U.S. DEPARTMENT

Catalog of "Common Use" Rail Corridors

of Transportation
Federal Railroad Administration

Office of Research And Development Washington DC 20590

DOT/FRA/ORD-03/16

Final Report
April 2003

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE
April 23, 2003

3. REPORT TYPE AND DATES COVERED

4. TITLE AND SUBTITLE
Catalog of "Common Use" Rail Corridors

5. FUNDING NUMBERS
DTFR53-00-R-0017
TOPR 008

6. AUTHOR(S)
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8. PERFORMING ORGANIZATION REPORT NUMBER
DOT-FRA-ORD-03-16

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Department of Transportation
Federal Railroad Administration
Office of Research and Development
1120 Vermont Avenue, NW: Mail Stop 20
Washington, DC 20590

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
DOT-FRA-ORD-03-16

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.
This document is also available on the FRA web site at www.fra.dot.gov.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)
This report is a catalog of "common use" rail corridors. These are defined as corridors where non-FRA-compliant light rail or rail rapid transit vehicles operate adjacent to, or on track shared with, rail freight or passenger operations coming under FRA safety regulations. Three types of common corridors are defined:

- shared corridor (track centers 25 to 200 feet apart)
- shared right-of-way (track centers less than 25 feet)
- shared track

All common use corridors in the U.S. now in operation or under construction are described, with maps and photographs. Information includes length of corridor, operating speed, traffic density and safety notification procedures.

14. SUBJECT TERMS
common corridor, shared corridor, shared track, railroad, rail transit

15. NUMBER OF PAGES
126

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std.
239-18 298-102

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ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in)	= 2.5 centimeters (cm)
1 foot (ft)	= 30 centimeters (cm)
1 yard (yd)	= 0.9 meter (m)
1 mile (mi)	= 1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2)	= 6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2)	= 0.09 square meter (m^2)
1 square yard (sq yd, yd^2)	= 0.8 square meter (m^2)
1 square mile (sq mi, mi^2)	= 2.6 square kilometers (km^2)
1 acre = 0.4 hectare (he)	= 4,000 square meters (m^2)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz)	= 28 grams (gm)
1 pound (lb)	= 0.45 kilogram (kg)
1 short ton = 2,000 pounds (lb)	= 0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp)	= 5 milliliters (ml)
1 tablespoon (tbsp)	= 15 milliliters (ml)
1 fluid ounce (fl oz)	= 30 milliliters (ml)
1 cup (c)	= 0.24 liter (l)
1 pint (pt)	= 0.47 liter (l)
1 quart (qt)	= 0.96 liter (l)
1 gallon (gal)	= 3.8 liters (l)
1 cubic foot (cu ft, ft^3)	= 0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3)	= 0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

[(x-32)(5/9)] °F = y °C

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm)	= 0.04 inch (in)
1 centimeter (cm)	= 0.4 inch (in)
1 meter (m)	= 3.3 feet (ft)
1 meter (m)	= 1.1 yards (yd)
1 kilometer (km)	= 0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2)	= 0.16 square inch (sq in, in^2)
1 square meter (m^2)	= 1.2 square yards (sq yd, yd^2)
1 square kilometer (km^2)	= 0.4 square mile (sq mi, mi^2)
10,000 square meters (m^2)	= 1 hectare (ha) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gm)	= 0.036 ounce (oz)
1 kilogram (kg)	= 2.2 pounds (lb)
1 tonne (t)	= 1,000 kilograms (kg)
	= 1.1 short tons

VOLUME (APPROXIMATE)

1 milliliter (ml)	= 0.03 fluid ounce (fl oz)
1 liter (l)	= 2.1 pints (pt)
1 liter (l)	= 1.06 quarts (qt)
1 liter (l)	= 0.26 gallon (gal)
1 cubic meter (m^3)	= 36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3)	= 1.3 cubic yards (cu yd, yd^3)

TEMPERATURE (EXACT)

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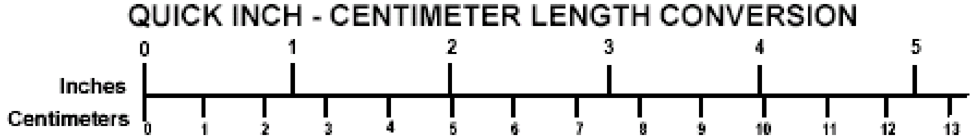
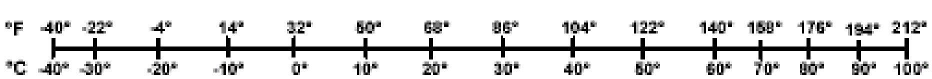


QUICK FAHRENHEIT - CELSIUS TEMPERATURE CONVERSION



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Acknowledgements

Thanks go to the transit systems that responded to the questionnaire, and to all those who took the time to meet with project staff and respond to questions.

A great deal of information on railroads in general, and in particular passenger railroads, is available on the World Wide Web. Some of the information in this report was taken from the public Web sites of transit systems; this material is in the public domain and has not been specifically credited.

The efforts of a number of transit enthusiasts have produced significant information on rail transit operations, especially in the form of photographs and detailed maps of track arrangements (which are preferable, in a technical report, to the color-coded schematics favored by transit agencies). The site nycsubway.org, in particular, contained information of great value in preparing this report.

The authors wish to thank two individuals in particular:

- Michael Calcagno, who generously gave the authors permission to use his detailed track maps of:
    - Boston
    - Chicago
    - Cleveland
    - Los Angeles (an especially excellent map, showing freight rail lines as well as transit trackage)
    - BART (San Francisco Bay Area)
    - Sacramento
    - San Diego
    - Washington
- Jon Bell, of Presbyterian College in South Carolina, who allowed use of his maps of the Hudson/Bergen Light Rail and the Newark City Subway line plus many photos, especially of Cleveland and Atlanta.

Some other individuals are credited specifically for images or maps. Uncredited photographs were taken by the authors. Uncredited maps are generally from transit authorities, or were not specifically noted as copyrighted material.

Any errors or omissions are those of the authors.

Executive Summary

The Federal Railroad Administration (FRA) has legal responsibility for the development and enforcement of safety regulations for the United States railroad industry.

In the last 20 years, a number of new transit systems have been constructed across the United States. In many locations, these systems have made use of either active or abandoned rail rights-of-way. In a few cases, track is shared, and FRA regulations apply. But in many locations, transit operators – especially "light rail" or trolley operators – share a common transportation corridor or right-of-way with freight trains. When track is shared, passenger-carrying vehicles must meet stringent strength requirements or freight and passenger operations must be time-separated. But when a right-of-way is shared, no regulations apply. There are no specific safety requirements, even when the transit operator and the freight railroad are as close together as two tracks on a double-track railroad. FRA defines these operations as common corridors when rail transit and railroad tracks are less than 200 feet apart, track center to track center.

To understand the scope of the issue, FRA would like to know how many common corridors exist in the United States, how many miles of general railroad system track are affected, and some details about each operation. This report presents a census of these systems. Information about each has been obtained from a survey, from the Internet, and from other public sources. What is presented here is believed to be a complete list of those transit operators having common corridors with freight railroads. Common corridors have been defined by the FRA as follows:

- Shared track (self explanatory)
- Shared right-of-way (ROW). These are tracks 25 feet or less center to center – this is an FRA definition of "adjacent tracks" for a specific regulation
- Shared corridor (separated by more than 25 feet, but less than 200 feet, center to center)

Findings of this study are as follows:

- Most transit systems with common corridor operations have established safety procedures and points of contact with the adjacent freight and/or commuter railroads
- Common corridors are a mix of fenced and unfenced operation, but most systems use fencing to separate their operations from those of the adjacent railroad, at least at stations
- In most cases, freight railroads recognize the proximity of rail transit operations with special instructions to employees in their rulebooks
- Neither freight railroads nor transit systems observe the FRA requirement to stop work when trains pass on adjacent tracks, if those tracks belong to a different operator.

Table A summarizes the route mileage of common corridor operation in the United States.

Table A: Common Corridor Operation, Current and Planned

Type of Operation	Current	Planned	Total
SHARED TRACK	62.1	56.7	118.8
Shared ROW	124.6	71.5	195.1
Shared Corridor	91.8	18.2	110.0
TOTAL	278.5	146.4	423.9

I. INTRODUCTION

The laws of the United States give the Secretary of Transportation safety jurisdiction over "every area of railroad safety." (49 U.S.C. § 20103). By delegation from the Secretary, the Federal Railroad Administration (FRA) administers the Federal railroad safety statutes that are codified at 49 U.S.C. §§ 20101 through 21311 (chapters 201 through 213 of Title 49 of the United States Code) and also exercises enforcement authority in the rail mode under the hazardous materials transportation laws (49 U.S.C. Chapter 51, 49 C.F.R. § 1.49). Under the railroad safety statutes, "railroad" is defined as follows:

> (1) "railroad"–
>
> (A) means any form of nonhighway ground transportation that runs on rails or electromagnetic guideways, including–
>
> (i) commuter or other short-haul railroad passenger service in a metropolitan or suburban area and commuter railroad service that was operated by the Consolidated Rail Corporation on January 1, 1979; and
>
> (ii) high speed ground transportation systems that connect metropolitan areas, without regard to whether those systems use new technologies not associated with traditional railroads; but
>
> (B) does not include rapid transit operations in an urban area that are not connected to the general railroad system of transportation. (49 U.S.C. § 20102(1)).

In turn, "railroad carrier" is defined as "a person providing railroad transportation." (49 U.S.C. § 20102(2)). This definition of railroad, added by the Rail Safety Improvement Act of 1988, Pub. L. No. 100-342, makes certain elements of FRA's safety jurisdiction quite clear:

- FRA, with one exception, has jurisdiction over any type of railroad regardless of the kind of equipment it uses, its connection to the general railroad system of transportation,[1] or its status as a common carrier engaged in interstate commerce.

- Commuter and other short-haul railroad passenger operations in a metropolitan or suburban area (except for one type of short-haul operation, i.e., urban rapid transit) are railroads within FRA's jurisdiction whether or not they are connected to other railroads, and are considered to be part of the general railroad system regardless of such connections.

[1] The "general railroad system of transportation" means the network of standard gauge track over which goods may be transported throughout the nation and passengers may travel between cities and within metropolitan and suburban areas, and portions of the network that lack a physical connection may still be part of the system by virtue of the nature of the operations that take place there.

- Rapid transit operations in an urban area that *are not connected* to the general railroad system are not within FRA's jurisdiction. This is the sole exception to FRA's jurisdiction over railroads. There is no exception for "light rail," a term not found in the statute. Notwithstanding this, FRA has not historically exercised regulatory jurisdiction over light rail operations.

- Rapid transit operations in an urban area that *are connected* to the general railroad system of transportation are within FRA's jurisdiction. Again, however, with the sole exception of the Port Authority Trans Hudson rapid transit line (which was operated as a railroad, with railroad union representation and work rules, until its purchase by the Port Authority of New York and New Jersey), FRA has not historically regulated rapid transit operations with connections to the general railroad network.

FRA has established regulatory standards for railroad track, equipment, signal and grade crossing systems, and operating practices, and has a staff of safety inspectors to enforce these standards to protect the safety of railroad employees and the general public. As noted above, FRA's authority extends to operators of local passenger service (such as commuter rail service between suburbs and city), and its regulations specify (among other things) certain standards of strength that passenger-carrying rail cars must meet. If the local operators choose to use vehicles (on the general railroad system) that do not meet FRA standards, they must apply for a waiver from FRA of the applicable safety regulation. See 49 C.F.R Part 211. Waivers have been granted to several operators of "light rail" (streetcar) vehicles who share their trackage with rail freight operators.

Rail transit operations that do not share trackage with freight railroads do not fall under FRA regulation. This means that planners seeking to make use of an existing rail right-of-way (even one that still carries rail traffic) need not obtain an FRA waiver as long as they construct separate tracks for transit operations. As freight railroads have reduced their operations in recent years, tracks have often been removed, leaving room in the existing right-of-way for a single- or double-track rail transit line. Thus, it is frequently the case that a new light or heavy rail line can be constructed quickly and relatively inexpensively in an existing corridor. Rail planners have also discovered that existing rail corridors can be good locations for construction of new light or heavy rail transit systems, because these corridors tend to run through commercial and industrial areas with few or no permanent residents (and thus there is a lesser likelihood of someone objecting to construction of a new rail operation).

For these reasons, the re-use of rail corridors for transit purposes has occurred in a number of cities nationwide. In some cases, rail freight service has been completely abandoned and the right-of-way can be converted entirely to transit use. However, more often some freight shippers remain or the rail line is needed for commuter service, and therefore the railroad and transit operators must share the right-of-way. To avoid the need to share track, transit operators can – where right-of-way width allows – construct dedicated tracks adjacent to the active freight trackage. Except to the extent necessary to ensure safety at the points of connection to the general railroad system (e.g., at a highway-rail grade crossing shared by a transit system and a conventional railroads) at present there are no specific safety standards or regulations applicable to operations of this kind. In cases where FRA concludes that an operation is not a "railroad" for purposes of 49 U.S.C. § 20102(1), local rail service providers, often agencies of state or local governments, may receive capital or operating funds from the Federal Transit Administration (FTA). However, FTA has no statutory authority for safety regulation. Instead, in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1992, the Congress directed states to designate agencies with safety regulatory responsibility for "fixed guideway" transportation (including heavy rail, light rail, funiculars, monorails, etc.). State inspectors working with transit properties, however, are not required to be familiar with FRA track safety standards (which may not, in fact, be appropriate for transit systems in all cases).

In the case of a transit system located on dedicated tracks adjacent to active freight trackage, FRA's concern is that the operations of a freight railroad in close proximity to a heavy or light rail transit line could present risks for each. For example, a freight train might derail and the derailed cars might encroach on the transit line. Further, a transit vehicle might have to be evacuated, and passengers could find themselves at risk of being hit by a freight train. In addition, roadway workers on the freight railroad might not realize the need to protect against transit vehicles, and vice versa.

FRA is also concerned that there is no single source for information about these transit operations that share rights-of-way or "common corridors" with freight railroads. Since transit operators are not required to make consistent reports to any Federal agency, and since operations on transit track in shared transportation corridors (as opposed to operations on shared track) is generally beyond FRA's regulatory authority (although FRA does exercise jurisdiction over rapid transit lines to the extent that they are connected to the general railroad system), neither FRA nor FTA has any systematic method for collecting information about:

- Design standards (typical track centers, fencing or other protection);
- Training of field maintenance forces;
- Cooperation between freight and passenger operations (e.g., emergency response and notification, points of contact, etc.);
- Sharing of railroad facilities (e.g., highway-rail grade crossing protection, bridges, other structures); and
- Protection used when rail transit and freight trackage connect or cross each other.

Accordingly, FRA has undertaken a study to determine how many miles of common corridors exist in which light or heavy rail transit facilities are parallel to, and within 200 feet or less of, active freight rail lines. This report include the results of a survey of rail transit properties to determine:

- The extent of "common corridors" in terms of route mileage;
- The types of protections between transit and freight railroad tracks (signal control, fencing, emergency response);
- Any shared "minor" facilities (bridges, highway-rail grade crossings); and
- Locations where level crossings or track connections exist.

The study begins with a general definition of common corridors and a description of the range of practices observed during field visits. Following this, there are specific descriptions of each transit system with common corridors. Where appropriate, the existence of shared track has also been noted. However, since a procedure for approval of shared track operations already exists, the issues relating to the operation of non-FRA-compliant rail vehicles on rail lines also used for freight operations have not been addressed in detail in this report.

II. Operations on Common Corridors -- Issues

A. Definition of Common Corridors

Common corridors are transportation corridors carrying both general freight railroad traffic and passenger trains of non-FRA-compliant equipment (heavy or light rail transit). FRA-compliant commuter rail equipment is not included in this study, since it is covered by existing regulations. The FRA has defined three types of common corridors:

1. Shared track, in which the heavy or light rail vehicles operate on the same tracks used by freight trains. FRA has written regulations governing this type of operation, in which temporal separation (no simultaneous operation) is required in most cases.

2. Shared right-of-way. In this case the transit vehicles run on separate tracks, but track centers are less than 25 feet (that is, separation between the centerline of the freight track and the centerline of the passenger track is less than 25 feet). Tracks separated by less than 25 feet are defined as "adjacent" by FRA, and certain roadway worker protection rules apply on adjacent tracks. FRA also defines "less than 30 feet" as the distance at which tracks are "non-insular" and operators are therefore subject to certain railroad regulations.

3. Shared corridor. Transit and freight operators share a transportation corridor, but tracks are separated by at least 25 feet and no more than 200 feet. FRA believes that intrusion by derailed freight or transit cars onto a parallel railroad track is unlikely beyond 200 feet.

In addition, FRA defines "shared minor facilities". These are:

- Rail/highway crossings where transit line and general railroad system share crossing protection
- Level crossings (diamonds) between transit tracks and general railroad system tracks
- Shared movable bridges

The focus of this study is on shared rights-of-way and shared corridors. Operations sharing track have been included, but are not described in detail since each has been granted a waiver by FRA and has provided detailed operating information in the waiver application.

The first step in the analysis described here was the development of a list of transit operations in common corridors. These included all transit properties that had applied for FRA waivers for operation on shared trackage. In addition, working with FRA the contractor prepared a list of those transit properties known to have made use of existing or abandoned rail corridors.

A questionnaire was mailed to all U.S. rail transit properties. Issues covered in the survey included:

- Length of any shared corridors
- Characteristics (shared track, shared ROW, shared minor facilities)
- Current safety precautions in place (if any)
- Operating practices, including type of train control
- Other characteristics such as type of propulsion (electric/diesel) and vehicle data
- Track gauge (all systems are standard gauge unless otherwise noted)

A physical inspection of each identified common corridor was also undertaken where possible, to verify information supplied by each transit property and to ensure that the physical characteristics and operational issues were properly understood for each corridor.

B. Overview of Findings, Common Corridor Operations

<u>Transit Systems With Common Corridor Operations</u>

Responses to FRA's questionnaire were reviewed by the contractor in order to identify those with common corridor operations. Follow-up telephone calls were made to each respondant, and available information from other sources (Web sites, databases, published materials of various kinds) was also checked. The objective was to identify all current transit operators, and all those with Full Funding Grant Agreements (FFGAs) from the Federal Transit Administration for proposed new construction, with lines that:

- Shared trackage with freight or commuter railroads
- Shared rights-of-way with freight or commuter railroads
- Shared corridors with freight or commuter railroads
- Had connections or level crossings with active freight or commuter lines

In some cases, questionnaire responses were at variance with data from other sources. In these cases, field visits usually cleared up any uncertainty. For a few transit properties, no response was received either to the questionnaire or to the follow-up phone calls. In these cases, the contractor and FRA used the best available information to define common corridors.

Table 1 summarizes the results of the survey and data collection. Transit properties not listed may utilize former rail corridors, but do not share corridors with active freight or commuter rail lines.

Based on a literature search, a survey, and a canvass of knowledgeable experts, these were the only transit systems identified as sharing common corridors with railroads. Other systems investigated and found to have no common corridors were as follows:

- Austin, TX: Planned light rail may use city-owned railroad ROW on which freight service is provided. No funding has yet been obtained.
- Buffalo: uses the former Delaware, Lackawanna & Western rail station for vehicle maintenance. No common corridor operations
- Charlotte: first phase will use a former Norfolk Southern ROW, now city-owned, which has no freight service. A possible future extension to Pineville (not yet funded) will share a ROW with NS branch line freight service
- Houston: First phase is street trackage only. No common corridor operation. A temporary two-mile test track is adjacent to UP. This will not be used for revenue service.
- Jacksonville: "Skytrain" operates to the former railroad station. Skytrain station is more than 200 feet from active freight tracks. No common corridor operations.
- Kenosha: Historic trolley operation is more than 200 feet from nearest railroad.
- Minneapolis: The Hiawatha Corridor project uses a former Milwaukee Road ROW; there are no current rail freight operations in the corridor.
- Norfolk: Project is "on hold" following refusal of Virginia Beach to participate. Line will use NS branch line ROW. No decision yet on shared track, shared ROW, or shared corridor, therefore project was not included in this report.
- Phoenix: System is in design. Information available at present indicates no use of a rail corridor.
- Pittsburgh: System uses a former railroad bridge and tunnel to reach downtown (the Panhandle Bridge). No common corridor operations. An infrequently used loop at Pittsburgh Penn Station is located at least 200 feet from active freight tracks. The proposed North Side extension will not use rail corridors.

Table 1: Transit Systems with Common Corridor Operations (Existing)

City	Operating Agency	Route Mileage			Shared Minor Facility (type)	Notes
		Shared Track	Shared ROW	Shared Corridor		
Atlanta	**METROPOLITAN ATLANTA REGIONAL TRANSIT AUTHORITY**	--	--	25.0	None	Three separate line segments. Track spacing varies; all track is fenced.
Baltimore	Maryland Mass Transit Administration	10.9		7.2	Track connection, diamond, grade crossing protection	Shared corridor with CSX Hanover Sub, heavy rail. Track spacing all > 25 ft. Light rail, shared track North Avenue to Timonium
Boston	Metropolitan Boston Transportation Authority	--	21.6	--	None	Two segments of shared ROW on Orange Line; one on Red Line. See text
Camden, NJ	Port Authority Transit Corp. (PATCO)	--	5.5	--	None	Track spacing almost all < 25 feet. No fencing. 5.3 miles shared w/NJT; 0.2 mi. with CSAO
Chicago	Chicago Transit Authority	--	11.9	3.4	None	Purple and Blue Lines, track centers > 25 feet. Others < 25 feet. All fenced.
Cleveland	Greater Cleveland Regional Transportation Authority	--	14.3	1.0	May be a diamond	Red Line, shared ROW. Unfenced. Light rail: shared corridor

Table 1 (continued): Transit Systems with Common Corridor Operations (Existing)

City	Operating Agency	Route Mileage			Shared Minor Facility (type)	Notes
		Shared Track	Shared ROW	Shared Corridor		
Dallas	**DALLAS AREA RAPID TRANSIT**	--	4.2	0.9	Track connection, grade crossing protection	Track at Dallas Union Station > 25 feet. Planned: 28.4 miles shared ROW
Denver	Regional Transportation District	--	11.8	--	Grade crossing protection	10th & Osage to Littleton/Mineral, shared ROW. Track spacing > 17 feet.
Jersey City	NJT -- Hudson/Bergen LRT	--	4.2	--	None	Track centers vary. Generally < 25 feet.
Los Angeles	Los Angeles County Metropolitan Transportation Authority	--	15.9	1.6	Diamond **CROSSING, GRADE CROSSING PROTECTION, BLUE LINE**	Green Line: 1.6 miles shared corridor, mostly elevated structure on RR ROW. Blue Line on shared ROW; fenced
Memphis	Memphis Area Transit Authority	--	2.0	--	Diamond crossing, grade crossing protection	Historic trolley operation. Shared ROW with CN industrial track. Trolley on exclusive track parallel to freight track.
Newark	New Jersey Transit -- Newark City Subway	0.2	0.8	--	Crossover	Shared with freight spur; freight trains must use light rail track to reach customer

New Orleans	New Orleans Regional Transportation Authority	--	1.5	--	Grade crossing protection	Riverfront Line parallels New Orleans Public Belt trackage.

Table 1 (continued): Transit Systems with Common Corridor Operations (Existing)

City	Operating Agency	Route Mileage			Shared Minor Facility (type)	Notes
		Shared Track	Shared ROW	Shared Corridor		
New York	New York City Transit	0.3	--	3.3	Track connections	Two shared corridors; short segment of shared track with subsidiary South Brooklyn RR. Track connections at 38th Street and Linden yards.
Oakland, CA	Bay Area Rapid Transit (BART)	--	--	18.6	None	Three segments. Planned 17 mile extension to San Jose will share rail corridor
Philadelphia	SEPTA light rail	--	--	--	Diamond crossing	Diamond in street, protected by standard highway crossing warning devices
Portland	Metropolitan Area Express	--	8.5	--	Lift bridge	Steel Bridge shared with UP; double-deck lift span with railroad underneath
Portland	Portland City Streetcar	--	--	--	Diamond crossing	BNSF spur may be out of service; no signal protection
Sacramento	Regional Transportation Dist.	--	6.9	3.0	None	16.5 miles shared ROW under construction or planned; 20’ track centers standard
St. Louis	Bi-State Development Agency	--	3.5	--	Diamond crossing; track connection, grade crossing protection	1.9 miles adjacent to UP; 1.6 miles adjacent to industrial track owned by Bi-State

Table 1 (continued): Transit Systems with Common Corridor Operations (Existing)

City	Operating Agency	Route Mileage			Shared Minor Facility (type)	Notes
		Shared Track	Shared ROW	Shared Corridor		
SALT LAKE CITY	**TRAX**	12.0	--	--	Diamond cr., two track connections; 33 grade crossings	Shared track with UP; no shared ROW or corridors
San Diego	San Diego Trolley	31.1	--	5.7	Track connections	**SHARED TRACK ON TWO LINES; SHARED CORRIDOR ON OLD TOWN/MISSION VALLEY LINE.**
San Francisco	SF Municipal Railway	--	--	--	Four diamonds	Third Street Line (under construction)
San Jose	Valley Transportation Authority	2.1	1.5	--	Track connection	Shared ROW with Caltrain; shared track, see text. Planned shared ROW, 6.8 miles
San Pedro	Port of Los Angeles	1.5	--	--	Track connection	Shared track with Pacific Harbor Line (temporal separation)
Scranton	Lackawanna County	4.0	--	--	Track connection	Shared track with Delaware Lackawanna Railroad (temporal separation)
Seattle	Waterfront streetcar	--	0.5	--	None	Shared ROW Bell Street to Broad, BNSF
Tacoma	Downtown trolley	--	--	--	Diamond crossing	Crossing of BNSF Lakeview Sub; see text
Tampa	Downtown trolley	--	--	--	Diamond crossing	Crossing with CSX, protected by flagmen
Washington,	Washington	--	10.0	22.1	None	All track in common corridors fenced, with

DC	Metropolitan Area Transportation Authority (WMATA)					intrusion detectors.
TOTALS		62.1	124.6	91.8		

Common Corridor Operations Planned/Under Construction

Several of the systems surveyed are in the midst of expansions of service. In several instances, major projects will add shared track, ROW, or corridors. Information on planned expansions has been limited to those for which funding has been identified, or where construction is actually underway. Unfunded future plans have not been tabulated in this study.

Table 2 provides a list of those systems with expansion plans, as well as new systems now under construction, where common corridors are planned.

Oceanside will have one mile of common corridor adjacent to a main line owned by North County Transit District (and used by BNSF, Amtrak, and Coaster trains), and will share the Escondido Branch (owned by NCTD) with BNSF local freight. Construction is expected to begin in Federal FY 2003.

In addition to systems shown on this list, several light rail systems now under construction will have level crossings with freight railroads. These systems are:

- San Francisco
- Tacoma
- Tampa

Survey Response

Initial response to the survey was very poor. This may have been, in part, due to difficulty in identifying the key person to whom the survey should be sent. Misdirected surveys were generally ignored. Follow-up phone calls were often successful in identifying a correct contact person at each agency. In some cases, however, transit properties replied to the survey by stating simply that they had no "common corridor" operations. This produced a difficult situation when the assertions were known to be inaccurate. Two examples are Atlanta and New York. The Atlanta system follows railroad rights-of-way for a significant part of its length, yet the email response from MARTA was that there were no common corridors on its system. A letter from NYCT stated that system had no common corridors.

MTA New York City Transit (NYCT) does have limited common corridor operations at two locations, one on the "N" Sea Beach Line and the other on the "L" Canarsie Line. NYCT also has two track connections to the general railroad network, one on the Canarsie Line and one on the "B" West End Line. These are used to deliver track materials to NYCT storage yards. NYCT also has a short segment of shared track. Subsidiary South Brooklyn Railway handles railroad cars of track maintenance materials over a short segment of track shared with the West End Line (an active subway line) in Brooklyn, from an interchange with the New York Cross Harbor Railroad to the 38th Street Yard, where material is transferred to work equipment for distribution.

Table 2: Transit Systems with Planned Common Corridor Operations (Under Construction or Funded)
Excludes Systems Under Construction Included in Table 1

City	Operating Agency	Route Mileage			Shared Minor Facility (type)	Notes
		Shared Track	Shared ROW	Shared Corridor		
Dallas	Dallas Area Rapid Transit	--	28.4	--	Grade crossing protection	Lines to Farmer's Branch, Pleasant Grove will use shared ROW. Both are funded
Jersey City	NJT -- Hudson/Bergen LRT	--	1.0	--	None	Extension to 22nd Street, Bayonne, on shared ROW
Los Angeles	Los Angeles County MTA	--	18.8	0.2	Grade crossing protection	Planned extension of Pasadena Gold Line to Claremont
Oakland, CA	Bay Area Rapid Transit	--	--	17.0	None	Extension to San Jose using UP Milpitas Sub
Oceanside, CA	North County Transit District	23.7	--	1.0	Grade crossing protection	Shared track on NCTD Escondido Branch; separate track to Oceanside Transportation Center. Construction start expected FY 2003
Sacramento	Regional Transportation Dist.	--	16.5	--	Grade crossing protection	South Line; Folsom extension. South Line on 20-foot track centers
San Jose	Valley Transportation Authority	--	6.8	--	Grade crossing protection	Vasona corridor under construction
Trenton, NJ	New Jersey Transit	33.0			Grade crossing protection	Shared track with Conrail Shared Assets
TOTALS		56.7	71.5	18.2		

The Metropolitan Boston Transportation Authority never responded to the survey, or to subsequent attempts at communication. Neither did GRCTA in Cleveland. Fortunately, most needed information could be collected from other sources.

In cases where transit properties chose to respond to the survey, or where the correct contact person could be identified following an initial lack of response, cooperation was generally excellent. A quantity of useful information, including track maps, employee rulebooks, safety instructions, and construction standards was freely supplied by many transit operators. Most helpful in this survey was data on safety training provided to workers, any special rules or regulations applying in common corridors, and information on construction standards covering such things as track spacing and fencing.

General Findings

In general, transit systems sharing transportation corridors with freight railroads had good communication with the railroads and had established emergency notification procedures in the event of an incident on either the freight railroad or the transit system. Some transit systems had policies of placing fencing between the transit tracks and the railroad, to prevent maintenance workers or passengers from inadvertently wandering onto the freight ROW. Anecdotal information about MARTA in Atlanta suggested that their construction standards called for fencing of their ROW when adjacent to rail lines, and the use of concrete barriers where track centers were closer than 25 feet. This could not be verified with MARTA due to a lack of response.

In locations where the transit and freight operators share rail/highway crossing protection, a high degree of cooperation is necessary. In San Diego, which has both shared trackage and shared ROW, San Diego Trolley (SDT) employees maintain crossing equipment on the east side of the shared ROW, while North County Transit District (NCTD) employees maintain equipment on the west side. Because NCTD commuter trains fall under FRA regulation, and freight trains also use the tracks, all SDT maintainers are trained in FRA standards and practices, and inspection of the equipment is carried out in accordance with FRA rules. In fact, all SDT track and maintenance personnel are FRA compliant. As the Chief Engineer pointed out in an interview, it would be difficult for employees to observe two different sets of maintenance standards and safety practices on different parts of the system, so SDT chose to become 100% FRA-compliant. The Baltimore light- and heavy rail systems are moving toward full FRA compliance as well.

There was a wide variation in traffic density and operating speed of the rail lines sharing common corridors with transit lines. Freight rail lines ranged from infrequently used branch lines or industrial tracks with 10 mph speed limits to heavily-used mainlines with much higher operating speeds. All transit operators interviewed noted that encroachments had been rare. The Chicago Transit Authority, with considerable trackage in the medians of limited-access highways, noted that automobile intrusion onto its ROW (despite concrete barriers) had been much more common than intrusion by rail vehicles.

In a few cases, transit lines were adjacent to rail lines used principally, or solely, for commuter rail service. This was true at one location in Chicago, where the “Purple Line” from Howard Street to Evanston parallels a former Chicago & Northwestern Railroad main line that carries Metra commuter trains and no regular freight traffic, and also in Boston, where the “Red Line” to South Braintree is closely paralleled by a single track carrying only commuter trains from South Station to Plymouth and Middleboro. Clearly, the risk of derailments, shifted loads, and intrusion is less on these lines than on busy freight main lines.

In virtually every common corridor, there were protocols for contacting the freight operator if a problem occurred on the light rail line. The reverse was also true. In most cases, the freight railroad had special instructions or timetable notices to crews that, in the event of an undesired emergency (UDE) brake application, or if a derailment or shifted load was suspected, they were to notify the dispatcher and inspect their train. Dispatchers were instructed to alert the light or heavy rail operator if a crew experienced a UDE or some other difficulty.

There was a wide variation in construction standards for transit lines in common corridors. In some locations, transit tracks were spaced only 12 or 13 feet, center to center from the closest freight track, without fencing of any kind,. giving the appearance of a multiple-track rail line. However, in some new construction such as the soon-to-be-opened “south line” in Sacramento, the design standard was a 20-foot center-to-center spacing. Light rail lines were likely to be spaced closer to freight tracks than heavy rail lines. The one exception to this was Cleveland, where the grade-separated heavy rail shares unfenced ROW and structures with adjacent grade-separated freight trackage. Cleveland, however, is unusual in that the Red Line uses overhead catenary. Other heavy rail lines employ third rail, and the ROW is fully fenced. Where shared ROW exists, generally the transit tracks are separated from freight trackage at least by fences, and sometimes by differences in elevation or “crash walls” (concrete barriers).

In a number of locations, a heavy rail line on an elevated structure follows an existing, at-grade freight railroad ROW. The BART line from Oakland to Fremont, for example, is adjacent to the former Western Pacific main line (now used only for industrial switching) for most of the distance from Oakland to Fremont. It is at the same grade as the freight line only briefly, at Hayward (where the BART maintenance shop is located). The aerial structure for the Green Line in Los Angeles follows the alignment of the BNSF Harbor Subdivision from El Segundo to the southwest end of the line. In Atlanta, several branches of the MARTA system follow freight lines, but are sometimes grade separated and often at a considerable distance from the freight trackage (50 feet or more). MARTA trackage is fully fenced.

Grade separations provide a fairly high level of safety for the transit operator. A catastrophic high-speed freight derailment might damage or even destroy one or more of the supporting columns of an elevated structure, but such derailments are statistically unlikely.

The following section covers each transit property that makes use of common corridors with freight rail lines. The sections vary considerably in length, since the exposure of some operators (such as SEPTA, with a single level crossing between a light rail line and a railroad) is extremely limited. At the other end of the spectrum, Chicago has four transit lines that closely parallel railroads, some with substantial freight traffic moving at relatively high speed, and some carrying frequent commuter trains and Amtrak trains.

III. Individual Transit System Descriptions

The following are narrative descriptions and photographs of common corridor operations on all transit systems in the United States having some combination of:

- Shared trackage
- Shared right-of-way
- Shared corridors; and
- Level crossings or track connections with freight railroads

The narrative and database descriptions cover the following transit system characteristics:

- Type of rail transit (light rail or heavy rail transit) and identification of the electric traction and voltage utilized (e.g., overhead trolley wire, overhead catenary, or third rail).

- Characterization of rail operations on adjacent rail lines, including volumes of commuter, intercity passenger, and/or freight traffic.

- Length of common corridor.

- Track centers between the general system and rail transit (all corridors with track centers of less than 200 feet are included, per FRA categorization). This information should be considered approximate in most cases, since track spacing can vary.

- Identification of any “minor points of connection” such as common active warning systems at highway rail grade crossings, at-grade rail to rail crossings, track connections, and common points of train control system (e.g., tracks of both modes on a movable bridge).

- Types of protection between operators (e.g., intrusion alarms, fences, nothing).

- Identification of owners and operators (rail transit and general rail system) within each common right-of-way.

- Information on how each of the multiple owners of rail facilities on a shared ROW handles emergency notification and response.

The narrative descriptions are necessary to an understanding of how operations are conducted on each transit property. There are many differences between transit properties, and operation in common corridors exhibit a wide variation in operating speeds, frequency, and passenger loadings.

In most metropolitan areas, a metropolitan planning agency (MPO) or other government or private agency has assembled a GIS for the metropolitan area. This usually contains information on transportation facilities, including transit routes. Where available, the transportation "layer" of the GIS database has obtained by FRA in machine-readable form.

Atlanta – Metropolitan Atlanta Regional Transit Authority (MARTA)

Atlanta has a new rapid transit system. Its first line was opened in 1979, making it more or less contemporary with Washington, DC's Metro, with which it shares some common characteristics. One of these is the use of railroad rights-of-way for suburban extensions of the network. Very little of MARTA's system is actually underground. Much more of it is at grade or on elevated alignments. Figure 1 shows a typical section adjacent to a rail line.

MARTA did not respond to the questionnaire, so information was obtained from other sources.

MARTA has 47 route miles, comprising a north/south line with one branch and an east/west line, also with one branch (this is currently operated as a shuttle service). Figure 4 shows the track layout.

The extent of MARTA's common rail corridors has been determined from various alternative sources. Common corridors are shown in Table 3.

Table 3: MARTA Common Corridors

Line	From	To	Distance (Mi.)	Notes
Northeast	Jct. w/North Line	Doraville	8.3	Norfolk Southern (NS); shared ROW
East	Georgia State	Avondale	8.3	CSX Transportation (CSXT)
South	Garnett	College Park	8.4	NS and CSXT
Total MARTA Common Corridors			25.0	

The Northeast Line runs parallel to the NS mainline from Atlanta to Charlotte and Washington. Initially, MARTA is on the west side of the ROW; then it crosses overhead to the east side, then back to the west shortly before the terminus at Doraville. With these exceptions, MARTA and the railroad are on the same grade, with an approximate 25-foot track spacing (this varies). The MARTA ROW is entirely fenced. The adjacent Norfolk Southern main line carries approximately 40 million gross tons (MGT) of traffic annually, at 50 mph maximum. Trains movements are controlled with Centralized Traffic Control (CTC).

Figure 1: MARTA train near Doraville

The East Line does not closely parallel the railroad, and is often at a higher grade, on a separate structure. The MARTA line skirts the south edge of Hulsey Yard (see Figure 2). This is the CSXT Georgia Subdivision. Maximum speed in this area is 25 mph. Signaling is Centralized Traffic Control, and approximate traffic density is less than 20 million gross tons (MGT) per mile annually, about six trains per day. Hulsey Yard, the CSXT intermodal facility for Atlanta, is adjacent to the MARTA East Line.

The south line parallels the joint NS/CSX tracks from Garnett station (where the line transitions from subway to surface operation) to East Point, and then the CSX line to Montgomery, AL from East Point to south of College Park Station. At this point, the South Line leaves the railroad ROW to enter Atlanta Hartsfield Airport. Figure 3 shows the Lakewood Station, with some auto rack cars in view on the right. The rail line adjacent to the MARTA South Line is jointly used by Norfolk Southern and CSX Transportation, and carries about 45 MGT annually, or about 20 trains per day. Train speed adjacent to the MARTA South Line is a maximum of 25 mph. Signaling is Centralized Traffic Control.

Figure 2: MARTA train near Decatur station

Figure 3: Lakewood station on the South Line

It was not possible to determine what standards for separation between transit and railroad tracks were used by MARTA. Observation revealed “crash walls” in a number of locations to protect both the ROW itself and columns supporting aerial structures.

Some further details are contained in the database entry for Atlanta, but due to MARTA’s nonparticipation in the survey, it is not known what arrangements exist for emergency notification between the railroads and MARTA, nor if there have been any intrusion incidents since MARTA began operations.

MARTA uses third rail current collection, at 750 VDC. The track is standard gauge. Maximum operating speed is 70 mph. Train protection is provided by a modern, multiple-aspect automatic train control (ATC) system. It could not be determined whether there were or are track connections to the general railroad system.

For reference, a track diagram of MARTA is provided as Figure 4.

MARTA has no grade crossings of any kind, shared with freight railroads or otherwise. It is not known whether MARTA has track connections to the freight railroad network.

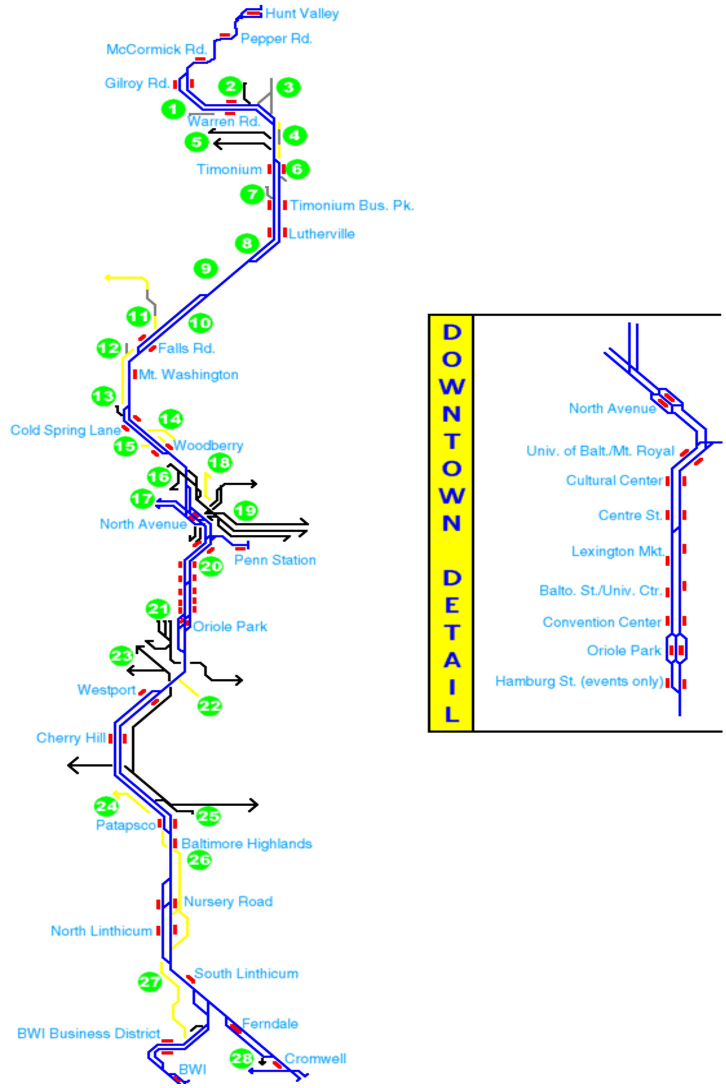
GIS data for railroads and MARTA in Georgia is available from the “transportation layer” of the Georgia GIS. The ArcInfo program is required to read the data. GIS data for MARTA may be found at:

http//:gis.state.ga.us

Figure 4: Track Map of MARTA System

Baltimore

Baltimore has two separate transit systems. Both are operated by the Maryland Mass Transit Administration (MTA). The light rail system consists of 27 route miles, most on private right-of-way, with operation through downtown Baltimore on street trackage in the Howard Street Transit Mall. Both north and south of downtown, the railroad is constructed on former railroad ROW, and when the light rail line opened, freight service was provided to shippers both north and south of downtown. Freight service on the northern part of the line was (and is) provided by Conrail Shared Assets, via a track connection to the storage yard and shop at North Avenue. Service to one shipper on the south end was provided via a connection from the CSX Curtis Bay Subdivision. This shipper has since relocated.



FRA has granted a waiver for use of the light rail line for freight operations, with temporal separation between freight and passenger service.

The light rail system uses overhead trolley wire, 600 VDC. Vehicles have a maximum speed of 55 mph. Wayside signals with enforcement control train movements.

Connections to the general railroad network are protected with derails, are interlocked, and their use must be authorized by the dispatcher. Figure 5 is a track map for the light rail system.

The heavy rail system operates on a single line from Owings Mills to Johns Hopkins Hospital. Metro opened for service in November 1983, serving nine stations from Charles Center to Reisterstown Plaza, the location of the maintenance facility (see Figure 6). It extended to Owings Mills (adding three stations) in July 1987. The extension from Charles Center to Johns Hopkins Hospital opened in May 1995. The line is now 15.5 miles long and serves fourteen stations. It is underground from Johns Hopkins to Mondawmin, runs on the surface for about a half mile south of the West Cold Spring station, where it is in a corridor with the former Western Maryland Railroad (now the

CSX Hanover Subdivision), then ascends to an aerial structure. The rest of the route to Owings Mills is elevated.

The car fleet consists of 100 heavy-rail cars in 50 married pairs (Metro cars must be connected in pairs to function, a minimum of two cars, and a maximum length which can be berthed in a station of six cars.) The cars are standard gauge, and are powered by a collector shoe, which draws power from the 750 VDC contact or "third" rail. Train protection is provided by a multi-aspect ATC system. A map is shown below.

The heavy rail line parallels the former Western Maryland Railroad main line (now the CSXT Hanover Subdivision) for 7.2 miles, from a point south of West Cold Spring station to the Baltimore beltway (I-695). Beyond that point, the transit line is in the median of I-787, or immediately to the north of the highway, into the terminal at Owings Mills. The transit line is only briefly at grade in the corridor with the CSX line, and is generally at least 50 to 100 feet distant from the rail line and on an elevated structure. The CSX rail line sees one local freight per day, originating in Baltimore and making a return trip to Hanover. Maximum timetable speed for this train is 25 MPH, and the line is unsignaled.

Figure 6: Baltimore Heavy Rail Track Map

There is a track connection between the heavy rail maintenance shop and the CSX Hanover Sub. It is protected with derails and switch locks. There are no grade crossings on the heavy rail line. The light rail line crossing protection is maintained in accordance with FRA standards.

Table 4 summarizes the common corridors in Baltimore.

Table 4: Baltimore MTA Common Corridors

Line	From	To	Distance (Mi.)	Notes
Central Light Rail	North Avenue	Timonium	10.9	Shared track with NS
Metro	West Cold Spring	I-695	7.6	CSX Transportation
Total MTA Common Corridors			18.5	

GIS information for Baltimore may be found at:http://www.baltometro.org/bm_brag.html

Boston – Metropolitan Boston Transportation Authority (MBTA)

The Boston network is larger and more complex than those of Atlanta and Baltimore. It is also more diverse, having been built in stages beginning with the 1893 opening of the Tremont Street Subway, the first underground rapid transit line in North America. The Tremont Street subway is still in use by Boston's Green Line light rail vehicles.

MBTA did not respond to the questionnaire, nor to several other attempts at contact, so the information here has been gathered from other sources. As with MARTA, information on emergency contacts and procedures is not available, nor is there information on any intrusions onto transit ROW by rail vehicles.

Total light rail (Green Line) route mileage is 32.4 miles. Combined mileage of the heavy rail lines is 46.4 route miles.

MBTA has five separate transit lines, using incompatible equipment. They are:

- Green Line (actually a network of several light rail lines using the Tremont Street Subway downtown, and a mix of street running and private right-of-way at other locations. This line uses 600 VDC trolley wire and catenary.
- Red Line (a north/south heavy rail line, with high platforms and third rail current supply at 650 VDC)
- Orange Line (also heavy rail, with third rail current supply at 650 VDC and high platforms)
- Blue Line (heavy rail, but using a mix of catenary and third rail at 650 VDC)
- Ashmont – Mattapan High Speed Line (light rail, functioning as an extension of the Red Line), using trolley wire at 600 VDC

The Orange Line and Red Line operate in common corridors with the general rail system. Table 5 summarizes these operations.

Table 5: MBTA Common Corridors

Line	From	To	Distance (Mi.)	Notes
Red	South Bay	Braintree	12.1	MBTA commuter service; no fht.
Orange	Community College	Malden	5.4	MBTA commuter service; limited freight
Orange	Back Bay	Forest Hill	4.1	Amtrak Northeast Corridor
Total MBTA Common Corridors			21.6	

Figure 7 shows the current system.

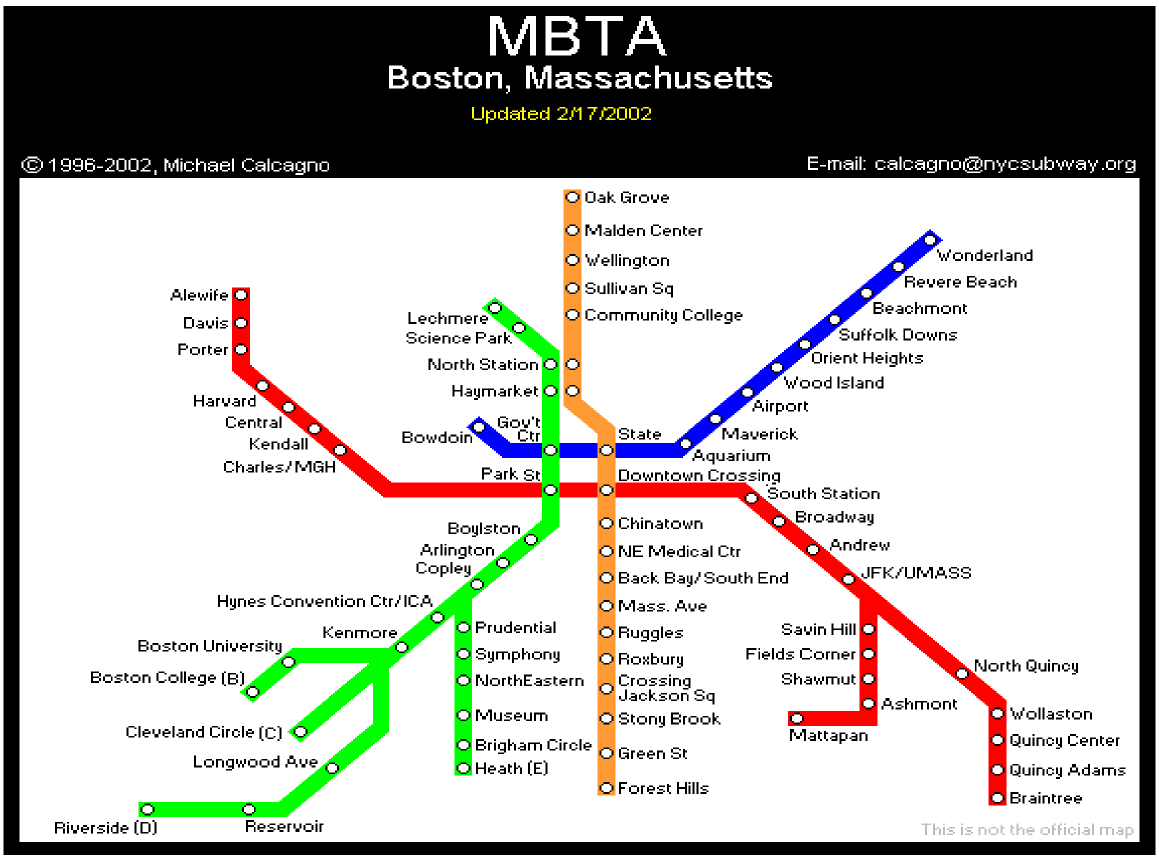


Figure 7: Boston Rail Transit Route Map

Thirty years ago, MBTA had no common corridor operations. Then a series of extensions and replacements of existing rapid transit lines were undertaken. First, the line from South Bay to Savin Hill was realigned onto a right-of-way formerly occupied by the Old Colony Railroad, which provided commuter rail service from the South Shore to Boston. Old Colony commuter rail service was abandoned in 1959, but during the Red Line relocation, space for a single railroad track was preserved.

In 1971, a new Red Line branch to Quincy was opened as part of the same project. This branch was later extended to Braintree. As with the earlier relocation, provision for a single railroad track for possible future commuter rail use was included in the project.

In 1995, the Red Line between South Bay and Braintree became part of a common corridor when rail commuter service to the South Shore was re-instituted over the right of way preserved during the Red Line extensions. Figure 8 shows a Red Line train at JFK/U.Mass station. Note the single track at right for commuter trains.

Between 1975 and 1981, the Orange Line north of the Charles River was relocated adjacent to an MBTA commuter rail line, and the aging elevated structure was demolished. In 1981 the Orange Line reached Malden and Oak Grove. Figure 9 shows an Orange Line train near Oak Grove.

In 1987 the Orange Line elevated structure in South Boston was demolished and the tracks were relocated into a five-track open cut called the "Southwest Corridor". This project provided a high-speed ROW for Amtrak trains between Readville and Boston, and accommodated local service by Orange Line transit vehicles between Forest Hill and Back Bay. Figure 10 shows an Orange Line train at Roxbury. Note the close proximity of the Amtrak line and its high-voltage catenary.

Two of the three corridors in which MBTA transit vehicles operate adjacent to tracks of the general railroad system are used primarily by MBTA commuter trains. Freight trains do not operate on the trackage from Braintree to South Station, and freight operations on the line from Sullivan Square to Malden are limited. On the Southwest Corridor, however, while there is no freight, Amtrak trains operate at up to 120 miles per hour from Forest Hills to Ruggles Street, and at 110 MPH from Ruggles Street almost into Back Bay station. All three rail lines are controlled by Centralized Traffic Control (CTC). Traffic density is less than 10 MGT on Amtrak's Northeast Corridor, and little more than one MGT on the two MBTA commuter lines. Amtrak runs about 36 trains per day between Boston and Forest Hills; MBTA adds another 32 trains per day on the Needham Line, 70 on the Stoughton Line, and 48 on the Attleboro/Providence line, for a total of 186 daily trains at this location. MBTA runs 24 trains per day on weekdays at Malden, plus six Amtrak "Downeaster" trains to Portland, ME, for a total of 30. On the MBTA line adjacent to the Red Line at Braintree, there is MBTA service only. The combined number of weekday trains to Middleboro/Lakeville and Plymouth/Kingston is 56.

Information on safety practices and encroachments by adjacent freight and passenger railroads was not obtained due to MBTA's failure to respond to the questionnaire. The Amtrak employee timetable for the Northeast Corridor contains no special instructions specific to the Southwest Corridor joint operation with the MBTA Orange Line.

There are no grade crossings on the MBTA Orange and Red lines. It is not known whether there are track connections between the MBTA and the general railroad network
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Figure 8: Red Line train at JFK/U.Mass Station

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Figure 9: Orange Line train near Oak Grove, adjacent to MBTA commuter rail

Figure 10: Orange Line train at Roxbury, adjacent to Amtrak NEC

Massachusetts GIS data is available from the following site:

http://www.state.ma.us/mgis/massgis.htm

There is an "infrastructure" layer that contains transportation improvements.

Camden, NJ – Port Authority Transit Corporation (PATCO)

PATCO (locally known as the "Speed Line") is a 14 mile long, double track rapid transit line connecting southern New Jersey suburbs to Philadelphia. Within the City of Philadelphia, PATCO uses a pre-existing subway line under Locust Street constructed during the 1930s. To cross the river, PATCO uses the Benjamin Franklin Bridge, completed in 1926 with a pair of trackways for "Bridge Line" service connecting downtown Camden with downtown Philadelphia. Bridge Line cars terminated at a subway station beneath Broadway, Camden, where connection could be made to several commuter rail services operated by the Pennsylvania Railroad and the Pennsylvania-Reading Seashore Lines.

East of Camden, PATCO utilizes a former railroad right-of-way to its Lindenwold terminal. For part of this distance, PATCO is paralleled by rail lines, first Conrail in Camden and then New Jersey Transit from Haddonfield to Lindenwold.

In Camden, PATCO shares 1,271 feet of elevated viaduct with an active freight rail line. This segment contains two bridges over streets, which are shared by PATCO and Conrail Shared Assets, the current freight operator. The tracks are on 13 foot centers, and there is no fencing.

Conrail has a 20 mph speed limit on this track, and operates approximately 14 trains per week, or two per day. Total gross tonnage on the line is about five MGT. Trains are controlled by CTC. Crews are instructed to notify the Pavonia yardmaster and inspect their trains if a UDE occurs in this area. The Pavonia yardmaster notifies PATCO's Center Tower. PATCO train operators are instructed to sound horns when passing freight trains, to alert any Conrail employees on the ROW to the presence of a PATCO train.

The common corridor between Haddonfield and Lindenwold came about because of PATCO's use of an existing rail line. When the Camden to Atlantic City Line was constructed in the 19th Century, trains ran to a waterfront terminal in Camden. In the 1920s, the Pennsylvania-Reading Seashore Lines (PRSL, a merger of competing companies owned by the Pennsylvania Railroad and the Reading Company) began rationalizing and improving the South Jersey rail network. A new bridge was constructed across the Delaware from Frankford, in Philadelphia, to Delair in New Jersey. Connections to the existing freight line between Camden and Trenton were constructed, as well as a passenger line that connected to the existing Atlantic City line just west of Haddonfield. This provided a circuitous, but all-rail, route between New Jersey and Center City Philadelphia.

When PATCO was constructed, through service was still operating from Philadelphia to Atlantic City. To preserve this service, PATCO constructed a three-track railroad from west of Haddonfield to Lindenwold. The north track was dedicated to general railroad service, and the other two made up the double-track PATCO Line. The three tracks are on the same grade, and mostly less than 20 feet apart, center to center, from Haddonfield to Lindenwold, a distance of 5.3 miles. As with the Conrail Shared Assets track, there is no fencing between the tracks. This track is now used by New Jersey Transit trains to Atlantic City. NJT is responsible for all maintenance and dispatching, although PATCO owns the track and ROW. Table 6 shows the extent of common corridors on PATCO.

Table 6: PATCO Common Corridors

From	To	Distance (Mi.)	Notes
Camden	Camden	0.24	Conrail Shared Assets; unfenced
Haddonfield	Lindenwold	5.30	New Jersey Transit; no freight
Total PATCO Common Corridors		5.54	

New Jersey Transit now operates Philadelphia to Atlantic City service via the Delair Bridge route described earlier. West of Haddonfield, where the two lines join, the NJT track is at a lower elevation than PATCO to provide 22 feet of overhead clearance for freight equipment as the three tracks pass through a cut in Haddonfield. East of Haddonfield the three tracks are at the same grade.

The Pennsylvania-Reading Seashore Lines, the operator of the commuter rail service, ceased running trains to Philadelphia in 1969, shortly after PATCO's opening. The PATCO-constructed track remained unused until 1989, when Amtrak began operating trains between Philadelphia and Atlantic City once again.

Figure 11 shows a New Jersey Transit train at the Haddonfield station, which is in the open cut.

Figure 11: New Jersey Transit train at Haddonfield PATCO station

On the remainder of the line to Haddonfield, the NJT track is at the same grade as PATCO, and mostly on 13-foot track centers. Figure 12 is a typical view; note the lack of fencing.

Figure 12: PATCO ROW Showing NJT Track

There have been no instances of encroachment by freight, commuter, or Amtrak trains on PATCO ROW. PATCO and the adjacent rail lines are entirely grade separated. There are no grade crossings or crossing protection, shared or otherwise. The track connection between PATCO's Lindenwold Yard and the NJT Atlantic City line has been removed.

When Amtrak rehabbed the Atlantic City Line, it was equipped with Centralized Traffic Control. Speed limit adjacent to the PATCO line between Haddonfield and Lindenwold is a maximum of 70 mph. NJT operates 30 trains per day on the Atlantic City Line.

Figure 13 shows a PATCO route map. The two sections of shared ROW are:

1. Between Camden Broadway and Ferry Avenue stations
2. Between Haddonfield and Lindenwold

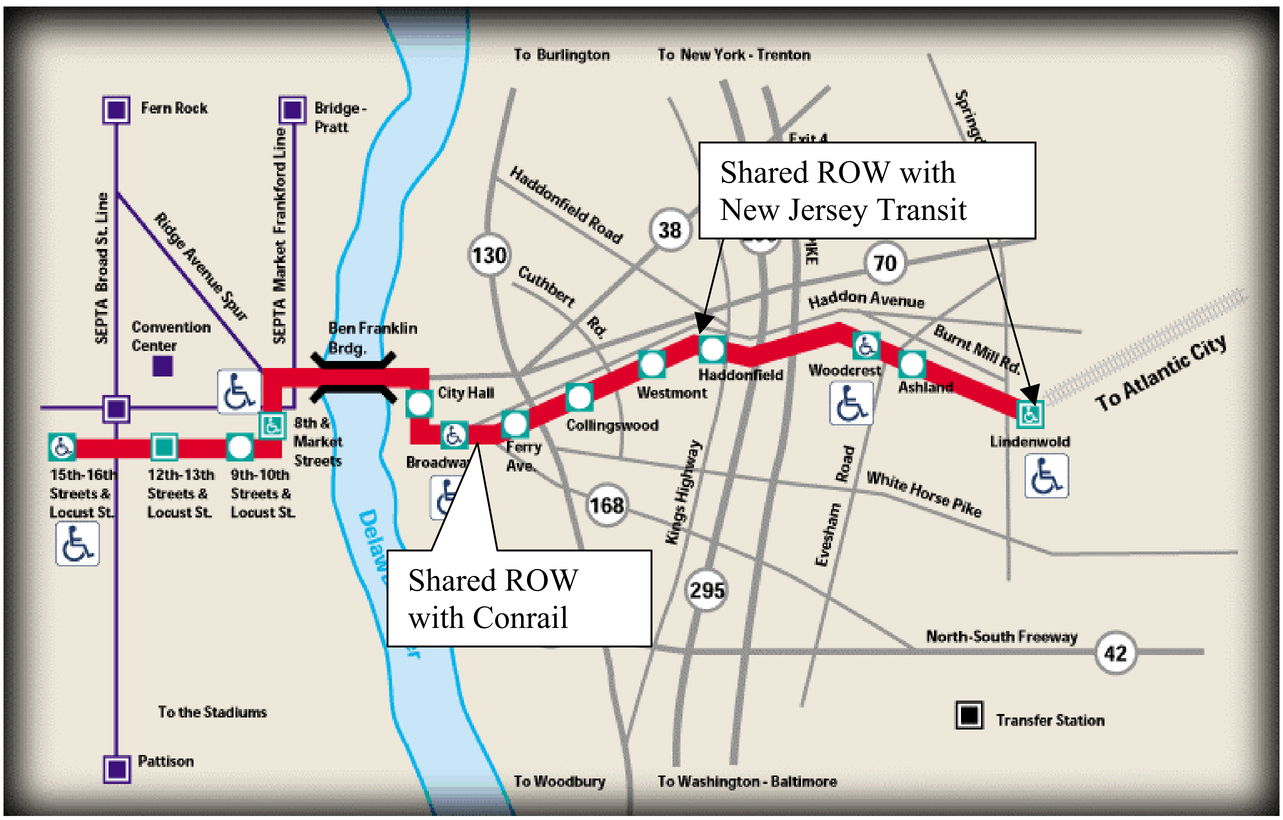


Figure 13 – PATCO Route Map

A GIS for Camden County, NJ (in which all PATCO shared corridor operations are located) is available at:

http://www.state.nj.us/transportation/gis/maps/

in either PDF or GIF format. The raw GPS coordinate data is available through the same site.

Chicago – Chicago Transit Authority (CTA)

The Chicago Transit Authority (CTA) operates one of the largest transit systems in North America, and from the standpoint of common corridors it is also one of the most complex. CTA provided a wealth of data on design standards and operating practices on its common corridors, at least one of which is nearly 100 years old.

CTA has 222 track miles, and about 100 route miles, of heavy rail rapid transit. The system uses third rail at 600 VDC. All lines are now equipped with continuous Automatic Train Protection (ATP) equipment, which provides operators with in-cab maximum speed displays and enforces maximum speeds and speed restrictions. CTA's network is known as the "El" because originally it was entirely elevated, even in downtown Chicago ("the Loop", named for the circle of elevated trackage that surrounded it).

Since World War II, CTA has invested in several new lines, including two new tunnels under the Loop and extensions of service in the medians of three freeways (a concept Chicago pioneered in the 1950s when the Eisenhower Freeway was constructed and an elevated transit line was relocated to its median).

CTA has a number of common corridors with the general railroad system. One has virtually no freight traffic; the others are busy freight lines. CTA's newest line, the Orange Line extension to Midway Airport, follows railroad rights of way for almost its entire length. Table 7 lists the common corridors and their characteristics for CTA. They are listed from north to south, moving counterclockwise around the Loop.

Table 7: CTA Common Corridors

Line	From	To	Distance (Mi.)	Notes
Purple	South Blvd.	Evanston Davis Street	1.6	Metra/C&NW North Line; no freight
Green	Laramie Ave.	Harlem Ave.	2.1	Union Pacific/Metra
Blue	Central Ave.	Harlem Ave.	1.8	Wisconsin Central; shared corridor (> 25 feet)
Orange	Canal/Cermak	Midway Airport	9.8	Illinois Central/ CSXT/ Belt Railway of Chicago (see text)
Total CTA Common Corridors			15.3	

CTA's standard is to provide a five-foot chain link fence between CTA tracks and the tracks of any parallel railroad. If distance between the clearance envelopes on the two parallel tracks is less than six feet, CTA will construct a concrete barrier.

The Purple Line parallels a former Chicago & North Western line that sees little, if any, freight. Commuter trains operated by Union Pacific under contract for Metra, the Chicago commuter operating authority, are by far the majority users of this line. The UP line and the CTA line are on parallel fills, with bridges over cross streets. There is a narrow roadway at ground level between the two fills. Center to center spacing of tracks is about 30 feet at the closest, farther than that in most places. Speed limit on the Metra/UP line is 70 mph. Figure 14 shows the Purple Line, looking south from the Davis Street station. Tracks to the right belong to Union Pacific Railroad. The shared corridor begins just north of Howard Street, the south terminal for the Purple Line, and continues to Davis Street station in Evanston, where the CTA and UP separate. Metra runs 62 weekday trains on the UP North Line; traffic control is by Centralized Traffic Control, and maximum authorized speed is 70 mph. There is no regular freight service on the line.

Figure 14: CTA Purple Line at Davis Street, Looking South

In contrast to this is the west end of the Green Line, where the CTA and the Union Pacific are in much closer proximity and there is also a much higher volume of freight traffic. The UP West Line also handles frequent Metra commuter trains. Figure 15 shows the view from the Harlem Avenue platform. Note the fencing (which is CTA's standard on shared corridors), and also the close proximity of the freight railroad tracks to the CTA tracks.

Figure 15: View looking west from Harlem Avenue, Green Line

The Green Line runs on an elevated structure over Lake Street from the Loop to Laramie Ave. The outer end of this line was relocated from its elevated structure onto the parallel, 5-track Chicago and North Western line in the 1960s. Two tracks were removed to make room for the CTA line. The C&NW line, now owned by Union Pacific, carries through freight trains, interchange trains, and Metra commuter trains at up to 70 mph. Freight volume is more than 30 MGT per year on this line, which is used by trains of UP and other railroads to reach UP's major classification yard in Elmhurst. Metra schedules 58 weekday commuter trains on this line.

The CTA Blue Line runs in the median of the Eisenhower Expressway from the Loop west to Central Avenue, where it moves to the south side of the highway, parallel to a line owned by CSX Transportation. This is the former Baltimore & Ohio Altenheim Subdivision. The Altenheim Sub is separated from the CTA Blue Line by at least 25 feet for the entire distance of the common corridor. The CTA ROW is fenced, per their standard. (See Figure 16.)

Principal user of the CSX Altenheim Sub is Wisconsin Central. Maximum operating speed is 25 mph, and WC accounts for less than 10 MGT of freight traffic per year. There are no Amtrak or commuter trains.

Last but by no means least, the CTA Orange Line parallels multiple railroads (at times, on both sides of the CTA tracks) from south of the Loop to Midway Airport. At most locations, tracks are on 13-foot centers, separated from the CTA by fences. At the Midway Airport terminal, the CTA tracks are in a cut adjacent to, and no more than 75 feet from, a parallel rail line owned by the Belt Railway of Chicago.

Figure 16: View of CSX trackage and freight train at Laramie Ave., Blue Line

Leaving the Chicago Loop on an elevated structure, the Orange Line crosses over the Amtrak connection from Union Station to the former Conrail Chicago Line (now owned by NS) just south of 21st Street, then descends to run at grade, parallel to a line used by Illinois Central, Amtrak, and Metra trains to Brighton Park. At Brighton Park the Orange Line turns south on an elevated structure, crosses the rail line, and returns to ground level to parallel a CSXT (former CR) line also used by other freight railroads. At 49th Street the Orange Line turns west, and follows an Indiana Harbor Belt line to Cicero Ave., where it turns south on an elevated structure (but parallel to the Belt Railway of Chicago) to a station at Midway Airport.

The freight trackage adjacent to the Orange Line runs the gamut in terms of operating speeds, from low-speed industrial tracks to a portion of the line that may carry high-speed passenger trains from Chicago to St. Louis. Figure 17 shows a southbound CTA train departing Ashland Avenue station while an Illinois Central (now Canadian National) freight heads north. While not all of the CTA Orange Line is on shared ROW with freight railroad tracks, much of it is in close proximity.

The several railroads with which the Orange Line shares corridors have varying densities. The Illinois Central line sees approximately 15 MGT of freight traffic per year, plus six daily Amtrak trains and another six Metra "Heritage Corridor" trains. The line is CTC.

The north/south line used by CSXT and others has an annual traffic density of less than 10 MGT (freight only) from Brighton Park south to the junction with BRC; operating speed is less than 20 MPH. The Belt Railway of Chicago line from 47th to 55th Streets has a density of less than five MGT, but the BRC main line parallel to Cicero Avenue at the Midway terminal has a density of more than 20 MGT. Speed limit is 25 mph on both lines. All this trackage is controlled by CTC.

CTA reports that rapid transit tracks, and the fences that separate them from freight railroads, are inspected twice per week. Since virtually all CTA trackage is grade separated, there are no grade crossings shared with freight railroads. The only track connection between the CTA and a freight railroad, at 63rd Street and Cottage Grove Ave. on the Green Line, has been removed.

Figure 17: Ashland Avenue station, Orange Line

Figure 18 on the next page shows CTA lines in schematic form. Stations referred to in Table 7 may be found on the map, indicating the limits of common corridors.

The Chicago Transit Authority control center has direct links to Metra (and, through them, communication with other railroads) and to Union Pacific. Union Pacific crews have specific instructions regarding the reporting of undesired emergency brake applications while adjacent to CTA rapid transit lines. The only incident CTA officers could recall on the system's common corridors was a case in which a door fell off an empty freight car and onto the Orange Line tracks between Halstead and Ashland Avenues in 1997. The operator of the first CTA train to approach the scene was able to stop short of the obstruction, and there were no major damages and no injuries.

The Regional Transportation Authority, the parent of CTA, Metra (the commuter rail operator), and the PACE suburban bus operator, maintains a GIS of Chicago transportation facilities, including:

- Roads
- Railroads
- Rail rapid transit

RTA has provided, in electronic form and ArcInfo format, the "transportation layer" of the Chicago GIS. This information is being forwarded to FRA.

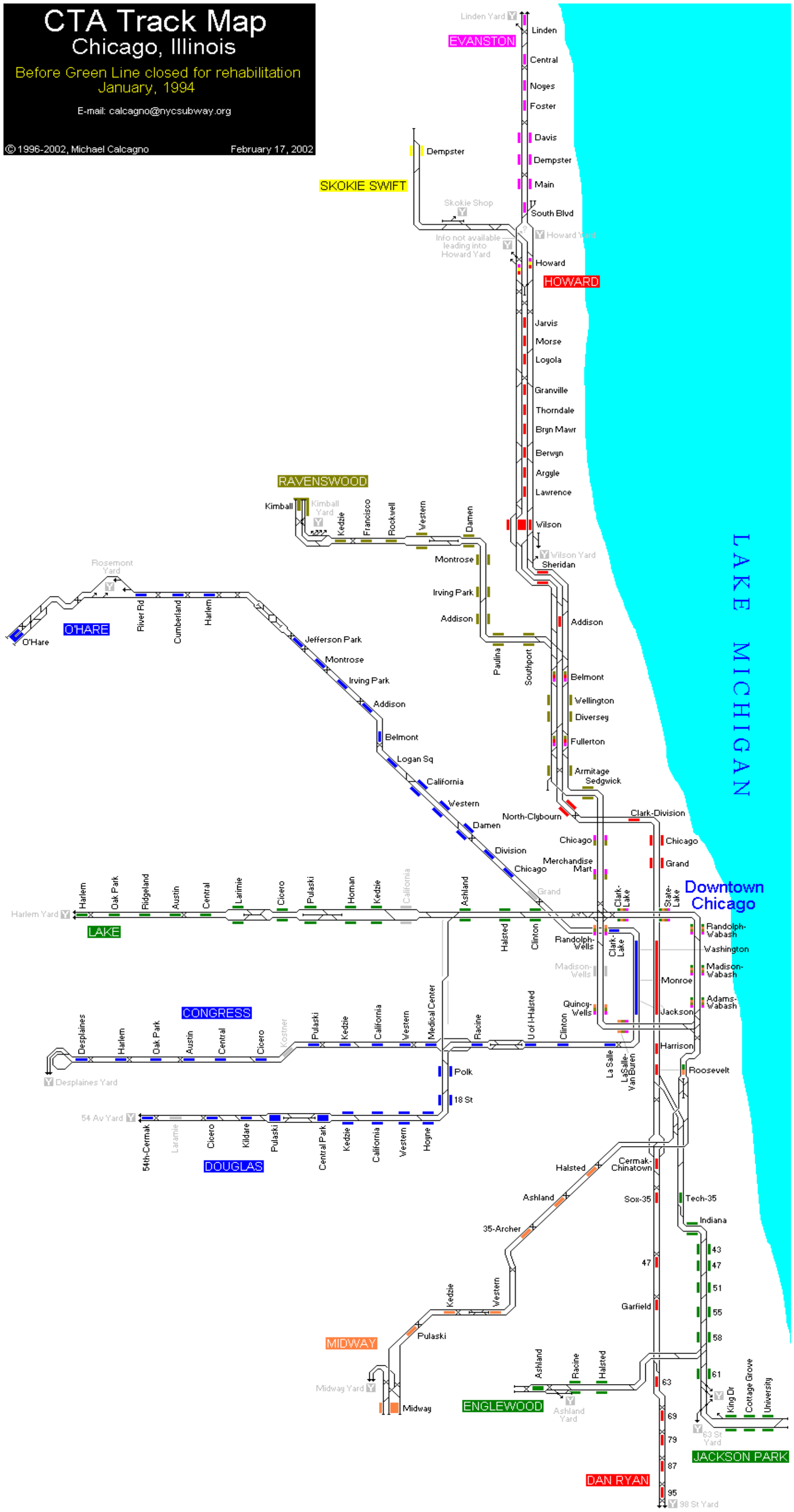


Figure 18: CTA Track Map

Cleveland – Greater Cleveland Regional Transit Authority (GCRTA)

GCRTA did not respond to the survey, so the information presented here has been obtained from alternate sources.

Cleveland has a single “heavy” rapid transit line, and two light rail lines. The Cleveland Red Line was constructed in the mid-1950s to then-current standards for heavy rail, with one exception. Overhead catenary rather than third rail was selected for power supply. This was done largely because the Red Line would share ROW with the general railroad network for much of its length. This railroad trackage, running east and west from Cleveland Union Terminal (CUT), had been electrified in the 1920s with a 3,000 VDC electrification for smoke abatement. Thus, railroad employees in Cleveland were familiar with overhead catenary and its dangers.

While using a different voltage then the terminal electrification (600 VDC rather than 3,000 VDT), the Red Line shared some of the CUT catenary towers to support its overhead wire. Interestingly, despite this sharing of ROW and even catenary towers, there was never simultaneous operation of the two electrifications. CUT was removing its trolley wire as CTS hung its new wire in 1954-1955. Diesel locomotives had made the terminal electrification obsolete.

Cleveland also has a light rail network, the former Shaker Heights Rapid Transit. Both services use Terminal Tower (the former CUT station) as their downtown terminal, and share trackage to East 55th Street. A recent extension of the Shaker Rapid (now the Blue and Green lines), the Lakefront Line, continues west and north from the Terminal Tower station and briefly parallels the former New York Central (now Norfolk Southern) freight mainline along the Cleveland waterfront.

Figure 19 shows the current arrangement of GRTA’s routes.

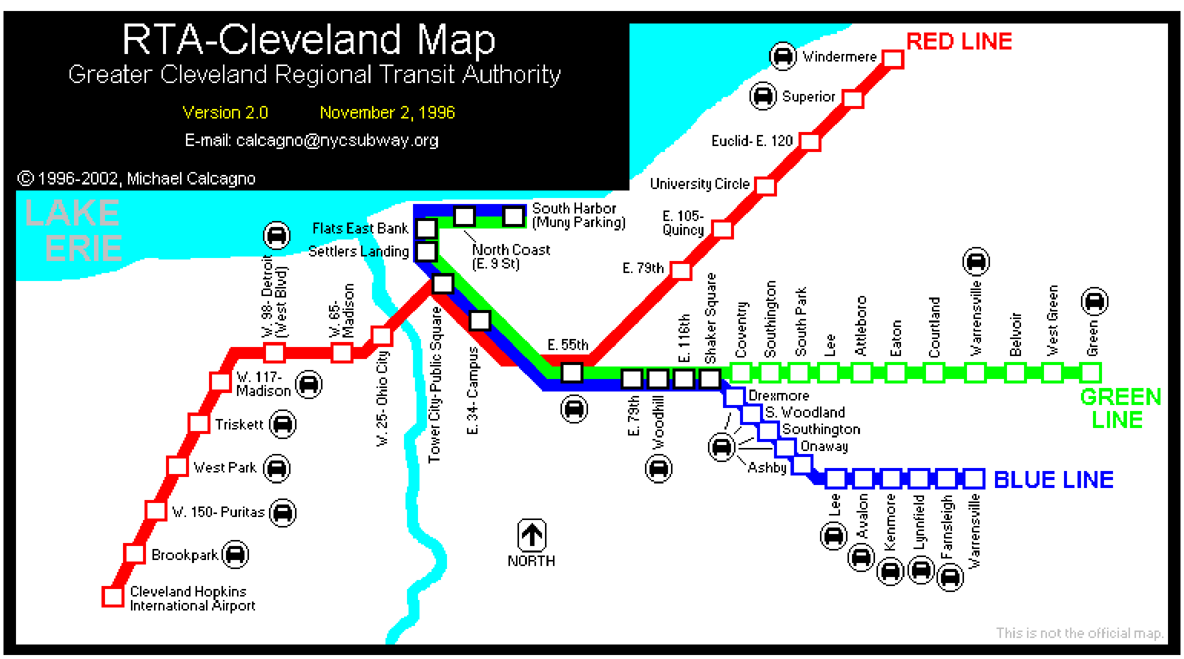


Figure 19: Cleveland Transit Map

Specific sections of common corridor operation, on shared ROW for the most part, are shown in Table 8.

Table 8: GCRTA Common Corridors

Line	From	To	Distance (Mi.)	Notes
Red	Berea Parkway	West 98th Street	6.0	CSX Chicago Line; unfenced
Red	West 98th Street	West 30th Street	2.8	NS Buffalo – Chicago main; unfenced
Red	E. 55th Street	Windermere	5.5	As above
Blue/ Green	W. 9th Street	S. Marginal Road	1.0	NS Cleveland – Chicago line
Total GCRTA Common Corridors			15.3	

Figure 20 shows a typical portion of the Red Line, near Triskett station on the west side of Cleveland. Figure 20 shows a portion of the new Waterfront Line (used by both Blue and Green light rail vehicles) adjacent to the Cleveland Amtrak station. The Red Line is entirely unfenced. There is a fence between the Waterfront Line and the NS main, as well as a somewhat wider track spacing, a minimum center-to-center spacing of approximately 20 feet.

Figure 20: Cleveland Red Line near Triskett Station

All Cleveland rapid transit lines, both light and heavy rail, use conventional wayside signals. The Red Line employs mechanical trip cocks; it is not known whether there is enforcement on the Blue and Green light rail lines. Catenary is energized at 600 VDC, typical for light rail operations. Red Line trains and light rail vehicles share the catenary between Terminal Tower and 55th Street.

Figure 21: Waterfront Line train at Amtrak station

Rail freight traffic patterns in the Cleveland area have changed since the purchase of Conrail by CSX Transportation and Norfolk Southern Corporation. The line from Berea into downtown Cleveland was formerly part of Conrail's Indianapolis main line, and annual tonnage exceeded 40 MGT. However, CSXT trains now use the "Short Line" from Berea to Collinwood, east of Cleveland, bypassing downtown Cleveland altogether. The freight volume on the common corridor between Berea Parkway and West 98th Street has been substantially reduced. The line was, and remains, CTC, with a maximum speed of 60 mph.

On the other hand, volume has grown on the Norfolk Southern line between West 98th Street and West 30th Street, and between East 55th Street and Windermere. Operating speeds on this line vary, but are typically 50 mph. Density in the years prior to the Conrail split was less than 30 MGT. It probably exceeds 40 MGT today.

It was reported that there is a level crossing of the Red Line with a switching lead in the vicinity of West117th Street. This could not be independently confirmed, and thus the type of protection (derails, signals, etc.) is not known. It is possible that the diamond crossing no longer exists.

It could not be determined whether any intrusions by freight rail vehicles into the transit corridors have ever occurred. The Red Line and two freight main lines have co-existed for nearly 50 years without apparent incident.

It could not be determined whether track connections exist between any of the Cleveland lines and the general rail network. There are no rail/highway crossings of any kind on the Red Line.

The new Waterfront Line parallels a busy NS main line. However, station platforms are between the tracks and the NS ROW, there is a fence, and track centers are at least 20 feet. There are no rail/highway crossings on this line.

GIS data for Cleveland is available from:

http://www.state.oh.us/das/dcs/ogrip/

Dallas – Dallas Area Rapid Transit

The Dallas Area Rapid Transit (DART) is in the midst of an expansion program, with 43 route miles of light rail transit to be operating by 2003. Much of the DART network is located in former rail corridors. In some locations, there is still active rail freight service. DART operations are with articulated light rail vehicles, powered by catenary at 750 VDC. Signal control is by means of wayside block signals. Maximum operating speed is 65 MPH.

Other rail rapid transit services in Dallas include the McKinney Avenue Transportation Authority, which operates historic streetcar service on McKinney Avenue and has no common corridors with railroads, and the Trinity Railway Express, a fully FRA-compliant commuter rail system. The current Dallas system, with extensions under construction, is shown as Figure 22.

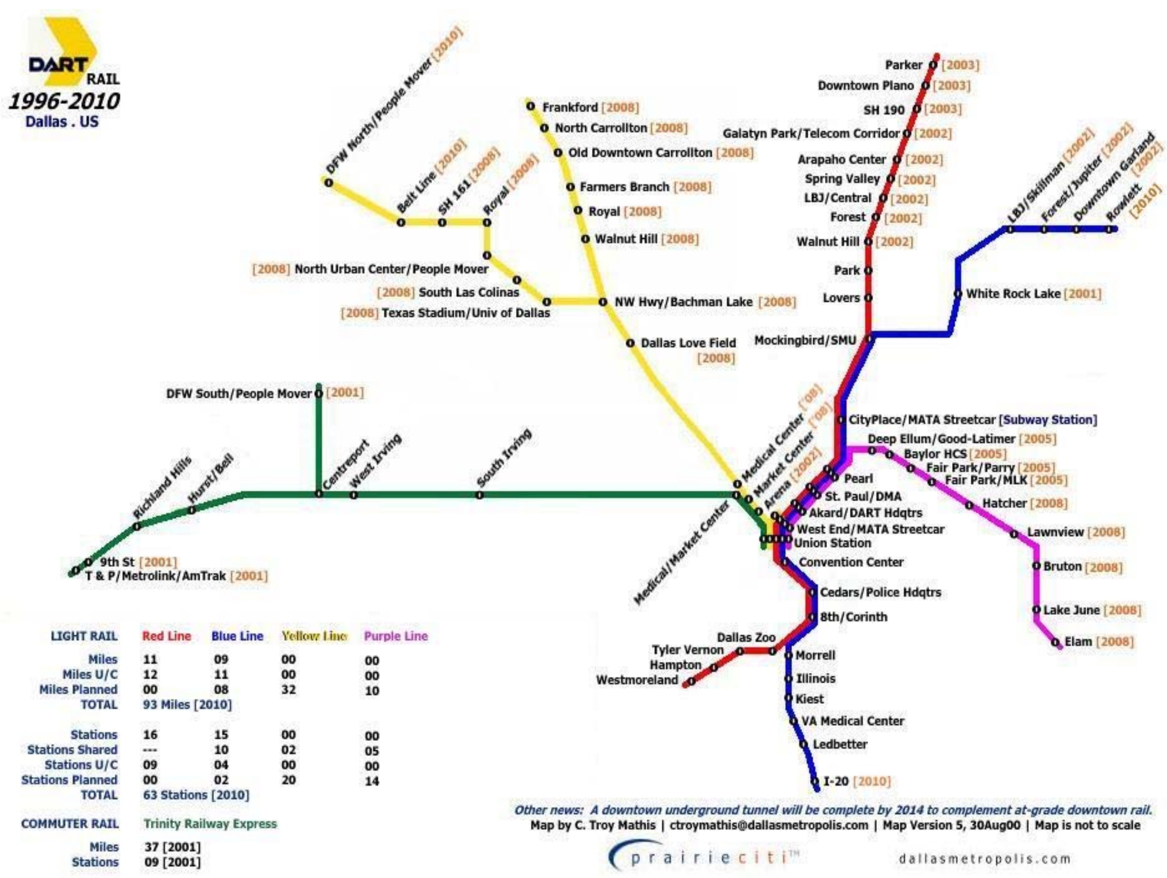


Figure 22: DART System, Showing Lines in Service and Planned

The Dallas system is expanding. Lines to Garland and downtown Plano are scheduled to open in 2002 or 2003. The lines to Elam and Frankford will both be in common corridors with active rail lines, but no stations on either line will open before 2008, and funding for these extensions is not yet secure. Thus, Table 9 reflects only the existing lines (Red and Blue) and the planned 2002 and 2003 extensions.

Specific sections of common corridor operation, on shared ROW for the most part, are shown in Table 9.

Table 9: DART Common Corridors (Current)

Line	From	To	Distance (Mi.)	Notes
Red/ Blue	North of Union Station	Convention Center	0.9	See text for description
Blue	LBJ/Skillman	Downtown Garland	4.2	Dallas, Garland, & Northeastern
Total DART Common Corridors			5.1	

Both the Red and Blue light rail lines share trackage through downtown Dallas. The light rail line curves from Pacific Street (which runs east/west) to parallel the railroad tracks through the Dallas Union Station area just west of the West End light rail station. The light rail line has a pair of tracks with side platforms. The other side of the west platform serves Trinity Railway Express trains exclusively (this track stub-ends at a bumper block south of the station). The next track serves TRE and Amtrak; it is separated from the fifth track by another platform. Finally, on the extreme west side of the ROW are the freight tracks. Even the tracks used by TRE are separated by about 20 feet from the light rail tracks. The two freight mains are at least 100 feet from the light rail tracks, but this is by far the busiest piece of railroad in a common corridor with DART. Trackage is used by both BNSF and UP, and annual density exceeds 40 MGT. Operating speeds are low, however, since there are complex junctions immediately north and south of Dallas Union Station. The Union Pacific dispatches this trackage using CTC. Maximum operating speed is 40 mph. Figure 23 shows a DART train and a TRE train across the platform. A second TRE track and the edge of the platform used by Amtrak may be seen to the left of the photo. The Union Station headhouse is in the background. Two freight tracks are out of sight to the left of the photo.

Existing DART lines to Westmoreland and LBJ/Skillman follow former rail corridors, but the freight tracks have been removed. A soon-to-open extension to Garland, TX will parallel the Dallas, Garland & Northeastern Railroad (DGNO) from LBJ/Skillman to Garland. This trackage, owned by DART, is leased to the short line operator. The light rail line crosses major arterials on this line via elevated structures, while the DGNO track remains at grade, with rail/highway crossings. There are only two rail/highway crossings with shared crossing protection on this line.

Figure 23: DART and other rail operations at Dallas Union Station

Figure 24 shows the soon-to-open Garland station, current end of the line. The KCS/DGNO diamond is in the foreground. DGNO trackage in this area has a 10 mph speed limit, and annual tonnage is less than one MGT. DGNO is controlled by voice radio and track warrants. There are signals protecting the diamond crossing with Kansas City Southern just east of the end of the DART line. The KCS line is within 200 feet of the DART line, is controlled by CTC, and has a 40 mph speed limit. Annual tonnage is less than 10 MGT. Figure 24 shows the diamond crossing between DGNO and KCS, just beyond the end of the light rail line at Garland Station. There are plans to extend the light rail line east to Rawlett in the future; this may – depending upon design – require a level crossing of KCS by DART.

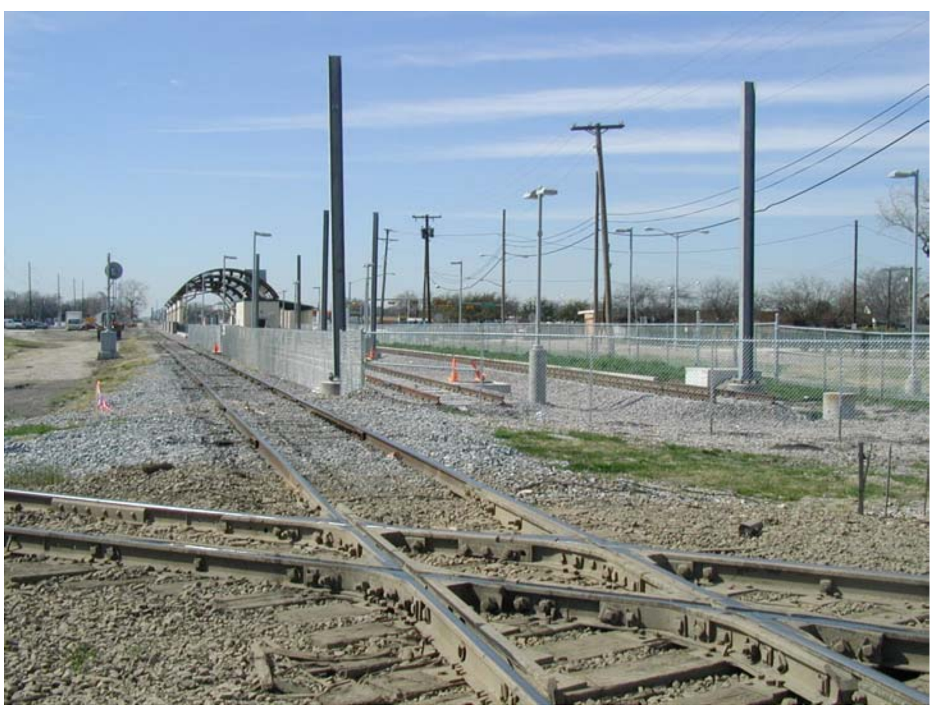


Figure 24: Garland Station

Planned extensions to Elam and Lewisville will also follow light-density, low-speed freight railroads, and most likely will be constructed parallel to, but on a separate ROW from, these freight rail lines. In both cases, the rail freight lines are branch lines with a 10 mph speed limit, limited freight service, and no signals ("dark"). Table 10 shows the planned extension.

Table 10: DART Common Corridors (Planned)

Line	From	To	Distance (Mi.)	Notes
Southeast	Downtown	Elam	5.0	Union Pacific branch line
Northwest	Downtown	Lewisville	23.4	Union Pacific branch line
Total DART Common Corridors			28.4	

The Southeast Corridor, called the Pleasant Grove Line, will open in 2006 or 2007. The freight line serves a single shipper, and will be left undisturbed by the construction of the light rail line. There will be no grade crossings shared with light rail. At Longview Station, the freight track will run between the station and the parking lot, and there will be a pedestrian crossing protected by gates.

The Northwest Line will parallel a Union Pacific (former Missouri-Kansas-Texas) line that serves as an industrial track. As on the Garland extension, the light rail line will cross the busier streets on viaducts. There will be some shared crossings, but design is not yet complete. This line is scheduled to open in 2008.

There is one other area of shared corridor operation, but it is non-revenue trackage. South of the Cedars station there is a wye connection with tracks that lead east to the maintenance facility and storage yard. This facility is located adjacent to a Union Pacific branch line, with which there is a track connection (interlocked, with derails). This non-revenue trackage runs for a total distance of no more than one-half mile.

The combined Red and Blue lines turn west at the wye, run very briefly adjacent to the freight railroad, then climb onto a viaduct to cross the Trinity River and the UP rail line on its east bank. The freight line ends at a connection to the Union Pacific main line on the east bank of the river.

The City of Dallas is in the process of converting its land records to GIS format. Additional information may be obtained from:

http://www.dallascityhall.com/dallas/eng/html/gis1.html

Denver – Regional Transportation District (RTD)

Denver has a light rail system, which, like that of Dallas, is expanding. The current system is shown in Figure 25. It consists of the Green Line, which runs in street trackage in downtown Dallas, and the Yellow Line, which follows a railroad ROW to reach Denver Union Station. Figure 25 shows the current route structure.

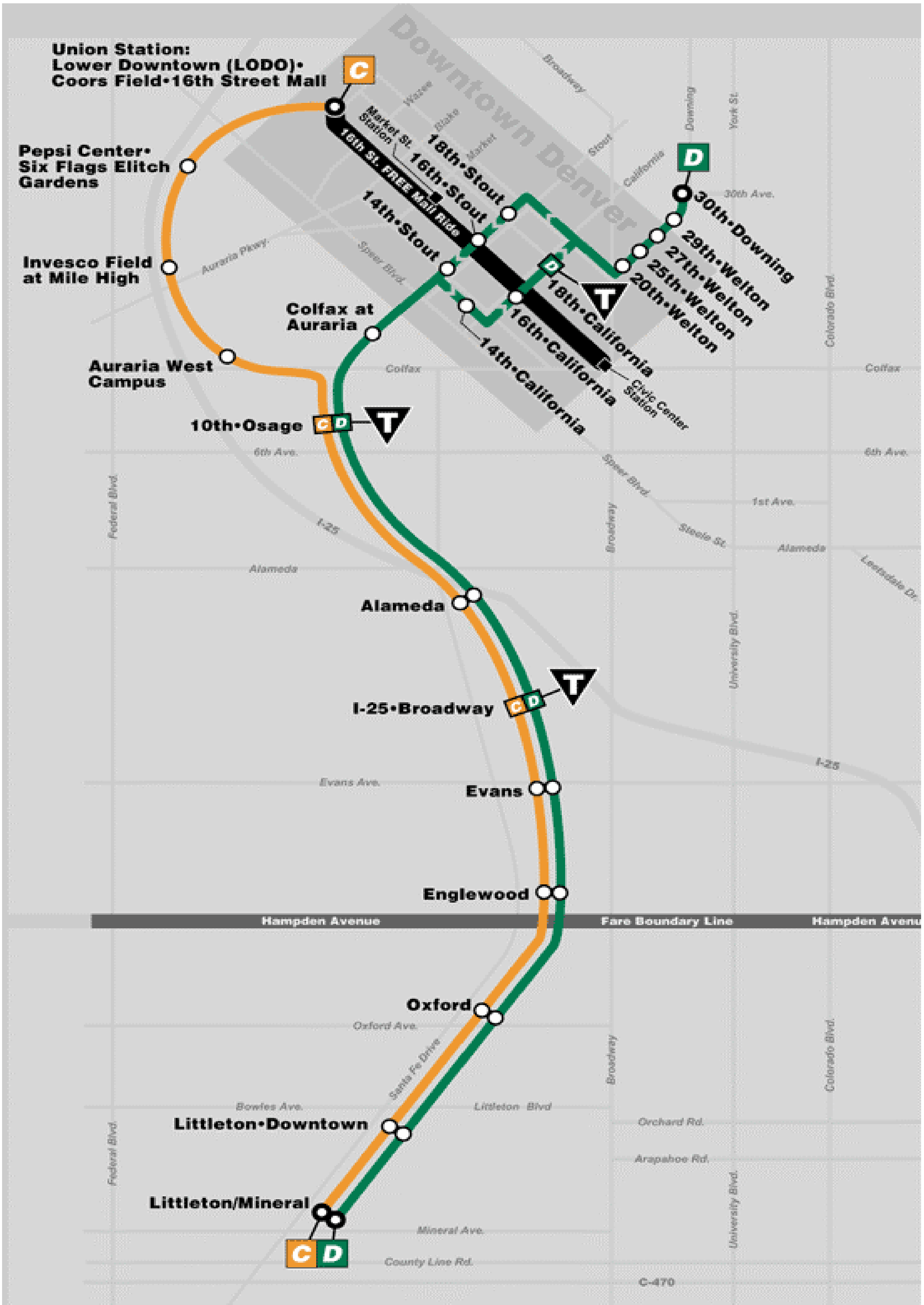


Figure 25: RTD Light Rail Map

Denver Regional Transportation District (RTD) also operates the bus system in Denver. RTD operates a modern light rail system, with articulated cars using 750 VDC overhead catenary. Maximum operating speed is 55 MPH.

Much of the current system follows railroad rights-of-way. From 10th and Osage, the combined Green and Yellow lines follow a very busy freight railroad all the way to the south terminal at Littleton/Mineral. (See Figures 26 and 27).e recent Yellow Line extension leaves the rail line at 10th & Osage, then regains another rail line just north of the Auraria Campus station and follows it almost to Union Station. The last three blocks are street running. Table 11 shows the two common corridors on the Denver system.

Table 11: Denver RTD Common Corridors

Line	From	To	Distance (Mi.)	Notes
Green/Orange	10th & Osage	Littleton	10.2	UP/BNSF joint trackage
Orange	10th & Osage	Denver US	1.6	Union Pacific
Total Denver RTD Common Corridors			11.8	

Denver RTD advises that a 25-foot track spacing is sought wherever space allows. A review of the engineering drawings for Sections A, B, C, and D indicate that, where common corridors exist, typical spacing is more than 25 feet almost everywhere. In a few cases center-to-center spacing is as little as 20 feet, and in a very few locations is 17 or 18 feet. Figure 26 shows 10th & Osage station. Note the fencing and the adjacent railroad tracks.

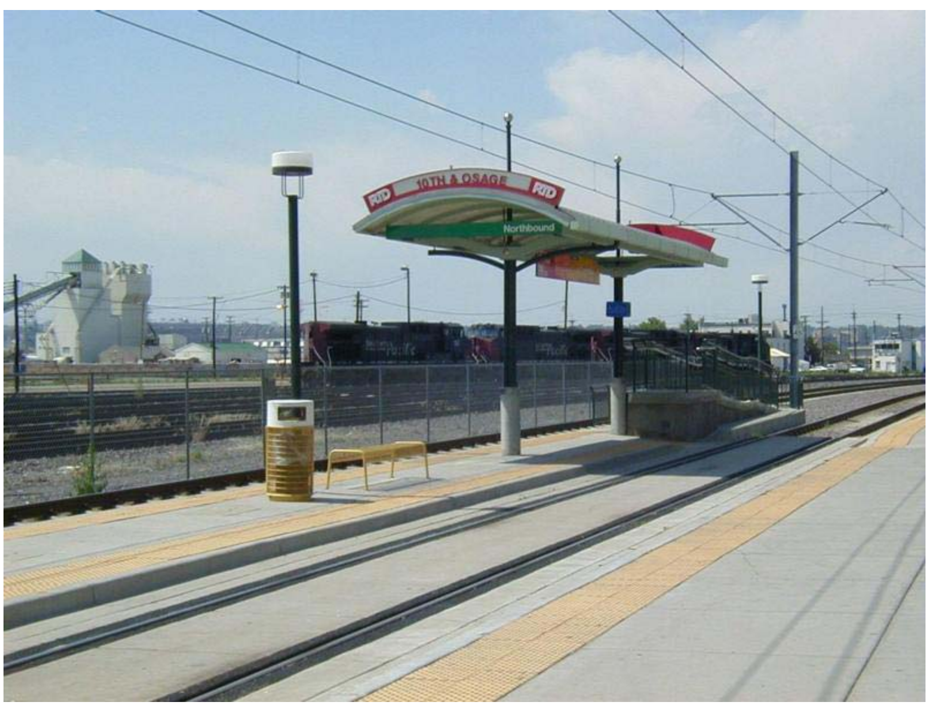


Figure 26: Denver RTD ROW, Showing UP Railroad Yard

Figure 27 shows the terminal at Littleton/Mineral. Here the light rail line has separated from the freight line, which may be seen in the background at the left of the photo.

Figure 27: South end of the light rail line, Littleton

Denver does not yet have a comprehensive metropolitan GIS. A not-for-profit group is developing a GIS database pilot, and the City of Denver web site advises that a GIS is under development. The not-for-profit pilot project may be found at:

http://www.rrcc-online.com/~gey235/des.html

Jersey City – Hudson/Bergen Light Rail Transit System

The Hudson/Bergen Light Rail Transit System (HBLRTS) is still under construction. The segment currently in operation comprises two lines. The north/south line runs from Newport, in Jersey City, to 34th Street in Bayonne, a total of 7.2 miles. The West Side Line extends from a junction with the north/south line at Communipaw Ave. (location of the shop and yard) west for 1.7 miles. The "minimum operating segment" funded by the Federal Transit Administration also includes a 5.1. mile extension northward from Newport through Hoboken to Tonnelle Ave. (TON-elly) in North Bergen, and a one-mile southern extension to 22nd Street in Bayonne. Figure 28 is a route map of the current operation and the near-term expansions of service.

Much of the Hudson/Bergen Line is constructed on former railroad right-of-way. The West Side Line uses the ROW of the former Newark Branch of the Central Railroad of New Jersey (there is no longer freight service on this line). The north/south main line uses the ROW of the Central Railroad of New Jersey main line, which originally ran from the Jersey City terminal station (now part of Liberty State Park) through Bayonne and across Newark Bay to Elizabeth, Bound Brook, and Allentown, PA.

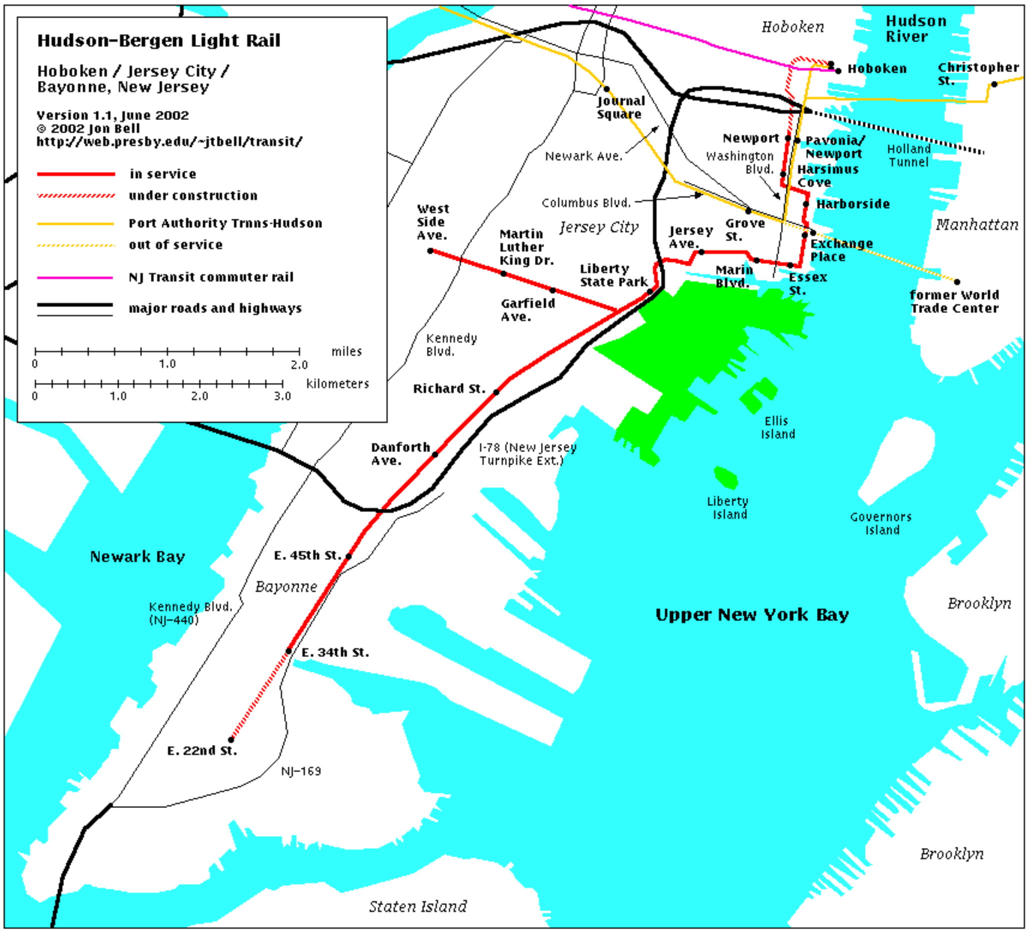


Figure 28 – HBLRT Map

The Hudson/Bergen car shop is located at the junction of the two light rail lines in Communipaw. From this point, the north/south line parallels active rail freight trackage for 4.2 miles, to 34th Street in Bayonne. From Communipaw to 59th Street, this trackage is part of the National Docks Secondary, a segment of a through freight route from Selkirk Yard in Albany, NY to Oak Island Yard in Newark, and carries about 11 MGT of freight traffic annually. Maximum operating speed is 25 mph. The line is unsignaled, dispatched under manual block rules.

At 59th Street, Bayonne, the National Docks Secondary crosses Newark Bay to reach Oak Island Yard. The Bayonne Industrial Track, a 10 mph, light-density line, parallels the light rail line on the same ROW (originally the four-track Jersey Central main) down to 34th Street, and the planned extension to 22nd Street will also follow this line. Track spacing is much closer than north of 59th Street, since both HBLRTS tracks, plus platforms, plus the single industrial track, must fit within the existing ROW. North of 59th Street two railroad rights-of-way are available; the National Docks Secondary uses the former Lehigh Valley Railroad ROW, while the HBLRTS uses the CNJ ROW. At some places, these tracks are almost 200 feet apart.

Figure 29 shows a southbound light rail vehicle entering the Liberty State Park station, just north of the yard and junction with the West Side Line at Communipaw. Above the train can be seen the railroad bridge carrying Conrail's National Docks Secondary, which the light rail line will parallel from this point south.

Figure 29: HBLRT Train at Liberty State Park station

Figure 30 is a view from the pedestrian bridge at the current end of the line, 34th Street in Bayonne. Note the confined ROW. The entire line south of 59th Street, including the planned southern extension to 22nd Street, is similarly configured. Note the fence, which is equipped with tilt and intrusion detectors.

Figure 30: Typical view of the ROW at 34th Street, Bayonne

The HBLRTS management has detailed emergency response procedures incorporated in an "Operating Guide" given to all employees. Dispatchers have phone numbers for Conrail Shared Assets, CSXT, Norfolk Southern, and New Jersey Transit (the HBLRTS platforms will be outside of Hoboken Terminal, adjacent to the NJT station tracks, when this segment of the line opens). HBLRTS uses a modern train control system, with cab signals and enforcement. Dispatchers can communicate directly with train operators by radio, and will shortly be able to communicate with passengers on each car via a public address system. The ROW is fully fenced when the trains are operating on private ROW (a portion of the line in Jersey City and Hoboken is located in streets). HBLRTS uses overhead catenary at 750 VDC for power. Table 12 shows current and planned corridors.

Table 12: Hudson/Bergen Common Corridors (Current and Planned)

Line	From	To	Distance (Mi.)	Note
North/South	Communipaw	34th St., Bayonne	4.2	CSX River Line
North/South	34th Street	22nd St. (note)	1.6	CSX Bayonne Ind. Track
Total Hudson/Bergen Common Corridors			5.8	

Note: segment to 22nd Street will open 2003

The future of the HBLRTS will see some changes. The extension to Tonnelle Ave. will use the ROW of the CSXT National Docks Secondary from north of Hoboken through Weehawken, and through a tunnel under the Palisades to North Bergen. It was originally planned that freight trains and HBLRTS would share the two-track ROW temporarily, with freight on one track and light rail on the other. However, freight traffic has already been re-routed, and there will be no common corridor operation on this segment.

There are long-term plans for an extension from Tonnelle Avenue north along the CSXT ROW rather than to the Vince Lombardi Park and Ride. However, this extension is not yet funded.

New Jersey has both a statewide site and county-by-county GIS data resources. The statewide GIS site may be found at:

http://www.state.nj.us/transportation/gis/

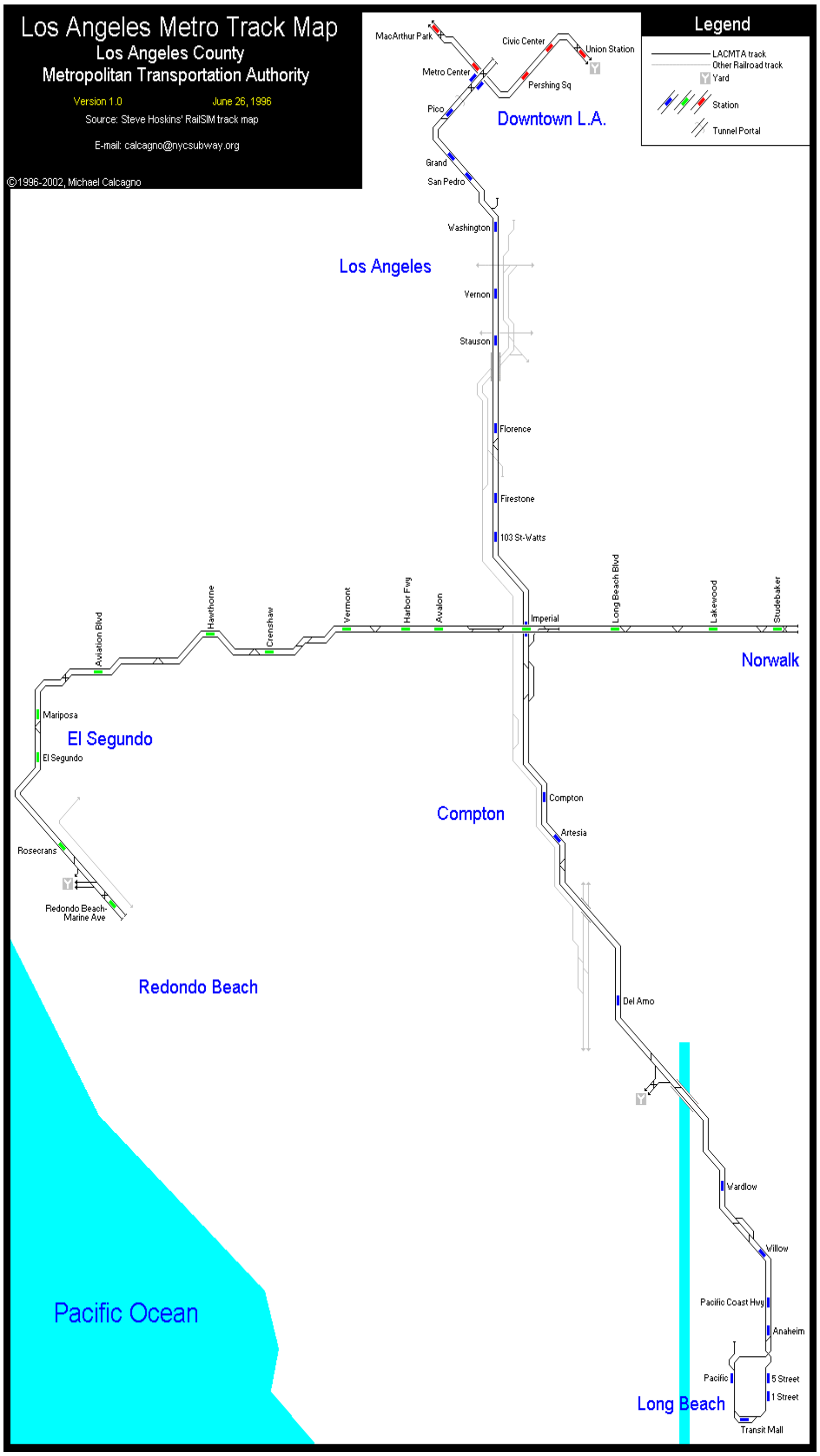
Los Angeles – Los Angeles County Metropolitan Transportation Authority

Los Angeles is now developing a large and complex rail transit system. There are three parts to the system:

1. The "heavy" rail Red Line
2. Two light rail lines (soon to be three). Those currently operating are the Blue Line (partially in street trackage) and the Green Line (entirely on elevated ROW)
3. An expanding commuter rail network, over trackage owned in part by the State of California and in part by various freight railroads.

Operator of the light and heavy rail is the Los Angeles County Metropolitan Transportation Authority (LACMTA). The commuter network is managed by the Southern California Regional Rail Authority, and operations are contracted to Amtrak. Figure 31 shows the Los Angeles light rail network as it presently exists. Adjoining freight trackage is shown in light gray.

The Red Line is completely underground except for the maintenance shop, and the commuter rail system is, of course, FRA-compliant. Common corridors in Los Angeles are found only on the light rail system.



All lines use cab signaling with speed enforcement. All use 750 VDC power supply; the Red Line uses third rail, while the light rail lines use catenary. Maximum operating speed is 55 MPH.

The Blue Line is a "conventional" light rail line. It begins in down-town Los Angeles at a two-level subway station (7th & Flower St.) shared with the Red Line. It proceeds toward Long Beach first via a short subway, and then street-level running in the median of Washington Avenue to Long Beach Avenue.

Making a sharp right turn onto the median of Long Beach Avenue, the Blue Line proceeds south to Long Beach. From the Washington Avenue station (at its intersection with Long Beach Avenue) the Blue Line is paralleled by active freight railroad tracks (sometimes on both sides of the ROW) for 15.9

miles, to a point between Wardlow and Willow stations. There is a diamond crossing with an industrial spur just south of the Washington Ave. Station. This is protected with signals and derails. Most of this trackage is the Union Pacific Wilmington Subdivision, which parallels the Blue Line from Washington & Long Beach Aves to Dominguez Junction, a distance of 11.0 miles. Beyond Dominguez Junction, an industrial track runs parallel to the Blue line for the remaining 4.9 miles.

The Gold Line, a light rail line now under construction, will run from Union Station to Pasadena on a former Santa Fe rail line purchased a decade ago by the state. It will use as its terminal about 2,000 feet of station track in Union Station; this will be the only common corridor on the route. However, there are plans to extend the Gold Line to Claremont, parallel to an active BNSF rail line. It has not been decided whether this extension will be on shared track or shared ROW

Table 13 shows the two current common corridors in Los Angeles, as well as the one under construction. Note that the industrial trackage south of Dominguez Junction on the Wilmington Sub does not show up on the map.

Table 13: Los Angeles LACMTA Common Corridors

Line	From	To	Distance (Mi.)	Notes
Blue	Washington Ave.	North of Willow	15.9	UP Wilmington sub; industrial track
Green	Douglas/Rosecrans	Marine Ave.	1.6	BNSF Harbor Sub
Gold	Union Station	Union Station	0.2	Under construction
Total LACMTA Common Corridors			17.7	

The UP Wilmington Sub is CTC as far as Watts Junction, 5.1 miles, and unsignaled beyond. Maximum speed is 40 mph. The industrial track has a speed limit of 10 mph and is unsignaled; the unsignaled portion of the Wilmington Sub has a 25 mph speed limit. The Wilmington Sub currently carries about 10 MGT per year, mainly traffic to the Port of Los Angeles and Long Beach. With the opening of the Alameda Corridor in April 2002, traffic on the Wilmington Sub may be expected to decrease substantially as trains are re-routed.

At Slauson Junction, the light rail line avoids crossing freight tracks at grade by means of a four-block elevated section. However, north of Slauson Jct., there is a level crossing with a BNSF line. This crosses the Wilmington Subdivision as well as the Blue Line. It is protected by signals and derails. It is an industrial track; traffic is light. The Blue Line common corridor is entirely fenced, with a sturdy wrought-iron fence. Figure 32 shows a southbound view from the Green Line platform; a southbound stack train is being overtaken by a Blue Line train.

Figure 32: Blue Line Common Corridor, near Watts

The Green Line, in contrast to the Blue Line, runs entirely on an elevated structure, with the exception of a short segment next to the yard and maintenance facility in El Segundo. This is also the midpoint of 1.6 miles of shared corridor.

Figure 33: Green Line and BNSF Harbor Sub from Marine Ave. Station

The Green Line operates for 17 of its 20 miles in the median of the Century Freeway (I-105). It leaves the freeway to pass near the Los Angeles airport on an elevated structure, then turns southeast along the BNSF Harbor Sub to Marine Avenue in the northeastern corner of Redondo Beach. Figure 33 shows the end of the Green Line at Marine Ave. station, looking northeast. The line descends off the structure and runs at grade adjacent to the Harbor Sub briefly before returning to an elevated structure and diverging toward Los Angeles airport.

The opening of the Alameda Corridor will affect the BNSF Harbor Sub in the same way it will affect the UP Wilmington Sub. Most traffic will be diverted to the Alameda Corridor, and the Harbor Sub, which now handles about six MGT annually, will see only local traffic.

At present these are the only common corridors in Los Angeles. However, the Gold Line (formerly the Pasadena Blue Line, which despite its name has no connection to the Long Beach Blue Line) is now under construction. It makes use of a former Atchison Topeka & Santa Fe rail line from Los Angeles Union Station (where it will use two station tracks) to Pasadena. The only common corridor on this line is approximately two thousand feet in Union Station itself, where the Gold Line will be adjacent to tracks used by Metra (SCRRA) commuter trains. There is no freight rail service between Pasadena and Union Station.

LACMTA has just completed an alternatives analysis for an extension of the Gold Line (or transit service connecting to the Gold Line) to Claremont, CA. East of Pasadena, the former Santa Fe line still carries local freight for BNSF. East of Cambridge Jct., between Pomona and Claremont, the line carries Metra commuter trains as well. A "locally preferred alternative" has yet to be selected, and no Federal funding has yet been secured. Options being investigated include a double-track light rail line shared with freight trains, an exclusive light rail line with a separate single track for freight, and a busway.

Los Angeles County has a GIS. However, available data do not indicate that it contains a "transportation layer". If not, the State of California Department of Transportation is developing a comprehensive, statewide GIS. URL for the Los Angeles County GIS is:

http://planning.co.la.ca.us/drp_maps.html

Memphis – Memphis Area Transit Authority

Memphis Area Transit Authority (MATA) consists of two segments, now run as parts of a single-direction loop. The original 2.5 mile Main St. Line opened in 1993 and runs the length of Main St., linking the South Main and Pinch historic districts with downtown. The 2 mile Riverfront Trolley Loop connects together the two ends of the Main St. Line, primarily using a railroad right-of-way shared with Amtrak.

The original Main Street line was double track, with 0.8 route miles in an exclusive trolley/ pedestrian mall, and the remainder sharing the street with traffic. In 1997, another 2 miles of parallel line (with 6 stations) was opened, running for most of its length on a double-track railroad right-of-way running along the edge of downtown close to the Mississippi River. One of the tracks is dedicated to MATA use, and the other to Amtrak and local freight. Riverfront cars operate in a one-way loop, using the Main St. Line as one leg of the circle. Table 14 shows the common corridor.

Table 14: Memphis Riverfront Line Common Corridor

Line	From	To	Distance (Mi.)	Note
Riverfront	Auction Ave.	Patterson Ave.	2.0	Canadian Nat'l "belt line"
Total Memphis Common Corridors			2.0	

The trolley loop uses historic trolley cars refurbished by Gomaco. Traction power at 600 VDC is supplied by trolley wire. There is no signal control on Main Street; operation is line-of-sight. The Illinois Central riverfront trackage is also unsignaled.

MATA is currently in the engineering phase of a 2.5 mile extension to connect the existing downtown system with the Medical Center complex. The line will operate in mixed traffic along Madison Avenue generally on tracks located in the inside travel lanes. Grade separations will be provided at two locations: (1) two new rail-only bridges at Danny Thomas Blvd. (one on each side of the existing bridge) and (2) reconstruction of the existing bridge at I-240 (with tracks placed on the bridge). The project will add six new stations and a small park-and-ride facility at the eastern end of the line. Five of the six stations will be located in the center of the street. There will be no common corridor operation on this line.

MATA is currently having contractor Gomaco refurbish five additional vintage trolleys for use on the line. An upgrade to light rail vehicles is planned when the new LRT system comes on line. The project is proposed as the last segment of the downtown rail circulation system as well as the first segment of a regional light rail line. Revenue service is projected to begin in March, 2004.

The MATA common corridor operation makes use of an industrial track also used by one daily Amtrak train to reach the downtown rail passenger station. There is limited local freight service on part of the line. Through freight trains of Illinois Central (now Canadian National) use a "belt line" that passes to the east of downtown Memphis. Maximum authorized speed on the industrial track is 10 mph, it is unsignaled, and carries less than one MGT of traffic. Figure 34 shows a MATA trolley car on the Riverfront Line. Note the absence of fencing between the trolley track and the freight track.

At Pyramid Interlocking, MATA cars cross the IC track. This is a standard railroad interlocking with signals but no enforcement (Figure 35). This is the north end of the Riverfront Line. At the south end, trolleys use an existing street underpass to exit the shared ROW and return to street trackage.

Figure 34: Memphis trolley on Riverfront Line

Figure 35: MATA car at Pyramid Interlocking

The common corridor portion of the MATA line shares a freight rail line, and will be in FRA's track database. Although no map of the MATA trolley line was available for this report, Tennessee maintains a GIS site. The URL is:

http://gis.state.tn.us/index.htm

Newark – New Jersey Transit (NJT)

The Newark City Subway is an obscure light rail line, except perhaps to its 15,000 daily riders. It was constructed in 1934 to provide a grade-separated entry to downtown Newark for various surface streetcar lines then operating in northern New Jersey. During the 1950s, these lines were abandoned one by one, until all that remained was a 4.3 mile line from Newark Penn Station to Franklin Avenue in north Newark. This line was operated with Presidents' Conference Committee (PCC) streetcars, obtained from various cities as they abandoned streetcar service.

By the 1990s, these cars were a half century old, and New Jersey Transit (the line's current operator) began to consider replacements. Kinki Sharyo was selected to provide cars identical to those on the Hudson/Bergen Light Rail Line. At the same time, the line was extensively modernized, with a new 750 VDC power distribution system, a modern ATC cab signal system, and station improvements. The decision was also made to build a new shop facility to maintain the new light rail vehicles and also the cars for a planned Newark/Elizabeth light rail line. This facility was located on vacant land at Grove Street in north Newark, about a mile from the end of the light rail line at Franklin Avenue.

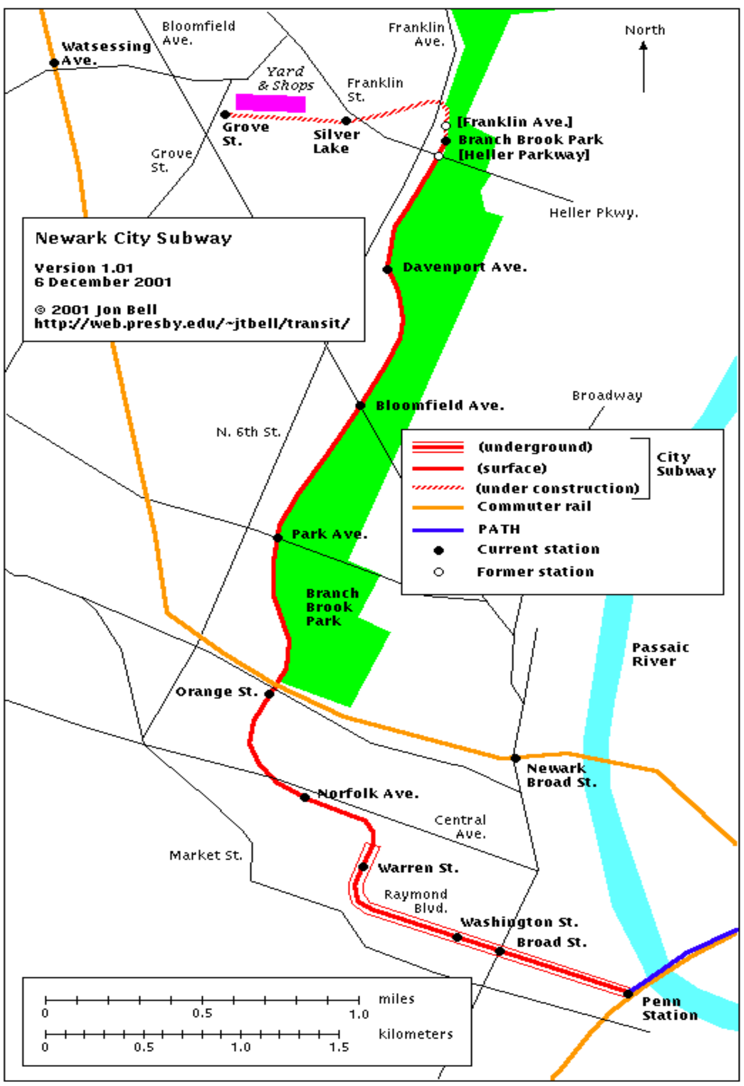


Figure 36: Newark City Subway, Showing Recently Opened Extension

Figure 36 shows the Newark City Subway as it exists, with the recently opened extension shown as a dashed line. The Norfolk Southern Orange Industrial Track connects just to the west of Franklin Avenue, and diverges east of Grove Street, sharing the ROW with the light rail line through the Grove Street station.

To reach the new shop, the light rail line was extended over the ROW of the Norfolk Southern (former Conrail) Orange Industrial Track. Figure 36 shows the ramp from Franklin Avenue station up to the NS ROW, which is elevated at this point. The NS Franklin Ave. overpass is at the right.

Because of ROW constraints, the NS line and the Newark City Subway share trackage for approximately 1,300 feet.

The NS line joins the northbound light rail track (righthand track in Figure 37) just out of sight to the right center of the photo, then crosses from north to south track at Silver Lake station (Figure 38) and finally passes to the south of the terminal station at Grove Street and continues about a half mile to the sole shipper on the line, Hartz Mountain Pet Foods

The short stretch of shared track is protected with derails; switches are under the control of the light rail dispatcher; NS trains are only permitted on the line during the hours when trolleys do not operate. A waiver has been granted by the FRA for this operation.

There is also about 0.8 mile of common corridor from just west of the Silver Lake station to Grove Street, where the NS line is immediately to the south of the light rail ROW. Table 15 shows the common corridor.

Table 15: Newark Common Corridor

From	To	Distance (Mi.)	Note
Silver Lake	Silver Lake	0.2	Shared Track
Silver Lake	Grove Street	0.8	Shared Corridor
Total Newark Common Corridors		1.0	

There are a total of three grade crossings on the shared track/shared corridor segment of the line. NS freight service operates infrequently to serve the one customer on the line, and operating speed is limited to ten mph.

The Newark City Subway extension entered service in mid-2002.

Figure 37: Light Rail Extension to Orange Industrial Track

Figure 38: Crossover for Freight Trains at Silver Lake Station

Figure 39, below, shows the Grove Street Station. The two light rail tracks are clearly visible. The NS Orange Industrial Track is to the right, having diverged from the light rail line west of the Silver Lake station. The light rail maintenance facility is to the left.

Figure 39: Grove Street Station

A GIS for the Newark, NJ area (Essex County) is available at:

http://www.state.nj.us/transportation/gis/maps/

in either PDF or GIF format. The raw GPS coordinate data is available through the same site.

New Orleans – Regional Transit Authority

New Orleans has a bus and streetcar (not light rail) system operated by the New Orleans Regional Transit Authority (RTA). There are currently two streetcar lines:

- The St. Charles Avenue line, running seven miles from downtown to Carrollton Ave. This is said to be the oldest continuously operating streetcar line in America.
- The Riverfront Line, 1. 5 miles long, constructed on ROW of the New Orleans Public Belt Railroad.

A third line is under construction. It will run 4.1 miles on Canal Street, from the Mississippi River to City Park Avenue. A one-mile branch will run on Carrollton Avenue to Beauregard Circle. This line will have no common corridor operation.

The New Orleans system is unusual in two respects:

1. It uses a fleet of vintage trolley cars, a number of which were built by Perley Thomas in the 1920s, and still operate on the system for which they were purchased.
2. The New Orleans system is one of the few remaining "trolley gauge" systems in the U.S. (along with San Francisco, Pittsburgh, and Philadelphia). Gauge is 5' 2½".

The line of interest here is the Riverfront Line. Originally opened in 1988, with standard-gauge vintage streetcars obtained from Melbourne, Australia, this line made use of one of two tracks on the New Orleans Public Belt Railway, a terminal railroad owned by the City of New Orleans. The Public Belt provides switching services for six Class I railroads, and also provides a trackage rights route through New Orleans. Table 16 shows the sole common corridor on the New Orleans system.

Table 16: New Orleans Common Corridor

From	To	Distance (Mi.)	Note
Thalia Street	Ursulines Street	1.5	New Orleans Public Belt
Total New Orleans Common Corridors		1.5	

The Riverfront Line has been rebuilt as a double-track line, and in 1997 was converted to New Orleans trolley gauge as part of the Canal Street construction project. At Canal Street, the Riverfront Line now connects to what will be the Canal Street streetcar line.

This trackage in turn connects to the downtown St. Charles Avenue trackage, making the streetcar services into a unified system. Figure 40 shows the junction of the Riverfront and Canal lines, with the single New Orleans Public Belt track at the left, and the connection to the Canal Line from the Riverfront Line curving off to the right.

Figure 40: Junction of Canal and Riverfront Lines, NOPB track to left

Figure 41 is a view of the tail track at the end of the Riverfront Line near Thalia Street in the Warehouse District. The double-track Riverfront Line runs adjacent to the NOPB track, on 13-foot track centers without fencing. The NOPB is unsignaled, dispatched by voice radio, and has a speed limit of 15 mph through the downtown area adjacent to the Riverfront Line. Despite operation of occasional through freights, total annual traffic on the Riverfront Line is less than five MGT.

The City of New Orleans has a GIS site in beta-test at present. It may be found at:

http://www.new-orleans.la.us/cnoweb/cpc/GISmain2.htm

However, since the Riverfront Line runs entirely on former NOPB trackage, GIS data should be contained in the FRA database. End points of the Riverfront Line will have to be defined with GIS coordinates.

Figure 41: Tail track at end of Riverfront Line, NOPB track to left

New York – MTA New York City Transit

The New York City transit system is a subsidiary of the New York Metropolitan Transportation Authority. This operating subsidiary is currently known as MTA New York City Transit (NYCT). NYCT did not return a survey, and in fact wrote a letter stating that there were no common corridors on their rail system. This section has been compiled from publicly available data.

Common corridor operations, while limited, do exist on NYCT. They consist of two shared corridors, one on the "N" Sea Beach line in Brooklyn and the other near Linden Boulevard in Queens, and one short segment of shared track.

New York City Transit is the largest rapid transit system in the Western Hemisphere, totaling more than 700 miles of mainline track and carrying more than four million riders a day. It is a "heavy rail" transit system, entirely grade-separated. The New York City system, by itself, accounts for more than 60% of annual heavy rail passengers in the United States.

Most of the system was constructed between 1900 and 1948; the train control system is based on wayside signals, track circuits, and enforcement of signal indications by means of mechanical trip arms. Maximum operating speed is 45 mph. The system is electrically powered, using third rail at 600 VDC.

While NYCT has a control center (the "Command Center"), actual control of the railroad is in the hands of train dispatchers at more than 100 "towers" around the system. This will change in the future, however. NYCT is designing a new, state-of-the-art control center, and is testing communications-based train control (CBTC) on the Canarsie Line, which coincidentally runs in one of the two common corridors on the network. The other corridor is in Bay Ridge, adjacent to the Sea Beach subway line.

NYCT's shared track is on the "B" West End Line. An NYCT subsidiary, the South Brooklyn Railway (SBK), interchanges rail freight with the New York Cross Harbor Railroad at 39th Street and 1st Avenue in Brooklyn, then hauls the traffic west across Third Avenue and through a gate onto the B West End line, thence less than a half mile into NYCT's 38th Street Yard, where materials are transloaded to NYCT work equipment. The only freight handled at present is material for track maintenance, but in the past SBK serviced commercial shippers via this shared track.

This shared track operation is carried out without FRA waiver, without derails, and without signal control. Access is via a hand-throw turnout with a manual switch lock. Permission to use the turnout is given by NYCT's Command Center.

Figure 42 shows a map of New York City passenger rail, including commuter rail lines as well as the subway. Locations of shared track and common corridors are identified on the map, and shown in Table 17.

Table 17: New York City Transit Common Corridors

Line	From	To	Distance (Mi.)	Notes
B West End	4th Ave.	6th Ave.	0.3	Shared with SBK RR
N Sea Beach	5th Avenue	New Utrecht Ave.	1.6	NY&A Bay Ridge Branch
L Canarsie	New Lots Ave.	Bushwick & Aberdeen Ave.	1.7	NY&A Bay Ridge Branch
Total NYCT Common Corridors			3.6	

The shared corridor on the Sea Beach Line runs from a tunnel portal east of 5th Avenue, through a cut next to the New York and Atlantic Railroad's Bay Ridge Branch, as far east as the New Utrecht Ave. subway station. At this point, the Sea Beach Line turns south in an open cut toward Coney Island, and the Bay Ridge Branch turns northeast toward East New York and Fresh Pond Junction.

The Bay Ridge Freight Line was once a main line, electrified with overhead catenary at 11,000 VAC and forming part of a major freight route from New England to the south via car floats across New York harbor. Now it is a single-track railroad with a maximum operating speed of 25 mph, devoid of signals and carrying little traffic. It is owned by the City of New York, and currently operated by short line New York & Atlantic Railway.

For most of the 1.6 miles, the subway line and the railroad are at different elevations, although both are below street level. Figure 43 shows a typical section. The New York & Atlantic rail line is at the extreme left lower corner of the photo.

Figure 42: New York City Transit Network, Showing Common Corriodrs

Figure 44 is a photo from the 1950s showing the other segment of common corridor with the Bay Ridge Branch. An NYCT Canarsie Line train is at New Lots Avenue with the catenary towers of the then-electrified Bay Ridge Branch in the background. From New Lots Avenue, the railroad and NYCT's Canarsie Line are close together until north of East New York. However, they do part company for two thousand feet or so at East New York, where the Bay Ridge Line tunnels under the Long Island Rail Road while the Canarsie Line runs overhead on a structure. Figure 45 shows the Canarsie Line elevated structure and the Bay Ridge Branch south of East New York.

Figure 43: N Train at Ft. Hamilton Parkway

Figure 44: Train at New Lots Ave. with Bay Ridge Line in Background

Figure 45: Canarsie Elevated Structure and Bay Ridge Branch, East New York

The Canarsie Line rejoins the Bay Ridge Freight Line briefly north of East New York, in a unique structure with the westbound subway track on the surface next to the rail freight line, and the eastbound track in a tunnel beneath the westbound track. Within a quarter mile, the Canarsie Line enters a subway and diverges from the Bay Ridge line.

There is a track connection near New Lots Avenue from the Bay Ridge Branch into NYCT's Linden Shop complex. Linden Shop receives track materials via the Bay Ridge Branch. The connection is protected with derails and switch locks.

New York State has an active Geographic Information Systems office. This office serves as a clearinghouse for publicly-available GIS data. The clearinghouse URL is:

http://www.nysgis.state.ny.us/

Oakland, CA – Bay Area Rapid Transit

The Bay Area Rapid Transit District was formed in 1957 to plan and construct a rail rapid transit system for the various communities in the San Francisco Bay area. Interestingly, the formation of BARTD coincided with the cessation of rail service across the San Francisco/Oakland Bay Bridge by private operator Key System. The Bay Area Rapid Transit (BART) system eventually constructed a new, 4.5 mile subaqueous tube to restore rail service across the Bay.

The original BART system consisted of 71 route miles and two lines: a north/south line from Richmond to Fremont, CA in the East Bay, and an east/west line from downtown San Francisco to Walnut Creek and Concord, CA, east of the Coast Range. The two lines intersected in downtown Oakland, CA, where BART's headquarters was also located. The east/west line also extended south to Daly City, CA, just south of the San Francisco city limits.

The system has grown to 95 route miles through extensions to Pittsburgh and Pleasanton. An extension from Daly City to Millbrae, CA and the San Francisco International Airport is soon to open, and another planned extension, from Fremont south to San Jose, CA, has just been announced.

BART is a heavy rail transit system, with an entirely fenced, grade-separated ROW. Track gauge is 5’ 6”, a width chosen to permit wider cars and greater stability. Current collection is by third rail, at 750 VDC. BART has always been automatically operated, with full automatic train operation (ATO) and automatic train stop (ATS). Despite this, there is an operator on each mainly as a final safety backup.

BART originally consisted of an east/west line connecting San Francisco with Concord,. CA, and a north/south line in the East Bay. The East Bay line was built largely along existing rail ROW. From Richmond south to Berkeley, the line ran on an elevated structure alongside a Santa Fe Railway branch line. Through Berkeley and Oakland, BART was underground. Immediately south of Oakland, the line returned to an elevated structure, this time along the Western Pacific Railway main line. BART ran adjacent to the WP most of the way to the south terminus at Fremont, CA. A map of the current BART network is shown as Figure 46.

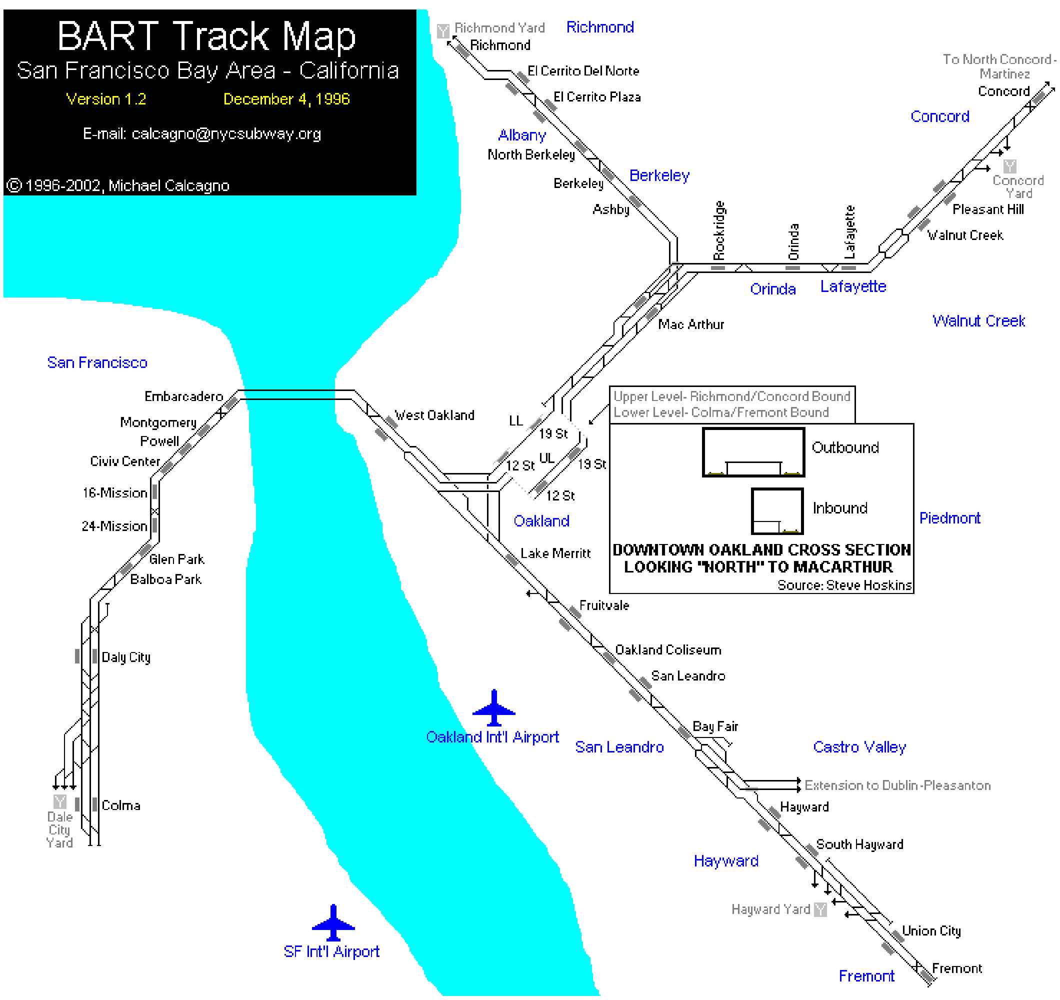


Figure 46: BART Track Map

Table 18 shows the three BART common corridors. The first of these is at the Richmond station. The Santa Fe branch into Berkeley which BART followed has been abandoned and is now, in part, a bike path. The only common corridor on the north end of the line is about one-quarter mile at the Richmond terminus. BART's station is adjacent to the Union Pacific (formerly Southern Pacific) main line, and next to the BART station is a rail passenger station constructed by the California Department of Transportation (CalTrans). See Figure 47 below.

Table 18: BART Common Corridors

From	To	Distance (Mi.)	Notes
Richmond	Richmond	0.3	Richmond station
Melrose	Fremont	16.3	BART mostly elevated
SFO	Millbrae	2.0	Through Millbrae station
Total BART Common Corridors		18.6	

Figure 47: BART Richmond, CA platform and adjacent Amtrak station on UP

The second BART common corridor begins south of Oakland, CA, where BART transitions from subway to an elevated structure. This structure follows the former Western Pacific main line (now the UP Oakland Subdivision) from south of Oakland almost to the end of the BART line at Fremont. At some locations, supports for the elevated structure are within the railroad ROW.

The only location where BART is at grade is between the Hayward station and BART's Hayward Yard. Figure 48 shows the view south from the Hayward station platform, with a BART train approaching. At one point in this area, the railroad and BART are separated by only about 25 feet and a fence, though the distance is greater in most areas.

Figure 48: View of UP from BART Hayward Station

The final common corridor on BART is at the soon-to-be-opened Millbrae Station. This station will be shared by BART and the "Caltrain" Peninsula Commuter service. The BART tracks are adjacent to the Caltrain tracks, but separated everywhere by either fences or a "crash wall". BART will parallel Caltrain tracks for a total of two miles, including the Millbrae station and tail tracks south of the station. However, for part of this distance BART is separated from the commuter tracks by a sound barrier, and there is also a short stretch of subway tunnel (about one quarter mile) at the junction with the line to the San Francisco International Airport (the extension will have two terminals, one at Millbrae and the other at the airport). During off-peak periods, trains will run to Millbrae, then to the airport, then back north. During rush hours alternate trains will serve Millbrae and the airport.

Figure 49 shows the joint Millbrae station, now under construction. Caltrain platform and southbound track are in foreground, across parking lot. BART will serve platform to rear.

Figure 49: Joint BART/Caltrain Station at Millbrae

Caltrain runs about 50 trains per day on their double-track railroad, for a total of about five MGT of traffic per year. Freight service is limited to one local switching job per day, five days per week. Maximum speed is 70 MPH through Millbrae (although most trains stop). The line is controlled by automatic block signals.

In addition, local planning authorities in May 2002 authorized BART to begin planning an extension from Fremont to San Jose, CA. This approximately 17 mile extension will follow the Union Pacific's Milpitas Subdivision for most of its length. Construction should be similar to BART's Fremont line, in which supports for the elevated structure are located within the railroad ROW. However, the Milpitas Sub may be abandoned, in whole or in part, by Union Pacific, since several other routes are available to the railroad between Niles Junction (near Fremont) and San Jose.

BART dispatchers have phone numbers for Union Pacific local supervision in the event of emergencies. Since BART is not often closer than 100 feet or so to active rail lines, or is vertically separated from them, safety rules for workers are not an issue.

A GIS description for BART's trackage may be found at:

http://www.gis.ca.gov/data_index.epl

Oceanside Light Rail Line – North County Transit District

The Oceanside line will be operated by the North San Diego County Transit District (NCTD), which also operates buses and the "Coaster" commuter rail service between San Diego and Oceanside, CA. The line will be operated with diesel multiple-unit (DMU) vehicles, which do not comply with FRA vehicle strength requirements. These vehicles will share trackage on the Escondido Branch with local freight trains operated by Burlington Northern & Santa Fe Railway. The branch is 23.7 miles long. To reach downtown from Escondido Junction, about a mile south of the downtown Oceanside Transportation Center (see Figure 48), the light rail line will leave the shared trackage and run on a dedicated track adjacent to, but separate from, tracks used by the Coaster and Amtrak trains between Los Angeles and San Diego. Total distance is about one mile.

The shared corridor may be separated from the BNSF main line by a fence. The design had not been finalized as of the date of this report. Construction on the line is expected to begin during 2003.

The shared-track operation will be similar to that of San Diego Trolley. Maintenance personal will have to comply with FRA track and signal maintenance requirements, since the entire branch (with the exception of the mile of common corridor between Escondido Junction and Oceanside) will be shared trackage. The Escondido Branch currently sees infrequent (weekly) local freight service at 10 mph. It is planned to use wayside signals for train control, and time separation for freight and passenger operations. Table 19 shows the planned Oceanside common corridor.

Table 19: Oceanside Planned Common Corridors

From	To	Distance (Mi.)	Note
Escondido Jct.	Escondido	23.7	Shared track with BNSF
Oceanside	Escondido Junction.	1.0	Shared corridor with NCTD
Total Oceanside Common Corridors		24.7	

Figure 50 is a map of Oceanside, showing the Escondido Branch and the common corridor. The light rail line will diverge from the railroad ROW at approximately the midpoint of the line in order to serve a campus of San Diego State University. Freight trains will continue operating over the existing alignment at this point; only DMUs will operate through the university.

At Escondido, there will be a maintenance shop adjacent to the existing rail line.

GIS data on this project is available from FRA's railroad GIS database. Design details for the proposed light rail line are contained in the waiver filing with FRA.

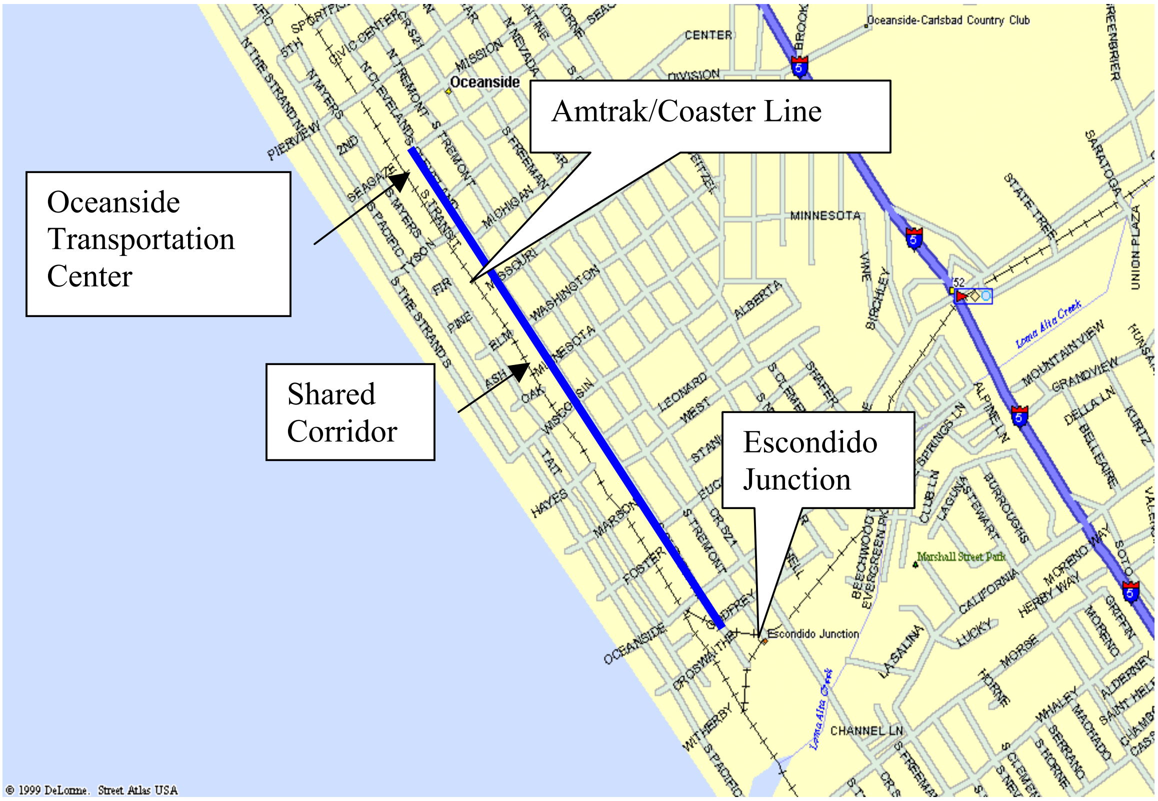


Figure 50: Oceanside Common Corridor, Downtown to Escondido Jct.

Philadelphia – Southeastern Pennsylvania Transportation Authority

Transit service (both bus and rail) in Philadelphia is provided by the Southeastern Pennsylvania Transportation Authority (SEPTA). SEPTA operates a number of rail transit services, including:

- Two rapid transit lines (of different gauges), one entirely in subway, the other mostly on an elevated structure except in the central business district.
- A network of five light rail lines, which share a subway under Market Street in the CBD. These are "trolley gauge," 5' 2½".
- Two suburban, wide-gauge trolley lines (separate from the other light rail lines) and a hard-to-classify "high speed line" running single cars on a third-rail, grade-separated, standard-gauge line.
- A network of FRA-compliant commuter rail lines

The Market-Frankford Line does cross above Amtrak's Northeast Corridor (NEC) on an elevated structure at one point, and also crosses two other, less active rail lines. There is nothing resembling "common corridor" operation on this line.

The light rail trains are single cars, operating at a maximum speed of 50 mph (although lower speeds prevail almost everywhere). Traction power is provided by trolley wire at 600 VDC. The trolleys use a tunnel to reach Center City, and operate in the tunnel under signal control. On the surface, all operation is "line of sight".

Neither the city light rail lines nor the suburban lines operate in common corridors. The Norristown High Speed Line crosses above a SEPTA commuter rail line (also used by freight trains) in downtown Norristown, PA.

The one connection between the city light rail lines and the general railroad network is in Darby, PA, where SEPTA Route 11 crosses the CSX Baltimore – Philadelphia main line at grade. The CSX line is signaled, has a maximum authorized speed of 50 mph, and sees about 20 MGT or eight trains per day. Traffic is controlled with Centralized Traffic Control. Table 20 shows the single diamond crossing on SEPTA.

Table 20: Philadelphia Shared Minor Facility

Line	Location	Distance (Mi.)	Note
#11 Darby	Main Street, Darby	N/A	Diamond crossing with CSX mainline

Since SEPTA is an operator of suburban commuter trains, and CSX and NS operate on SEPTA-owned tracks, an emergency notification system is in place.

There is no signal control on the SEPTA Route 11, which runs in the street. The only protection provided at the level crossing is a set of standard highway gates and flashers. There are no derails, signals, or any other protective devices. In Figure 51, a SEPTA Route 11 car approaches the crossing.

Figure 51: CSXT Grade Crossing with SEPTA Route 11 Trolley, Darby, PA, Looking South

This is currently the only active crossing of a freight railroad main line by a trolley. Other crossings exist, but only on branch lines or industrial spurs and switching leads. The SEPTA crossing has existed for at least 100 years, and there is no record of train/trolley collision at the crossing.

Philadelphia's transportation GIS is currently under development, sponsored by the Delaware Valley Regional Planning Commission.

Portland – Tri-County Metropolitan Transit (Tri-Met) and Portland Streetcar

Portland, OR has two light rail systems. The first is the Tri-County Metropolitan Transportation District of Oregon (Tri-Met), operating the rail system under the name Metropolitan Area Express (MAX). Its light rail line is standard gauge, and currently comprises about 51 track miles. Recently, extensions to the west side of Portland (via a deep-bore tunnel) and to the airport were opened. Figure 51 shows the current network.

The second line is Portland Streetcar (also shown on Figure 51), which uses articulated trolleys built in Eastern Europe. Portland Streetcar operates a 4.5 mile loop through downtown Portland and nearby neighborhoods. Portland Streetcar equipment is smaller and lighter than MAX cars; as a result, track construction is to a lower standard, and while Streetcar equipment can operate on MAX routes, MAX cars cannot operate on the Streetcar trackage.

Both lines use 600 VDC catenary or trolley wire. MAX uses cab signals and ATS on private ROW; street trackage is unsignaled on both systems.

Portland has two common corridors and two shared facilities. The first common corridor is on MAX's line from Portland to the east. For 7.5 miles between the Hollywood station and the Gateway station, the MAX line runs on the south side of the Banfield Freeway, Interstate 84. Since I-84 was originally constructed parallel to the Union Pacific Railroad's main line east from Portland toward Pendleton, OR and Boise, ID, the light rail line is sandwiched between the freeway and the railroad (see Figure 53).

Track spacing in this corridor varies, it is generally greater than 25 feet, and the light rail line is fenced. The Union Pacific line carries more than 40 MGT (about 20 trains per day), and the maximum authorized speed is 45 mph. UP traffic is controlled by Centralized Traffic Control with cab signals.

The second common corridor is in the vicinity of Beaverton Creek station, where MAX shares a ROW with shortline Portland and Western Railroad. Train speeds on this line are 10 mph, train control is by voice radio, and traffic is infrequent. Figure 54 shows Beaverton Creek station and the MAX tracks, with a P&W freight train approaching on the adjacent freight track. Total length of this corridor is about a mile.

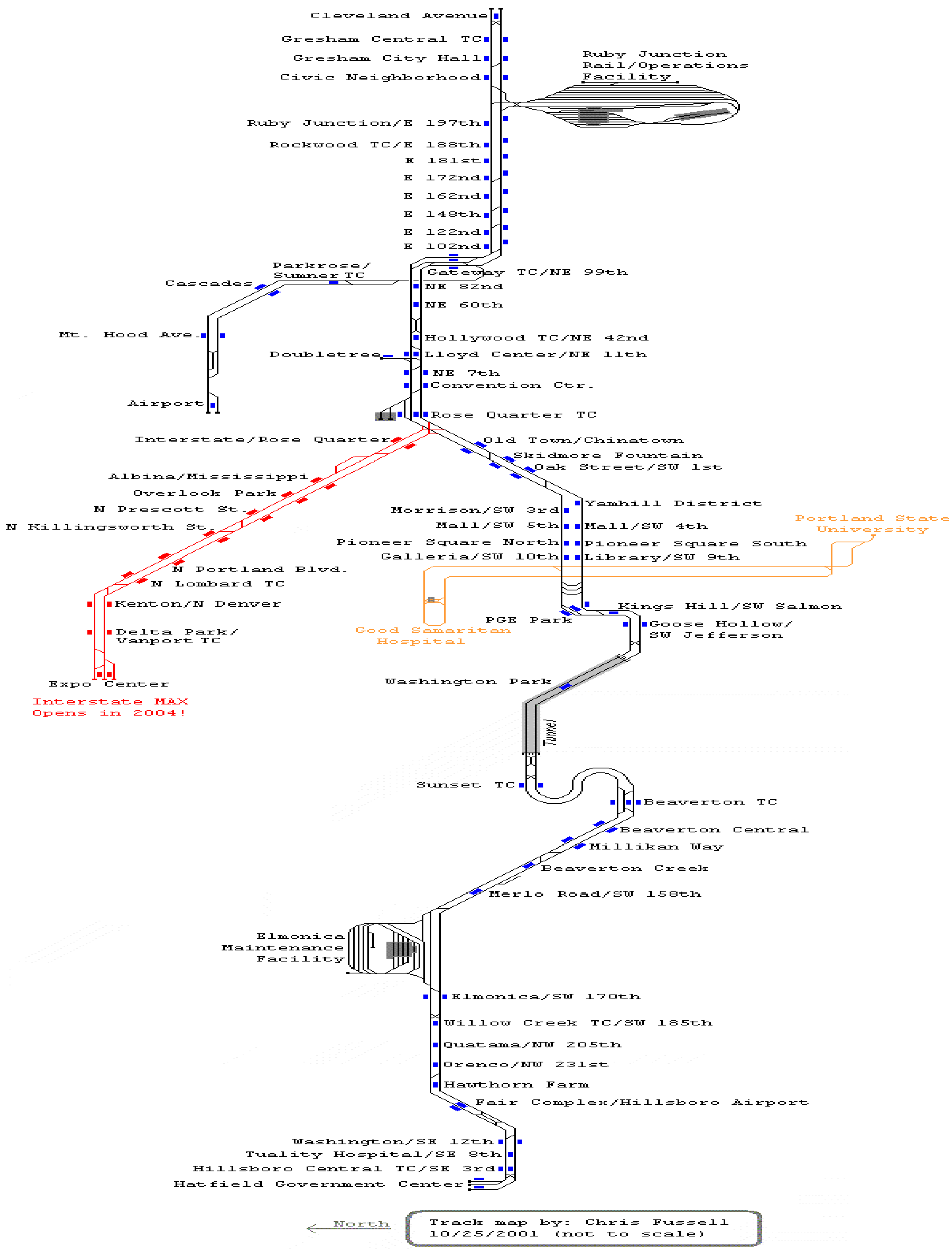


Figure 52: Portland Light Rail Track Map

Figure 53: N.E. 60th Street

Figure 54: P&W Freight Train at Beaverton Creek station

There are also two shared “minor facilities”:

- The Steel Bridge over the Willamette River, which MAX shares with the Union Pacific Railroad. The bridge is double deck, with MAX and automobile traffic on the upper deck and UP trains on the lower.
- A diamond crossing of Portland Streetcar and a BNSF industrial track in downtown Portland.

The Steel Bridge is a lift bridge owned and operated by the Union Pacific Railroad. It was constructed in 1912, and is unique in that the two levels of the lift bridge are independent, allowing the freight railroad portion to raise without interrupting light rail and vehicular traffic on the upper deck. UP restricts its trains to 6 mph over this structure. Figure 55 shows the Steel Bridge.

Figure 55: Steel Bridge, Portland, OR

A railroad employee is on duty 24 hours per day to open the bridge as necessary to allow river traffic to pass. Since the lower deck of the bridge is used by UP freight trains, the bridge mechanism and associated signals are subject to FRA rules regarding inspection and maintenance.

While UP owns and operates the Steel Bridge, MAX and UP have means for communication about the bridge and also have a notification system is in place for incidents on the Banfield Corridor.

The other minor shared facility is a diamond crossing of the Portland Streetcar with a seldom-used industrial spur north of downtown Portland at 13th Avenue. The spur is owned by Burlington Northern & Santa Fe and appears to be inactive. There is no signal protection of any kind at the crossing. Figure 56 shows the BNSF crossing of the Portland Streetcar. The ZETA-TECH staff member who visited Portland reported that portions of the freight track were paved over north of the diamond (between the diamond and the connection to the general railroad network).

Figure 56: Diamond Crossing with BNSF on Portland Streetcar

Table 21 lists the common corridors and minor shared facilities on the Portland MAX and Portland Streetcar system.

Table 21: Portland Common Corridors and Shared Minor Facilities

Location	Type of Facility	Ownership/Railroad
Banfield Freeway	Shared ROW, 7.5 miles	Union Pacific Railroad
Beaverton Creek	Shared ROW, 1.0 miles	Portland & Western Railroad
Steel Bridge	Shared lift bridge, two decks	Union Pacific Railroad
13th Ave., Portland	Diamond crossing	BNSF, possibly out of service

An index of available data, which does not appear to contain GIS data for the Portland light rail system but does include roads and railroads in the State of Oregon, may be found at:

http://www.gis.state.or.us/data/alphalist.html

Sacramento – Regional Transit District

Sacramento has a rapidly growing light rail system. In addition to the 20.6 route miles now in operation, Sacramento Regional Transit District (RTD) has three extensions planned:

1. Mather Field (current terminal) 10.2 miles to Folsom (this will occur in phases; first phase extension is 2.8 miles to Sunrise Blvd.)
2. Bee Bridge 6.8 miles to Meadowview Road (this line is entirely adjacent to a UP freight rail line)
3. 0.7 mile downtown extension to the Amtrak station.

A large part of Sacramento's current system operates in common corridors, and more will do so when the extensions are complete. The South Line will open in 2003; construction of the first phase of the Folsom Line extensions will begin in 2003. Figure 57 is a map of the currently operating Sacramento system plus extensions planned and under construction.

Sacramento operates a modern standard-gauge light rail system using wayside signals and 750 VDC overhead trolley wire or catenary (varies by location).

Common corridors on the currently operating system are as follows:

- From just west of Roseville Road to just west of Swanston (three miles), the Watt/I-80 line parallels the Union Pacific (former Southern Pacific) main line
- From 65th Street to Mather Field Road, a distance of 6.9 miles, the Folsom Line follows the UP (former SP) Folsom Branch.

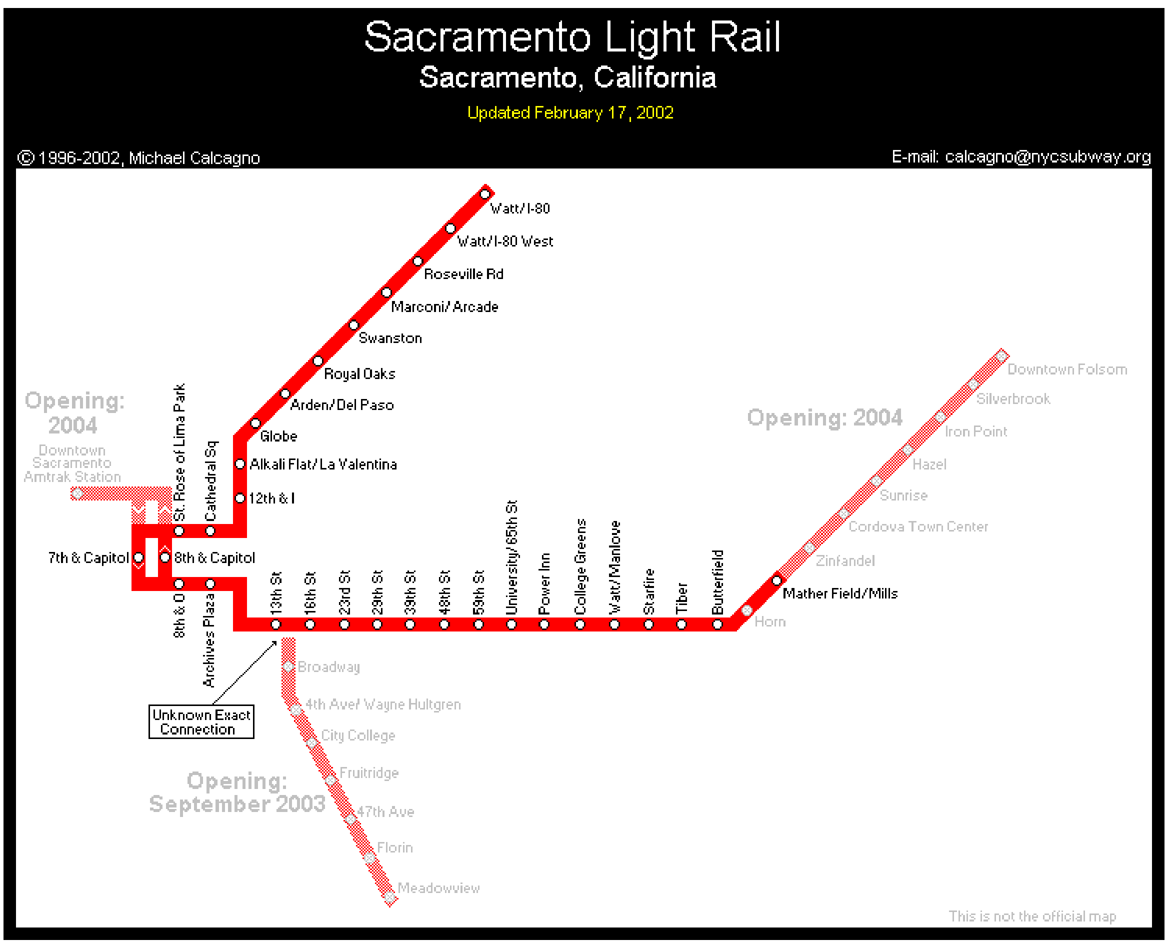


Figure 57: Sacramento Light Rail System

Figure 58 shows a view looking west from the Swanston station. An eastbound Watt/I-80 train is approaching. The light rail maintenance yard is behind the photographer. West of Swanston, the line goes from double to single track as it leaves the railroad

ROW. The track spacing shown at Swanston is typical of the entire three-mile stretch. West of Roseville Road, the line leaves the railroad ROW and climbs to a never-used freeway bridge over the UP tracks to reach its terminal at Watt/I-80. The UP line carries heavy traffic at 60 mph speeds, and is controlled by CTC. There are four daily Amtrak trains (two each way) on this shared corridor.

The other existing common corridor makes use of the ROW of the Folsom Branch, a 10-mph industrial track that formerly extended from the center of Sacramento to Folsom, but is now abandoned west of 65th Street and is out of service from west of Mather Field Road to Folsom. The line was purchased by Sacramento RTD a decade ago, and the light rail line uses this ROW. UP provides local freight service from a junction with its main line at 65th Street to west of Mather Field Road. Operating speed is 10 mph, and the line is unsignaled.

RTD plans to extend service east to Folsom along this line, a total distance of 10.2 miles from the current terminal at Mather Field Road. Construction will occur in phases, with Phase I extending the line to Sunrise Blvd., 2.8 miles. Design is underway; construction has not yet begun. The entire route to Folsom will use the existing railroad ROW. There will be no shared track. Construction will start in 2003.

Figure 58: Common Corridor with Union Pacific Railroad at Swanston

At 65th Street, the light rail line crosses the UP double-track main line on the "Bee Bridge" (named for the local newspaper, the Sacramento Bee). This is also the location of the junction with the South Line, which will extend along the UP tracks to Meadowview Road, a distance of 6.3 miles. Figure 59 shows the junction. In the right foreground is the turnout leading to the Folsom Branch. The Bee Bridge is in the background, spanning the UP tracks. To the left foreground, the South Line curves to parallel the UP main tracks. Spacing is typically 20 feet on center; there is no fencing between the light rail line and the freight tracks. The South Line opens in 2003.

Figure 59: Bee Bridge and Junction with South Line

Current and planned common corridors on Sacramento RTD are shown in Table 22. Refer to the route map for opening dates of the extensions.

Table 22: Sacramento RTD Common Corridors

From	To	Distance (Mi.)	Notes
Roseville Road	Swanston	3.0	In service; UP main line
65th Street	Mather Field Rd.	6.9	In service; Folsom Branch
Mather Field Road	Folsom	10.2	Planned; Folsom Branch
65th Street	Meadowview Rd.	6.3	Under const.; UP main
Total SRTD Common Corridors		26.4	

Sacramento has perhaps a larger percentage of its route mileage in common corridors than any other light or heavy rail system. Sacramento RTD has made an effort to cooperate with Union Pacific (in every case the operator of adjacent rail lines) and recognize FRA concerns in planning its line extensions. As part of the planning for the South Line, RTD participated in workshops with local Federal Transit Administration (FTA) and FRA officials and UP staff, and a series of procedures were developed to deal with malfunctioning grade crossing warning devices and other emergencies. These procedures are attached as Appendix A to this report. They include decision trees, lists of telephone numbers, and other information helpful to those responding to emergencies.

GIS data for Sacramento may be found at:

http://www.gis.ca.gov/data_index.epl

St. Louis – Bi-State Development Agency

St. Louis is another new light-rail system, having run its first train a little more than a decade ago. The St. Louis system makes extensive use of former railroad rights-of-way. Its route through downtown St. Louis uses a railroad tunnel originally built in the 1880s to connect the Eads Bridge (the first railroad bridge over the Mississippi at St. Louis) with St. Louis Union Station. The light rail line crosses the Mississippi River on the Eads Bridge, and follows a former CSX Transportation rights of way on the Illinois sides of the river. From Union Station, the light rail line parallels active Union Pacific and BNSF rail lines to Grand Avenue, and then uses former Terminal Railroad Association of St. Louis (TRRA) and Wabash Railroad ROW for a long distance. However, only the short stretch from Union Station to the Central West End station is shared with active railroads.

The St. Louis system is operated by a Bi-State Development Agency subsidiary called Metrolink, and currently covers 34.4 route miles. One extension is in the planning stages, with construction to start in 2003. The extension will not make use of common corridors.

Metrolink operates with wayside signals and catenary at 750 VDC. Light rail vehicles are articulated, and can operate in trains. There is no street trackage on the system.

The only portion of the Metrolink system that operates in a "common corridor" lies immediately west of St. Louis Union Station (now a downtown shopping mall and entertainment center). Leaving Union Station, the light rail line swings to the west and runs along the north side of the Union Pacific (former Missouri Pacific) main line from St. Louis to Kansas City. The light rail line is adjacent to, and in some areas within 15 feet of, the freight rail line. Just west of Grand Avenue, the light rail line leaves the UP and turns slightly to the north onto a former Wabash Railroad ROW. West of Grand Avenue, a spur from the UP line crosses the light rail line at grade to reach the Metrolink shops and an industrial spur on the north side of the line rail line operated by Respondak, a contractor which provides industry switching services. This spur parallels the light rail line to the Central West End station. Total distance is 3.5 miles. Figure 60 shows the Metrolink system. Table 23 shows the length of the common corridors.

Table 23: St. Louis Common Corridors

From	To	Distance (Mi.)	Note
Union Station	Grand Avenue	1.9	Common corridor w/UP, BNSF
Grand Ave.	Central West End	1.6	Shared ROW with Respondak
Total St. Louis Common Corridors		3.5	

Access to the industrial track and to Metrolink's maintenance facility is controlled by both derails and signals. Derails and the turnout from the UP are locked with Metrolink switch keys. UP cannot open the locks; keys are issued only to the Respondak switch crews and to Metrolink employees.

Signals protecting the diamond crossings are under the control of Metrolink's dispatchers. Freight movements to and from the Metrolink shops and the Respondak industrial track occur only after light rail operations end for the evening. Figure 61 shows a map of the common corridor areas

Figure 60: Metrolink Route Map

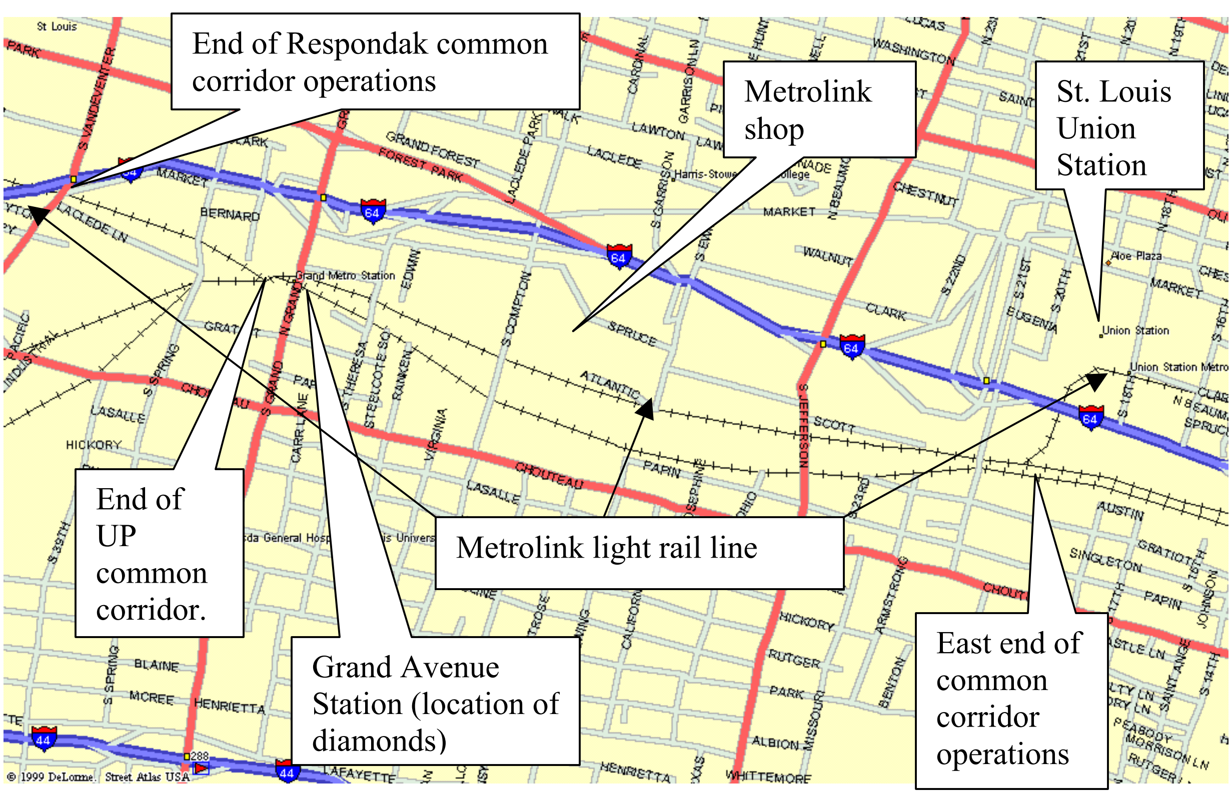


Figure 61: St. Louis Common Corridor Operation

Figure 62 shows the diamonds as seen from the Grand Avenue bridge, looking west.

Bi-State has good lines of communication with Union Pacific. Bi-State train dispatchers have the phone number of the Grand Avenue yardmaster.

Bi-State reports that one derailment has occurred adjacent to the Grand Street station, with coal from one of the derailed freight cars encroaching onto the Bi-State ROW. There was no other damage, and no injuries resulted.

Bi-State also crosses over or under freight rail lines at one location in Missouri, and at three locations in Illinois.

GIS data for much of the Bi-State network may be available from the FRA database, since most of Bi-State's trackage is located on former freight railroad trackage. The St. Louis County GIS site may be found at:

http://www.co.st-louis.mo.us/plan/gis/

Figure 62: Looking west from Grand Avenue, St. Louis

Salt Lake City- Utah Transit Authority

Salt Lake City's system is another new light rail system. It currently includes 15.3 route miles. Of those, 12 route miles involve a shared trackage operation, for which the Utah Transit Authority (UTA) has been granted a waiver for temporal separation by FRA.

The UTA light rail line has two routes. The east/west red line operates principally in streets, together with auto and truck traffic. The north/south blue line operates in streets to 1300 South, where there is a junction with a rail freight spur that continues north on a separate alignment to 700 South. Figure 63 is a system map.

From 1300 South to the south end of the UTA line at Sandy, tracks are shared with freight trains. Service is provided by Utah Railway under contract, with time-of-day separation between light rail trains and freight traffic. There is a level crossing with a UP spur at 2400 South, protected by signals and derails. There is another freight connection at Atwood, 8900 south. The freight line continues south of Sandy, eventually reaching a junction with the UP main line southwest of Provo, UT. Table 24 provides a summary.

The UTA line has conventional block signals without enforcement. Power is supplied by a 750 VDC catenary. Operating speeds are unusually high for a light rail line, as high as 65 MPH on parts of the line. Freight is restricted to 35. Typically, one freight per day operates in the early morning hours to provide switching services to a number of industries located along the light rail line.

Table 24: Salt Lake City Common Corridors

From	To	Distance (Mi.)	Note
1300 South	8900 South	12.0	Shared track with Union Pacific
Total Salt Lake City Common Corridors		12.0	

There are 33 shared grade crossings. All UTA maintenance is performed in accordance with FRA rules, since so much of the line is shared trackage.

There are no common corridors on the UTA trackage, although another UP line (the former Denver & Rio Grande Western main line) comes within about 1,000 feet at one point, and the two lines run parallel for perhaps a mile.

Figure 64 shows the south terminal of the UTA line at Sandy. From here, freight trackage continues south.

The twelve miles of shared track are in the FRA's GIS of the United States railway network. The City of Salt Lake provides GIS data and maps in ARCView format. They may be found at:

http://www.ci.slc.ut.us/info/gis/

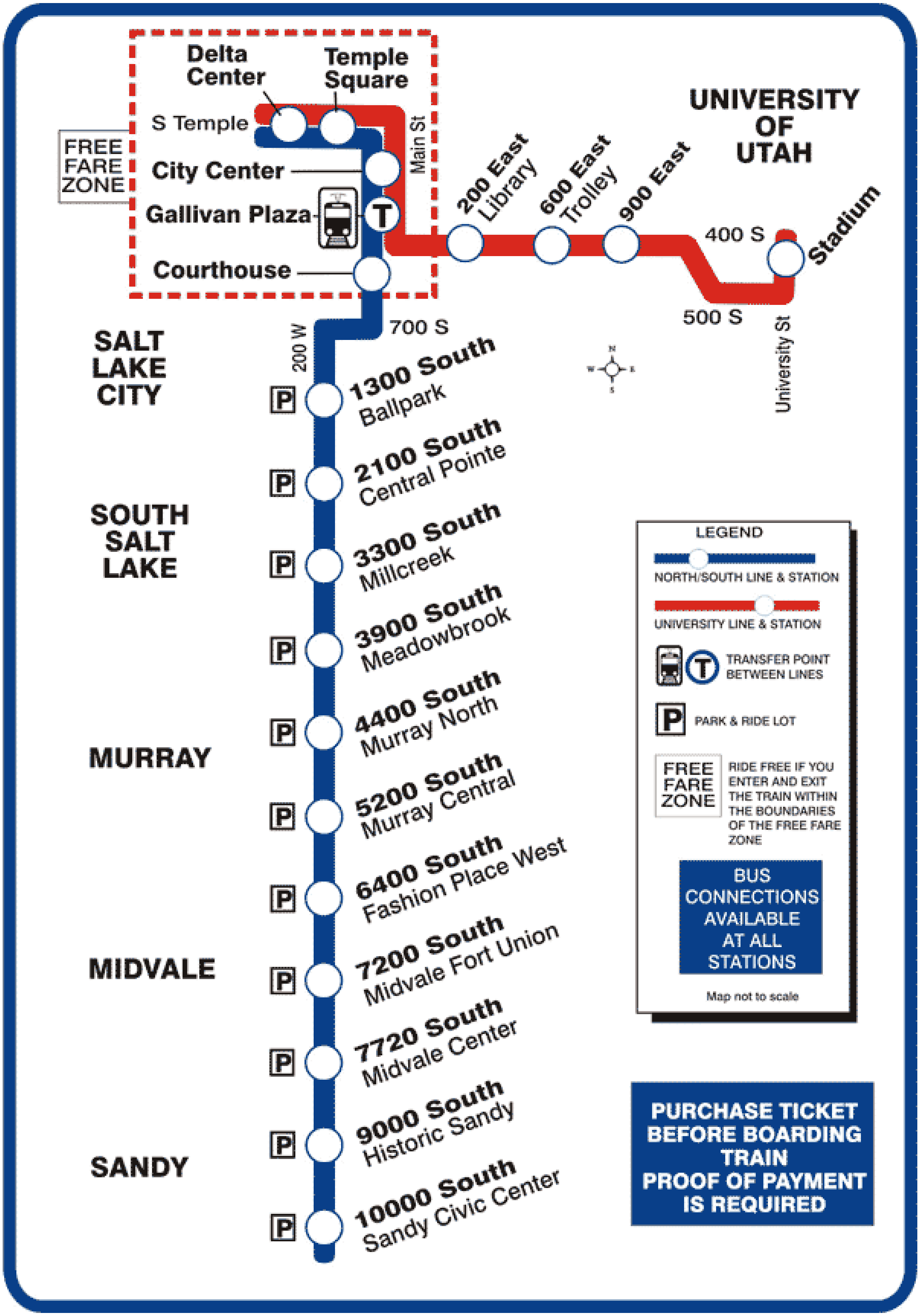


Figure 63 – UTA Route Map

Figure 64: Light Rail Terminal at Sandy, UT

San Diego – San Diego Trolley

San Diego Trolley (SDT) is the first of the new light rail systems in America. The original line from San Diego to the Mexican border at San Ysidro opened in 1981. In a deliberate attempt to keep costs down, builders made use of an existing rail line purchased by the City of San Diego. The existing rail was used, catenary was erected, and some passing sidings were installed. Construction was managed by Metropolitan Transportation Development Board (MTDB).

The line was shared use from the beginning. Contractor San Diego and Imperial Valley (SDIV) provided freight service, connecting with Mexican railroads at the border and with the Santa Fe in downtown San Diego. Of course, there was no temporal separation at first because there were no FRA rules covering shared trackage. Now, San Diego complies with FRA rules on shared use of tracks, and freight service is restricted to the hours that light rail trains do not operate.

As the system has grown, more money has been available and more amenities have been provided to riders. The line to El Cajon (and later beyond to Santee), the second constructed, was also built on an existing rail line and is also shared with freight trains as far as El Cajon. Street trackage in downtown San Diego is obviously not shared, however.

The Harborside Line from the yard at 12^{th} and Imperial to the Santa Fe Depot, and the Old Town/Mission Valley line from there to north of Old Town station are on shared ROW (although the yard itself is shared with BNSF freight trains, Coaster commuter trains, and SD&IV locomotives and cars).

Table 25 shows San Diego common corridors.

Table 25: San Diego Trolley Common Corridors

From	To	Distance (Mi.)	Notes
12 & Imperial	San Ysidro	13.4	Shared track
12^{th} & Imperial	El Cajon	17.7	Shared track
12^{th} & Imperial	Old Town	5.4	Shared corridor with NCTD
Total SDT Common Corridors		36.5	

Figure 65 shows the shared corridor on the Harborside Line. Note the bike path and the fencing between the freight railroad tracks and the light rail line. The track spacing is fairly typical of this newer construction.

The Old Town/Mission Valley line is a continuation of the Harborside Line, also a shared corridor. At Old Town, the station is shared with Coaster commuter trains to Oceanside. Figure 66 shows the station, with the track used by freight, commuter, and Amtrak trains to the left of the picture. Total length of this common corridor is 5.7 miles.

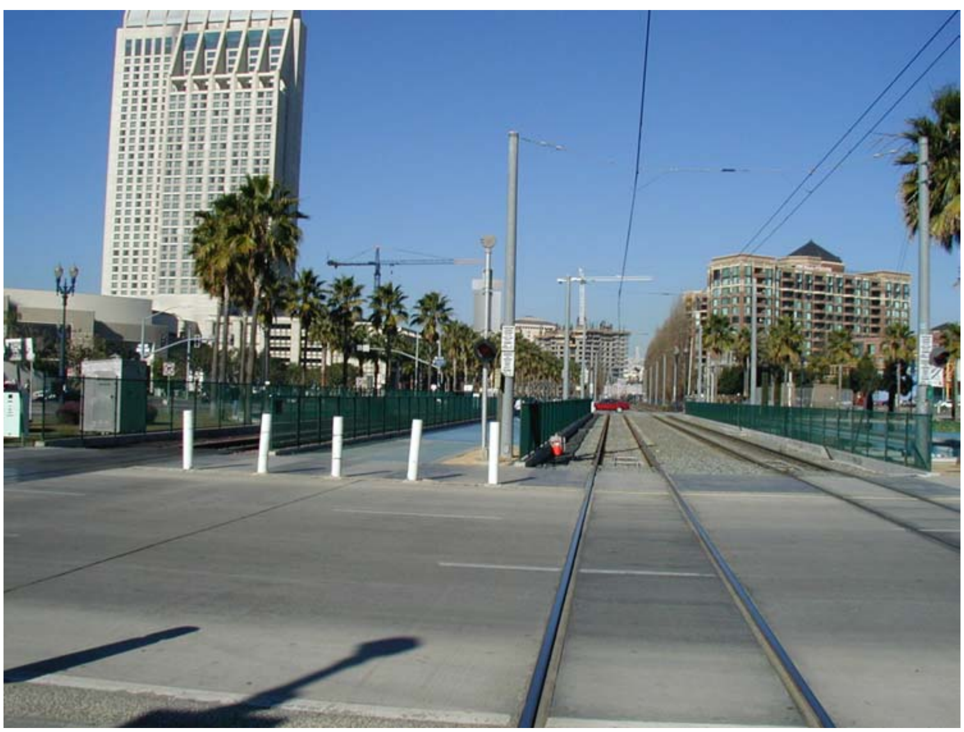


Figure 65: Harborside Line, San Diego with BNSF at Left

Figure 66: Old Town Station

At Old Town, the freight and passenger tracks are in close proximity, with a narrow shared platform between the light rail line and the tracks used by Amtrak, NCTD, and BNSF freight trains. Passengers accessing the light rail platforms from a parking lot must cross two mainline railroad tracks carrying passenger trains at 65 miles per hour.

Freight traffic on the shared trackage is light on the El Cajon line (about three trains per week). On the line between downtown and San Ysidro, SD&IV runs a daily freight train. San Diego Trolley dispatches both lines.

South of the Amtrak station, traffic is limited to two freights per day plus Coaster equipment moves to and from the 12th & Imperial yard. The NCTD-owned trackage on the shared corridor north of the San Diego Amtrak station sees 10 Amtrak trains each way per day, a pair of freight trains, and 22 "Coaster" commuter trains (operated by Amtrak for NCTD). Operating speed is 65 mph and traffic is controlled by CTC. Between the MTDB yard at 12th and Imperial and the Santa Fe Depot, maximum speed is 10 MPH for freight and 15 MPH for passenger trains.

The Mission Valley Line is in sharp contrast to the original route to the border. It is mostly on an elevated structure, which follows the San Diego River through an area of dense residential and commercial development

Figure 67 shows a track map of the San Diego light rail system.

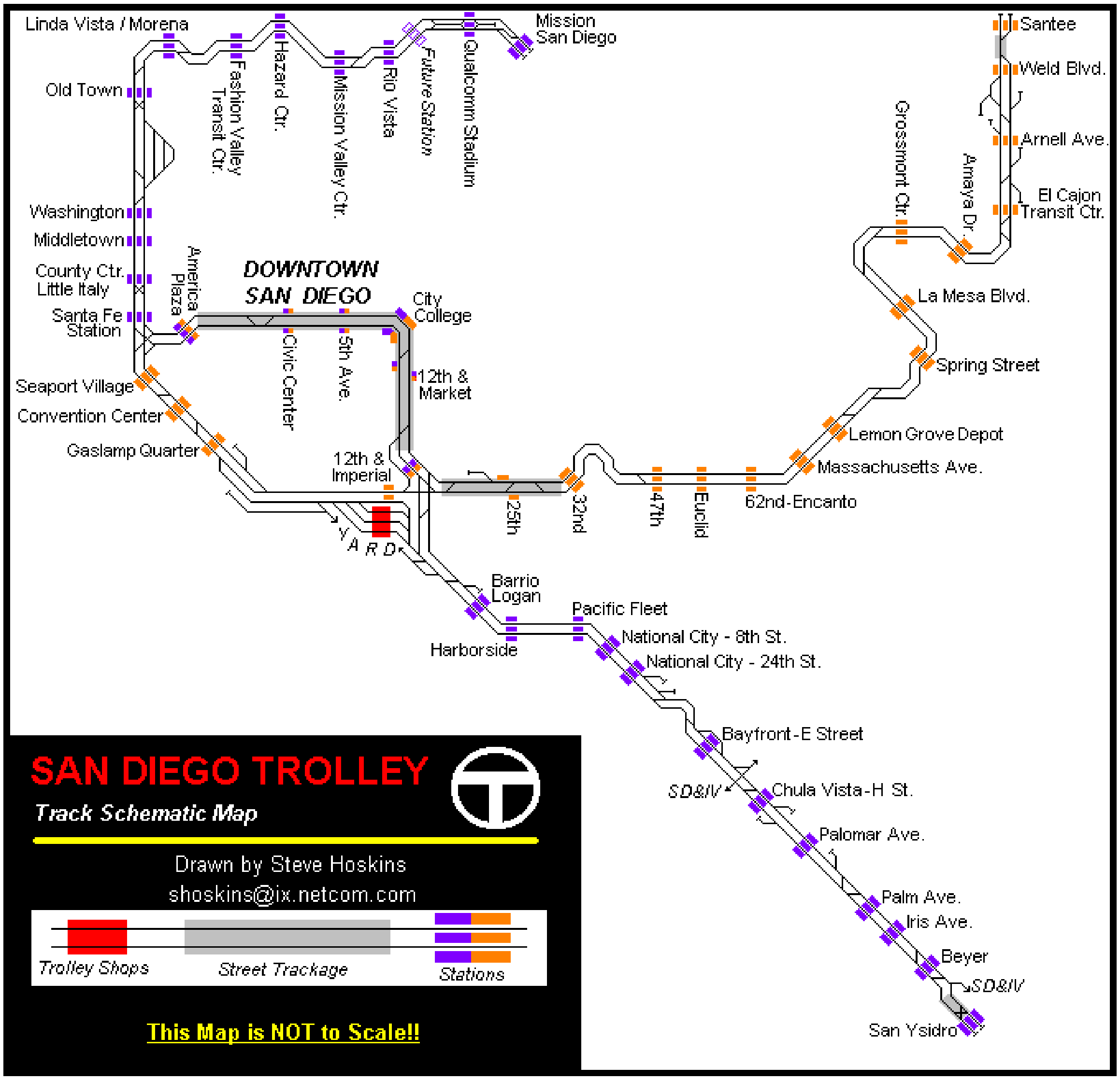


Figure 67: San Diego Trolley Track Map

As with Salt Lake City, San Diego complies with FRA maintenance standards and practices, since with so much of the system consisting of shared trackage, there would be little point in having two sets of maintenance standards.

San Diego Trolley uses block signals (no enforcement) to control operations, except on street trackage. Where freight and trolleys share trackage, there is temporal separation of freight and passenger operation per FRA rules. This constrains freight trains to a very small operating window, especially on the El Cajon line where freight can operate only in a two and a half hour period between the last trolley of the night and the first in the early morning. On the common corridor, freights are likely to show up at any time.

GIS information for San Diego is available from the California GIS Web site:

http://www.gis.ca.gov/data_index.epl

San Francisco – San Francisco Municipal Railway (MUNI)

San Francisco has a diverse transit system, with BART providing rapid transit service on a 5’6” gauge network and San Francisco Municipal Railway (MUNI) operating a “trolley gauge” light rail system somewhat like Philadelphia’s. Five lines converge on a downtown tunnel under Market Street, which was built as part of the BART construction. This is a two-level tunnel, with BART on the lower level and MUNI trains above. As in Philadelphia, trolleys operate in the tunnel under signal control, and by line of sight elsewhere.

Of course, there are also buses, trolley (electric) buses, and the famous cable cars. There are no common corridors or shared facilities anywhere on MUNI’s network except on the planned Third Street line.

Figure 68: MUNI Third Street Line

When the MUNI subway was completed in the 1970s, the intention was to abandon the surface trackage on Market Street, but the city and MUNI realized it had potential as a “historic trolley” route. So for a number of years, vintage trolley cars from various transit properties in the United States and abroad have been operating on Market Street, at first only in the summer tourist season but lately all year.

To relieve pressure on the Powell & Hyde cable cars that carry tourists from Market Street to Fishermen’s Wharf (a popular tourist destination), MUNI decided about 10 years ago to rebuild street trackage in the Embarcadero (formerly freight trackage serving the piers) as a trolley line serving both Market Street and Fishermen’s Wharf. This trackage was connected to the Market Street surface trackage to create a new “E” Embarcadero and Market Street route.

At the same time, tracks were extended south from the Embarcadero to serve the Caltrain Commuter rail station at 4th and Townsend Streets. Initially, service was provided with historic cars, but eventually a portal to the subway was opened near the Embarcadero and cars from the "J" line (which operates in the subway) were routed to a turnback at the Caltrain station.

This led to yet another proposal, for a new trolley line extending south on Third Street through an industrial and commercial area of south San Francisco (see Figure 68). It was hoped that this line might revive the district, which was suffering from the relocation of most port activities to Oakland, CA across the Bay.

The Third Street Line has been funded, and construction started in 2002. It is of relevance here because it will contain a total of four diamond crossings with active rail lines, two on the "main line" and two on leads to the car maintenance facility. MUNI is in the process of determining what kinds of protection will be needed to prevent conflicts between freight and passenger operations. The trackage belongs to the Port of San Francisco. Union Pacific Railroad provides freight service. All four rail spurs see only limited traffic to and from warehouses and wharves. Maximum speed is 10 mph, and train control is by voice radio.

The first phase of the Third Street Line will run to the Bayshore Station in South San Francisco. It is expected to open in 2005. The City of San Francisco and MUNI are also seeking funding for a Central Subway that will run across Market Street to Chinatown. This line will have no shared facilities or common corridors. Table 26 shows the four diamonds on the Third Street Line.

Table 26: San Francisco Shared Minor Facilities (future)

Line	To	Distance (Mi.)	Note
Third Street	Bayshore BART station	N/A	Two diamond crossings with rail spurs, main line
Third Street	Bayshore BART station	N/A	Two diamond crossings with rail spurs, yard tracks at shop

At Bayshore Station, there may be a short common corridor with Caltrain. A final design has not yet been decided. Since this line has not been not constructed, photos are not yet available. Ground was broken for construction on May 28, 2002. GIS data is available from:

http://www.gis.ca.gov/data_index.epl

San Jose – Valley Transportation Authority

The Valley Transportation Authority (VTA) operates a light rail line connecting San Jose with Mountain View and Santa Clara, CA. Like many other light rail systems, VTA is expanding. Current operations cover 29.7 route miles on two lines: a north/south line mostly on Main Street in San Jose, and an east/west line in the "Tasman Corridor", mostly following Tasman Boulevard from Mountain View to north San Jose, although there is some private ROW between Mountain View and Fair Oaks. Figure 69, taken from the VTA Web site, shows the current system. It is shaped like a "T", with the Tasman Line (at top) connecting with the north/south line at Baypointe Station.

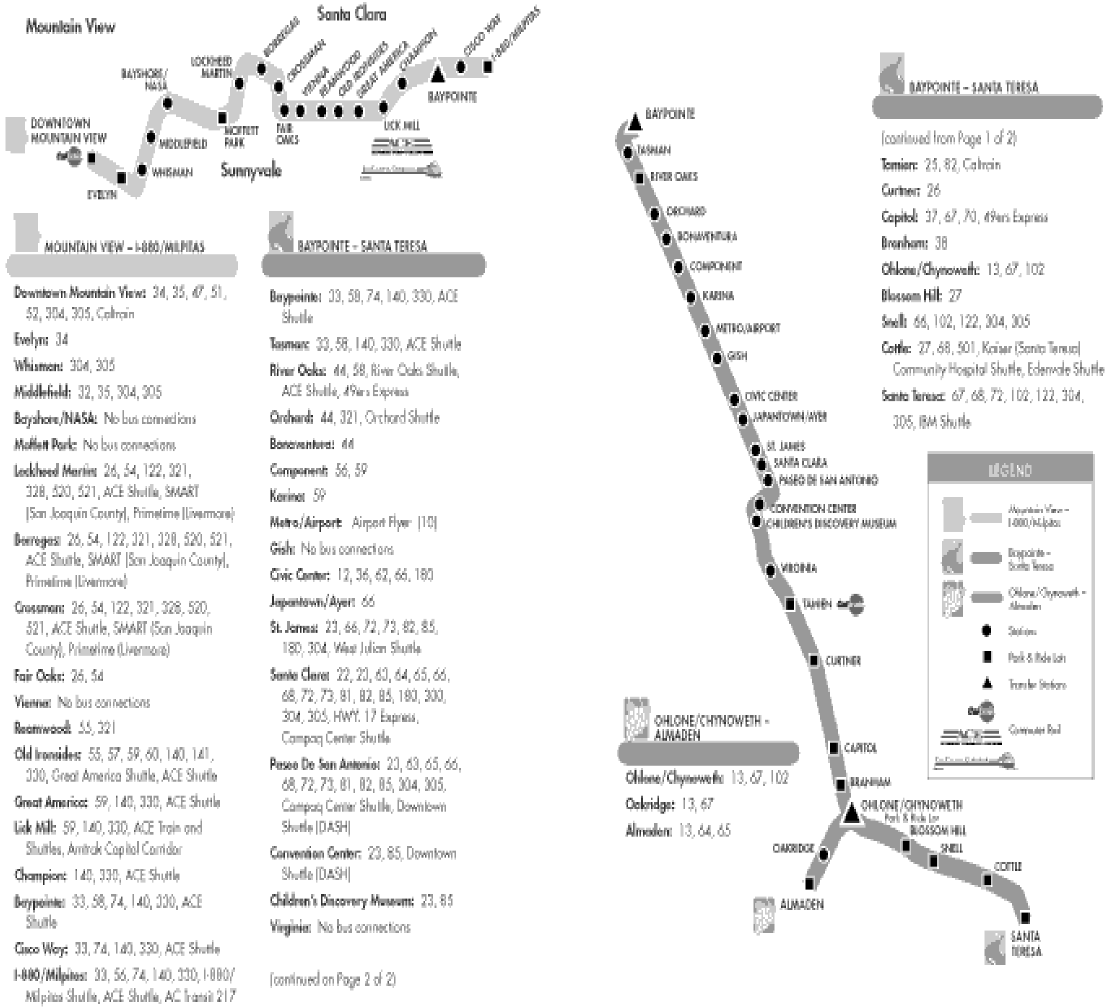


Figure 69: VTA Light Rail System

VTA operates a fleet of articulated light rail cars similar to those used in Sacramento. These cars were designed by the Urban Transit Development Corporation (UTDC), of Toronto. They are now manufactured by Bombardier. Maximum speed is 55 mph, but since much of the system is in streets (the north/south line from Diridon station to Baypointe, and the Tasman Line from Lockheed Martin to its eastern terminus), this speed is seldom if ever reached.

At present, VTA has one common corridor and one segment of shared trackage. These are as shown in Table 27. The common corridor extends from Mountain View to Evelyn, where VTA's Tasman Line parallels the Caltrain commuter line. The single VTA track shares a ROW with Caltrain, but is fenced. There is one track connection, but it is partially dismantled at present. It was installed to facilitate use of the shared trackage. Figure 70 shows the common corridor at Mountain View.

Table 27: VTA Common Corridors, Current

From	To	Distance (Mi.)	Notes
Mountain View	Evelyn	1.5	Shared ROW (Caltrain)
Evelyn	Bayshore/NASA	2.1	Shared track
Total VTA Common Corridors		3.6	

Figure 70: Common Corridor with Caltrain at Mountain View

When VTA was constructed, the National Aeronautics and Space Administration (NASA) wished to retain rail access to Moffet Field. Therefore, VTA filed a waiver application with FRA covering 2.1 route miles, from the track connection to Caltrain north of Evelyn station to a turnout near the NASA/Bayshore station leading to the Moffet Field spur. This segment has never actually been used for rail freight service, which is why the connection to Caltrain has been dismantled.

Caltrain runs about 50 trains per day on their double-track railroad through Mountain View, for a total of about five MGT of traffic per year. Freight service is limited to one local switching job per day, five days per week. Maximum speed is 70 MPH (although most trains stop). The line is controlled by automatic block signals. Caltrain is planning a major project to replace the signals and add additional tracks to permit express operations. This should not, however, affect the common corridor at Mountain View.

Two expansions of the system are underway, and one of these will involve a common corridor.

The first expansion of the system is the Tasman East/Capitol Corridor, an 8.3 mile eastward extension of the Tasman Line from Milpitas, following Capitol Avenue. This extension is partially at grade in a reserved median, and partially on an elevated structure to avoid busy cross streets at some locations. None of it is in common corridors with rail lines. This line is now under construction.

The second planned expansion is the 6.8 mile Vasona Corridor, also under construction. It will parallel the UP Vasona Industrial Lead from the downtown San Diego Amtrak station to Vasona. The track continues another eight miles to Permanente; extensions of the light rail line are possible. Figure 70, from VTA's Web site shows the Vasona project.

The Vasona Industrial Lead sees little traffic. Maximum operating speed is 10 MPH, and the line is currently excepted track. VTA plans to improve the track to at least FRA Class I prior to opening the line for service.

VASONA LIGHT RAIL PROJECT

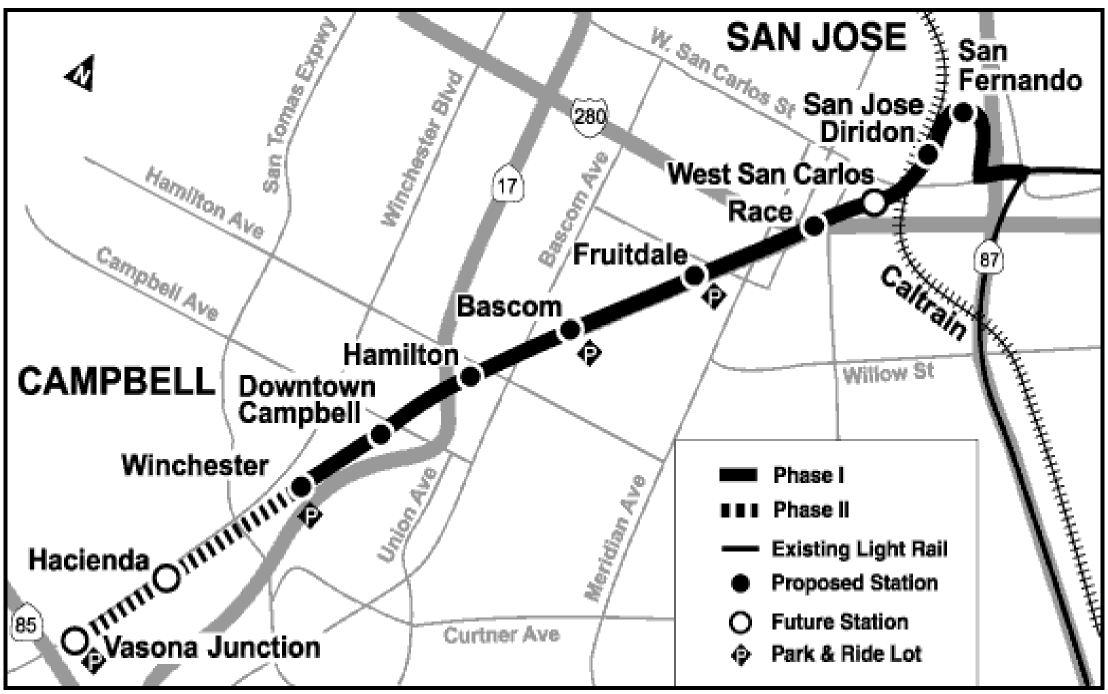


Figure 71: Vasona Light Rail Project

No other San Jose lines run in common corridors, although there are connections for passengers between VTA and Caltrain at Tamien station (VTA is on an elevated structure above and to the west of Caltrain), between VTA, Amtrak, and Caltrain at the Diridon Transportation Center (the Vasona Line will tunnel under the station), and between VTA and Altamont Commuter Express at Six Flags/Great America on the Tasman Corridor (VTA's station is in the middle of Tasman Blvd., on a bridge over the UP line).

GIS information for San Jose is available from the California GIS Web site:

http://www.gis.ca.gov/data_index.epl

San Pedro, CA (Port of Los Angeles Red Car Line)

The Port of Los Angeles (POLA) has funded the construction of a 1.5 mile trolley line to connect various tourist attractions on the San Pedro, CA waterfront. The line makes use of an active freight railroad spur, formerly a part of the Pacific Electric Railway. Trolley and freight operations are temporally separated; trolleys operate from 10 a.m. to 6 p.m., while freights operate at night and whenever the trolleys do not operate. Hand-operated derails protect against simultaneous freight and passenger operations.

The Pacific Harbor Line operates local switching service on the track used by the Red Cars. There is one freight shipper on the line. The PHL Assistant Trainmaster at Badger Bridge will be responsible for ensuring that proper procedures are followed in making the track safe for passenger operation. The contractor for POLA is Herzog Transportation Services, Inc., a contract operator of several commuter rail lines. HTSI personnel will ensure that derails and platform extensions are in the proper position for freight or passenger service (as appropriate) and will report to PHL. The PHL assistant trainmaster will note the report in the Digicon train traffic control system used by PHL.

The Red Car Line uses high-level platforms with retractable extensions. Extensions are raised after trolley service ends, providing clearance for freight cars (see Figure 72).

Figure 72: Red Car at Platform, Showing Retractable Extension

The line contains one passing siding, adjacent to the 6th Street/Downtown San Pedro station. Two cars will operate simultaneously. Three cars have been acquired. Two are newly constructed reproductions of Pacific Electric Railway “Red Cars” of the 1915 period; the third is a restored Red Car. The two replicas will cover most service. The restored car will be used for charters and special events.

Power will be provided by 600 VDC trolley wire. Only the trackage used by the trolleys will be wired. This includes the 1.6 miles of main line and car barn lead, plus the single passing siding.

There is no signal control on the track used by the Red Cars. Operations are governed by General Code of Operating Rules (GCOR) Rule 6.28, which restricts operation on "other than main tracks" to a maximum of 20 mph. PHL freight operates at 10 mph. As noted above, there is no simultaneous operation.

Since the Red Cars use an active rail line, this trackage is already in FRA's GIS database of the U.S. rail network.

Figure 73 shows the restored Red Car adjacent to freight railroad tracks at the south end of the line. This is the only connection to the PHL main line.

Figure 73 : Red Car Adjacent to PHL Trackage

Table 28 summarizes shared track operations on this line.

Table 28:, San Pedro, CA Common Corridor

Line	From	To	Distance (Mi.)	Note
Red Car	Swinford St.	22nd Street	1.4	Shared track with Pacific Harbor Line
Total San Pedro Common Corridors			1.4	

Scranton (Lackawanna County Electric City Station and Museum)

Lackawanna County, Pennsylvania is constructing a historic trolley operation that, when complete, will run from the main passenger station at Steamtown National Historic Park to a visitor center on Montage Mountain. Steamtown is operated by the National Park Service (NPS). The trolley line will be operated by Delaware-Lackawanna Railroad (a short line) for the Lackawanna County Railroad Authority).

The line is currently in operation for a distance of about two miles. Eventually it will extend about four miles in total, to the visitor center on Montage Mountain.

Track and right-of-way are owned by Steamtown (NPS) and the Lackawanna County Rail Authority. The Delaware-Lackawanna Railroad provides freight service to one shipper near the Visitor Center. The shipper is currently serviced from the south. When construction of track for the historic trolley operation is completed, the shipper will be served from the north, via trackage through Steamtown. The connection to the general rail network at the south end of the line will be removed.

Freight trains will not operate when trolleys are in operation, per FRA regulations. Delaware-Lackawanna will supply crews for the trolleys, and will dispatch the trolley line. The Delaware-Lackawanna dispatcher will ensure that simultaneous operation of trolleys and freight will not occur. When construction is complete, the only connection to the general railroad network will be in Steamtown's yard. Figure 74 shows a trolley at the Steamtown boarding location.

Figure 74: Trolley at Steamtown Station

The railroad is operated electrically, with 600 VDC trolley wire. There are no signals; control is by voice radio. Maximum operating speed is 20 mph. One unusual feature of the Lackawanna County trolley is the 4,747 foot tunnel under part of the City of Scranton used by the trolley. Figure 75 shows the north portal of the tunnel just south of the bridge over Roaring Brook.

Right-of-way used by these trolleys was mostly part of the Lackawanna & Wyoming Valley Railroad, a third-rail interurban electric railway that operated between Scranton and Wilkes-Barre. There is no operation in streets, and there are no rail/highway grade crossings on the line. Table 29 summarizes the shared track operation.

Table 29: Scranton Common Corridor

From	To	Distance (Mi.)	Note
Steamtown	Montage Mountain	4.0	Shared trackage owned by Lackawanna County Railroad Authority and Steamtown; freight service provided by Delaware-Lackawanna Railroad
Total Scranton Common Corridors		4.0	

Figure 75: North Portal of Tunnel

Seattle – Waterfront Streetcar Line

The George Benson Waterfront Streetcar Line provides trolley access to the International District, Pioneer Square, various Seattle waterfront activities along Elliott Bay, and Myrtle Edwards Park on 1.6 route miles of trolley line. Service is provided by the King County Department of Transportation. Equipment is meticulously maintained 1927 Australian streetcars brought from Melbourne beginning in 1982. Electric power is provided at 600 VDC via trolley wire.

The waterfront streetcar line is named for George Benson, former City of Seattle and Metro Council member. Known as the "father of the Waterfront Streetcar," Benson was the driving force behind the reinstatement of the historic streetcar line.

Figure 76: Seattle Streetcar Map

The Seattle Waterfront Streetcar makes use of trackage along Alaskan Way formerly belonging to Burlington Northern Railroad. As in San Diego, the initial operation used the existing track. Track has since been rebuilt, and the line has been extended east on city streets to reach King Street Station and Union Station (King Street is Amtrak's station, Union Station is now a transportation center). There are no longer any physical connections between this trackage and other Burlington Northern & Santa Fe tracks. Figure 76 shows the current configuration.

The portion of the Waterfront Streetcar of interest here is the northern 2,239 feet from Bell Street to the carbarn north of Broad Street, plus an additional 328 feet of track through the carbarn to a tail track. For this distance, 0.48 mile, the Waterfront Streetcar Line is adjacent to a busy freight and passenger rail line carrying trains of BNSF plus Amtrak trains. These tracks follow the shore of Puget Sound from Everett, WA to Seattle. At Bell Street, the tracks enter a tunnel and pass under downtown Seattle to King Street Station. The Waterfront Streetcar continues south along Alaskan Way.

Figure 77 shows a typical view of this area, looking south from Broad Street.

Visible in the photo is the point where the trolley track is closest to the BSNF main line. BNSF in this area moves more than 30 MGT, or about 20 trains per day. There are six Amtrak trains as well. The BNSF line is controlled by Centralized Traffic Control. The yellow and red flags in the photo indicate a temporary speed restriction. Maximum authorized speed in this area is 20 MPH.

Figure 77: Looking South Toward Downtown, BNSF Tracks to Left, Streetcar to Right

Table 30 shows the common corridor.

Table 30: Seattle Common Corridor

From	To	Distance (Mi.)	Note
Bell Street	Broad Street	0.5	Shared ROW with BNSF
Seattle Common Corridors		0.5	

Most of the trackage of the Seattle Waterfront Trolley is in the FRA track database, since it originally was freight trackage. The extension east on Main Street to Union Station is in the street, and is not former freight railroad track.

Tacoma – Central Puget Sound Regional Transit Authority

Tacoma is building a new light rail line. It will be only 1.6 miles long, but it is hoped that it might bring a revival of downtown Tacoma. Sound Transit (the Central Puget Sound Regional Transportation Authority) will be the operator. It will use trolleys similar to those on Portland Streetcar, and 600 VDC trolley wire. Of interest here is a level (diamond) crossing with the BNSF Lakeview Subdivision, which runs from Tacoma to Nisqually. Currently the line, known as Tacoma Link, is under construction. Anticipated completion will be in 2003. The line will be unsignaled except for the BNSF crossing. An FRA waiver agreement has been executed. Figure 78 shows a route map.

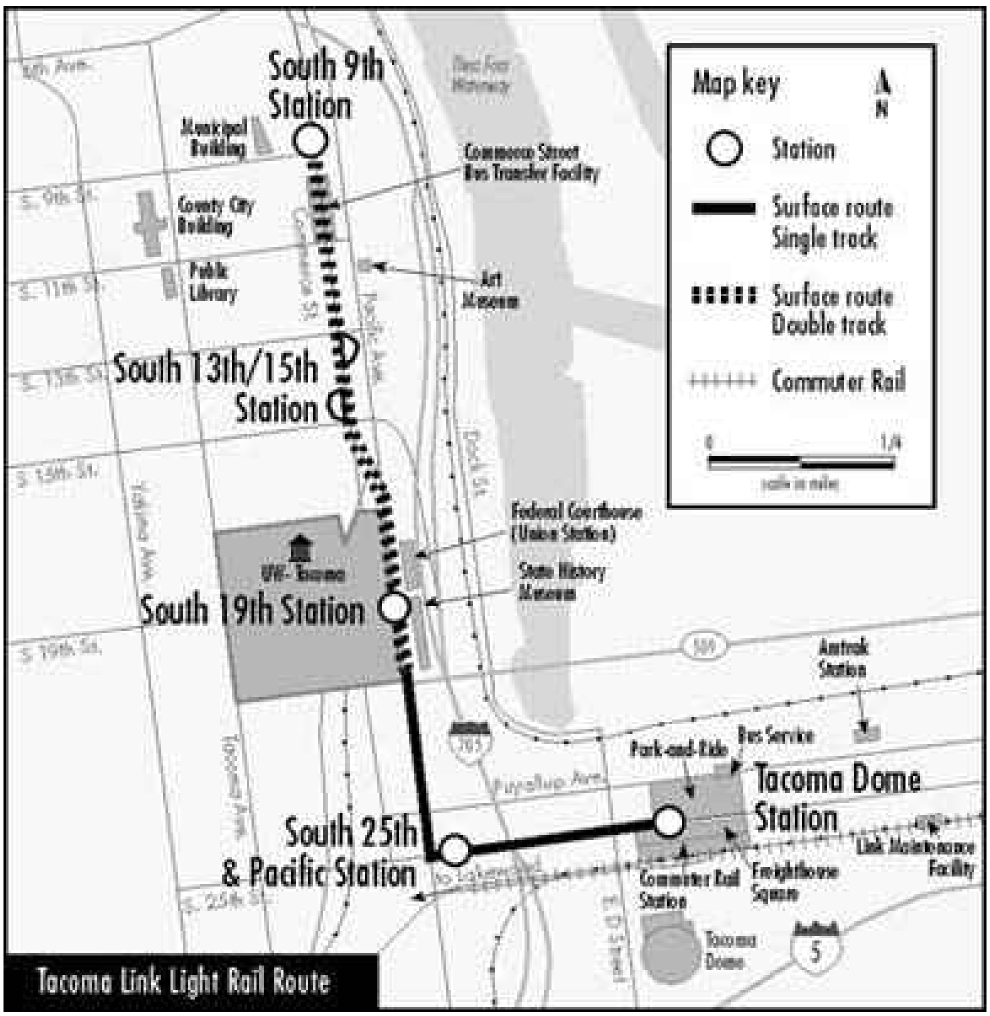


Figure 78: Tacoma Light Rail Route

The Lakeview Subdivision climbs a steep grade leaving Tacoma, and BNSF's timetable includes special instructions to train crews for "mountain grade operation from Tacoma to MP 3.1. The crossing is just north of the Federal courthouse on Pacific Ave. (formerly Tacoma Union Station – see Figure 79 below). FRA has mandated derails and signals at the level crossing at Tacoma's light rail with the BNSF Lakeview Subdivision, due to the steep grade and the risk of runaway cars.

Table 31 shows the shared facility.

Table 31: Tacoma Shared Minor Facility

Location	Facility	Note
Pacific Ave.	Diamond crossing	Crossing with BNSF Lakeview Sub

Figure 79 shows the site of the diamond crossing. Surveying is underway (tripod to left). Construction work is underway elsewhere on the line.

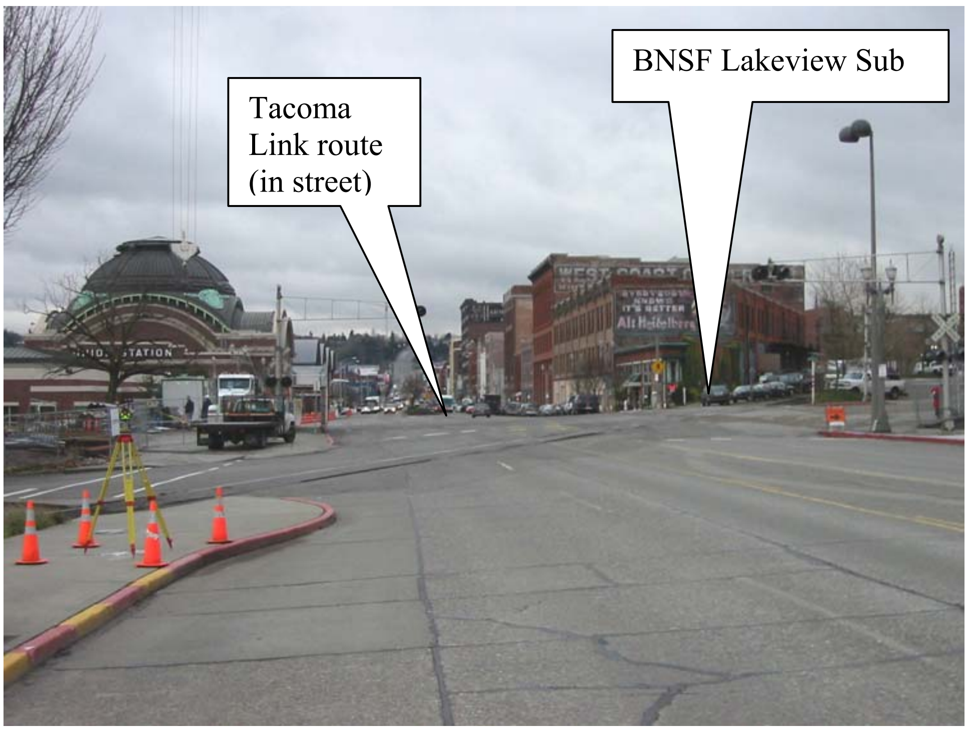


Figure 79: Crossing location, BNSF and Tacoma Link, Pacific Avenue

Tampa – Hillsborough Country Area Regional Transit Authority (HART)

On October 8, 2001, the Hillsborough County Area Regional Transit Authority (HARTline) voted to approve a long range plan to build an electric light rail system. The initial 20-mile, $950-million segment would link downtown Tampa with Ybor City, the University of South Florida and the West Shore business district. The full network would be completed over a 20-year period. The board also approved specific routes and station locations of the first leg, a 2.3 mile "Heritage Trolley" route between downtown Tampa and historic Ybor City. Figure 79 shows a map of the system.

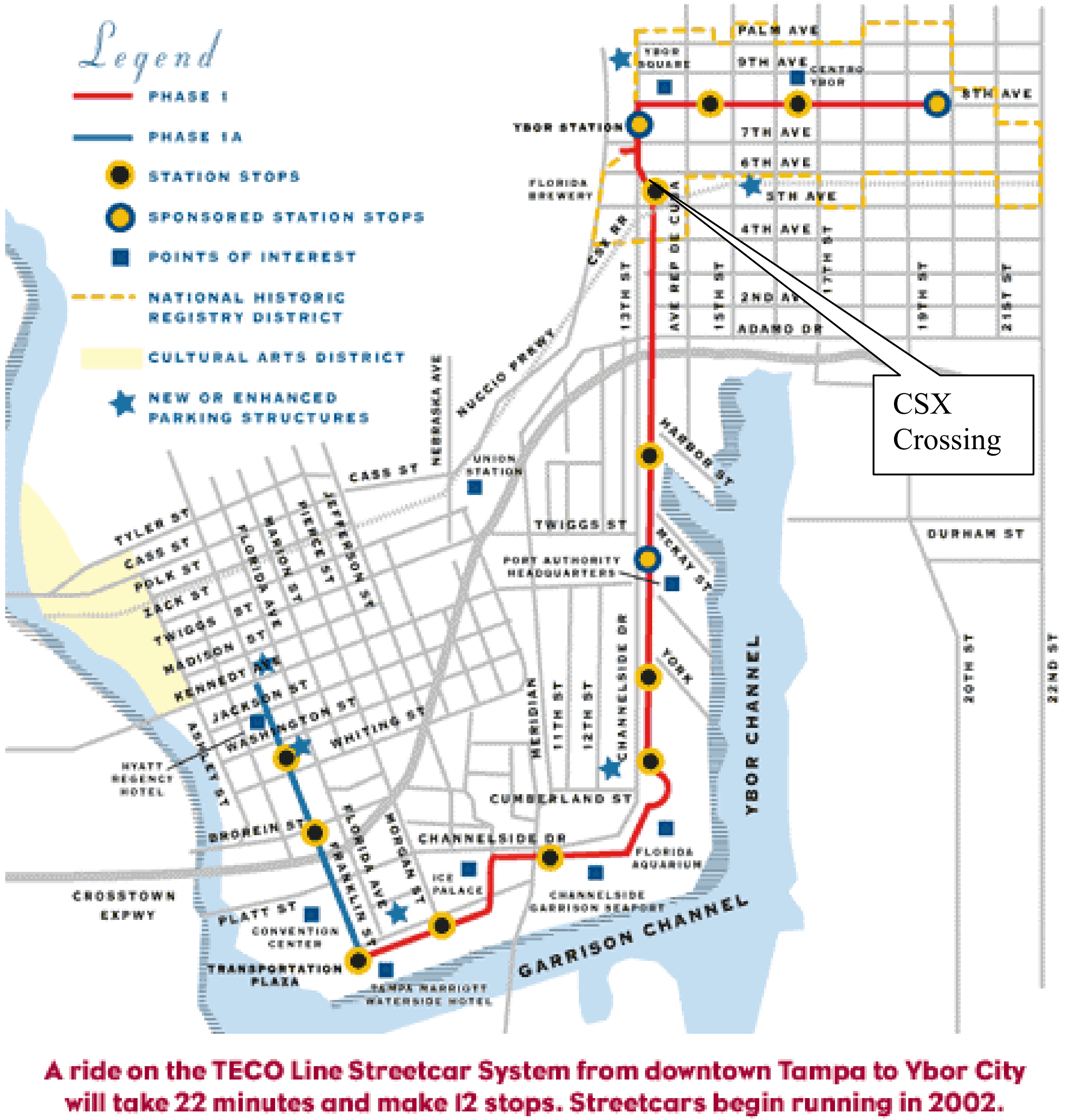


Figure 80: Map of TECO Line, Showing Level Crossing with CSX

The first line segment extends from Ybor City through the Channelside and Garrison Seaport Districts to the Tampa Convention Center in the CBD, making use of a former CSX freight ROW along 13th Street. The system is designed to operate as a single-track bidirectional line with six passing tracks to permit the meeting and passing of streetcars traveling in opposite directions. Up to eight streetcars may operate simultaneously and serve 12 station stops every 6 to 9 min in either direction. The ability to meet this schedule with this limited design configuration is possible because the streetcars have their own separate ROW and thus are not competing with automobile traffic. The vast majority of the ROW, approximately 70 percent, is owned by public entities. The remaining 30 percent in private ownership is being donated to the project.

The line operates with "hard" meets, without signals. The locations of the meets depend on the number of streetcars operating at any one time. All of the sidings are directional with spring switches. Power for the system is 600 volts direct current (DC) supplied by an overhead power distribution system. Track is standard gauge. Equipment will consist of eight replica “Heritage” cars built by Gomaco.

The selected alignment must cross a CSX rail line at grade, as noted on Figure 80. The crossing is located at 5th Avenue and 13th Street in Tampa. This CSX line serves Tampa Union Station, which sees two Amtrak trains per day, and also connects with a spur to Port Tampa. Speed limit across the diamond is 25 mph, and the trackage is controlled by the yardmaster at Uceta Yard in Tampa. To ensure safety, HART will pay CSXT to provide flagmen to protect movements across the crossing.

Table 32 shows the shared facility.

Table 32: Tampa Shared Minor Facility

Location	Facility	Note
5th Ave./ 13th Street	Diamond crossing	Crossing with CSXT industrial track

Trenton – Southern New Jersey Light Rail Transit System

The Southern New Jersey Light Rail Transit System (SNJLRTS) will provide diesel light rail transit service from Trenton to Camden along the Delaware River. Non-FRA-compliant articulated diesel light rail vehicles will travel along a rebuilt freight railroad line for 33 of the 34 route miles. The line will reach the Camden waterfront on street trackage. The north terminal will be at the Trenton railroad station, but there are plans to extend tracks through the streets to the New Jersey state capitol building.

Freight and passenger trains will share the line with time-of-day separation. Conventional color-light block signals will control train movements. Maximum operating speed will be 55 MPH for DMU vehicles, lower for freight. An FRA waiver has been executed for operation. The line is expected to open in late 2003.

Figure 81 is a map of the project. Since most trackage is on the alignment of an existing rail line, GIS data can be obtained from FRA’s railroad track database.

In Camden, the SNJLRTS will operate in city streets for less than a mile, and will also have a short segment of dedicated trackage from Hamilton Avenue on the former Conrail Bordentown Secondary to platforms adjacent to the Trenton Amtrak station. These are separated by at least 50 feet from the tracks on which high speed trains operate.

At certain points on the line, one track may be dedicated to light rail and the other to freight, but essentially all track is shared between Federal Street in Camden and Hamilton Ave. in Trenton. Table 33 shows the shared trackage.

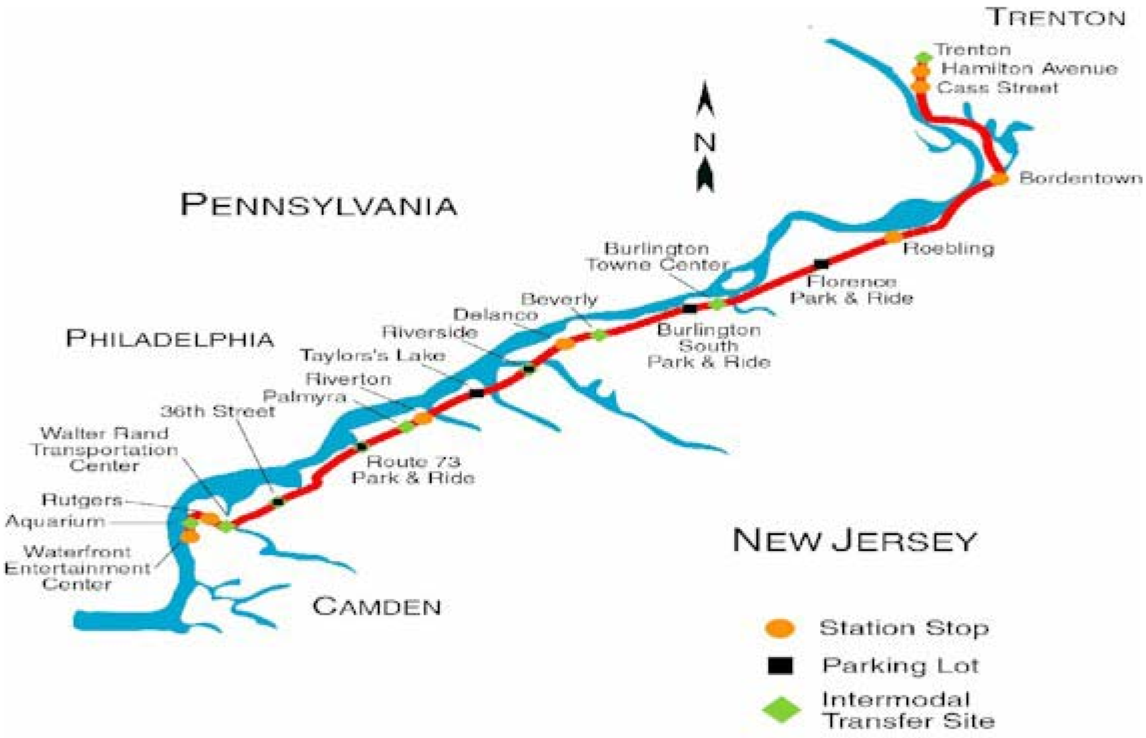


Figure 81: SNJLRTS Route Map

Table 33: Camden-Trenton Light Rail Line Common Corridor

From	To	Distance	Note
Federal Street, Camden	Cass Street, Trenton, NJ	33	Shared track with Conrail Shared Assets
Total Distance		33	

Washington, DC – Washington Area Metropolitan Transportation Authority

Washington's system is a heavy rail rapid transit system operated by the Washington Metropolitan Area Transit Authority (WMATA). WMATA began construction of its system in 1971; the first line opened in 1976. With the opening of the line to Branch Avenue in 2001, the last piece of the 101-mile system originally planned was completed. Extensions of the system are under discussion.

As designed, WMATA was a standard-gauge heavy rail transit system, completely grade separated. Trains were to be automatically operated, with an on-board operator's function limited to announcing station stops and closing the doors. The design maximum speed was 75 MPH.

As the train control equipment and the track structure have aged, speeds have been reduced (to a current maximum of 59 MPH), and the authority has resorted to manual operation of trains pending overhaul or replacement of on-train equipment.

WMATA, like BART before it, was intended as a cross between an urban rapid transit system and a suburban commuter railroad. Many lines reach far into the Maryland and Virginia suburbs. In doing this, they make extensive use of railroad rights-of-way.

WMATA planned for coordination with railroads from the beginning of track construction. All trackage in common corridors is fenced, and the fences are equipped with intrusion detectors. Initially, these detectors provided warnings to railroad personnel and to WMATA's Control Center. They are now wired directly into the train control system, so that an intrusion alert will stop trains on the affected track section.

Figure 82 below shows the current Washington Metro system. Common corridors are listed in Table 34. It should be understood that in these corridors, there may be short sections of subway or aerial structure due to junctions, crossings of the adjacent rail line, or for other reasons

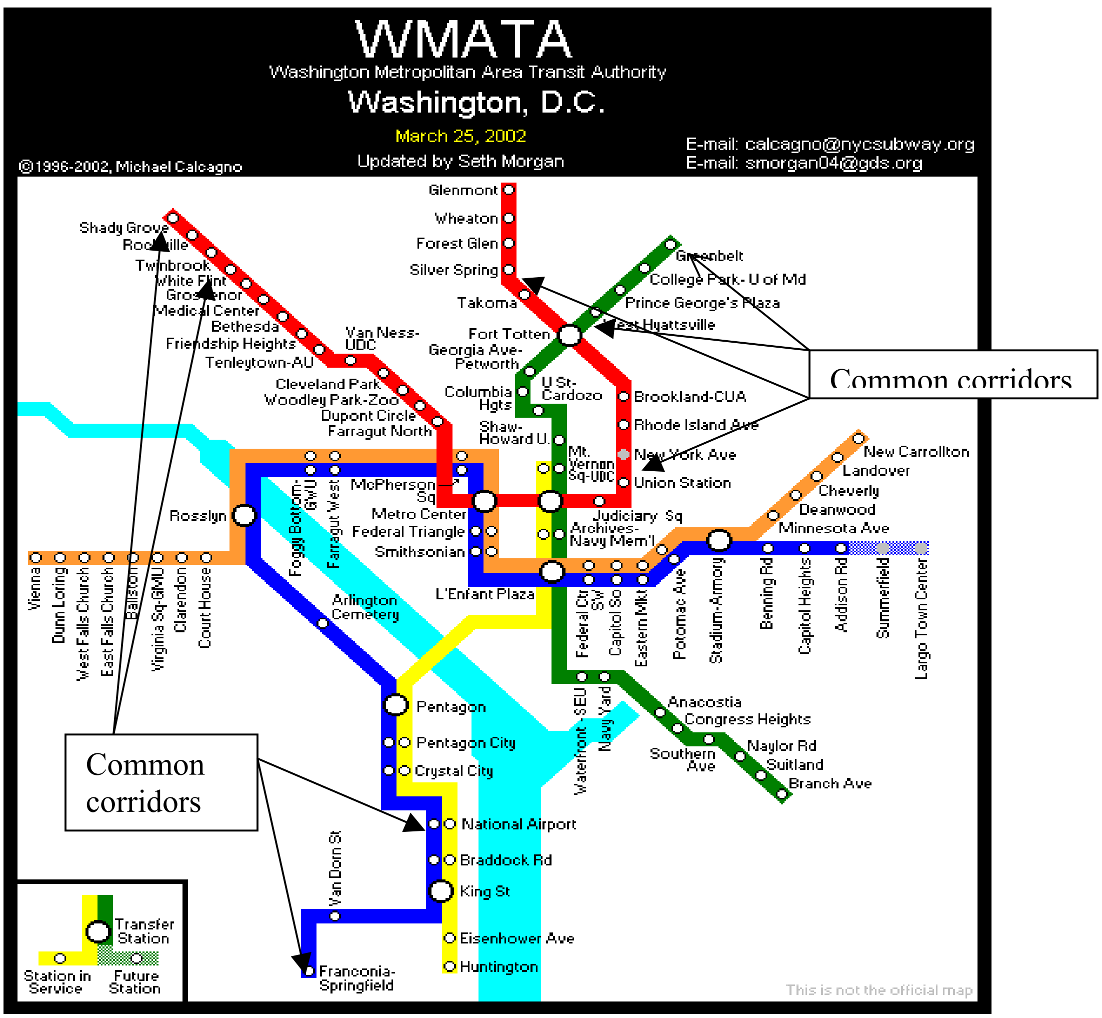


Figure 82: WMATA Route Network

For a time, joint inspections of the common corridors were undertaken with railroad personnel. Now inspections are carried out independently, but close relations are maintained.

WMATA makes no distinction between its rail common corridors and its track in the median of Interstate 66. Identical intrusion detection systems are in use on all common corridors, including the highway, and special work rules for common corridors apply both to rail and highway corridors.

Metro reports a total of six points at which their rail lines cross over or under CSXT, Amtrak, or NS trackage. There are also thirteen highway bridges that cross both Metro and freight railroad tracks.

All the WMATA common corridors are similar in design, although track spacing varies. WMATA reported on their questionnaire that, of the 32.1 miles shown in Table 34, ten miles were "shared ROW" based on the FRA definition, and the balance were "shared corridors". In either case, the ROW is fenced and equipped with intrusion detectors.

Table 34: WMATA Common Corridors

From	To	Dist. (Mi.)	Notes
White Flint	Shady Grove	5.2	Red Line, CSX Metropolitan Sub
Union Station	Silver Spring	7.4	Red Line, CSX Metropolitan Sub
National Airport	Franconia/Springfield	8.7	Blue Line, CSX RF&P Sub, NS Alexandria Sub
Dean Ave.	New Carrolton	5.5	Orange Line, CSX Alexandria Sub, Amtrak Northeast Corridor
W. Hyattsville	Greenbelt	5.3	Green Line, CSX Capital Sub
Total WMATA Common Corridors		32.1	

Figure 83 shows the Greenbelt station, adjacent CSXT tracks, and a platform for the MARC (Maryland Rail Commuter) trains that operate on CSXT.

The freight railroad lines whose ROW Metro shares are busy railroads. Amtrak's Northeast Corridor (New Carrollton) carries 20 MGT and about 50 passenger trains per day in each direction. The CSXT Alexandria Sub and RF&P Sub (Orange Line and Blue Line) are part of the major north/south freight route on the East Coast, carrying more than 40 MGT. Most of this traffic comes off the Metropolitan Sub (Red Line in two separate segments). Virginia Railway Express commuter trains also use this line.

Perhaps the least busy line paralleling Metro is the NS Alexandria Sub, which sees limited use (< 10 MGT) since most freight has been re-routed away from the Washington metropolitan area via Riverton, VA.

Figure 84 is another view of the Greenbelt station, showing the proximity of the CSXT Capital Sub. Fencing is not limited to station areas, but is continuous. All fencing is equipped with intrusion detectors and tilt detectors.

Figure 83: Greenbelt MARC and Metro stations

Figure 84: Metro train at Greenbelt

WMATA has had two instances of intrusion onto the transit ROW resulting from derailments of freight trains, both on the Red Line between Union Station and Silver Spring. In both cases, the intrusion alarms performed their intended function, trains were stopped, and there were no injuries to passengers or Metro employees.

It appears that there is no locally maintained GIS database. GIS data for transportation improvements in the Washington, DC region is only available from:

http://www.bts.gov/gis/

Appendix A: Safety Procedures for Shared Grade Crossings in Common Corridors Developed by Sacramento RTD

FEDERAL RAILROAD ADMINISTRATION/FEDERAL TRANSIT ADMINISTRATION WORKSHOP

HIGHWAY/RAIL GRADE CROSSING WARNING SYSTEMS:
SAFETY REQUIREMENTS FOR JOINT USE CORRIDORS SHARED BY SACRAMENTO REGIONAL TRANSIT AND UNION PACIFIC RAILROADS

Final

Meeting Date: October 25, 2001

Meeting Location: Federal Railroad Administration Offices
801 – I Street, Room 484, Sacramento, California

Attendees:

Federal Transit Administration, Region IX

Edward Carranza	(415) 744-2741

Federal Railroad Administration

Irene Hernandez	(916) 498-6540
Joseph Steffanic	(909) 276-6062
Ken Johnson	(530) 284-1913
Michael Fedora	(916) 498-6540
Brad Hess	(916) 414-2325
Robert Monroe	(916) 414-2325

Union Pacific Railroad

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Glenn Brooks	(916) 789-6305
Trent Allen	(916) 789-6123

Sacramento Regional Transit District

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W.P. Grizard	(916) 321-2846
Larry Davis	(916) 648-8422
Alan Storey	(916) 648-8410

California Public Utilities Commission

R.G. Webb	(916) 327-3131
Bree Arnett	(415) 703-1722
Joe Farley	(916) 327-3239

SCRRA

Jaime Romo	(909) 859-4101

Gannett Fleming PMOC Team

David Adams	(415) 760-0345
Stanimir Jacimovic	(415) 981-5335

PURPOSE OF THE WORKSHOP

The purpose of this workshop was to:

Verify and refine the agreement on procedures to ensure safety at shared highway rail grade crossing warning systems between Sacramento Regional Transit and Union Pacific Railroad.

Discuss Roadway Worker Protection requirements.

WORKSHOP REPORT

1. OPENING REMARKS

The workshop was organized and chaired by Mr. Mike Fedora and Mr. Joseph Steffanic from the Federal Railroad Administration (FRA) office in Sacramento. After welcoming all participants, they reported that the FRA and other regulatory entities have requested that an agreement and that straightforward instructions be developed for the Sacramento Regional Transit and Union Pacific Railroad personnel in the event of joint construction, testing, repair, record keeping, as well as accident and incident reporting for the shared highway rail grade crossing warning systems on joint use corridors.

Mr. Joseph Steffanic handed out FRA documents containing:
Definitions,
Sketches showing some examples,
Federal regulations and Railroad Actions,
Appendix B to Part 234, and
Pertinent Regulations

In addition, meeting minutes from the September 19, 2001 meeting were distributed to all participants for their review and comments.

2. DEFINITIONS

To avoid misunderstanding, Mr. Joseph Steffanic recommended that the definitions used in all further discussions and in the final document be in accordance with Part 234 and Appendix B.2

3. INCIDENT NOTIFICATION, DECISION, UP/RT ACTION AND REPORTING TREE

Mr. W.P. Grizard presented the final draft for the notification, decision-making process, UP/RT action, and reporting tree developed in accordance with the discussion held on September 19, 2001. This material was accepted by all parties and constitutes a draft agreement for the shared highway rail grade crossing warning systems on the joint use corridors. If implemented, this document will ensure that all safety and regulatory requirements of 49 CFR Parts 214 and 234 are fulfilled.

4. WAIVER

The decision was made to move to another meeting a discussion of RT's need for a waiver to flag a crossing in the event of an activation failure, as it did not involve all parties.

5. HOT LINE

The decision was made that emergency communication between RT controllers and UPRR dispatchers could be expedited by the use of a dedicated phone line between Roseville dispatch office and Metro Control.

6. OPERATING RULE DIFFERENCES

RT will change their operating rules on protecting adjacent railroad tracks and will eliminate the rule of stopping when personnel are between the tracks. Other rules possibly conflicting will be examined in a follow-up meeting between UPRR and RT.

7. ROADWAY WORKER PROTECTION

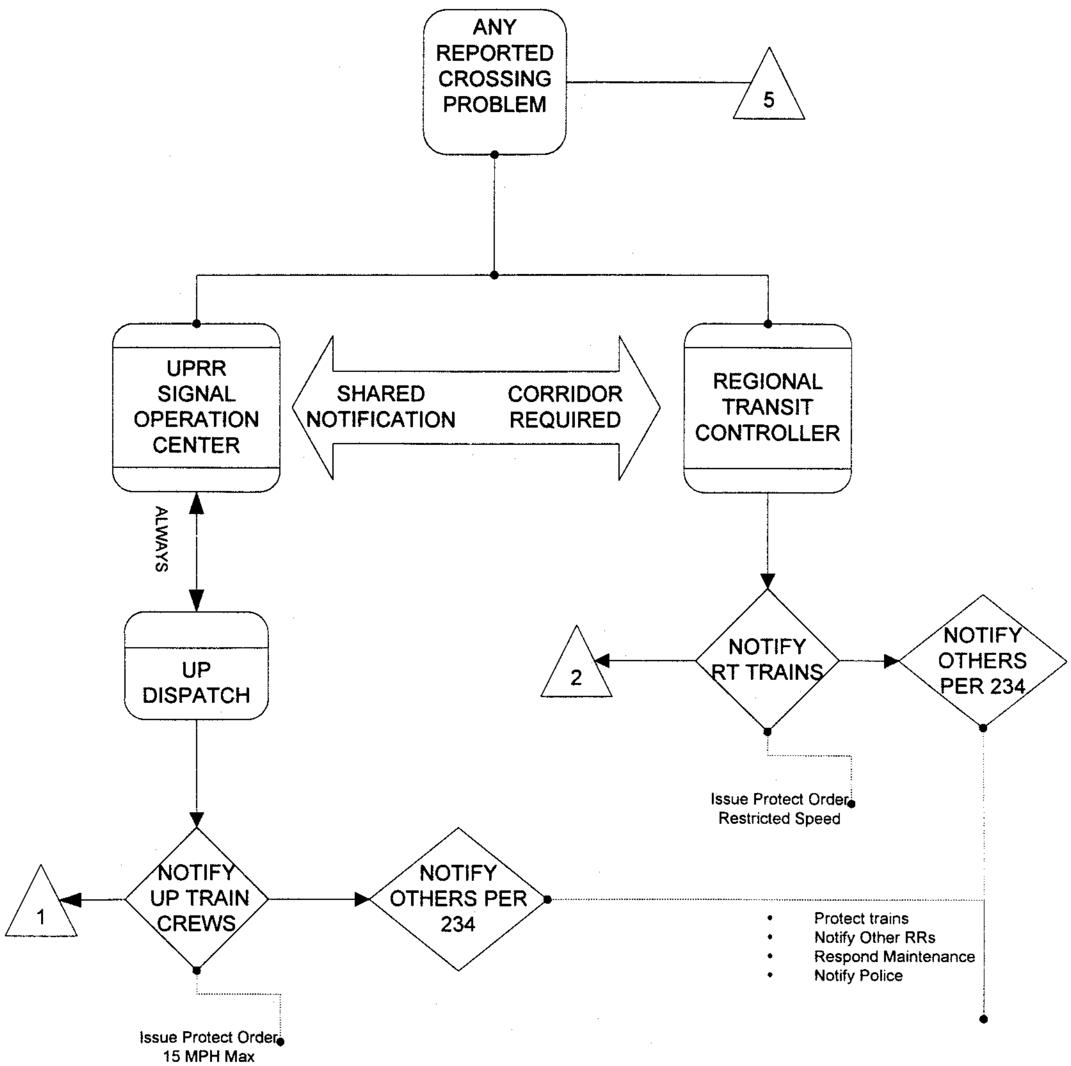
It was agreed that whenever necessary, both railroads, Sacramento Regional Transit and Union Pacific Railroad will create one joint-work group with one employee in charge. Only employees who pass both safety Roadway Protection programs can be designated to be in charge. To certify that employees are qualified and have passed the safety roadway protection programs, both railroads will use a 'train the trainer' system.

The understanding is that the employee in charge (EIC) be fully qualified under the Part 214 Subpart C requirements. The EIC does not have to be qualified on operating rules of both railroads.

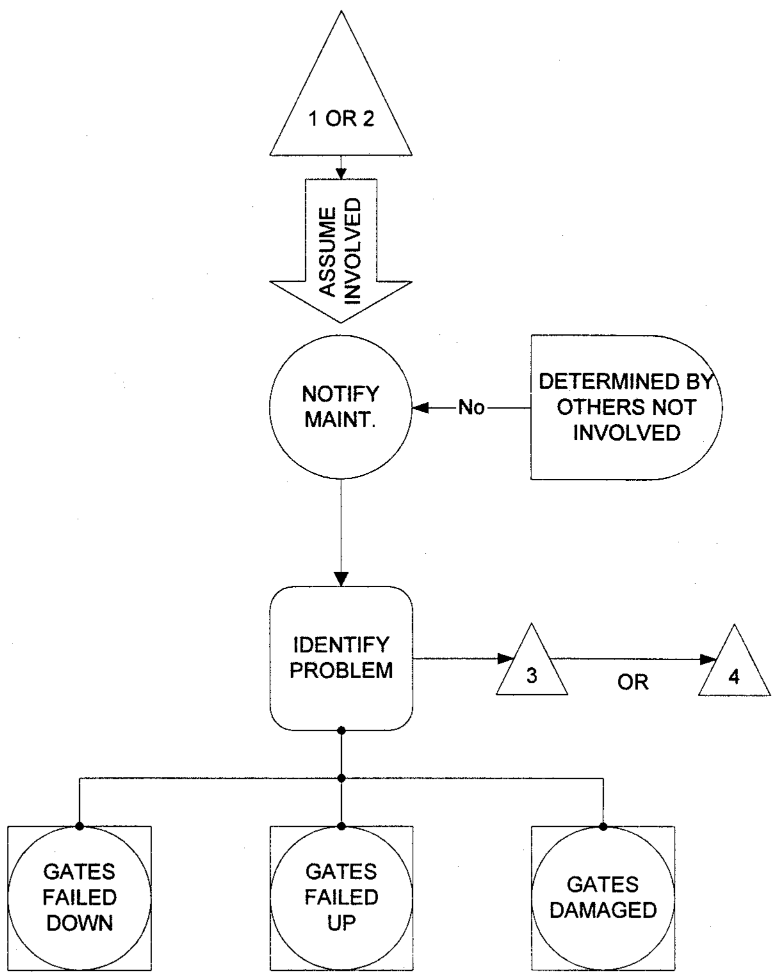
Copies of the flow charts/decision trees are attached.

FRA WS 102501a
SJ/DSA
35868
12/14/01

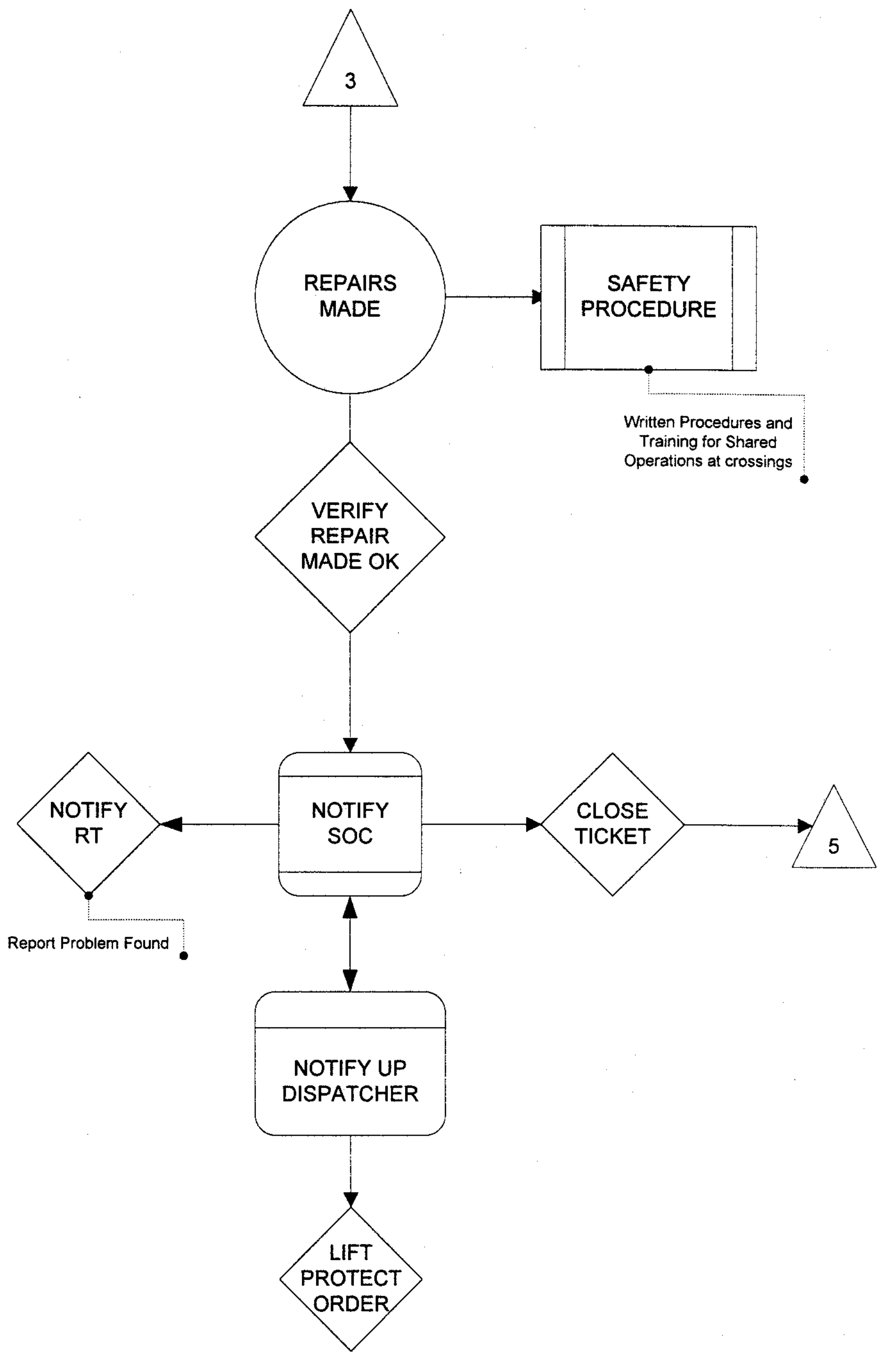
NOTIFICATION TREE



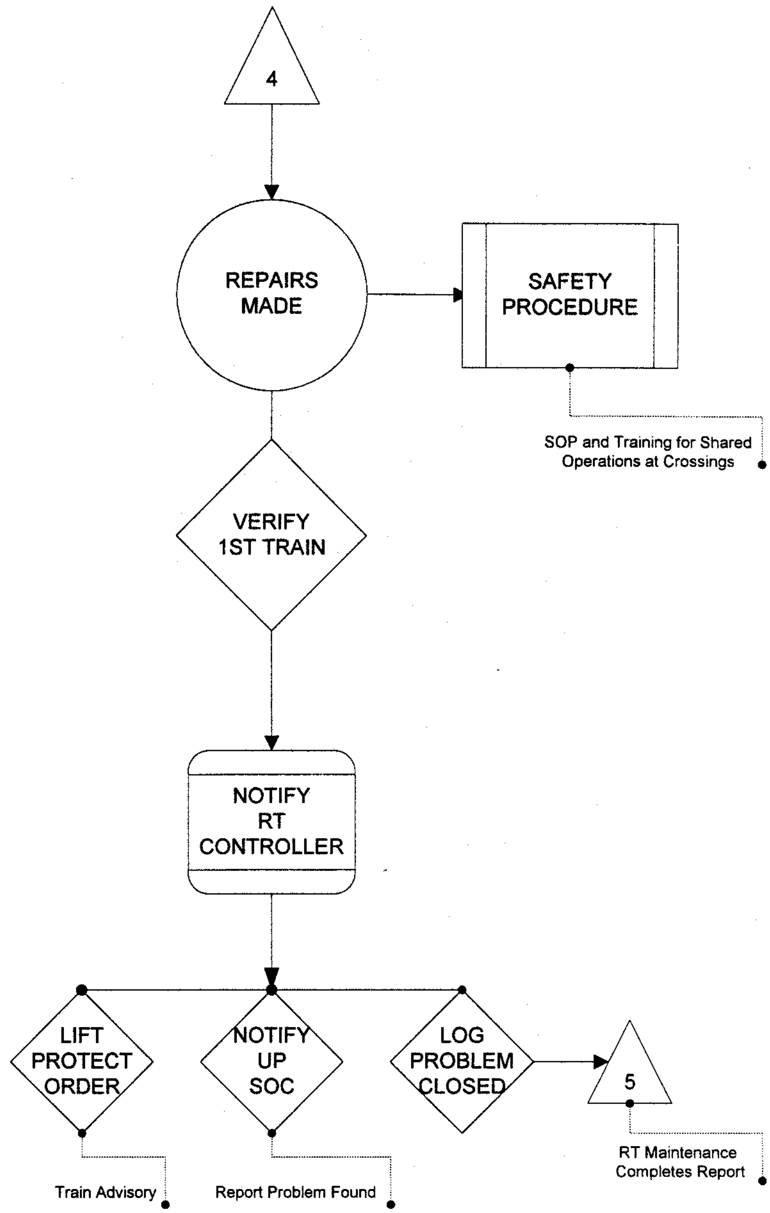
DECISION TREE



UNION PACIFIC ACTION TREE



REGIONAL TRANSIT ACTION TREE



REPORTING TREE