8

Metropolitan
Transportation
Authority

One Gateway Plaza
Los Angeles, CA
90012-2952

PLANNING AND PROGRAMMING COMMITTEE
OCTOBER 15, 2003

SUBJECT: FIXED GUIDEWAY SYSTEM PLAN AND PRIORITIES

ACTION: ADOPT FIXED GUIDEWAY SYSTEM PLAN AND PRIORITIES

RECOMMENDATION

Adopt the Fixed Guideway System Plan Priorities in Attachment A.

ISSUE

At its June 2003 meeting, the MTA Board directed staff to report back with a comprehensive rail program which prioritizes MTA's next phase of rail projects and includes an indication of the possibility of alternative technologies with comparative costs. This Board Report responds to that directive and expands the discussion to include all urban fixed guideway projects (e.g., busways and rail). In addition, having a clear vision of fixed guideway priorities will assist the MTA in effectively competing for increasingly scarce federal and state funding resources and provide direction for prioritizing MTA project development work.

POLICY IMPLICATIONS

The recommended Fixed Guideway System Plan Priorities are consistent with the 2001 Long Range Transportation Plan elements and the 2003 Short Range Transportation Plan. One new project, a Metro Center connector, is recommended for priority consideration to address system connectivity issues. The recommended priority lists are expanded to go beyond the Short Range Plan time frame. This will help direct staff resources so that the highest priority projects will be ready for any new funding opportunities. This is consistent with MTA goals to seek new sources of funding to implement necessary transportation improvements since adopting clear priorities will help the MTA compete for such new funding.

OPTIONS

The MTA Board can change the projects and/or the priority order of the projects. Staff recommended the projects and priorities based on the 2001 Long Range Transportation Plan, ridership, and systemwide capacity needs.

FINANCIAL IMPACT

Adoption of the recommended action will not have any immediate impact on MTA's FY04 budget and this report does not authorize any new expenditure of funds. In the longer term, the recommended action may help the MTA to obtain additional new revenues needed to implement important capital projects by establishing a clear commitment to a prioritized list of fixed guideway projects. Ultimately, construction of most of the projects on the list will require significant new revenues than currently projected within the immediate future.

DISCUSSION

2001 Long Range Transportation Plan

In 2001, the MTA Board adopted a Long Range Transportation Plan (LRTP) which, among other things, identified a series of fixed guideway rail and busway projects along with expenditure levels for bus fleet improvements, rail rehabilitation, Metrolink, Metro Rapid Bus lines and smaller transit capital projects. The LRTP also balanced the commitment to public transportation with other transportation needs such as highway, arterial, bikeway, pedestrian and other modal improvements. The LRTP was based on a comprehensive assessment of financial resources, performance objectives, and community outreach.

The LRTP divided fixed guideway projects into two major categories. The first category was the Recommended (funded) Plan. This included projects that the Board had already committed to (Baseline) and the next phase of projects fundable by 2025 based on projected revenues (Constrained Plan). The second major category was the Strategic (unfunded) Plan which listed six additional projects for consideration should significant new resources become available.

Recommended Fixed Guideway System Plan

The recommended next priorities focuses on the fixed guideway projects/corridors in the Long Range Transportation Plan with one exception. One additional project is being recommended as part of this action, a proposed Metro Center Connector. This project is a primarily at-grade light rail connector through downtown Los Angeles (alignment to be determined). This proposed connector could link service on the Metro Gold Line to service on the Metro Blue Line and the future Exposition Line. Patronage estimates on the future Exposition and Gold Line Eastside Extension coupled with existing ridership on the Metro Gold and Blue Lines will be better served by a direct light rail connection. This will improve safety and efficiency of rail operations by

relieving constraints in the existing Blue Line tunnel where trains currently have to come in and turn back on the same track. Other rail system needs such as additional cars and maintenance yards are also included in this project listing. It should be noted that some systemwide maintenance yard needs would be addressed by the Gold Line extension from Sierra Madre Villa to Irwindale.

Attachment A shows the MTA fixed guideway priorities. Baseline projects are shown at the top of the list as the highest priority. The next phase of projects are those from the Constrained element of the Long Range Transportation Plan. The next group of projects is from the Strategic (unfunded) element of the Long Range plan. They are listed in a proposed priority order. As more information about these projects is gathered through the Long Range Planning process or future environmental work, updated data will be provided to the Board for consideration. Other projects that have previously been studied, or recently suggested, are listed last. The MTA Planning Department will collect more information about these projects, work with the Board to establish criteria and come back with proposed priorities in the future. This could be done as a part of the upcoming Long Range Planning process.

Attachment B is a series of three maps. The first map shows the recommended highest and high priority projects. The second map adds fixed guideway projects/corridors that were listed in the Strategic (unfounded) element of the LRTP. The third map adds projects outside of the LRTP but which have been previously studied or recently suggested.

Attachment C provides a brief background of each project including where it was listed in the LRTP and its current status.

Fixed Guideway Technologies

Attachment D is a compilation of different busway and rail technologies that are used in different parts of the country or the world along with a rough comparison of their capacities and costs. In planning a transit corridor improvement, MTA staff considers these technologies in the initial screening process. The ultimate recommendation of technology is based on the available space in the corridor for tracks, roadways, columns, etc.; expected impacts from at-grade, aerial, and below grade projects; the capacity required to meet projected demand; cost; community input; and other factors.

NEXT STEPS

If the recommended action is adopted, Staff will utilize the fixed guideway plan and priorities in future funding and planning efforts. Additional priorities and projects would be established as part of the next update of the Long Range Transportation Plan.

ATTACHMENT(S)

A. Fixed Guideway Priorities
B. Maps of the Fixed Guideway System
C. Background on Urban Fixed Guideway System Planning
D. Fixed Guideway Technologies

Prepared by: Carol Inge, Deputy Executive Director, Transportation Development & Implementation
David Mieger, Director, Westside Area Planning Team

James L. de la Loza, Executive Officer
Countywide Planning And Development

Roger Snoble
Chief Executive Officer

Fixed Guideway System Plan Priorities

ATTACHMENT A

Priority	Status	Source	Project	Map Code	Estimated Ridership*	Ridership per mile	SRTP/LRTP Year Open
Highest Priority (In Construction, Final Development)					**Map Reference B1**		
N/A	Const.	Baseline LRTP	**San Fernando Valley Metro Rapidway**	2	22,000	1,600	2005
N/A	FFGA	Baseline LRTP	**Eastside LRT Extension**	3	23,000	3,800	2008
N/A	Const.	Baseline LRTP	**Wilshire Metro Rapid BRT Upgrades**	4	53,000	4,000	2009
High Priority (LRTP Constrained Plan and/or PE Phase)					**Map Reference B1**		
1	IN P.E.	Baseline LRTP	**Exposition LRT**- Downtown LA to Culver City	5	43,000	4,400	2012-2015
2	Draft EIS/EIR	CP-LRTP	**Exposition LRT**- Culver City to Santa Monica	6	27,000	3,600	2020-2025
3 - 4	MIS	CP-LRTP	**Crenshaw Transit Corridor**	7	32,000	2,900	2015-2020
3 - 4	MIS	CP-LRTP	**San Fernando Valley North South Corridor**-Enhanced Transit Services	8	21,000-39,000	1,200-2,200	2015-2020
5	10yr old MIS	------	**Metro Center Connector & System Upgrades** (LRT Vehicles, Facilty Expansion & Upgrades)	9	17,100	7,700	2025+
N/A[1]	10yr old EIS/EIR	CP-LRTP	**Metro Green Line Extension** to LAX [1]	10	2,300	900	TBD
Strategic (unfunded) Long Range Plan					**Map Reference B2**		
6 [2]	20yr old EIS/EIR	SP-LRTP	**Metro Red Line Wilshire Extension-**to Century City (Initial Phase to Fairfax Avenue)[2]	11	19,500**	6,500**	2025+
7 [3]	Draft EIS/EIR	SP-LRTP	**Metro Gold Line Extension-**Sierra Madre Villa to Claremont [3]	12	15000***	700	2025+
8	10yr old EIS/EIR	SP-LRTP	**LRT-** Union Station to Burbank/Glendale	14	32,500	2,400	2025+
9	MIS	SP-LRTP	**Metro Green Line-** Extension to South Bay Galleria	16	3,300	1,400	2025+
10	MIS	SP-LRTP	**Metro Gold Line-** Eastside Extension to Whittier	15	7,200	1,100	2025+
11	Never Studied	SP-LRTP	**Vermont Transit Corridor-**from Green Line to Hollywood	13	N.A	N.A	2025+

* Sources: 1995 LRTP, 2001 LRTP, 2003 SRTP and MIS/EIR's. **3 mile segment to Fairfax using current Metro Redline boardings per mile.

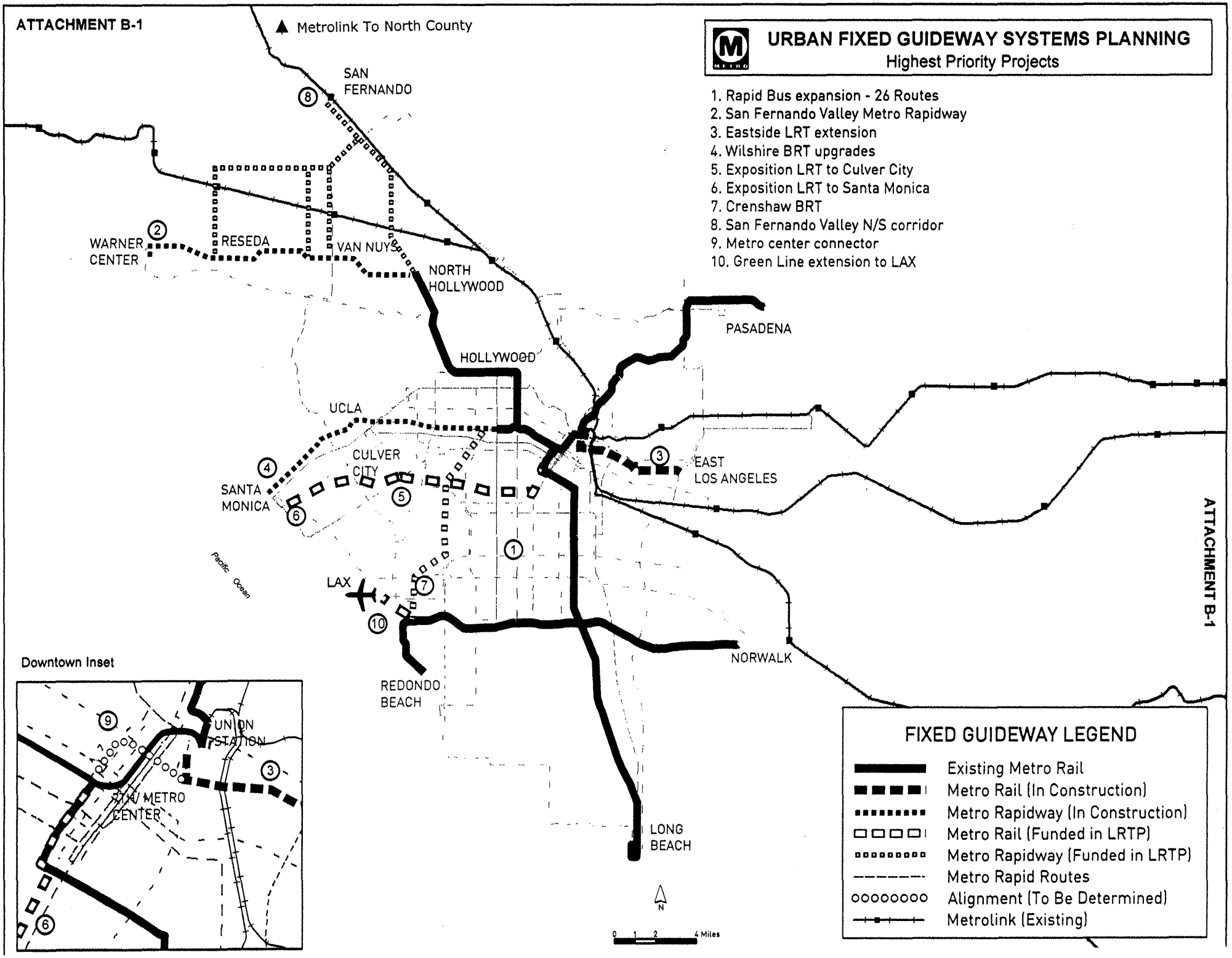
***Ridership based on LA-Pasadena Construction Authority.

1. To be funded by others.
2. Only if significant new eligible funding is found
3. Important for providing a maintenance facility to meet system needs, Rail extension could be built in phases.

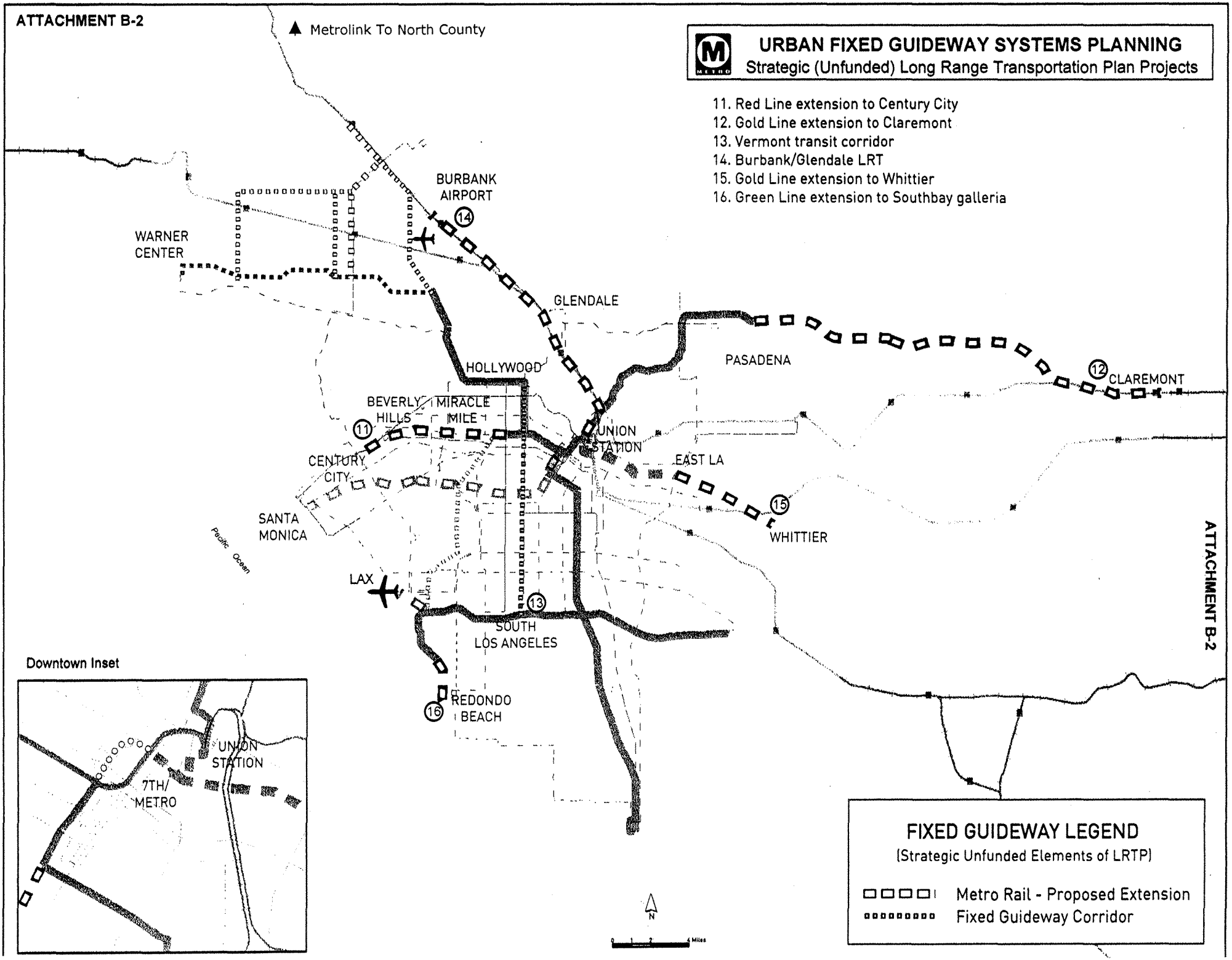
Other Projects Studied or Recently Suggested [1]				Map Reference B3			
TBD	Under Study by Others	Not In LRTP	West Santa Ana Branch Right-of-Way	17	N.A	N.A	2025+
TBD	Under Study by Others	Not In LRTP	Harbor Subdivision Branch Right-of-Way	18	N.A	N.A	2025+
TBD	Under Study by Others	Not In LRTP	Sepulveda Pass HOV/Transit Connector	19	N.A	N.A	2025+
TBD	Previously Studied	Not In LRTP	Ventura Freeway (US101)/134 Aerial Rail	20	N.A	N.A	2025+
TBD	Previously Studied	Not In LRTP	10/60 Corridor Light Rail Transit Project	21	N.A	N.A	2025+
TBD	10yr old EIS/EIR	Not In LRTP	Metro Green Line Extensions to Norwalk/Westchester	22	N.A	N.A	2025+
TBD	Under Study by Others	Not In LRTP	High Speed Rail Connectors	23	N.A	N.A	2025+
TBD	N/A	Not In LRTP	Miscellaneous (SilverLine, Green Line Extension North, Yellow Line, Redline via West Hollywood etc.)	24	N.A	N.A	2025+

Sources: 1995 LRTP, 2001 LRTP, 2003 SRTP, Clatrans, SCAG & Community Suggestions.

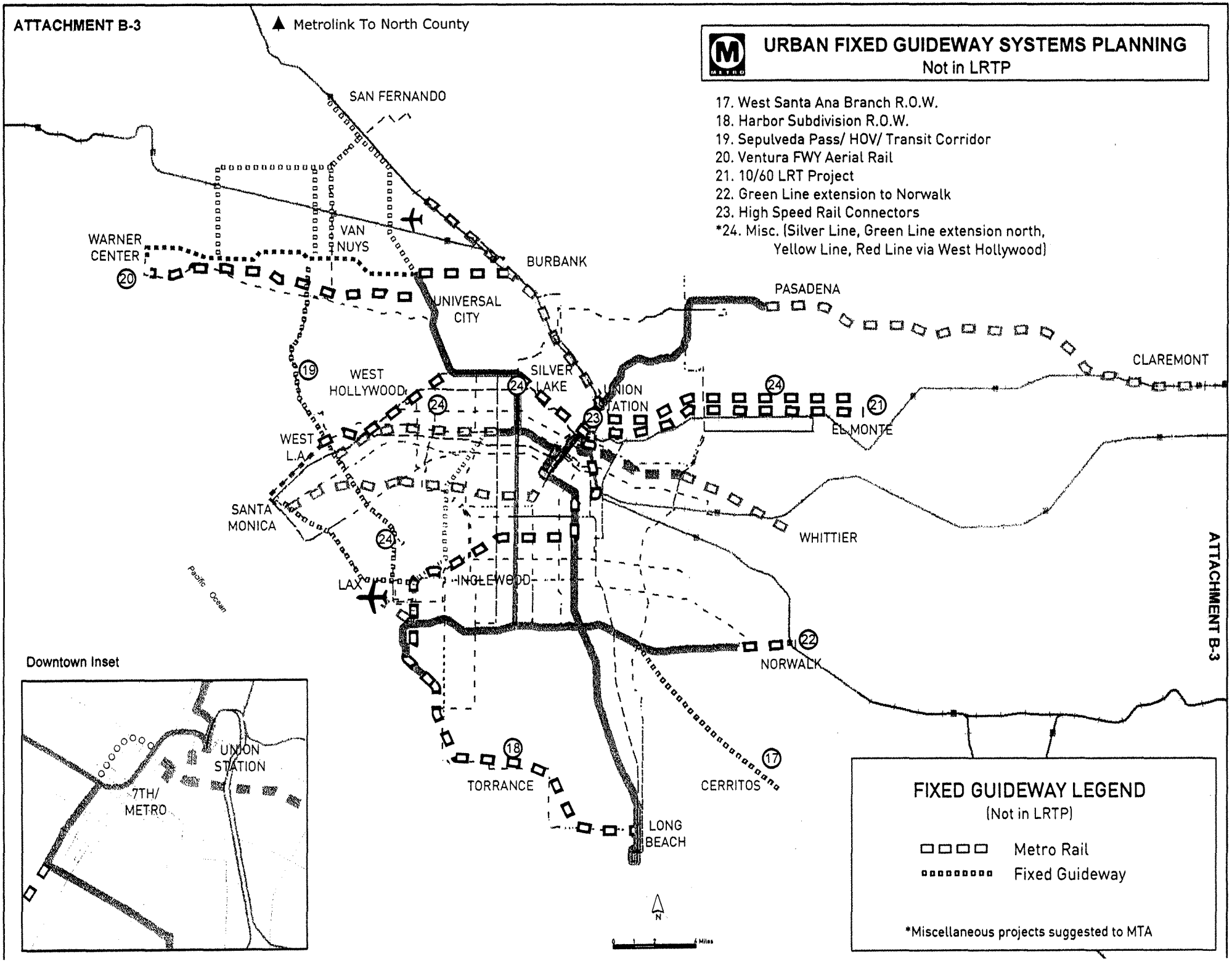
1. Further planning studies would have to be done to prioritize these projects.


ATTACHMENT B-1
Metrolink To North County
URBAN FIXED GUIDEWAY SYSTEMS PLANNING
Highest Priority Projects
1. Rapid Bus expansion - 26 Routes
2. San Fernando Valley Metro Rapidway
3. Eastside LRT extension
4. Wilshire BRT upgrades
5. Exposition LRT to Culver City
6. Exposition LRT to Santa Monica
7. Crenshaw BRT
8. San Fernando Valley N/S corridor
9. Metro center connector
10. Green Line extension to LAX
SAN FERNANDO
WARNER CENTER
RESEDA
VAN NUYS
NORTH HOLLYWOOD
PASADENA
HOLLYWOOD
UCLA
CULVER CITY
SANTA MONICA
EAST LOS ANGELES
Pacific Ocean
LAX
NORWALK
REDONDO BEACH
LONG BEACH
Downtown Inset
UNION STATION
7TH/ METRO CENTER
FIXED GUIDEWAY LEGEND
Existing Metro Rail
Metro Rail (In Construction)
Metro Rapidway (In Construction)
Metro Rail (Funded in LRTP)
Metro Rapidway (Funded in LRTP)
Metro Rapid Routes
Alignment (To Be Determined)
Metrolink (Existing)
N
0 1 2 4 Miles
ATTACHMENT B-1

ATTACHMENT B-2



ATTACHMENT B-2


ATTACHMENT B-3
Metrolink To North County
URBAN FIXED GUIDEWAY SYSTEMS PLANNING
Not in LRTP
17. West Santa Ana Branch R.O.W.
18. Harbor Subdivision R.O.W.
19. Sepulveda Pass/ HOV/ Transit Corridor
20. Ventura FWY Aerial Rail
21. 10/60 LRT Project
22. Green Line extension to Norwalk
23. High Speed Rail Connectors
*24. Misc. (Silver Line, Green Line extension north, Yellow Line, Red Line via West Hollywood)
SAN FERNANDO
WARNER CENTER
VAN NUYS
BURBANK
UNIVERSAL CITY
PASADENA
CLAREMONT
WEST HOLLYWOOD
SILVER LAKE
UNION STATION
EL MONTE
WEST L.A.
SANTA MONICA
WHITTIER
LAX
INGLEWOOD
NORWALK
TORRANCE
CERRITOS
LONG BEACH
Pacific Ocean
Downtown Inset
UNION STATION
7TH/ METRO
FIXED GUIDEWAY LEGEND
(Not in LRTP)
Metro Rail
Fixed Guideway
*Miscellaneous projects suggested to MTA
ATTACHMENT B-3

BACKGROUND ON URBAN FIXED GUIDEWAY SYSTEMS PLANNING

Systems' planning for urban fixed guideways is contained in the MTA Long Range Transportation Plan, adopted by the Board in 2001. In addition, the Board has taken subsequent actions on specific projects based on ongoing corridor studies. Projects include urban rail and bus rapid transit corridors that utilize "fixed guideways" i.e., dedicated rights of way. The following summarizes the status of the urban fixed guideway projects.

Long Range Transportation Plan- Baseline & Constrained Elements (Funded)

The following projects were previously programmed by the MTA Board in the Baseline and Constrained (funded) Element of the 2001 Long Range Transportation Plan.

Long Range Plan Baseline

- Metro Rapid System
  The Board Adopted 2001 Long Range Transportation Plan includes a network of Metro Rapid lines running on 26 routes throughout the County. Subsequent to the adoption of the Long Range Transportation Plan, the Board adopted the Metro Rapid Five-Year Implementation Plan in September 2002 and added three additional lines through other actions.

  Status: Six routes implemented to date. Plan calls for implementation of 20 additional lines at a schedule of 4 per year through 2008.

- San Fernando Valley Metro Rapidway
  This project extends for 14 miles from the Metro Red Line North Hollywood Station to Warner Center in the West San Fernando Valley. It is a bus rapid transit project that includes 13 stations, five of which will provide parking for approximately 3,300 cars.

  Status: Project is under construction and scheduled to open for service in 2005.

- Metro Gold Line Eastside Extension
  This project extends for 6 miles from Union Station to Atlantic Boulevard in East Los Angeles. It is a light rail transit project that includes 6 stations.

  Status: Project is out to bid. Negotiation of Full Funding Grant Agreement in process. Project scheduled to start construction in 2004 and open for service in October 2008.

- Wilshire Metro Rapid BRT Project
  This project extends for 15 miles from the Wilshire/Western Metro Red Line Station to the City of Santa Monica. It is a bus rapid transit project that will upgrade the existing Wilshire/Whittier Metro Rapid line by including higher capacity buses, upgrades to existing Bus Division #10, reconstructed curb lanes in segments, enhanced stations and peak period dedicated bus lanes in segments where supported by local jurisdictions.

  Status: Project has state environmental clearance and will complete preliminary engineering in September 2003. Upgrades are scheduled to be completed by November 2008.

- Exposition Light Rail Transit Project (to Culver City)
  The Long Range Transportation Plan included a project from Downtown Los Angeles to the Mid-City area (vicinity of Crenshaw or Culver City, depending upon funding availability). In June 2001, the Board adopted light rail transit as the Locally Preferred Alternative for this project from Downtown Los Angeles to Culver City and passed a resolution expressing an intention to complete the project to Santa Monica in the future. The line to Culver City is 9.6 miles in length and includes 7 new stations.

  Status: Project is in final environmental clearance and preliminary engineering. Project currently scheduled to open in September 2012, although this date could be accelerated to mid-2009 if new sources of funding are identified.

Long Range Transportation Plan- Constrained (Funded Plan)

- Crenshaw Transit Corridor
  The Long Range Transportation Plan identified a Crenshaw Transit Corridor project extending from Wilshire/Crenshaw to the Metro Green Line near Los Angeles International Airport (LAX). A Major Investment Study (MIS) was completed in January 2003, which included options for Bus Rapid Transit and Light Rail Transit. The Board approved certain Metro Rapid enhancements within the corridor including possible segments of fixed guideway BRT operation, but did not adopt a preferred mode or alignment for the ultimate fixed guideway project.

  Status: Completed MIS. Current funding availability identifies implementation of initial enhancements by 2009 and construction of a full project in the second decade of the Long Range Transportation Plan.

- Exposition Transit Corridor (Extension to Santa Monica)
  The Long Range Transportation Plan included a project from the Mid-City area (vicinity of Crenshaw or Culver City) to West Los Angeles as either a BRT or LRT project. In June 2001, the Board adopted light rail transit as the Locally Preferred Alternative for the first phase of the Expo line from Downtown Los

Angeles to Culver City. The Board also passed a resolution expressing an intention to complete the project to Santa Monica in the future. The extension from Culver City to Santa Monica would be 7.1 miles in length and include 7-8 additional stations.

Status: Draft EIR/EIS completed. Current funding availability identifies construction in the second decade of the Long Range Transportation Plan.

- San Fernando Valley North/South Transit Corridor
  The Long Range Transportation Plan included a transit corridor project from Ventura Boulevard to Sylmar/San Fernando. A Major Investment Study was completed in April 2003 and the Board approved a package of bus transit improvements to multiple corridors.

  Status: MIS completed. Current funding availability identifies implementation of initial phase by 2009 and completion of later phases in the second decade of the Long Range Transportation Plan.

- Metro Green Line Extension to LAX
  This project was envisioned as an LRT extension for approximately 2.3 miles from the Metro Green Line Aviation Station to LAX Parking Lot C. The Long Range Transportation Plan does not identify funding for this project but identifies it in the funded plan as a project to be funded by others. The Los Angeles World Airports (LAWA) has proposed constructing a people-mover from the Metro Green Line Aviation Station to the LAX Central Terminal Area with airport funds as a part of the LAX Master Plan.

  Status: The LAX Master Plan is currently in the environmental/PE phase. Construction of the people-mover is scheduled to be completed by about 2010 in conjunction with the Master Plan improvements.

Core Capacity Enhancements

This project is not currently in the Long Range Transportation Plan. It was previously studied as a primarily underground segment. It is currently under consideration as a primarily at- grade, or surface, light rail line. This project would provide needed system connectivity for the light rail system of projects in the funded Long Range Transportation Plan.

- LRT Metro Connector
  This project would provide a 2-mile connector segment in Downtown Los Angeles linking the Gold, Blue and/or Expo lines into a single operating system. This could enable through running of trains from Pasadena and/or East LA to Long Beach and/or Culver City/Santa Monica as well as greater economies and flexibilities in the maintenance and service of the light rail fleet.

Status: Feasibility study was completed in 1993.

Projects in the Strategic Element of the 2001 Long Range Transportation Plan (Unfunded)

In addition to the Baseline and Constrained Element projects, the unfunded Strategic Element of the Long Range Transportation Plan included six additional fixed guideway projects. These are listed below. The Strategic Element also included the generic listing of "Extensions and/or upgrades to transit corridor projects identified in the constrained plan."

- Wilshire Red Line Extension (HRT) (to Century City)
  This project is an approximately 6.8 mile westerly extension of the Metro Red Line subway from the Wilshire/Western Station to Century City. Conceptual alignments for a westerly extension of the Metro Red Line all the way to Westwood were identified in 1990. Study efforts in the 1990's focused on a south westerly extension of the subway to the Mid-City area (Pico/San Vicente).

  Status: The most recently studied extension (Mid-City extension) was suspended in 1998 along with other rail projects due to funding constraints.

- East Los Angeles Transit Corridor to Norwalk/Whittier (LRT)
  This project is an approximately 7 mile easterly extension of the Eastside Light Rail Transit Project from the adopted Atlantic/Pomona station to either Norwalk or Whittier.

  Status: A Major Investment Study was prepared for this extension in early 2000.

- Metro Gold Line Extension- Pasadena to Claremont
  This project would extend the Metro Gold Line from the Sierra Madre Villa station approximately 22 miles easterly to the City of Claremont primarily using an existing railroad right-of-way. This project might also accommodate systemwide light rail transit maintenance facilities in the vicinity of Irwindale. Shorter segments of this line have been discussed for initial implementation. The Gold Line Joint Powers Authority is currently planning this line.

  Status: Project currently in environmental phase about to start preliminary engineering. Project could open by 2010 if new sources of funding are identified.

- Vermont Transit Corridor (BRT)
  This project would be an upgrade of the Vermont Metro Rapid Bus to provide exclusive lanes.

Status: No work has been conducted beyond the Metro Rapid Bus implementation.

- Burbank/Glendale Transit Corridor (LRT)
  This project would be an approximately 12.5 mile light rail line branching off of the Pasadena Gold Line to the Cities of Burbank and Glendale.

  Status: An Environmental Impact Report was prepared for this project in 1994.

- Metro Green Line Southern Extension to South Bay Galleria (LRT)
  This project would be an approximately 2.5 mile light rail line from the Metro Green Line Marine Station in Redondo Beach to the South Bay Galleria.

  Status: A Route Refinement Study was completed in 1990.

- Extensions and/or Upgrades to Corridors in the Constrained Plan

Projects Not Included in the 2001 Long Range Transportation Plan

There are a number of fixed guideway projects not identified in the Long Range Transportation Plan that could be considered. These include those projects identified in previous studies or which are under study by others. These are candidate projects requiring further analysis and include:

- West Santa Ana Branch Right-of-Way
  This is an existing MTA-owned ROW. This is currently being studied by the Gateway Cities COG for a transit connection between Orange County and Los Angeles. That study is primarily evaluating MagLev rail technology.

- Harbor Subdivision Branch Right-of-Way
  This is an existing MTA-owned Right of Way linking Downtown to LAX and the South Bay. The South Bay COG and SCAG are currently studying this route for Diesel Multiple Unit (DMU) or other Metrolink compatible rail. Portions of this route have also been considered for use by the Crenshaw Corridor (BRT or LRT) and by the California High Speed Rail Authority as a rail connector between Union Station and LAX.

- Sepulveda Pass HOV/Transit Connector
  The project is being studied by Caltrans as a component of the I-405 Sepulveda Pass HOV Connector Study that has the potential to connect the San Fernando Valley with the Westside of Los Angeles via the Sepulveda Pass. Bus Transit Centers in Westwood, LAX, Fox Hills and the San Fernando Valley East-West

Rapidway could be connected with a bus transitway if this project were constructed.

- High Speed Rail Connectors
  The California High Speed Rail Authority and SCAG are currently studying several corridors for high speed rail connectors including from LAX to Downtown Los Angeles and to the San Gabriel Valley.

- Ventura Freeway (US 101) Aerial Rail/I-134
  This would be an aerial rail line in the middle of the Ventura Freeway (US-101) from the Universal City Metro Red Line Station extending west across the San Fernando Valley, perhaps extending further east. This alignment was considered in the recently completed 101-corridor Study. No long term improvement was chosen for the corridor.

- 10/60 Corridor Light Rail Transit Project
  This would be a 15-mile light rail transit project parallel to the San Bernardino Freeway (I-10) between Union Station and the I-605 Freeway in El Monte. A Preliminary Planning Study was completed in 1993.

- Metro Green Line Extension to Norwalk
  This project is an approx 2-mile underground extension of the Green Line from its current terminal at the I-605 to the Norwalk Metrolink Station transfer turnaround. An Environmental Impact Report was completed in 1993.

- Miscellaneous
  Various rail alignments proposed by constituent groups or individuals (i.e., SilverLine, Green Line Extension North YellowLine, Red Line Extension from Hollywood, and others).

Fixed Guideway Technology Summary **Attachment D**

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
Bus Rapid Transit **BRT**	**BRT** functions similar to light rail however types of BRT systems can exit the guideway and operate as a street running bus. BRT can be a conventional bus on an exclusive arterial lane. Overhead Guided BRT includes the Electric Trolley Bus (ETB), similar to street cars using an electric overhead catenary to propel the vehicle, however can change lanes in mixed flow traffic. Roadbed Guided BRT uses either 'guide wheels' attached to a rail to guide the bus, optical sensors that read a painted stripe, or embedded magnets in the roadbed.	3,000-10,000	$2 million (Optical/ Magentic)-30 million (Guided Wheel/ETB)	Guide wheels require exclusive elevated Rights Of Way (ROW). Optical and magnetic guidance is very flexible in mixed flow operation. ETB requires electric substations similar to light rail.	Adelaide Australia, San Francisco, Ottawa, Canada, Rouen, France Other European, Asian cities.

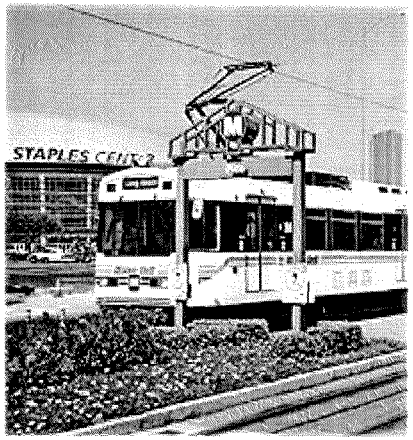
San Francisco ETB

Adelaide O-Bahn (Guided wheels)

Rouen France (Optical Guidance)

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
Light Rail Transit **LRT**	**LRT** is an electric railway that can operate in single or multiple rail cars on fixed rails and may use shared or exclusive rights-of-way (ROW). Light rail vehicles are primarily driven electrically with power being drawn from an overhead electric line via a trolley or a pantograph. LRT can be automated or operator driven.	5,000-20,000	Approx $60 million per mile primarily at-grade.	LRT can operate in any grade with aerial and tunneling being the most expensive.	Many major cities worldwide.



Los Angeles (Blue Line)

Los Angeles (Green/Gold Line)

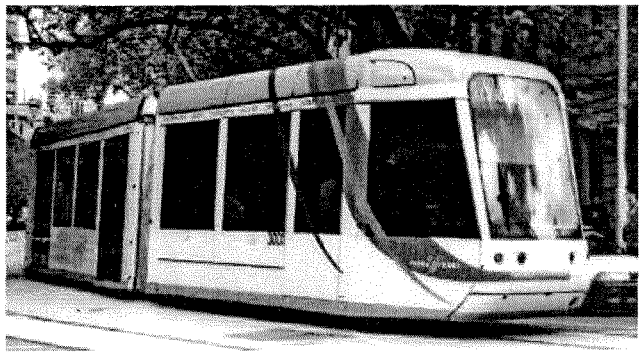
Boston

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing primarily at-grade systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
Light Rail Transit **LRT** **Streetcars**	**Street Cars** or **Trams** are similar to LRT in operations; however, they are typically smaller than LRT vehicles, run at slower speeds, don't require exclusive ROW, serve as urban and neighborhood circulators, and are primarily low-floor with sidewalk or median boarding.	5,000-10,000	$5-10 million	Flexible, does not require high floor platforms or ROW and provides cost effective circulation to downtown areas. Mixed flow operations speed limited by traffic volumes.	San Francisco, Portland, New Orleans, Seattle Melbourne, Sydney, Hong Kong. Widespread throughout European cities.

New Orleans

Portland



Melbourne

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
Heavy Rail Transit **HRT** **Third Rail**	**HRT** is electric railway with the capacity for a "heavy volume" of passengers. HRT operates on exclusive ROWs that are at-grade (see next page), elevated, or in tunnels with multi-car trains, and is characterized by high speed and rapid acceleration, propelled with either third rail or multiple unit systems and high platform loading. **Third Rail**-Typical of 'metro' style HRT, a third rail provides the traction for the rail cars and trains sets are typically 2-6 cars. Third rail HRT is usually limited to dense urban areas.	10,000-35,000	100-$250 million (tunnel)	HRT can move high passenger volumes quickly and efficiently. Requires exclusive ROW with high capital cost. At grade systems require grade-separated crossings.	In most metropolitan cities throughout the world.

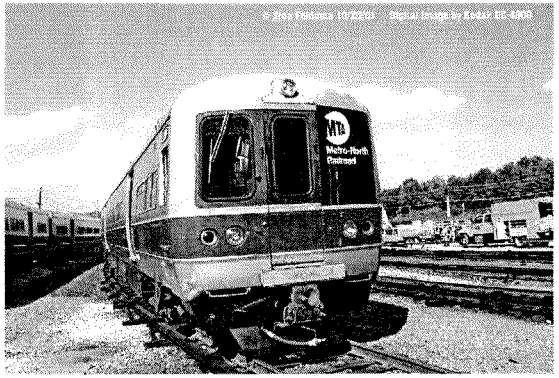
Los Angeles Red Line

Washington D.C. Metro

Paris Metro

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
Heavy Rail Transit **HRT** **Multiple Unit (MU)**	**MU-** A multiple unit is an HRT in which the traction is supplied by driving bogies under one or more carriages of the train either electrically (EMU) with an overhead power supply similar to LRT or onboard fuel source (DMU/DEMU). MU can operate in any grade and allows at-grade crossings, as the power supply is overhead. MU allows variable stopping distances (less than 1/2 mile) and can switch from urban, suburban or commuter hinterland service. MU typically runs 3, 6, 9 or up to 12 car consists and shares tracks with freight trains. MU also operates in double deck car consists for increased capacity with high or low platforms. MU is also known as 'Suburban Rail'	10,000-45,000	$40 (at grade shared with freight)- $250 million (tunnel ROW)	Flexibility, very high capacity and cost effective with shared ROW. Hybrid application can serve urban/suburban areas simultaneously. Ability to share ROW with freight but requires exclusive ROW outside of freight lines.	Extensive application in European, Asian, Australian and Brazilian Cities. Limited examples in Nth America.



EMU (New York MTA)

DMU (Ottawa/San Diego NCTD)

Double Deck EMU (Australia)

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
Commuter Rail Transit **CRT**	**CRT** is a railroad where local and regional passenger trains operate between a central city, its suburbs and/or another central city primarily during peak hours. CRT can be either locomotive-hauled, self-propelled or with an electric overhead pantograph and stopping distances are rarely no less than 3 miles. CRT usually share the same ROW with freight trains in a 4-8 car configuration, low floor boarding platforms, and can operate with double deck cars. CRT is characterized by time based and distance based fares. Also known as "suburban rail."	1,000-5,000	$5-10 (at grade. Self propelled shared with freight low platforms	Low capital cost, fast implementation. Limited passenger capacity based on infrequent service and long distances between stations.	Extensive throughout Nth and South America, Europe, Asia, Australia and some examples in Africa.

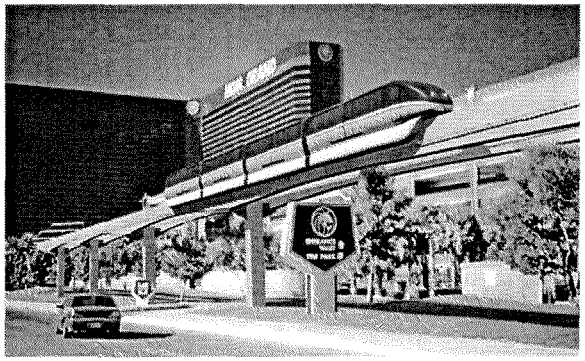
CalTrain (Bay Area)

Metrolink (Los Angeles)

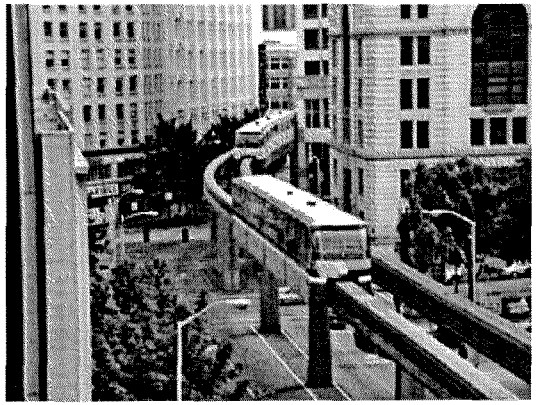
Utah

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing primarily at-grade systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
Monorail People Movers **MPV**	**MPV** is an electric railway in which train cars are suspended from or straddle a single beam or rail. Monorails are operated either manually or with automated guideway systems. In almost all cases, the rail is elevated, but monorails can also run at grade, below grade or in subway tunnels. Monorail vehicles are wider than the guideway that supports them. Various technologies include electric or fuel power, and "minirail" rubber-tired vehicles.	5,000-20,000	$100-250 million	Provides effective circulation for constant levels of passenger demand such as tourist destinations or airports. Requires exclusive ROW, high capital costs and limited peak period passenger capacity.	Seattle, Sydney, Tokyo-Haneda airport, Tama-Japan, Pocos De Caldas-Brazil, Las Vegas Strip.



Las Vegas

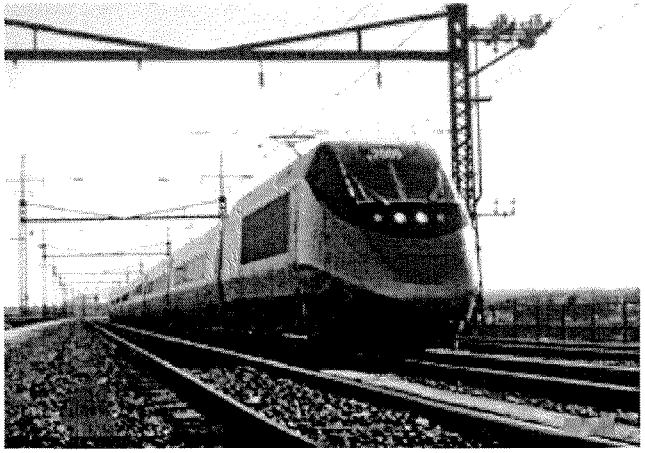


Seattle

Kamakura, Japan

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
High Speed Rail **HSR**	**HSR**, sometimes called High Speed Ground Transportation, refers to a series of technologies involving trains traveling at top speeds of 90 to 320mph. **STEEL WHEEL HSR** are aerodynamic steel wheel trains electrically propelled using an overhead pantograph on an exclusive, grade-separated ROW. Train consists vary between 6-12 cars and provide rapid intercity service in primarily dense corridors.	1,000-5,000	$20-50 million	Provides rapid point-to-point intercity travel times competitive to short-haul aviation (less than 500 miles). Requires grade separations and ROW.	France (TGV) Japan (Shinkansen), Germany (ICE), Spain (AVE), Italy (Pendolini), Benelux (Thalys), UK (Eurostar), Sweden (x2000), North America (Acela)

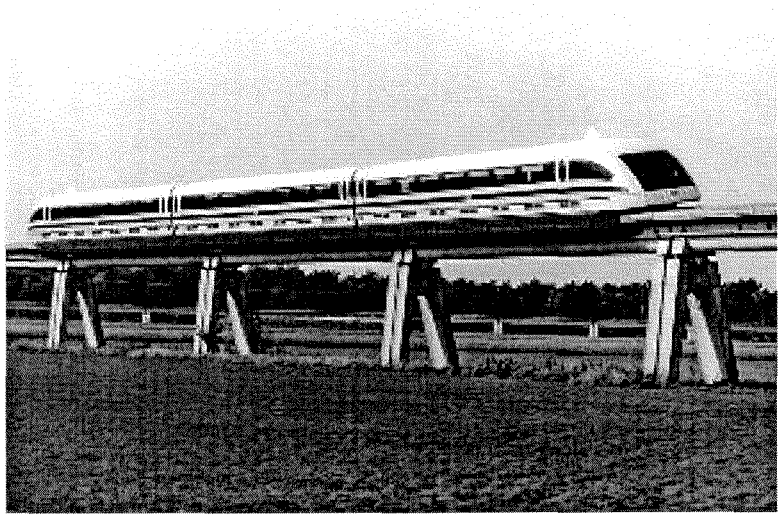


North America Acela (Amtrak)

Japan Shinkansen

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Average capital costs based on existing systems expressed in current U.S. dollars.

Guideway Category	Definition Type	Passengers Capacity Per hour*	Capital Costs per mile **	Comments	Examples of Urban Revenue Service
MAGLEV HSR	**MAGLEV HSR** uses magnetic levitation forces to lift, propel, and guide a vehicle over an exclusive grade separated guideway. The magnetic field created by the electrified coils in the guideway walls and the track combine to propel the train. Maglev trains float on a cushion of air, eliminating friction and loud noise.	1,000-10,000	$70-100 million (aerial)	Provides quiet and rapid point-to-point intercity travel. Requires exclusive usually elevated, ROW very high capital cost.	Shanghai, China.



Maglev (Shanghai)

*Average passenger capacities based on existing systems and reflect various vehicle capacity and service frequency assumptions.
**Capital cost is based on existing system in Shanghai expressed in current U.S. dollars.