proximity of pre-existing contaminated sites, cultural resources, and parks and recreation facilities, but to varying degrees. Three of the alternatives (Alternatives 1, 7, and 8) would cross the Coyote Pass Escarpment, an area of surface deformation believed to be a result of fault movement along the Elysian Park Thrust Fault. The remaining discussion in this section focuses on the differences between the build alternatives. Discussion of possible mitigation options for adverse impacts was presented in the previous sections of this chapter.

Alternative 1

This BRT alternative would require an additional 28 acres of land for park-and-ride facilities based on preliminary estimates of parking needs. This is one of the alternatives with the lowest requirements for additional property. At this conceptual level of design, only general locations of park-and-ride facilities (i.e., vicinity of some of the station areas east of I-710) are known. Specific site locations will be determined as the design advances to later stages of project development. The possibility of constructing parking structures (instead of surface lots) at some locations will also be determined later for the selected alternative. If structures were built, the additional land requirements would be reduced.

The numbers of accidents that may potentially occur were estimated based on historical statistics for similar bus operations and on similar arterial streets. An estimated 170 to 225 bus accidents and 385 automobile accidents are projected to occur annually. Alternative 1, as well as all of the other BRT alternatives, is forecasted to result in higher numbers of accidents involving a transit vehicle than those alternatives employing at-grade LRT. All of the BRT alternatives are projected to result in similar numbers of bus accidents. However, Alternative 8 would result in the least accidents of the BRT alternatives (165 to 215 bus accidents) because of the subway segment. This alternative is estimated to result in the next to least number of automobile accidents of all of the build alternatives. Alternatives 4, 5, 7, and 8 are estimated to result in the fewest auto accidents (380 annual accidents).

Alternative 1 ties with Alternatives 4 and 5 in directly serving the highest number of existing redevelopment or special revitalization zones (they each serve ten). However, this alternative ranks next to lowest in numbers of short-term jobs created (25,222 direct and indirect jobs). Only Alternative 2 ranks lower (24,857 such jobs). Although Alternative 1 ranks lowest of the build alternatives in numbers of permanent jobs created (3,748 direct and indirect jobs), it would still create 2.5 times as many permanent jobs as the TSM Alternative. In terms of highest numbers of low-income families served within 1/2 mile of the transit stations, Alternative 1 ranks third (31,583 families). The alternative is second in terms of minority populations served within the same distance of the stations (127,817 persons). All of the station areas for all of the build alternatives serve high concentrations of minority populations. Like Alternatives 4, 5, 7, and 8, this alternative also serves high concentrations of low-income families within 1/2 mile of all of the stations, with the exception of those at Beverly/Wilcox, Beverly/Montebello, Beverly/4th, and Whittier/Norwalk. Alternative 1 also ranks second in numbers of zero-car households (8,587 households) and in workers using public transportation to get to work (7,585 persons) within 1/2 mile of the stations. Alternative 1 ties with Alternative 2 in providing the fewest corridor daily transit trips (174,500) of the build alternatives. However, both alternatives would still provide more transit trips than either the No-Build or TSM Alternative (25,400 and 9,200 more trips each day, respectively).

With regard to potential visual impacts, this alternative would potentially affect the highest number of sensitive receptors of all alternatives (541 residences, schools, parks, bicycle trails, and/or cemeteries). However, this alternative includes a bus guideway. Overall impacts of this mode are expected to be less than a light rail mode because light rail would necessitate removal of median landscaping (where it already exists) and installation of an overhead catenary system. The BRT mode does not have these requirements. Alternative 1 would have the highest numbers of noise-impacted buildings and parks (554) of the alternatives. Because this mode involves buses, vibration would not be an issue.

This alternative ranks mid-range with regard to estimated pollutant criteria/precursor emissions. It ranks fourth best with regard to CO_2 emissions.

Alternative 1 crosses about 300 feet of the Coyote Pass Escarpment However, it is anticipated that this at-grade alternative would be affected less severely than the subway alternatives crossing the escarpment (Alternatives 7 and 8) in the event of future seismic activity along the escarpment.

This alternative has the lowest potential for concern with regard to possibly encountering pre-existing hazardous substance sites during construction. The BRT mode would involve only limited subsurface construction activity. In general, the major areas of concern for encountering contaminated sites under any of the build alternatives exist in the western portion of the study area between Union Station and Indiana Street.

Of the totally at-grade alternatives, the lowest numbers of potential cultural resources and sites listed on the State and National Registers (124) were identified in proximity of Alternative 1. However, all of the alternatives involving subway (Alternatives 6, 7, and 8) have fewer (75, 48, and 109, respectively). In general, the area between about Boyle Avenue and Indiana Street has the highest concentrations of such resources for all of the alternatives considered. Fewer potential resources were identified further east within the study area. Because of the limited subsurface construction activity associated with Alternative 1, there is no potential for encountering fossil sites and remains during construction.

A total of nine park and recreation facilities were identified within 300 feet of the alignment. This is the distance considered in the evaluation as the area where potential impacts are possible. All of the build alternatives are in proximity of between eight and 11 such resources; therefore, this alternative falls in the middle-range in the ranking of this criterion.

The final criterion evaluated is the potential impacts on utilities during construction. Alternative 1, as well as all of the other totally at-grade alternatives, would have the highest impacts because relocation of utilities buried within the street or on overhead poles above the street is expected to some degree.

Alternative 2

This BRT alternative, along with Alternatives 3 and 6, has the highest requirements for additional land (35 acres) to accommodate park-and-ride facilities according to preliminary estimates of parking needs. An estimated 170 to 225 bus accidents and 430 automobile accidents are projected to occur annually. Alternative 2, as well as all of the other BRT alternatives, is forecasted to result in higher numbers of accidents involving a transit vehicle than those alternatives employing at-grade LRT. All of the BRT alternatives are projected to result in similar numbers of bus accidents. This alternative is also tied with Alternatives 3 and 6 for the highest number of estimated automobile accidents of all of the build alternatives. The total accidents (both bus and auto) are estimated to be the highest of all of the build alternatives.

Alternative 2 also serves nine existing redevelopment or special revitalization zones tying with Alternatives 3 and 6 for second highest number of such zones served. Alternative 2 ranks lowest in numbers of short-term jobs created (24,857 direct and indirect jobs) as a result of construction of the project. It ranks second to lowest in numbers of permanent jobs created (3,770 direct and indirect jobs). Only Alternative 1 ranks lower (3,748 such jobs).

Alternative 2 ties with Alternative 3 for having the highest numbers of both low-income families (36,967 families) and minority populations (141,353 persons) served within 1/2 mile of the stations. As

previously mentioned, all of the station areas for all of the build alternatives serve high concentrations of minority populations. Like Alternatives 3 and 6, this alternative also serves high concentrations of low-income families within 1/2 mile of all of the stations, with the exception of the one at Whittier/Norwalk. Alternative 2 also ties with Alternative 3 in having the highest numbers of zero-car households (9,553 households) and workers using public transportation to get to work (8,521 persons) within 1/2 mile of the stations. This alternative ties with Alternative 1 in providing the fewest corridor daily transit trips (174,500) of the build alternatives. However, both alternatives would still provide more transit trips than either the No-Build or TSM Alternative (25,400 and 9,200 more trips each day, respectively).

With regard to potential visual impacts, this alternative ranks about middle range in terms of numbers of sensitive receptors potentially affected (427 residences, schools, parks, bicycle trails, and/or cemeteries). This alternative again ties with Alternative 3 with regard to numbers of receptors. However, overall impacts are expected to be less than the light rail mode proposed for Alternative 3 because it does not require removal of median landscaping or installation of an overhead catenary system. This alternative (like Alternative 3) again ranks in about the middle with regard to potential noise impacts (483 noise-impacted buildings and parks). Because this mode involves buses, vibration would not be an issue.

Alternative 2 ranks third best with regard to reductions in estimated pollutant criteria/precursor emissions. It ranks third best with regard to CO_2 emissions.

This alternative (like Alternatives 3 through 6) does not cross the Coyote Pass Escarpment. Therefore, potential ground deformation hazards are not a concern of this alternative. Alternative 2 is ranked second with regard to lowest potential concern for possibly encountering pre-existing hazardous substance sites during construction. The BRT mode would involve only limited subsurface construction activity.

Alternative 2 also ties with Alternative 3 in highest numbers of potential cultural resources and listed sites in proximity of the alignment (158). However, there is no potential for encountering fossil sites and remains during construction of this alternative. The fewest park and recreation facilities (8) of all the build alternatives are located close to the alignment of Alternative 2. Like the other at-grade alternatives, this alternative would have the highest impacts on utilities during construction.

Alternative 3

This LRT alternative follows the same alignment as Alternative 2 and shares many of the same impacts. Impacts on land requirements for the park-and-ride facilities, redevelopment and revitalization areas served, cultural resources, and utilities would be the same. The numbers of low-income and minority populations, zero-car households, and workers using public transportation to get to work that would potentially be served are also similar.

However, some differences are evident due to the different mode. The number of corridor daily transit trips is projected to be higher with this alternative (178,700) than with Alternative 2 (174,500), ranking it fourth highest in terms of ridership. The same numbers of sensitive receptors would be affected by noise as Alternative 2, but the LRT mode also introduces the potential for vibration impacts on those receptors. Also, similar numbers of sensitive receptors would possibly be affected by visual impacts as Alternative 2. However, the overall impact would be greater since the LRT mode will require removal of existing landscaping in medians and installation of an overhead catenary system.

Alternative 3 ranks second best with regard to reductions in estimated pollutant criteria/precursor emissions and with regard to CO_2 emissions.

An estimated 50 to 65 light rail vehicle accidents and 430 automobile accidents are projected to occur annually. Alternative 3 ties with Alternative 5 in highest projected numbers of light rail vehicle accidents. However, all of the LRT alternatives would result in fewer accidents involving a transit vehicle than those alternatives employing at-grade BRT. This alternative is tied with Alternatives 2 and 6 for the highest number of estimated automobile accidents of all of the build alternatives.

Alternative 3 nearly ties with Alternative 5 in estimated short-term jobs created (43,378 for Alternative 3 and 43,362 for Alternative 5). Both rank mid-range in numbers of such jobs. Alternative 3 also ranks mid-range in numbers of permanent jobs created (4,202 direct and indirect jobs).

The potential for concern with regard to possibly encountering pre-existing contaminated sites is somewhat higher than Alternative 2 because this mode will require some additional subsurface construction activity as compared to BRT. Construction of aerial structures associated with the Baseline and Evergreen Options for connecting to Union Station may require mitigative actions in contaminated areas. Also, one additional park (for a total of 9 facilities) would be in close proximity of this alternative if the Alameda Option for connection to Union Station were selected. If the Baseline or Evergreen Options were selected to connect to Union Station, then there would be potential for encountering fossil sites and remains during construction of the elevated segments. There is no such potential if the Alameda (at-grade) Option were selected.

Alternative 4

This BRT alternative would require an additional 28 acres of land for park-and-ride facilities according to preliminary estimates. This is one of the alternatives with the lowest requirements for additional property. An estimated 170 to 220 bus accidents and 380 automobile accidents are projected to occur annually. Alternative 4, as well as all of the other BRT alternatives, is forecasted to result in higher numbers of accidents involving a transit vehicle than those alternatives employing at-grade LRT. All of the BRT alternatives are projected to result in similar numbers of bus accidents. However, this alternative ties with Alternatives 5, 7, and 8 for the fewest projected auto accidents.

In terms of highest numbers of low-income families served within 1/2 mile of the stations, Alternative 4 ranks second (31,586 families) tying with Alternative 5. It ranks fourth highest, along with Alternative 5, in numbers of minorities served within the same distance of the stations (124,194 persons). Alternative 4 ranks third highest and fourth highest, respectively, in numbers of zero-car households (8,530 households) and in numbers of workers using public transportation (7,347 persons) within 1/2 mile of the stations. Again, this alternative is tied with Alternative 5 for these two criteria. However, Alternative 4 ranks second to last with regard to number of corridor daily transit trips (174,900).

Alternative 4, along with Alternatives 1 and 5, directly serve the highest number of existing redevelopment or special revitalization zones (ten). An improved transit system could assist in the revitalization of these projects by providing improved access and mobility. However, Alternative 4 ranks third from the bottom in numbers of short-term jobs created (25,520 direct and indirect jobs) and in numbers of permanent jobs created (4,003 direct and indirect jobs). With regard to potential visual impacts, this alternative would potentially affect the second highest number of sensitive receptors (490 residences, schools, parks, bicycle trails, and/or cemeteries). This is the same number potentially affected by Alternative 5. As mentioned before, the overall impacts are expected to be less, however, than a light rail mode (as in Alternative 5) because no landscaping would need to be removed in the medians, and no overhead catenary system would need to be installed. A total of 504 buildings and parks would be affected by noise, which is also similar to Alternative 5. However, vibration would not be an issue for this BRT mode.

Alternative 4 achieves some of the fewest pollutant criteria/precursor emission reductions compared to the No-Build Alternative of any of the build alternatives (ranking from sixth to eighth depending on the type of emissions considered). It ranks one of the lowest of the build alternatives with regard to CO_2 emissions and also results in higher such emissions than the No-Build Alternative.

This alternative (like Alternatives 2, 3, 5, and 6) does not cross the Coyote Pass Escarpment. Therefore, potential ground deformation hazards are not a concern of this alternative. Alternative 4 has the third lowest potential for concern with regard to possibly encountering pre-existing hazardous substance sites during construction. The BRT mode would involve only limited subsurface construction activity.

This alternative also ties with Alternative 5 for second highest number of potential cultural resources and listed sites identified in proximity of the alignment (132). Because of the limited subsurface construction activity associated with Alternative 4, there is no potential for encountering fossil sites and remains during construction.

A total of ten park and recreation facilities were identified within 300 feet of the alignment, ranking it second highest in terms of numbers of such facilities within close proximity. Like the other at-grade alternatives, Alternative 4 would have the greatest impact on utilities during construction.

Alternative 5

LRT Alternative 5 follows the same alignment as Alternative 4 and shares many of the same impacts. Impacts on land requirements for the park-and-ride facilities, redevelopment and revitalization areas served, cultural resources, and utilities would be the same. The numbers of low-income and minority populations, zero-car households, and workers using public transportation to get to work that would potentially be served are also similar.

However, some differences are evident due to the different mode. The number of corridor daily transit trips is projected to be higher with this alternative (180,350) than with Alternative 4 (174,900), ranking it second highest in terms of ridership. The same numbers of sensitive receptors would be affected by noise as Alternative 4, but the LRT mode also introduces the potential for vibration impacts on those receptors. Also, similar numbers of sensitive receptors would possibly be affected by visual impacts as Alternative 4. However, the overall impact would be greater since the LRT mode will require removal of existing landscaping in medians and installation of an overhead catenary system.

Alternative 5 achieves some of the fewest pollutant criteria/precursor emission reductions compared to the No-Build Alternative of any of the build alternatives (ranking from seventh to eighth depending on the type of emissions considered). It ranks worst of the build alternatives with regard to CO_2 emissions, but it still has fewer such emissions than the TSM Alternative.

An estimated 50 to 65 light rail vehicle accidents and 380 automobile accidents are projected to occur annually. Alternative 5 ties with Alternative 3 in highest projected numbers of light rail vehicle accidents. However, all of the LRT alternatives would result in fewer accidents involving a transit vehicle than those alternatives employing at-grade BRT. This alternative is tied with Alternatives 4, 7, and 8 for the least number of estimated automobile accidents of all of the build alternatives.

Alternative 5 nearly ties with Alternative 3 in estimated short-term jobs created (43,378 for Alternative 3 and 43,362 for Alternative 5). Both rank mid-range in numbers of such jobs. Alternative 5 provides the third highest number of permanent jobs (4,568 direct and indirect jobs).

The potential for concern with regard to possibly encountering pre-existing contaminated sites is somewhat higher than Alternative 4 because this mode will require some additional subsurface construction activity as compared to BRT. Construction of aerial structures associated with the Baseline and Evergreen Options for connecting to Union Station may require mitigative actions in contaminated areas. Also, one additional park (for a total of 11 facilities) would be in close proximity of this alternative if the Alameda Option for connection to Union Station were selected. If the Baseline or Evergreen Options were selected to connect to Union Station, then there would be a potential for encountering fossil sites and remains during construction of the elevated segments. There is no such potential if the Alameda (at-grade) Option were selected.

Alternative 6

This LRT alternative includes a subway segment from about US 101 (east of the Los Angeles River) to 1st/Lorena. It is tied with Alternatives 2 and 3 for the highest requirements for additional land (35 acres) to accommodate park-and-ride facilities, according to preliminary estimates of parking needs. An estimated 45 to 60 light rail vehicle accidents and 430 automobile accidents are projected to occur annually. This alternative is estimated to result in slightly fewer light rail accidents than the totally at-grade LRT alternatives because of the subway segment. However, as noted previously, all of the LRT alternatives would result in fewer accidents involving a transit vehicle than those alternatives employing at-grade BRT. This alternative is tied with Alternatives 2 and 3 for the highest number of estimated automobile accidents of all of the build alternatives.

Alternative 6 serves nine existing redevelopment or special revitalization zones tying with Alternatives 2 and 3 for second highest number of such zones served. This alternative creates the third highest number of short-term jobs (55,379 direct and indirect jobs). With regard to permanent jobs, Alternative 6 ranks fifth in numbers of jobs created (4,084 direct and indirect jobs). Only the BRT alternatives would create fewer such jobs.

In terms of numbers of low-income families served within 1/2 mile of the stations, Alternative 6 ranks fourth lowest (31,523 families). The alternative is the next to the lowest in terms of minority populations served within the same distance of the stations (122,522 persons). It ranks fourth lowest in numbers of zero-car households (8,120 households) and also ranks the next to the lowest in numbers of workers using public transportation to get to work (6,733 persons) within 1/2 mile of the stations. However, Alternative 6 ranks third highest with regard to daily transit trips within the corridor (179,550).

Alternative 6 would potentially visually affect the lowest number of sensitive receptors (296 residences, schools, parks, bicycle trails, and/or cemeteries). However, overall impacts would be greater in the areas affected than a BRT mode because of the need to remove landscaping in the medians and install an overhead catenary system. This alternative also would have the least number of noise-impacted buildings and parks of all the build alternatives (358 affected by wayside noise for the at-grade segments and 50 affected by ground-borne noise for the subway segment). However, the LRT mode would introduce the potential for vibration impacts on those receptors. The possible vibration impacts of the at-grade portion of the alternative would, however, be less than the subway portion because of the lower operating speed required along the at-grade segment.

Alternative 6 achieves the best reduction in pollutant criteria/precursor emissions of any of the alternatives under consideration. This also holds true with regard to CO_2 emissions.

This alternative (like Alternatives 2 through 5) does not cross the Coyote Pass Escarpment. Therefore, potential ground deformation hazards are not a concern of this alternative. Alternative 6 has the third highest potential for concern with regard to encountering pre-existing contaminated sites since the major

areas of concern are not in the tunnel segment. It is likely that the proposed subway segment, and possibly the elevated segment of the Baseline and Evergreen Options for connecting with Union Station (proposed in this alternative as well as LRT Alternatives 3 and 5), would encounter some subsurface contamination related to historical industrial activities.

The second fewest potential cultural resources and listed sites were identified in the vicinity of this alternative (75). Both the subway segment of this alternative and the elevated segment of the Baseline and Evergreen Options for connecting with Union Station have a potential for encountering fossil sites and remains during construction. The at-grade segments have no potential since limited subsurface construction activity would occur.

A total of eight park and recreation facilities were identified within 300 feet of the alignment assuming the Alameda Option is selected for connection to Union Station. Only seven such facilities are in close proximity of this alternative if the other two options are selected. Note that the alternative is located within a subway segment near one of the facilities (LANI Park). No impacts on that park would be expected as a result of this alternative. Potential impacts on parks would be among the lowest of all the alternatives depending on which alternative is selected for connecting to Union Station. Like Alternatives 7 and 8, Alternative 6 would have the least impacts on utilities because of the subway segment. However, impacts are still likely in the vicinity of the subway station excavation areas.

Alternative 7

This hybrid alternative consists of a heavy rail subway segment from Union Station to 1st/Lorena and a LRT at-grade segment from 1st/Lorena east to Whittier/Norwalk. It is tied with Alternatives 1, 4, 5, and 8 for the lowest requirements for additional land (28 acres) to accommodate park-and-ride facilities, according to preliminary estimates of parking needs. An estimated 35 to 50 light rail vehicle accidents and 380 automobile accidents are projected to occur annually. This alternative is estimated to result in fewer light rail accidents than all of the LRT alternatives because it contains the longest length of subway segment where accidents would not be an issue. This alternative is also tied with Alternatives 4, 5, and 8 for the lowest number of estimated automobile accidents of all of the build alternatives. Overall, Alternative 7 ranks best in terms of fewest anticipated total accidents (light rail vehicle and auto).

In terms of numbers of low-income families, minority populations, zero-car households, and workers using public transportation to get to work within 1/2 mile of the stations, Alternative 7 ranks the lowest with 23,312 families, 100,294 persons, 6,024 households, and 5,100 workers, respectively. It also would directly serve the fewest redevelopment or special revitalization zones (seven) of any of the build alternatives. However, it would provide the highest number of corridor daily transit trips (180,750) and would create the most short-term jobs (79,141 direct and indirect jobs). It is estimated that this alternative would create more than 20,000 additional such jobs than Alternative 8 which ranks second highest in this category. Alternative 7 would also create the most permanent jobs (5,108 direct and indirect jobs).

Alternative 7 would potentially visually affect the second lowest number of sensitive receptors (300 residences, schools, parks, bicycle trails, and/or cemeteries). This is only four more than affected under Alternative 6. However, overall impacts would be greater in the areas affected than a BRT mode because of the need to remove landscaping in the medians and to install an overhead catenary system. The noise impacts would affect the second lowest number of buildings and parks (378 affected by wayside noise for the LRT at-grade segments and 68 affected by the ground-borne noise for the heavy rail subway segment). There would also be a potential for vibration impacts on those receptors due to both modes. However, such impacts would be less for the at-grade portions than the underground portion because of the lower speeds required for the street-running operation.

This alternative ranks about mid-range with regard to pollutant criteria/precursor emission reductions compared to the No-Build Alternative of any of the build alternatives (ranking from fourth to fifth depending on the type of emissions considered). It also ranks mid-range with regard to CO_2 emissions.

Approximately 800 feet of proposed tunnel segment of Alternative 7 crosses the Coyote Pass Escarpment. Alternative 7 also has the highest potential for concern with regard to encountering pre-existing contaminated sites west of the Los Angeles River. Alternatives 7 and 8 will involve extensive subsurface excavation in the vicinity of contaminated sites. Both of these subway alternatives are located through industrially developed property that has historically contained oil and gas production wells. High levels of methane gas and hydrogen sulfide are potential concerns associated with the tunneling. Previous studies in the vicinity of Union Station, conducted as a part of the previous Red Line study effort, have found groundwater to be contaminated with hydrocarbons, hydrogen sulfide gas, and various volatile organic compounds, and semi-volatile organic compounds. Two former coal-gasification sites are also located in the study area. Another major source of concern is the former site of six large gasoline above ground storage tanks (currently under demolition and being taken off-site) located near the Friedman Bag Company at the northwest corner of Ducommun and Vignes Streets.

The lowest number of potential cultural resources and listed sites were identified in the vicinity of this alignment (48). There is a potential to encounter fossil sites and remains during construction of the subway segment. A total of 9 park and recreation facilities are located in close proximity of the alignment. Note that the total parks nearby included two (Pecan Park and LANI Park) within the subway segment. No impacts on those parks would be expected as a result of this alternative. Like Alternatives 6 and 8, Alternative 7 would have the least impacts on utilities because of the subway segment. However, impacts are still likely in the vicinity of the subway station excavation areas.

Alternative 8

This hybrid alternative consists of a heavy rail subway segment from Union Station to Chavez/Soto and a BRT at-grade segment from Chavez/Soto east to Whittier/Norwalk. It is tied with Alternatives 1, 4, 5, and 7 for the lowest requirements for additional land (28 acres) to accommodate park-and-ride facilities, according to preliminary estimates of parking needs. An estimated 165 to 215 bus accidents and 380 automobile accidents are projected to occur annually. Alternative 8, as well as all of the other BRT alternatives, is forecasted to result in higher numbers of accidents involving a transit vehicle than those alternatives employing at-grade LRT. All of the BRT alternatives are projected to result in similar numbers of bus accidents except that Alternative 8 would have slightly fewer such accidents (approximately five less each year). This alternative ties with Alternatives 4, 5, and 7 for the fewest projected auto accidents.

Alternative 8 serves some of the fewest existing redevelopment or special revitalization zones (eight). Only Alternative 7 serves fewer such zones (seven served). It would create the second highest number of short-term jobs (58,611 direct and indirect jobs) and also the second highest number of permanent jobs (4,718 direct and indirect jobs).

In terms of numbers of low-income families served within 1/2 mile of the stations, this alternative ranks next to last (30,919 families) for fewest numbers served. It ranks third highest in numbers of minorities served within the same distance of the stations (126,496 persons). Alternative 8 again is next to last for fewest zero-car households served (7,918 households) and third highest in numbers of workers using public transportation to get to work (7,430 persons) within 1/2 mile of the stations. With regard to corridor daily transit trips, this alternative ranks fifth (177,150).

With regard to potential visual impacts, this alternative would potentially affect the third highest number of sensitive receptors (482 residences, schools, parks, bicycle trails, and/or cemeteries). However, the visual impacts are confined to the area where the BRT mode would operate. Overall impacts of this mode are expected to be less than a light rail mode due to reasons previously stated. Alternative 8 has the second highest numbers of noise-impacted buildings and parks of all of the build alternatives (538 affected by wayside noise for the BRT at-grade segments and 45 affected by the ground-borne noise for the heavy rail subway segment). There would also be a potential for vibration impacts on the receptors located in the vicinity of the heavy rail subway segment. The bus mode would result in no vibration impacts.

Alternative 8 achieves some of the fewest pollutant criteria/precursor emission reductions compared to the No-Build Alternative of any of the build alternatives (ranking from sixth to seventh depending on the type of emissions considered). It ranks worst with regard to CO_2 emissions of the build alternatives, but it still results in fewer such emissions than the TSM Alternative.

Alternative 8 has the longest length of crossing of the Coyote Pass Escarpment (800 feet of proposed tunnel segment and 300 feet of proposed at-grade busway). This alternative has the second highest potential for concern with regard to encountering pre-existing contaminated sites. The discussion of Alternative 7 identifies the major areas of concern.

The third lowest number of potential cultural resources and listed sites were identified in the vicinity of this alignment (109). However, this alternative has the highest number of such resources of the alternatives involving a subway segment. There is a potential to encounter fossil sites and remains during construction of the subway segment. A total of 9 park and recreation facilities are located within 300 feet of the alignment. Note that the total parks nearby included one (Pecan Park) within the subway segment. No impacts on this park would be expected as a result of this alternative. Like Alternatives 6 and 7, Alternative 8 would have the least impacts on utilities because of the subway segment. However, impacts are still likely in the vicinity of the subway excavation areas.

Conclusions

Selection of an alternative for implementation will require consideration of tradeoffs. Some of the major observations of the comparative evaluation are discussed in this section.

The numbers of accidents anticipated to occur each year were estimated for each of the build alternatives based on historical data for similar bus, light rail, and automobile operations. With regard to accidents involving a transit vehicle, all of the at-grade BRT alternatives are estimated to result in substantially more accidents (more than three times) than the at-grade LRT alternatives. However, the number of estimated automobile accidents is related more to the segment that is traversed than the mode of transit being offered under each alternative. Alternatives 2, 3, and 6 would likely result in the highest number of auto accidents (an estimated 430 per year), while the other build alternatives would result in a projected 380 to 385 auto accidents each year. Based on historical statistics provided by MTA's Operations Safety Department for similar types of operating segments of the Metro Blue Line for light rail and by FHWA and Caltrans for automobile accidents on similar types of arterial streets, the following observations were noted. Only about five percent of the light rail accidents involved pedestrians. The majority of the accidents related to private vehicle conflicts with the LRT vehicle. Most of the automobile accidents involved property damage only; however, the remainder involved some type of personal injuries.

Because the portion of the study area west of Lorena Street has generally higher population densities, families with higher numbers of children, and higher transit usage than the eastern portion of the study area, the probability of accidents occurring in the western area is higher for the totally at-grade

alternatives. The subway segments associated with Alternatives 6 through 8 would substantially reduce the probability of accidents in the Boyle Heights area where the tunneled sections would be located.

BRT Alternative 2 and LRT Alternative 3 would both serve the highest numbers of low-income (36,967 families) and minority populations (141,353 persons) within 1/2 mile of the stations. They also would serve the highest numbers of zero-car households (9,553 households) and workers using public transportation (8,521 workers) within 1/2 mile of the stations. These two alternatives follow the same alignment. Alternative 7 would serve the fewest of these populations (23,312 low-income families, 100,294 minorities, 6,024 households, and 5,100 workers, respectively). However, with regard to numbers of corridor daily transit trips, Alternative 7 would provide the highest number (180,750), followed closely by Alternative 5 (180,350). Alternatives 1 and 2 would result in the lowest number of such trips of the build alternatives (174,500 each). It is important to note that higher numbers of transit trips are anticipated for all of the build alternatives as compared to the No-Build and TSM Alternatives. The increase in corridor daily transit trips for the build alternatives range between 31,650 (Alternative 7) and 25,400 (Alternatives 1 and 2) as compared to the No-Build Alternative. A comparison to the TSM Alternative shows that projected increases for the build alternatives range from 15,400 additional trips (Alternative 7) to 9,200 additional trips (Alternatives 1 and 2).

Alternative 7 would result in creation of the highest number of short-term and permanent jobs (79,141 and 5,108 jobs, respectively). Alternative 2 would result in creation of the fewest short-term jobs (24,857), and Alternative 1 would result in creation of the fewest permanent jobs (3,748). Note that the alternatives employing heavy rail or LRT all would result in creation of more short-term and permanent jobs than any of the alternatives employing only the BRT mode.

Research of transit systems in other cities indicates that rail transit investment (similar to that associated with Alternatives 3, 5, 6, 7, and a portion of Alternative 8) offers greater possibility to support community development and revitalization efforts than implementing BRT (similar to that associated with Alternatives 1, 2, 4, and a portion of Alternative 8). However, it appears that the location, type, and success of development is often contingent on other factors as well such as market forces, public policy initiatives, and financing scenarios, particularly in less affluent communities.

With regard to air quality impacts, all of the build alternatives would result in criteria pollutant/precursor emissions reductions as compared to the TSM Alternative and would also result in reductions as compared to the No-Build Alternative except in the case of NO_x where three of the alternatives (Alternatives 4, 5, and 8) would produce higher emissions. Alternative 6 would achieve the greatest reductions among the build alternatives while Alternative 5 would generally result in the fewest reductions. Greenhouse gas emissions (measured in terms of tons of CO_2), from all of the build alternatives would be less than the TSM Alternative. Five of the build alternatives (Alternatives 1, 2, 3, 6 and 7) would also achieve reductions of greenhouse gas emissions as compared to the No-Build Alternative. Alternative 6 would again achieve the greatest reductions.

A comparison of potentially noise-impacted buildings shows that BRT Alternative 1 would have the greatest impact while LRT at grade/subway Alternative 6 would have the least impact. Buses, in general, are noisier than light rail vehicles because they result in wayside noise impacts at greater distances from an alignment than light rail vehicles. However, it is expected that both at-grade modes would still have an adverse impact on the first row of buildings because of the close proximity of the buildings to the streets. The extent of impact on the first row buildings would generally be more severe with buses than with a light rail vehicle. Sound walls are considered the most effective noise control measure for at-grade systems. However, to be effective, they must block the direct view of the noise source and must be solid with minimal openings. Installation of sound walls is not feasible for any of the at-grade LRT or BRT

alternatives being considered because they would interfere with normal traffic movements and would restrict emergency vehicle access.

Noise levels from underground operations of either LRT or heavy rail (ground-borne noise) are normally heard as a low level rumbling sound on the inside of buildings and is not perceptible on the outside of a building. In general, even with closed windows, noise levels from underground operations (as with the subway segments of Alternatives 6, 7, and 8) would result in lower interior noise levels than BRT or LRT at-grade operations. Also, the outside at-grade rail noise levels would be significantly higher than ground-borne noise from underground operations which are generally not perceptible outdoors. With regard to vibration, no impacts would be expected from buses because they are rubber tired vehicles. However, such impacts are possible with both LRT and heavy rail. The potential vibration impacts from at-grade LRT operations would be less than from underground operations because of the lower speeds required for the street-running operation. However, mitigation techniques are available to minimize both potential ground-borne noise and vibration impacts.

With regard to potential visual impacts, both the number of sensitive receptors near an alignment and the mode itself should be considered. The mode, however, is probably a more important factor than the number of receptors located near an alignment when considering overall impact. An at-grade LRT would have the greatest impact because it would necessitate the removal of landscaping in the street medians and the installation of an overhead catenary system. A BRT mode has no such requirements. Although BRT Alternative 1 would be in close proximity of the highest number of sensitive receptors (541), LRT Alternative 5 would likely have the highest overall impact. It would affect the greatest number of receptors (490) of the LRT alternatives. Alternatives 6 and 7 (both involving subway segments) would affect the fewest such receptors (296 and 300, respectively). However, both of these alternatives incorporate LRT in the at-grade segments. Alternative 2 would affect the fewest receptors (427) of the alternatives employing BRT. It fares better than Alternative 8, which involves both a heavy rail subway segment and a BRT at-grade segment. The at-grade portion of Alternative 8 passes by more residences than Alternative 2.

Any alternative involving subway would have the least overall visual impact on the surrounding community because most of the facilities would be located underground. Therefore, Alternatives 6, 7, and 8 would have the least impact on the Boyle Heights community where the subway segments are located. As noted in Table 5, Alternatives 6 and 7 would potentially affect only 33 and 14 receptors, respectively, in the portion of the study area between Union Station and Lorena Street because these two alternatives operate mostly underground. These numbers compare with more than 200 receptors for each of the other at-grade alternatives in the same study area. Although Alternative 8 includes a subway segment, this alternative potentially affects 199 receptors in this portion of Boyle Heights due to the at-grade BRT portion that operates from Chavez/Soto to 4th Street/Lorena.

Regarding proximity to cultural resources, all of the alternatives will need to deal with both historic structures and subsurface remains in the Union Station/Alameda area. Note that, overall, the subway alternatives generally fare best of the build alternatives because they pass underground beneath the highest concentration of resources in Boyle Heights. Alternatives 6, 7, and 8 pass by 75, 48, and 109 such resources, respectively. Of the at-grade alternatives, BRT Alternative 1 passes by the fewest resources (124). The other at-grade Alternatives 2 through 5 each pass by the highest number of such resources (between 132 and 158, depending on the alternative). On the other hand, the at-grade alternatives have the least potential for encountering fossil sites and remains during construction since no major subsurface excavation activity is required. The subway segments of Alternatives 6 through 8 and the elevated segments (associated with the Baseline and Evergreen Options for connection with Union Station) of LRT Alternatives 3, 5, and 6 have the highest potential for encountering these resources.

The extensive subsurface excavation associated with Alternatives 7 and 8 also rank these subway alternatives the highest in terms of potential for concern for encountering existing contaminated sites during construction. Alternative 6 ranks the third highest in terms of potential concern since it has a shorter subway segment than Alternatives 7 or 8 and because the subway segment is east of the Los Angeles River where there is less of a concern for encountering hydrogen sulfide and other contaminants. Although there is still a concern for encountering hazardous substances along Alternative 6, most of the contaminated areas identified are located in the western portion of the study area between Union Station and Indiana Street and are, therefore, in the vicinity of the subway segments of Alternatives 7 and 8. Mitigation measures to address construction and operation of subway segments through contaminated ground, specifically the western portion of the study area, had been developed and incorporated into the design of the suspended Metro Red Line Eastside Extension project. Similar measures could be employed as needed for this project. The BRT alternatives have the lowest potential for concern for encountering contaminated sites followed by the at-grade LRT alternatives. Both types of alternatives would involve only limited subsurface construction activity.

Three of the build alternatives (Alternatives 1, 7, and 8) cross the Coyote Pass Escarpment that is associated with the Elysian Park Thrust, a buried thrust fault that underlies portions of the western study area. It is anticipated that the at-grade alternatives would be affected less severely than the subway alternatives in the event of future seismic activity along the escarpment. Alternative 8 has the longest length of crossing of the escarpment (about 800 feet of tunnel segment and 300 feet of at-grade segment). Special steel tunnel liners to mitigate the effects of deformation with added ductility had been incorporated into the design of the tunnel segments crossing the escarpment for the suspended Metro Red Line Eastside Extension project.

The impacts on utilities during construction would likely be greater for the totally at-grade alternatives than those alternatives involving subway segments (Alternatives 6 through 8) since relocation of some utilities buried within the street or on overhead poles above the street will be required. The depth of the tunneling will mostly avoid utilities. However, impacts are still likely in the subway station excavation areas.

TABLE 4
COMPARISON OF ALTERNATIVES –ENVIRONMENTAL ISSUES
(Union Station to Whittier/Norwalk)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Compatibility with local plans and policies	Maintains status quo.		Generally compatible except in vicinity of Whittier/Norwalk Station. An amendment to Whittier General Plan and revisions to Southwest Whittier Zoning may be needed.							
Redevelopment/ Revitalization areas served	Current trends and market conditions would prevail.		10	9	9	10	10	9	7	8
Potential for Economic Development[1]	Baseline Condition	Low	Low	Low	Good	Low	Good	Good	Good	Heavy Rail – Good BRT – Low
Short-term/ permanent jobs created	0/0	5,453/1,464	25,222/3,748	24,857/3,770	43,378/4,202	25,520/4,003	43,362/4,568	55,379/4,084	79,141/5,108	58,611/4,718
Potential residences and businesses displaced for alignment and stations[2]	0	0	0	0	0	0	0	0	0	0
Estimated acres needed for park-and-ride facilities[3]	0	0	28	35	35	28	28	35	28	28
Low-income families within 1/2 mi. of stations No./% of total	N/A	N/A	31,583/24%	36,967/26%	36,967/26%	31,586/25%	31,586/25%	31,523/25%	23,312/23%	30,919/24%
Minority populations within 1/2 mi. of stations No./% of total	N/A	N/A	127,817/93%	141,353/94%	141,353/94%	124,194/92%	124,194/92%	122,522/93%	100,294/91%	126,496/93%
Zero-car households within 1/2 mi. of stations No./% of total	N/A	N/A	8,587/24%	9,553/25%	9,553/25%	8,530/24%	8,530/24%	8,120/24%	6,024/21%	7,918/23%

TABLE 4
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(Union Station to Whittier/Norwalk)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Workers using public transportation within 1/2 mi. of stations No./% of total	N/A	N/A	7,585/15%	8,521/16%	8,521/16%	7,347/15%	7,347/15%	6,733/15%	5,100/13%	7,430/15%
Corridor daily person trips	3,532,600	3,540,900	3,542,600	3,542,900	3,546,100	3,542,800	3,546,500	3,546,700	3,546,000	3,544,400
Corridor daily transit trips	149,100	165,300	174,500	174,500	178,700	174,900	180,350	179,550	180,750	177,150
Corridor daily transit mode share	4.2%	4.7%	4.9%	4.9%	5.0%	4.9%	5.1%	5.1%	5.1%	5.0%
Increased daily transit trips as compared to:										
-No-Build		16,200	25,400	25,400	29,600	25,800	31,250	30,450	31,650	28,050
-TSM		N/A	9,200	9,200	13,400	9,600	15,050	14,250	15,450	11,850
Potential visually affected receptors[3]	0	0	541	427	427	490	490	296	300	482
Change in regional emissions (tons per year) compared to No-Build	Baseline									
-VOC		+9	-14.08	-23.36	-27.60	-3.62	-2.08	-40.84	-13.87	-.3.71
-CO		+150	-329.83	-509.82	-571.77	-131.48	-83.48	-825.65	-309.71	-130.03
-NO_x		+38	-25.51	-52.59	-70.59	+6.31	+5.82	-110.04	-29.30	_+5.15
-PM_{10}		+1	-2.69	-4.20	-4.75	-1.02	-0.64	-6.88	-2.54	-1.01
-CO_2		+42,363	-3,319	-24,339	-36,261	-22,363	-24,505	-67,613	-944	+23,512
EPA regional air quality designation										
-O_3	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme	Extreme
-CO	Serious	Serious	Serious	Serious	Serious	Serious	Serious	Serious	Serious	Serious
-PM_{10}	Serious	Serious	Serious	Serious	Serious	Serious	Serious	Serious	Serious	Serious
-NO_x	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment

TABLE 4
COMPARISON OF ALTERNATIVES –ENVIRONMENTAL ISSUES
(Union Station to Whittier/Norwalk)

Criteria	Alternative									
	No-Build	TSM	1	2	3	4	5	6	7	8
			BRT	BRT	LRT	BRT	LRT	LRT (subway)/ LRT	Heavy rail (subway)/ LRT	Heavy rail (subway)/ BRT
Potential sensitive receptors affected by noise and vibration[5] (xx) applies to ground-borne noise in subway segment.	Baseline	Added bus service could result in slight increases in noise levels at some locations.	554	483	483	504	504	358/(50)	378/(68)	538/(45)
Portion of alignment that crosses Coyote Pass Escarpment (feet) -at grade -subway	N/A	N/A	 300 0	 0 0	 0 0	 0 0	 0 0	 0 0	 0 800	 300 800
No. contaminated sites nearby Potential for concern[6]: High Moderate Low	N/A	N/A	 1 9 5	 1 11 3	 1 15 6	 1 14 4	 4 11 8	 9 10 40	 17 8 44	 15 4 8
No. water crossings	N/A	N/A	3	3	3	3	3	3	2	2
Acres of floodplain affected[7]	0	0	0	0	0	0	0	0	0	0
Acres of wetland affected[7]	0	0	0	0	0	0	0	0	0	0

TABLE 4
COMPARISON OF ALTERNATIVES –ENVIRONMENTAL ISSUES
(Union Station to Whittier/Norwalk)

Criteria	Alternative									
	No-Build	TSM	1	2	3	4	5	6	7	8
			BRT	BRT	LRT	BRT	LRT	LRT (subway)/ LRT	Heavy rail (subway)/ LRT	Heavy rail (subway)/ BRT
Energy consumption (Change in annual BTUs) compared to: No-Build TSM		110,877 N/A	17,331 -93,545	-29,301 -140,178	-61,649 -172,525	76,194 -34,682	75,963 -34,914	-132,445 -243,321	19,352 -91,525	78,453 -32,424
Potential cultural resources Nearby	0	0	109	137	137	116	116	54	34	98
National/State Register cultural resource sites[8]	0	0	14	21	21	14	14	20	14	9
Potential for fossil sites and remains being encountered during construction[8]	None	None	None	None	Potential in elevated segment (Baseline and Evergreen Options)	None	Potential in elevated segment (Baseline and Evergreen Options)	Potential in elevated segment (Baseline and Evergreen Options) and in subway segment	Potential in heavy rail (subway segment)	Potential in heavy rail (subway segment)
Parks and recreation facilities nearby[8,9]	0	0	9	8	9	10	11	8	9	9
Utility impacts	None	None or minimal	Alternative is at-grade. Will have the highest impact on utilities.					Fewer impacts expected for the subway segment than the at-grade segments. However, impacts still likely in subway station excavation areas.		
Expected Annual Bus Accidents on the BRT Alignment [10]	N.A.	N.A.	170 to 225	170 to 225	N.A.	170 to 220	N.A.	N.A.	N.A.	165 to 215
Expected Annual LRT Accidents on the LRT Alignment[10]	N.A.	N.A.	N.A.	N.A.	50 to 65	N.A.	50 to 65	45 to 60	35 to 50	N.A.

TABLE 4
COMPARISON OF ALTERNATIVES –ENVIRONMENTAL ISSUES
(Union Station to Whittier/Norwalk)

Criteria	Alternative									
	No-Build	TSM	1	2	3	4	5	6	7	8
			BRT	BRT	LRT	BRT	LRT	LRT (subway)/ LRT	Heavy rail (subway)/ LRT	Heavy rail (subway)/ BRT
Expected Annual Automobile Accidents along the Fixed Guideway Alignments[10]	N.A.	N.A.	385	430	430	380	380	430	380	380

Notes to Table 4:

[1]The success of any economic development depends also on other factors in addition to the provision of a transit system. Examples of other factors include: implementation of appropriate public policies to encourage development; local market forces; subsidies; innovative financing scenarios; and land use and zoning changes to encourage transit-oriented development.

[2]Additional land may be needed to accommodate the cut-and-cover process of constructing the heavy rail station box area at 1st/Boyle (Alternatives 7 and 8) and at 1st/Lorena (Alternative 7). This possibility will be further investigated if one of these alternatives is selected, and the design is further refined.

[3]Only general locations of park-and-ride facilities are known at this conceptual level of analysis. Therefore, numbers of residences and businesses that could potentially be displaced cannot be determined. The land requirements are, therefore, reported in acres and are based on preliminary estimates of parking needs.

[4]This quantitative analysis does not take into account the differences in visual impacts due to the various transit modes. For example, LRT has an overhead catenary system associated with that mode, while BRT does not. Totals for each alternative may increase once specific park-and-ride facility locations and height (i.e., if a parking structure rather than a surface lot is constructed) information becomes available.

[5]Vibration is not an issue for the BRT alternatives.

[6]The assignment of a low to high potential for concern is based on the presumed construction activity for completion of the alternative when compared to historical, regulatory, and field reconnaissance information.

[7]At the current conceptual level of design, the existing crossings of the Los Angeles, Rio Hondo, and San Gabriel Rivers would not need to be widened nor would new support piers be required. If it is determined at an advanced design stage that bridge widening or additional piers may be required, then impacts are possible.

[8]Slight differences in total numbers expected for LRT Alternatives 3, 5, and 6 depending on which option is selected for connecting to Union Station.

[9]For Alternatives 6 and 8, the subway segment passes underneath or in close proximity to one recreational resource. For Alternative 7, the subway segment passes underneath or in close proximity to two recreational resources. Adverse impacts are unlikely.

[10]Based on historical data provided by MTA's Operations Safety Department for similar bus and light rail operations and by Caltrans and FHWA for similar arterial streets.

TABLE 5
COMPARISON OF ALTERNATIVES – ENVIRONMENTAL ISSUES
(Union Station to Lorena Street)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Compatibility with local plans and policies	Maintains status quo.		Generally compatible.							
Redevelopment/ Revitalization areas served	Current trends and market conditions would prevail.		6	6	6	6	6	6	4	4
Short-term/permanent jobs created	0/0	N.A./N.A.	11,486/886	11,814/868	19,449/889	11,561/906	19,762/981	31,271/829	42,765/855	43,025/951
Potential residences and businesses displaced for alignment and stations[1]	0	0	0	0	0	0	0	0	0	0
Estimated acres needed for park-and-ride facilities[2]	0	0	0	0	0	0	0	0	0	0
Low-income families within 1/2 mi. of stations No./% of total	N/A	N/A	16,959/31%	16,959/33%	16,959/33%	16,963/33%	16,963/33%	11,606/36%	8,635/33%	16,295/31%
Minority populations within 1/2 mi. of stations No./% of total	N/A	N/A	58,306/96%	54,672/96%	54,672/96%	54,690/96%	54,690/96%	36,073/94%	30,599/95%	56,985/97%
Zero-car households within 1/2 mi. of stations No./% of total	N/A	N/A	5,038/35%	4,980/37%	4,980/37%	4,981/37%	4,981/37%	3,568/30%	2,478/36%	4,369/33%

TABLE 5
COMPARISON OF ALTERNATIVES – ENVIRONMENTAL ISSUES
(Union Station to Lorena Street)

Criteria	Alternative									
	No-Build	TSM	1	2	3	4	5	6	7	8
			BRT	BRT	LRT	BRT	LRT	LRT (subway)/ LRT	Heavy rail (subway)/ LRT	Heavy rail (subway)/ BRT
Workers using public transportation within 1/2 mi. of stations No./% of total	N/A	N/A	4,809/24%	4,570/25%	4,570/25%	4,572/25%	4,572/25%	2,823/26%	2,339/25%	4,654/24%
Potential visually affected receptors[3]	0	0	260	212	212	212	212	33	14	199
Potential sensitive receptors affected by noise and vibration[4] (xx) applies to ground-borne noise in subway segment.	Baseline	Added bus service could result in slight increases in noise levels at some locations.	230	180	180	180	180	19(51)	0(69)	169(45)
Portion of alignment that crosses Coyote Pass Escarpment (feet)	N/A	N/A								
-at grade			300	0	0	0	0	0	0	300
-subway			0	0	0	0	0	0	800	800
No. contaminated sites nearby Potential for concern[5]:	N/A	N/A								
High			1	1	1	1	2	6	9	9
Moderate			6	5	8	7	8	7	5	2
No. water crossings	N/A	N/A	1	1	1	1	1	1	0	0
Acres of floodplain affected[6]	0	0	0	0	0	0	0	0	0	0

TABLE 5
COMPARISON OF ALTERNATIVES – ENVIRONMENTAL ISSUES
(Union Station to Lorena Street)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Acres of wetland affected[6]	0	0	0	0	0	0	0	0	0	0
Potential cultural resources Nearby	0	0	94	107	107	101	101	5	6	84
National/State Register cultural resource sites[7]	0	0	3	6	6	6	6	5	5	2
Potential for fossil sites and remains being encountered during construction[7]	None	None	None	None	Potential in elevated segment (Baseline and Evergreen Options)	None	Potential in elevated segment (Baseline and Evergreen Options)	Potential in elevated segment (Baseline and Evergreen Options) and in subway segment	Potential in heavy rail (subway segment)	Potential in heavy rail (subway segment)
Parks and recreation facilities nearby[7,8]	0	0	2	3	4	3	4	3	2	2
Utility impacts	None	None or minimal	Alternative is at-grade. Will have the highest impact on utilities.					Fewer impacts expected for the subway segment than the at-grade segments. However, impacts still likely in subway station excavation areas.		

Notes to Table 5:

[1]Additional land may be needed to accommodate the cut-and-cover process of constructing the heavy rail station box area at 1st/Boyle (Alternatives 7 and 8) and at 1st/Lorena (Alternative 7). This possibility will be further investigated if one of these alternatives is selected, and the design is further refined.

[2]Only general locations of park-and-ride facilities are known at this conceptual level of analysis. Therefore, numbers of residences and businesses that could potentially be displaced cannot be determined. The land requirements are, therefore, reported in acres and are based on preliminary estimates of parking needs.

[3]This quantitative analysis does not take into account the differences in visual impacts due to the various transit modes. For example, LRT has an overhead catenary system associated with that mode, while BRT does not. Totals for each alternative may increase once specific park-and-ride facility locations and height (i.e., if a parking structure rather than a surface lot is constructed) information becomes available.

[4]Vibration is not an issue for the BRT alternatives.

[5]The assignment of a low to high potential for concern is based on the presumed construction activity for completion of the alternative when compared to historical, regulatory, and field reconnaissance information.

[6]At the current conceptual level of design, the existing crossings of the Los Angeles, Rio Hondo, and San Gabriel Rivers would not need to be widened nor would new support piers be required. If it is determined at an advanced design stage that bridge widening or additional piers may be required, then impacts are possible.

[7]Slight differences in total numbers expected for LRT Alternatives 3, 5, and 6 depending on which option is selected for connecting to Union Station.

[8]For Alternatives 6 and 8, the subway segment passes underneath or in close proximity to one recreational resource. For Alternative 7, the subway segment passes underneath or in close proximity to two recreational resources. Adverse impacts are unlikely.

TABLE 6
COMPARISON OF ALTERNATIVES – ENVIRONMENTAL ISSUES
(Union Station to Atlantic Boulevard)

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Compatibility with local plans and policies	Maintains status quo.		Generally compatible.							
Redevelopment/ Revitalization areas served	Current trends and market conditions would prevail.		7	7	7	7	7	7	5	5
Short-term/permanent jobs created	0/0	N.A/N.A.	15,248/1,441	16,954/1,604	31,196//1,755	15,509/1,502	28,731/1,714	43,748/1,706	58,713/1,746	47,435/1,693
Potential residences and businesses displaced for alignment and stations[1]	0	0	0	0	0	0	0	0	0	0
Estimated acres needed for park-and-ride facilities[2]	0	0	3.75	10	10	3.75	3.75	10	3.75	3.75
Low-income families within 1/2 mi. of stations No./% of total	N/A	N/A	24,508/30%	28,516/30%	28,516/30%	24,511/31%	24,511/31%	23,081/31%	16,143/30%	23,750/30%
Minority populations within 1/2 mi. of stations No./% of total	N/A	N/A	86,746/97%	97,475/97%	97,475/97%	83,123/97%	83,123/97%	78,688/96%	58,908/97%	85,110/97%
Zero-car households within 1/2 mi. of stations No./% of total	N/A	N/A	6,615/31%	7,415/31%	7,415/31%	6,558/32%	6,558/32%	5,983/32%	4,046/30%	5,940/30%

TABLE 6
COMPARISON OF ALTERNATIVES – ENVIRONMENTAL ISSUES
(Union Station to Atlantic Boulevard)

Criteria	Alternative									
	No-Build	TSM	1	2	3	4	5	6	7	8
			BRT	BRT	LRT	BRT	LRT	LRT (subway)/ LRT	Heavy rail (subway)/ LRT	Heavy rail (subway)/ BRT
Workers using public transportation within 1/2 mi. of stations No./% of total	N/A	N/A	6,304/21%	6,896/21%	6,896/21%	6,066/21%	6,066/21%	5,110/20%	3,799/20%	6,129/21%
Potential visually affected receptors[3]	0	0	334	404	404	286	286	225	88	273
Potential sensitive receptors affected by noise and vibration[4] (xx) applies to ground-borne noise in subway segment.	Baseline	Added bus service could result in slight increases in noise levels at some locations.	331	396	396	281	281	221(51)	88(69)	270(45)
Portion of alignment that crosses Coyote Pass Escarpment (feet) -at grade -subway	N/A	N/A	 300 0	 0 0	 0 0	 0 0	 0 0	 0 0	 0 800	 300 800
No. contaminated sites nearby Potential for concern[5]: High Moderate	N/A	N/A	 1 7	 1 7	 1 10	 1 8	 3 9	 8 9	 12 6	 10 3
No. water crossings	N/A	N/A	1	1	1	1	1	1	0	0
Acres of floodplain affected[6]	0	0	0	0	0	0	0	0	0	0

TABLE 6
COMPARISON OF ALTERNATIVES – ENVIRONMENTAL ISSUES
(Union Station to Atlantic Boulevard)

Criteria	Alternative									
	No-Build	TSM	1	2	3	4	5	6	7	8
			BRT	BRT	LRT	BRT	LRT	LRT (subway)/ LRT	Heavy rail (subway)/ LRT	Heavy rail (subway)/ BRT
Acres of wetland affected[6]	0	0	0	0	0	0	0	0	0	0
Potential cultural resources Nearby	0	0	105	126	126	112	112	55	29	93
National/State Register cultural resource sites[7]	0	0	7	10	10	8	8	9	7	4
Potential for fossil sites and remains being encountered during construction[7]	None	None	None	None	Potential in elevated segment (Baseline and Evergreen Options)	None	Potential in elevated segment (Baseline and Evergreen Options)	Potential in elevated segment (Baseline and Evergreen Options) and in subway segment	Potential in heavy rail (subway segment)	Potential in heavy rail (subway segment)
Parks and recreation facilities nearby[7,8]	0	0	3	3	4	4	5	3	3	3
Utility impacts	None	None or minimal	Alternative is at-grade. Will have the highest impact on utilities.					Fewer impacts expected for the subway segment than the at-grade segments. However, impacts still likely in subway station excavation areas.		

Notes to Table 6:

[1]Additional land may be needed to accommodate the cut-and-cover process of constructing the heavy rail station box area at 1st/Boyle (Alternatives 7 and 8) and at 1st/Lorena (Alternative 7). This possibility will be further investigated if one of these alternatives is selected, and the design is further refined.

[2]Only general locations of park-and-ride facilities are known at this conceptual level of analysis. Therefore, numbers of residences and businesses that could potentially be displaced cannot be determined. The land requirements are, therefore, reported in acres and are based on preliminary estimates of parking needs.

[3]This quantitative analysis does not take into account the differences in visual impacts due to the various transit modes. For example, LRT has an overhead catenary system associated with that mode, while BRT does not. Totals for each alternative may increase once specific park-and-ride facility locations and height (i.e., if a parking structure rather than a surface lot is constructed) information becomes available.

[4]Vibration is not an issue for the BRT alternatives.

[5]The assignment of a low to high potential for concern is based on the presumed construction activity for completion of the alternative when compared to historical, regulatory, and field reconnaissance information.

[6]At the current conceptual level of design, the existing crossings of the Los Angeles, Rio Hondo, and San Gabriel Rivers would not need to be widened nor would new support piers be required. If it is determined at an advanced design stage that bridge widening or additional piers may be required, then impacts are possible.

[7]Slight differences in total numbers expected for LRT Alternatives 3, 5, and 6 depending on which option is selected for connecting to Union Station.

[8]For Alternatives 6 and 8, the subway segment passes underneath or in close proximity to one recreational resource. For Alternative 7, the subway segment passes underneath or in close proximity to two recreational resources. Adverse impacts are unlikely.

V. Cost

This section summarizes the capital and operating and maintenance (O&M) costs for each alternative and for the capital costs for the shorter segments to Lorena Street and Atlantic Boulevard.

Capital Costs

A summary of total capital costs for each alternative from Union Station to Whittier/Norwalk (full length alternative) is shown in Table 7 below.

The BRT alternatives range from $394.4M to $415.1M for the three full length alternatives. In general, these estimates reflect a lower level of technology, construction complexity, and overall cost than the LRT and HRT alternatives. Therefore, the cost-per-mile is less than the other modes.

The LRT alternatives range from $748.7M to $936.2M for the three full length LRT alternatives. The highest estimate is associated with utilization of tunneling technology and both a subway station and a partially depressed station. On a cost-per-mile basis, these estimates are consistent with historical light rail project experience.

The two hybrid alternatives, which include a heavy rail technology, range from $848.8M for the HRT/BRT full length alternative to $1,178.0M for the HRT/LRT full length alternative. These alternatives reflect the cost associated with tunnel work, below-grade stations, and additional vehicle and systems costs for heavy rail.

The capital cost for the Transportation System Management (TSM) Alternative is estimated at $53 million.

For purposes of this analysis, consideration was given to the potential for a "phased" construction approach. A phased approach, which might result from cash flow, funding, or other reasons, would result in the construction of an abbreviated alignment (with the potential of future extension to the full alignment length).

Also presented in Table 7 are the capital costs for each alternative if the alignments extend only from (A) Union Station to Lorena St. and (B) Union Station to Atlantic Blvd. No provision has been made for possible economies-of-scale adjustments, construction inefficiencies, or other considerations in this regard.

Table 7 Summary of Capital Costs			
Alternative	**Union Station to Lorena Street, millions 1999 $**	**Union Station to Atlantic Boulevard, millions 1999 $**	**Union Station to Whittier/Norwalk, millions 1999 $**
TSM	$53.0	$53.0	$53.0
1 – BRT	$179.6	$238.5	$394.4
2 – BRT	$187.4	$268.9	$415.1
3 – LRT	$286.8	$460.0	$764.6
4 – BRT	$180.0	$241.5	$405.3
5 – LRT	$288.7	$419.7	$748.7
6 – LRT	$452.0	$632.4	$936.2
7 – HRT/LRT	$603.5	$828.5	$1,178.0
8 – HRT/BRT	$516.1	$681.6	$848.8

Special Discussion of Tunneling Issues and Impacts

Tunneling conditions and alternative tunneling technologies were explored extensively during the design of the suspended Metro Red Line Eastside Extension alignment. This alignment, referred to as the suspended project, would have extended the Red Line from Union Station to First and Lorena Streets, via Little Tokyo. Specifically, mitigation measures for tunneling impacts were developed to address ground surface settlement, tunneling through contaminated ground, and tunneling through the Coyote Pass Escarpment. These measures were incorporated into an essentially complete final design prior to project suspension, and would be directly applicable for alternatives 6, 7, and 8. It should be noted that Alternative 6 would require significantly less mitigation for contaminated ground conditions as the alignment is at grade in the area west of the Los Angeles River, where most of the ground contamination exists. Tunneling conditions and the appropriate mitigation measures for the new proposed alternatives with tunnel sections are expected to be similar to those of the suspended project. The capital cost estimates took into account the latest knowledge of the tunneling issues and the expected construction costs.

Ground Surface Settlement

Geologic conditions for most of the alignment are sands, clays and gravels, which in tunneling terms are described as "soft ground." During tunneling, some ground loss will occur, producing surface settlement. The amount of settlement measured at the surface will be a function of the tunnel depth, size, tunneling techniques, and geology. To reduce surface settlement, pressure-face Tunnel Boring Machines (TBM) and pre-cast, bolted, gasketed lining systems were proposed for the suspended project. The pressure-face technology maintains positive fluid or soil pressure on the tunnel face which decreases the potential for ground loss and soil instability (sloughing, caving) at the tunnel face, which in turn reduces soil movement and surface settlement. In combination with the face pressure, grout is installed immediately behind the TBM to fill the annular space between the installed precast concrete liners (tunnel rings) and the ground. This technology provides an additional measure to reduce surface settlement. An additional benefit of the pressure-face TBM is the ability to tunnel below the groundwater table without requiring dewatering or lowering of the groundwater table.

Coyote Pass Escarpment

Approximately 800 feet of the proposed tunneled segments of Alternatives 7 and 8 cross the Coyote Pass escarpment. This potentially active buried thrust fault has been documented extensively during investigations by the MTA for the suspended project. As opposed to surface fault offset occurring during

an earthquake, the buried (blind) thrust fault produces an escarpment or hill feature. A relatively flexible steel tunnel liner in the portion crossing the Coyote pass was developed to accommodate bending at the crossings. A similar design could be used for Alternatives 7 and 8.

Ground Contamination

The proposed tunnel segments will traverse two inactive oil fields and contaminated ground. These conditions are most prevalent in the area between Union Station and the Los Angeles River, where previous industrial activity has occurred. As for existing Metro Red Line tunnels, there is documented subsurface methane gas. Between Union Station and the Los Angeles River, hydrogen sulfide exists in the groundwater as well as free oil and tar. To address the environmental issues discussed above, a closed-system of transporting cuttings and special tunnel liners (providing a secondary gasket) were proposed for the suspended project. Using the pressure-face TBM (in combination with the gasketed lining system), excavated soil can be transported through a closed system to a separation plant at the surface where special ventilation and mitigation measures can be implemented to contend with contaminated soil. Treatment methods for neutralizing the hydrogen sulfide within the spoil disposal system have also been developed. These or similar measures would be required for Alternatives 7 and 8. Alternative 6 is less likely to encounter hazardous gas and may not require such mitigation measures for contaminated ground.

Operating and Maintenance Costs

The MTA operating and maintenance costs for each of the alternatives were developed in a consistent manner for each of the corridor studies. Tables 8, 9, and 10 presents the annual operating and maintenance costs in millions of 1999 dollars for each of the alternatives by segment (Tables 8 and 9) and for the full length of the alternative (Table 10) and compares the incremental cost of each alternative compared to the No Build and Transportation System Management (TSM) Alternatives.

Table 8
Operating and Maintenance Cost Estimate Summary
Union Station to Lorena

Alternative, Union Station to Lorena	Annual Operating and Maintenance Cost (millions, 1999 $)*	Annual O&M Costs Compared to the No Build (millions, 1999 $)	Annual O&M Costs Compared to the TSM (millions, 1999 $)
No Build	$848.4	N.A.	N.A.
TSM	$863.7	$15.3	N.A.
1 – BRT	$873.2	$24.7	$9.5
2 – BRT	$873.2	$24.8	$9.5
3 – LRT	$873.6	$25.2	$9.9
4 – BRT	$873.8	$25.4	$10.1
5 – LRT	$874.9	$26.5	$11.3
6 – LRT	$873.2	$24.7	$9.5
7 – HRT/LRT	$878.3	$29.9	$14.7
8 – HRT/BRT	$880.5	$32.0	$16.8

* Cost for full operation of the MTA system, not just the alternatives

Table 9 Operating and Maintenance Cost Estimate Summary Union Station to Atlantic (Phase I)			
Alternative, Union Station to Atlantic	**Annual Operating and Maintenance Cost (millions, 1999 $)***	**Annual O&M Costs Compared to the No Build (millions, 1999 $)**	**Annual O&M Costs Compared to the TSM (millions, 1999 $)**
No Build	$848.4	N.A.	N.A.
TSM	$863.7	$15.3	N.A.
1 – BRT	$877.3	$28.8	$13.6
2 – BRT	$877.4	$29.0	$13.8
3 – LRT	$879.0	$30.6	$15.4
4 – BRT	$878.6	$30.1	$14.9
5 – LRT	$881.1	$32.7	$17.4
6 – LRT	$878.4	$29.9	$14.7
7 – HRT/LRT	$885.3	$36.8	$21.6
8 – HRT/BRT	$886.1	$37.7	$22.5

* Cost for full operation of the MTA system, not just the alternatives

Table 10 Operating and Maintenance Cost Estimate Summary Full Length Alternatives			
Alternative, Full Length	**Annual Operating and Maintenance Cost (millions, 1999 $)***	**Annual O&M Costs Compared to the No Build (millions, 1999 $)**	**Annual O&M Costs Compared to the TSM (millions, 1999 $)**
No Build	$848.4	N.A.	N.A.
TSM	$863.7	$15.3	N.A.
1 – BRT	$887.4	$39.0	$23.7
2 – BRT	$887.7	$39.3	$24.0
3 – LRT	$892.2	$43.8	$28.5
4 – BRT	$890.1	$41.7	$26.4
5 – LRT	$896.0	$47.6	$32.3
6 – LRT	$890.9	$42.5	$27.2
7 – HRT/LRT	$901.6	$53.2	$37.9
8 – HRT/BRT	$897.5	$49.1	$33.8

* Cost for full operation of the MTA system, not just the alternatives

VI. Evaluation of Alternatives

This section compares the eight build alternatives using various evaluation criteria, the analyses presented in sections III, IV, and V, and identifies the significant tradeoffs between the alternatives being considered.

Costs

The initial capital and annual operating and maintenance costs are summarized in Table 11 for the full-length alternatives. Also shown in Table 11 are the estimated capital costs for the Phase I segments to Atlantic Boulevard. All costs are in 1999 dollars. The capital costs include all engineering, design, construction, facilities, rolling stock, and contingency costs required to implement the alternative. The annual operating and maintenance costs include all the costs related to the fixed guideway component and the support bus service component of each alternative. The annual operating and maintenance costs are those over and above the cost to operate and maintain the No Build alternative.

Table 11
Summary of Capital and Operating and Maintenance Costs

Alternative	Capital Cost, millions 1999 $, full length alternative	Annual Operating and Maintenance Cost (above the No Build), millions 1999 $, full length alternative	Capital Cost, millions 1999 $, Phase I segment, Union Station to Atlantic
No Build	N.A.	N.A.	N.A.
Transportation Systems Management (TSM)	$53	$15.3	$53
1 – BRT	$394	$39.0	$238
2 – BRT	$415	$39.3	$269
3 – LRT	$765	$43.8	$460
4 – BRT	$405	$41.7	$242
5 – LRT	$749	$47.6	$420
6 – LRT	$936	$42.5	$632
7 – HRT/LRT	$1,178	$53.2	$828
8 – HRT/BRT	$849	$49.1	$681

Effectiveness in Improving Mobility

This section is a summary of the benefits of the alternatives on improving mobility for the residents and businesses in the Eastside Corridor. Sections III and IV discuss the impacts in more detail and this section highlights four basic criteria related to improving mobility. These include (1) daily new transit trips compared to the No Build Alternative, (2) daily new transit trips compared to the TSM Alternative, (3) daily fixed guideway boardings, and (4) daily automobile vehicle miles saved compared to the TSM Alternative. Table 12 presents the data for the four criteria discussed above.

Table 12 Summary of Effectiveness Criteria				
Alternative	**Daily New 2020 Transit Trips Compared to the No Build Alternative**	**Daily New 2020 Transit Trips Compared to the TSM Alternative**	**Daily Fixed Guideway Transit Boardings**	**Annual Vehicle Miles Saved Compared to the TSM Alternative**
No Build	N.A.	N.A.	N.A.	N.A.
Transportation Systems Management (TSM)	19,900	N.A.	N.A.	N.A.
1 – BRT	28,700	8,700	11,500	1,276,000
2 – BRT	27,200	7,300	12,400	1,769,000
3 – LRT	31,700	11,800	17,000	1,977,000
4 – BRT	29,100	9,200	11,300	725,000
5 – LRT	33,800	13,900	18,000	629,000
6 – LRT	32,300	12,400	17,800	2,677,000
7 – HRT/LRT	34,300	14,400	18,700	1,252,000
8 – HRT/BRT	30,000	10,100	14,000	727,000

Efficiency (Cost-Effectiveness)

The efficiency or cost-effectiveness analysis provides a means of comparing the benefits of the alternatives being considered relative to the costs of the alternatives. Two measures or criteria are used: (1) operating cost per passenger mile; and (2) the incremental cost per new transit trip in the forecast year of 2020.

One measure of efficiency is the change or improvement in the operating cost per passenger mile in the forecast year of 2020 compared to the TSM alternative. The other measure of efficiency or cost-effectiveness is the incremental cost per new transit trip in the forecast year of 2020. This measure, expressed in 1999 dollar values, is based on the annualized total capital investment and annual operating costs divided by the forecast change in annual transit trips, compared to the TSM Alternative. This cost-effectiveness index measures the cost per new transit trip attracted to transit as a result of the alternative's improvements. This reflects benefits to existing transit users (making more trips), attraction of new transit trips, and the cost-efficiency of the improvements proposed. It can be interpreted as the ratio between the necessary capital and operating investment, and the return on that investment in terms of new transit trips being made. The TSM Alternative is used as the comparison baseline, since it incorporates a modest expansion in MTA bus services for the Eastside Corridor, and represents a low-cost approach to addressing the transportation needs in the corridor, without the construction of major new facilities. The TSM Alternative therefore provides a baseline against which to isolate the added costs and added benefits resulting from a major investment, such as the fixed guideway alternatives proposed for the Eastside Corridor. The incremental cost per new trip may also be measured against the No Build Alternative.

Table 13 presents the operating cost per passenger mile for each alternative compared to the TSM Alternative. The lower the incremental cost per passenger mile the more attractive the alternative is. The LRT alternatives have the lowest incremental operating cost per passenger.

Table 13 Operating Cost per Passenger Mile Compared to the TSM Alternative			
Alternative	**Incremental Annual Operating and Maintenance Cost (1999 dollars, millions)**	**Incremental Annual Transit Passenger Miles, millions**	**Incremental Operating Cost/Passenger Mile**
Transportation Systems Management (TSM)	N.A.	N.A.	N.A.
1 – BRT	$23.77	24.99	$0.95
2 – BRT	$23.99	15.46	$1.55
3 – LRT	$28.49	33.18	$0.86
4 – BRT	$26.42	22.20	$1.19
5 – LRT	$32.29	40.79	$0.79
6 – LRT	$27.26	37.37	$0.73
7 – HRT/LRT	$37.91	36.10	$1.05
8 – HRT/BRT	$33.86	24.54	$1.38

Table 14 presents the annualized capital costs of each alternative. The annualization is based on the Federal Transit Administration's (FTA) recommended discount rate of seven percent, and the FTA suggested useful economic lives of capital components.

Table 14 Annualization of Capital Costs			
Alternative	**Total Capital Costs, millions 1999 $**	**Annualized Cost, millions 1999 $**	**Incremental Annual Cost Compared to TSM Alternative, millions 1999 $**
No Build	N.A.	N.A.	N.A.
Transportation Systems Management (TSM)	$53	$6.1	N.A.
1 – BRT	$394	$39.4	$33.3
2 – BRT	$415	$41.2	$35.1
3 – LRT	$765	$65.7	$59.6
4 – BRT	$405	$40.7	$34.6
5 – LRT	$749	$64.4	$58.3
6 – LRT	$936	$79.4	$73.3
7 – HRT/LRT	$1,178	$99.3	$93.2
8 – HRT/BRT	$849	$75.6	$69.5

Table 15 presents the year 2020 annualized cost and benefit values and resulting cost-effectiveness for the eight build alternatives compared to the TSM Alternative. Alternative 1 and Alternative 5 are the most

cost-effective related to this measure. The hybrid alternatives (Alternatives 7 and 8) are the least cost-effective related to this measure.

Table 15
Cost-Effectiveness: Incremental Cost per Incremental Transit Trip Compared to the TSM Alternative

Alternative	Incremental Annualized Capital Cost (1999 dollars, millions)	Incremental Annual Operating and Maintenance Cost (1999 dollars, millions)	Incremental Total Annualized Cost (1999 dollars, millions)	Incremental Annual Transit Trips in 2020, millions	Cost-Effectiveness (Incremental Cost per New Transit Trip)
1 – BRT	$33.27	$23.77	$57.04	2.75	$20.74
2 – BRT	$35.09	$23.99	$59.08	2.33	$25.36
3 – LRT	$59.62	$28.49	$88.11	3.74	$23.56
4 – BRT	$34.60	$26.42	$61.02	2.90	$21.04
5 – LRT	$58.34	$32.29	$90.63	4.38	$20.69
6 – LRT	$73.29	$27.26	$100.55	3.90	$25.78
7 – HRT/LRT	$93.22	$37.91	$131.13	4.56	$28.76
8 – HRT/BRT	$69.46	$33.86	$103.32	3.20	$32.29

Table 16 also presents the year 2020 annualized cost and benefit values and resulting cost-effectiveness for the eight build alternatives compared to the No Build Alternative.

Table 16
Cost-Effectiveness: Incremental Cost per Incremental Transit Trip Compared to the No Build Alternative

Alternative	Incremental Annualized Capital Cost (1999 dollars, millions)	Incremental Annual Operating and Maintenance Cost (1999 dollars, millions)	Incremental Total Annualized Cost (1999 dollars, millions)	Incremental Annual Transit Trips in 2020, millions	Cost-Effectiveness (Incremental Cost per New Transit Trip)
TSM	$6.10	$15.24	$21.34	6.26	$3.41
1 – BRT	$39.38	$39.00	$78.38	9.00	$8.71
2 – BRT	$41.20	$39.23	$80.43	8.58	$9.37
3 – LRT	$65.72	$43.72	$109.44	10.00	$10.94
4 – BRT	$40.71	$41.65	$82.36	9.15	$9.00
5 – LRT	$64.45	$47.53	$111.98	10.64	$10.52
6 – LRT	$79.39	$42.50	$121.89	10.16	$12.00
7 – HRT/LRT	$99.32	$53.15	$152.47	10.81	$14.10
8 – HRT/BRT	$75.56	$49.10	$124.66	9.46	$13.18

Environmental

This section summarizes the significant environmental concerns and differences between the alternatives. The most significant environmental issues and concerns related to the following criteria: (1) traffic

impacts; (2) number of on-street parking spaces lost; (3) number of potential visually affected receptors; (4) number of potentially sensitive receptors affected by noise and vibration; (5) number of potential cultural resources nearby; (6) number of National/State Register cultural resources nearby; (7) compatibility with local plans and policies; (8) number of redevelopment/revitalization areas served; and (9) safety issues as measured by number of possible fixed guideway modes and automobile accidents. These nine issue areas point out differences between the alternatives and represent the most significant areas of concern to the public. Table 17 presents the information for each alternative for the nine critical concern areas listed above.

TABLE 17
Environmental Issues/Concerns

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Traffic Impacts	lowest	lowest	highest	highest	highest	highest	highest	moderate	lowest	moderate
Parking spaces lost	0	0	339	365	402	352	396	236	172	320
Potential visually affected receptors[1]	0	0	541	427	427	490	490	296	300	482
Potential sensitive receptors affected by noise and vibration[2] (xx) applies to ground-borne noise in subway segment.	Baseline	Added bus service could result in slight increases in noise levels at some locations.	554	483	483	504	504	358/(50)	378/(68)	538/(45)
Potential cultural resources Nearby	0	0	109	137	137	116	116	54	34	98
National/State Register cultural resource sites[3]	0	0	14	21	21	14	14	20	14	9
Compatibility with local plans and policies	Maintains status quo.		Generally compatible except in vicinity of Whittier/Norwalk Station. An amendment to Whittier General Plan and revisions to Southwest Whittier Zoning may be needed.							
Redevelopment/ Revitalization areas served	Current trends and market conditions would prevail.		10	9	9	10	10	9	7	8
Expected Annual Bus Accidents on the BRT Alignment	N.A.	N.A.	170 to 225	170 to 225	N.A.	170 to 220	N.A.	N.A.	N.A.	165 to 215
Expected Annual LRT Accidents on the LRT	N.A.	N.A.	N.A.	N.A.	50 to 65	N.A.	50 to 65	45 to 60	35 to 50	N.A.

TABLE 17
Environmental Issues/Concerns

Criteria	Alternative									
	No-Build	TSM	1 BRT	2 BRT	3 LRT	4 BRT	5 LRT	6 LRT (subway)/ LRT	7 Heavy rail (subway)/ LRT	8 Heavy rail (subway)/ BRT
Alignment										
Expected Annual Automobile Accidents along the Fixed Guideway Alignments	N.A.	N.A.	385	430	430	380	380	430	380	380

[1]This quantitative analysis does not take into account the differences in visual impacts due to the various transit modes. For example, LRT has an overhead catenary system associated with that mode, while BRT does not. Totals for each alternative may increase once specific park-and-ride facility locations and height (i.e., if a parking structure rather than a surface lot is constructed) information becomes available.
[2]Vibration is not an issue for the BRT alternatives.
[3]Slight differences in total numbers expected for LRT Alternatives 3, 5, and 6 depending on which option is selected for connecting to Union Station.

Equity

Equity relates to the impacts and benefits to the transit reliant system users and related specials needs groups such as low income and minority populations. A summary of the primary demographics (within one-half mile of the proposed stations) by each alternative is shown in Table 18. Based on the demographics Alternatives 2 and 3 would serve the most transit dependent within walking distance of the fixed guideway stations. Alternatives 1, 4, 5, 6, and 8 are very similar to Alternatives 2 and 3. Alternative 7 would serve the lowest number of transit dependent persons.

TABLE 18
DEMOGRAPHICS SUMMARY BY ALTERNATIVE[1]

Alternative/ Station	Minority Population		Low-Income Families		Workers 16 and Older Using Public Transportation		Zero-Car Households	
	No.	% of Total Pop.	No.	% of Total Families	No.	% of Workers 16 and Older	No.	% of Total Residential Units
Los Angeles County	5,228,442	59.0	1,308,255	15.1	267,210	6.5	333,562	11.2
Study Area	406,865	86.6	89,205	19.7	18,203	10.1	19,414	15.5
No-Build	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1 - BRT	127,817	92.5	31,583	24.2	7,585	15.1	8,587	23.8
2 – BRT	141,353	93.8	36,967	25.8	8,521	16.2	9,553	25.1
3 – LRT	141,353	93.8	36,967	25.8	8,521	16.2	9,553	25.1
4 – BRT	124,194	92.3	31,586	24.8	7,347	15.2	8,530	24.3
5 – LRT	124,194	92.3	31,586	24.8	7,347	15.2	8,530	24.3
6 – LRT	122,522	93.2	31,523	25.4	6,733	14.9	8,120	24.3
7 – HRT/LRT	100,294	91.4	23,312	22.7	5,100	13.0	6,024	21.1
8 – HRT/BRT	126,496	92.8	30,919	24.0	7,430	15.0	7,918	22.6

[1]Includes the total served within one-half mile of all of the stations included in each alternative.
Source: 1990 U.S. Census Data.

Community Involvement Response

A rigorous public involvement was conducted throughout the study. Listed below are the summary of activities undertaken. The public involvement documentation is summarized in three documents: (1) Scoping Meetings Summary Report, September 24, 1999; (2) Second Round of Community Meetings Summary Report, October 30, 1999; and (3) Third Round of Community Meetings Summary Report, February 2000.

Major activities conducted included the following items:

- Ten major community meetings in August (Scoping) and October 1999 and January 2000 throughout the Eastside Corridor and attended by more than 585 community stakeholders.
- Federal and State community and agency scoping process (August 1999) and published the Notice of Intent in the Federal Register and the Notice of Preparation with the State Clearinghouse.
- Conducted more than 34 meetings with community based organizations.
- Conducted 33 briefings with Eastside elected officials and staff members.

- Combined mailings and flyers distribution to more than 67,500 households, businesses, and community organizations.
- Published meeting notices in the Los Angeles Time, La Opinion, Eastside Sun, Our Times, and Rafu Shimpo.

The community expressed many concerns, especially within the Boyle Heights area related to possible community impacts of at-grade fixed guideway investments. The following is a succinct summary of what the community consensus appeared to be based on the inputs received and actions taken by community groups:

- The Boyle Heights and East Los Angeles communities prefer the previously adopted Locally Preferred Alternative and the Suspended Project due to less environmental impacts and superior quality of service.
- Due to MTA's financial constraints the Boyle Heights community and areas of East Los Angeles would consider Alternative 6 as a viable alternative to consider in the next phase.
- The communities east of Atlantic Boulevard (Montebello, Pico Rivera, and Whittier) are undecided about the fixed guideway transit mode and the specific alignment.

Trade-Offs Between Alternatives

This section highlights key differences and tradeoffs between the alternatives relative to costs, performance, mobility, impacts, and community response to the alternatives. The significant areas of tradeoffs between the alternatives are listed below:

- The full-length alternatives capital costs. From an initial capital cost standpoint the pure BRT alternatives (1, 2, and 4) are by far the lowest initial cost ($400 million). The LRT at-grade alternatives (3 and 5) are the next lowest cost ($750 million). The LRT Alternative 6 with a 1.8 mile tunnel section under Boyle Heights increases the at-grade alternative costs by about $200 million in order to mitigate the adverse impacts and community opposition to an at-grade alternative (either BRT or LRT) through the narrow streets of the Boyle Heights community. Alternatives 7 and 8 are two-station extensions of the Metro Red Line subway to 1st/Lorena or to Chavez/Soto. Alternative 7 connects to an LRT system to the end of the corridor and is by far the most expensive at almost $1.2 billion. Alternative 8 uses BRT to the end of the corridor and has a total capital cost of almost $850 million.
- Proposed Phase I segment capital costs. From an initial capital cost standpoint the pure BRT alternatives (1, 2, and 4) are by far the lowest initial cost ($238 to 269 million). The LRT at-grade alternatives (3 and 5) are the next lowest cost ($420 to 460 million). The LRT Alternative 6 with a 1.8 mile tunnel section under Boyle Heights increases the at-grade alternative costs by about $200 million in order to mitigate the adverse impacts and community opposition to an at-grade alternative (either BRT or LRT) through the narrow streets of the Boyle Heights community. Alternatives 7 and 8 are two-station extensions of the Metro Red Line subway to 1st/Lorena or to Chavez/Soto. Alternative 7 connects to an LRT system as far as Atlantic and is by far the most expensive at $828 million. Alternative 8 uses BRT as far as Atlantic and has a total capital cost of $681 million.
- From the standpoint of annual operating and maintenance costs, Alternatives 1, 2, and 4 (all BRT) perform the best (least cost). Alternative 6 is the lowest cost rail oriented alternative and is only slightly higher than the BRT alternatives. Alternative 7 (HRT/LRT) is the most expensive alternative.
- From a performance and mobility standpoint the BRT alternatives (1, 2, 4, and 8) perform less than the rail-oriented alternatives (3, 5, 6, and 7). Alternatives 5 (LRT) and 7 (HRT/LRT) perform the best.

- The most cost efficient alternatives based on annual operating costs per passenger mile compared to the TSM Alternative are Alternatives 5 and 6.
- The incremental cost per new transit trip compared to the TSM Alternative is the highest for Alternatives 7 and 8. Alternatives 1 and 5 are the most cost-effective alternative followed by Alternatives 4, 3, 2, and 6.
- From an environmental issues and concerns standpoint, the pure at-grade BRT and LRT alternatives (1, 2, 3, 4, and 5) and Alternative 8 (mostly at-grade) have the most potential for adverse environmental impacts, especially in Boyle Heights and sections of East Los Angeles with the older narrow streets and dense residential and business areas. Alternatives 6 and 7 are the best from an environmental impact standpoint.
- From an equity and environmental justice aspect, all the alternatives serve the Eastside communities but the alternatives that provide the most transit service with the least amount of community impacts are the alternatives that would have the best rating in this category. Even though Alternatives 2 and 3 would serve the most persons within ½ mile of the stations, they would have considerable impacts on the community. There is a distinct tradeoff between the service provided and the possible adverse impacts depending on the community and the policy makers.
- From the standpoint of the community and the ten community meetings the following is a synopsis of the collective input received:
  - The Boyle Heights and East Los Angeles communities prefer the previously adopted Local Preferred Alternative (6.8 miles and 7 stations) and Suspended Project (3.7 miles and 4 stations) due to less environmental impacts and superior quality of service but many are willing to accept Alternative 6 in situations of MTA financial hardship
  - The communities east of Atlantic Boulevard are undecided about transit mode and specific alignment
  - The Boyle Heights community and Whittier Boulevard merchants are opposed to the at-grade options regardless of mode