northeast corridor transportation

CONNECTIONS

linking
our region's
opportunities

INITIAL RESPONSE TO KEY ISSUES

Response to
Policy Steering Committee Directives
and
Public Comments

December 2001

Prepared by
The Indianapolis Metropolitan Planning Organization
and
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northeast corridor transportation

CONNECTIONS

linking our region's opportunities

RESPONSE TO KEY ISSUES

A Response to
Policy Steering Committee Directives
and Public Comments

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RESPONSE TO KEY ISSUES

A Response to
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Executive Summary

The Response to Key Issues for the Con**NECT**ions study was prepared as a result of directives received from the Con**NECT**ions Policy Steering Committee and citizen comments received at five community outreach meetings.

Current Status and Next Steps – As of December 2001, the Draft Environmental Impact Statement (DEIS) is complete and was made available for public review on September 28th. The Indiana Department of Transportation (INDOT) conducted an official public hearing on November 15th to encourage further comments on the document and process. Approximately 350 people attended the public hearing.

Following the public comment period (and based on input from the public, agencies, the Citizens Advisory Committee and the Technical Working Group) the Policy Steering Committee, with INDOT, will approve a locally preferred alternative.

A Final Environmental Impact Statement (FEIS) will then be prepared on the selected alternative or action. The FEIS will include information on the comments received during the comment period, as well as responses to those comments.

The public and agency input to date and the technical studies in this report reflect potentially different stages of consensus for highway and transit alternatives. As documented in the DEIS, highway options would provide needed benefits to the transportation system regardless of which transit alternative is selected. Issues related to transit alternatives are less clear, particularly those involving rail service. From both a service and local funding standpoint, several elected officials and members of the public have suggested that additional studies be prepared to evaluate broader service and funding options before identifying a selected long-term option for transit.

Given the apparent differences in consensus levels and the independent processes for implementation, it is likely that the highway and transit alternatives will be developed in separate stages from this point forward. Subject to comments on the DEIS and input at the public hearing, highway improvements might move directly into an FEIS process, followed by final design and construction. Transit might be subjected to supplemental studies that address a larger rail system, potentially including lines to the Indianapolis International Airport and/or Johnson County (Greenwood). These studies could be used as a basis to supplement the DEIS as necessary, and could be followed by an FEIS, preliminary engineering, final design and construction. It should be noted that this process does not preclude near-term improvement and evolution of the local bus system similar to that described in the DEIS for Alternative B-1.

It should also be noted that even though the project team continues to acquire information and explore options (such as diesel multiple units discussed later in this report), the alternatives for this project were "frozen" in the fall of 2000 so that the Draft Environmental Impact Statement (DEIS) could be completed. By freezing the alternatives, no changes or new assumptions have been made so that the data remained constant for the completion of the DEIS report. However, since the fall of 2000 new information has become available, as noted in the Plan Refinements section below.

PLAN REFINEMENTS

Commuter Rail Vehicle Options

A new rail technology, referred to as the Diesel Multiple Unit (self-propelled rail vehicle or "DMU"), appears feasible for further analysis in the Indianapolis setting. DMU's offer clear benefits over locomotives with respect to service, cost and community impact. DMU's are being utilized in Europe and U.S. installations are expected soon. They appear to be an excellent fit for the northeast corridor and help address the issue of noise expressed by citizens. If their success is proven, they could be the primary commuter rail choice in Indianapolis.

Staging of Alternative RB4

All components of RB4 should be studied to fully address cost and environmental impacts in the Draft Environmental Impact Statement, but actual implementation could occur in stages. For discussion purposes the commuter rail segment of RB4 from Fishers to Noblesville could be considered in a later phase. A park and ride location in Fishers might serve the Noblesville demand until this segment is constructed in a subsequent phase.

SUPPLEMENTAL INFORMATION

Transportation System Benefits

Public roadways will continue to serve most trips in central Indiana. The H5 highway option will help reduce traffic congestion by adding additional roadway capacity to the roadway system and by attracting traffic from the arterial street system and onto the freeway system.

The RB4 rail-bus option will help reduce traffic congestion by providing an alternative to private vehicle use. The trips diverted to transit are particularly important because the vast majority (70%) occur during the morning and evening rush hours when the greatest demand is placed on the roadway system.

Headways

Headways are defined as the amount of time between transit vehicles arriving at a given rail station or bus stop. The headways for a rail or bus system should be set to meet user demand in a cost-effective manner while providing acceptable service for users. Similar systems in other cities have trains that operate more frequently than currently proposed for Indianapolis. This means that the trains in those cities traverse the rail line and arrive at / depart from stations or stops more often than is proposed for this system.

Alternative RB4, as currently configured for the 2025 scenario, would result in 12 trains per hour between 38th Street and Castleton during the morning and evening rush hours. At off-peak hours, there would be six trains per hour.

To respond to local citizen's concerns about potential neighborhood impacts, longer headways north of 38th Street and reduced hours on weekends have been examined to reflect likely headways at the start up of a system (versus a 2025 scenario). In addition, schedules and headways are subject to change to meet evolving transportation demand.

Travel Times

Con**NECT**ions data indicates that rail transit will offer travel time advantages during peak hours for many trips in the future. Analyses conducted for this study show that future travel times will increase on the roadways and that traveling by rail will result in time savings over corresponding travel in the automobile during peak periods.

Table E-A

2025 Peak Hour Travel Time in Minutes				
From Downtown to:	**LRT**	**CRT**	**Arterials**	**Freeways**
State Fairgrounds	23	10	12	--
Castleton	38	22	30	33
Fishers (116th Street)	--	32	47	46
Noblesville (North of White River)	--	45	60	59
Noblesville (206th Street)	--	50	65	64

Auto Delays at Railroad Crossings

There are 40 streets that cross the Hoosier Heritage Port Authority (HHPA) rail line, including several major multi-lane arterials. At most of these locations, crossing delays will be 30 to 60 seconds, less than a typical traffic signal cycle. Red lights at a signalized intersection with a 90-second cycle would stop traffic 40 times an hour. Traffic would stop a maximum of 16 times an hour at railroad crossings during the peak period under the RB4 scenario.

Rail Transit Noise

Noise along the HHPA rail corridor is a concern due to the proximity of many residences and recent experience with the State Fair Train. Major sources of noise include vehicle operation and horns at crossings. Diesel Multiple Units (DMU's) would be quieter than locomotives, and the reconstruction of the track would improve conditions substantially. A "closed system" is recommended at crossings where four-quadrant gates and other measures could potentially eliminate the requirement for horns.

Property Value Impacts (Rail Line)

Research in this area is not definitive due to a limited number of studies, differences among existing rail systems, and the wide range of factors that influence property values. Every effort should be made to maintain if not enhance property values along the rail corridor by addressing noise and esthetic issues raised by residents. This could be accomplished by using: DMU vehicles, double gates at railroad crossings to potentially eliminate the need for sounding horns, landscaping and screening where needed, and transit station and park and ride locations attractively integrated into their surroundings. See Appendix A for a discussion of several studies.

Highway Noise

Noise along I-465 is a major issue. Based on INDOT's noise policy it is premature to commit to noise barriers on I-465 at this time. The final decision must be deferred to the design phase. To foster community understanding, the INDOT policy is presented in Appendix B.

REGIONAL SYSTEM

Regional transit needs have recently been examined in the *Central Indiana Transportation and Land Use Vision Plan* and the *Regional Mass Transit Service Plan for Central Indiana*. Both studies identified the need for a regional system and included recommendations pertaining to the preservation of key rail corridors.

While the northeast corridor is the area with the greatest need for congestion relief, rail improvements should be considered in the context of a regional system. The most likely extensions follow existing rail corridors that exist west to the airport and south to Greenwood. These could be extended to Brownsburg and Franklin in the future.

The extension to the airport should be examined further. In addition, bus service providing linkages to a developing regional rail system should be available throughout the region. Infrastructure improvements such as sidewalks connecting neighborhoods and commercial/service areas to bus shelters and rail stations should be strongly considered.

Introduction

The Response to Key Issues for the Con**NECT**ions study is in response to directives received from the Con**NECT**ions Policy Steering Committee and citizen comments received at five community outreach meetings.

DIRECTIVES FROM THE POLICY STEERING COMMITTEE

The Con**NECT**ions Policy Steering Committee met with the Management Team on June 30, 2000 to discuss study progress. They concurred with the Technical Working Group's recommendation to proceed with developing more details for alternatives H5 and RB4 (see Figures I-1and I-2 on the following pages). They also instructed the Management Team to develop a preliminary concept for regional rail service showing how the rail option recommended in RB4 would fit into a regional system.

Because of the regional significance of the Con**NECT**ions study, the Policy Steering Committee instructed the Management Team to continue to expand its public involvement efforts to include the larger regional community and to ensure that residents of the Northeast Corridor be given ample opportunity to voice their opinions regarding the options being considered.

In subsequent conversations with the Policy Steering Committee Co-Chairs, input from the public meetings was reviewed, and a need was identified for supplemental information to address citizen concerns. Suggestions were also made for potential refinements to be considered prior to the identification of a selected alternative.

This report is provided to address these key issues. Section 1 describes potential refinements to selected elements of the RB4 alternative. Section 2 provides additional information to clarify or better describe the Con**NECT**ions alternatives with respect to selected benefits and impacts. Section 3 reviews the concept of future rail system expansion within a regional plan.

PUBLIC FORUMS

- A Regional "Channel 13 Listens" Forum was held on July 27, 2000.
- Four public information meetings were held on the following dates:
  - ✓ August 1, 2000 at Fishers Town Hall
  - ✓ August 3, 2000 at Cathedral High School
  - ✓ August 8, 2000 at Noblesville High School
  - ✓ August 10, 2000 at Arlington High School

The Regional Channel 13 Listens meeting was attended by 136 individuals. A broad range of comments and opinions were heard. Primarily persons who either live on or near the Hoosier Heritage Port Authority Rail Corridor or I-465 attended the four public information meetings. Attendance at the four meetings totaled 230 citizens, ranging from forty to over eighty participating per meeting.

In addition, many meetings were held with neighborhood organizations, interest groups and the Citizens Advisory Committee. Those public meetings provided invaluable input into the study and helped to guide the study process and recommendations.

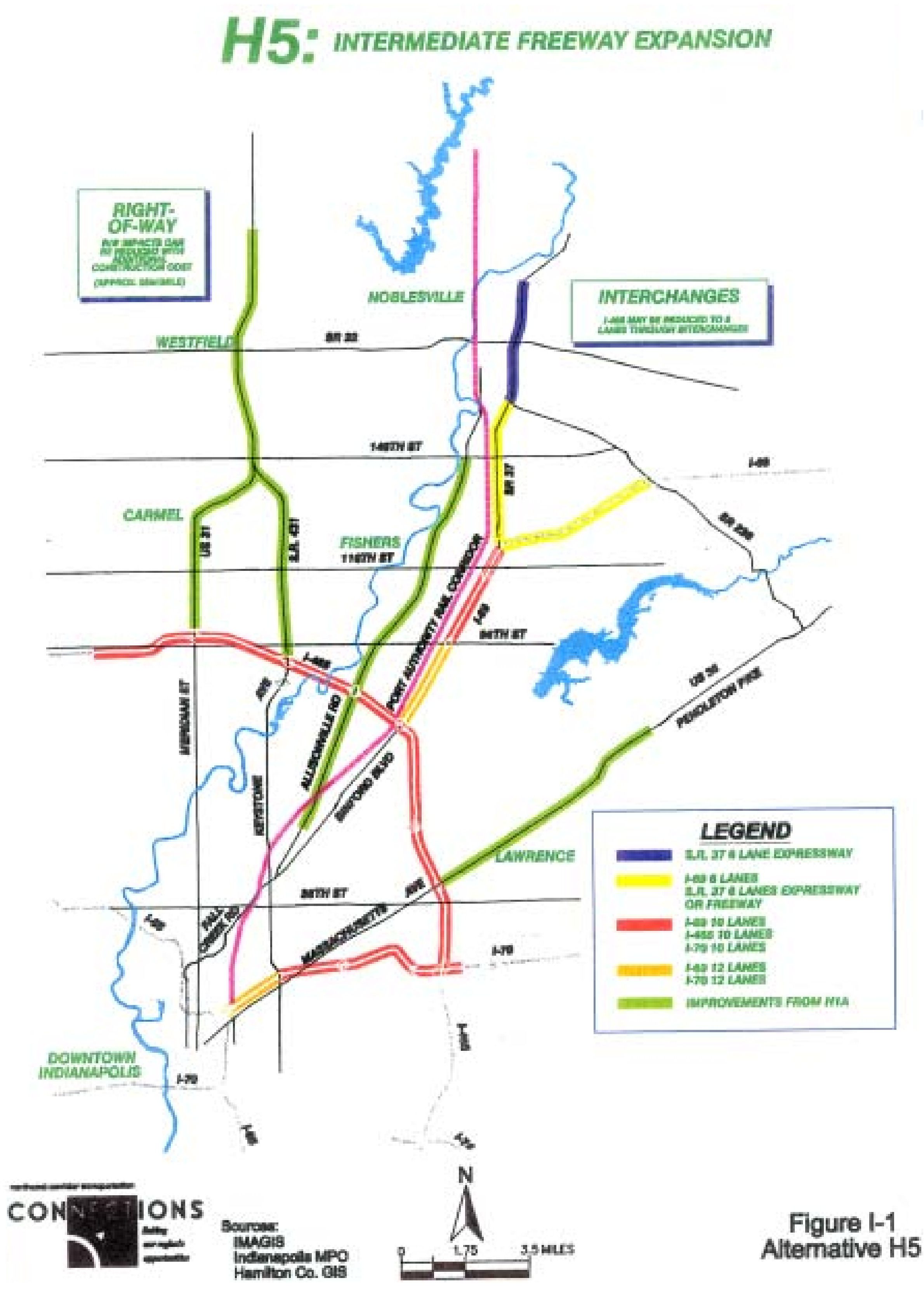


Figure I-1
Alternative H5

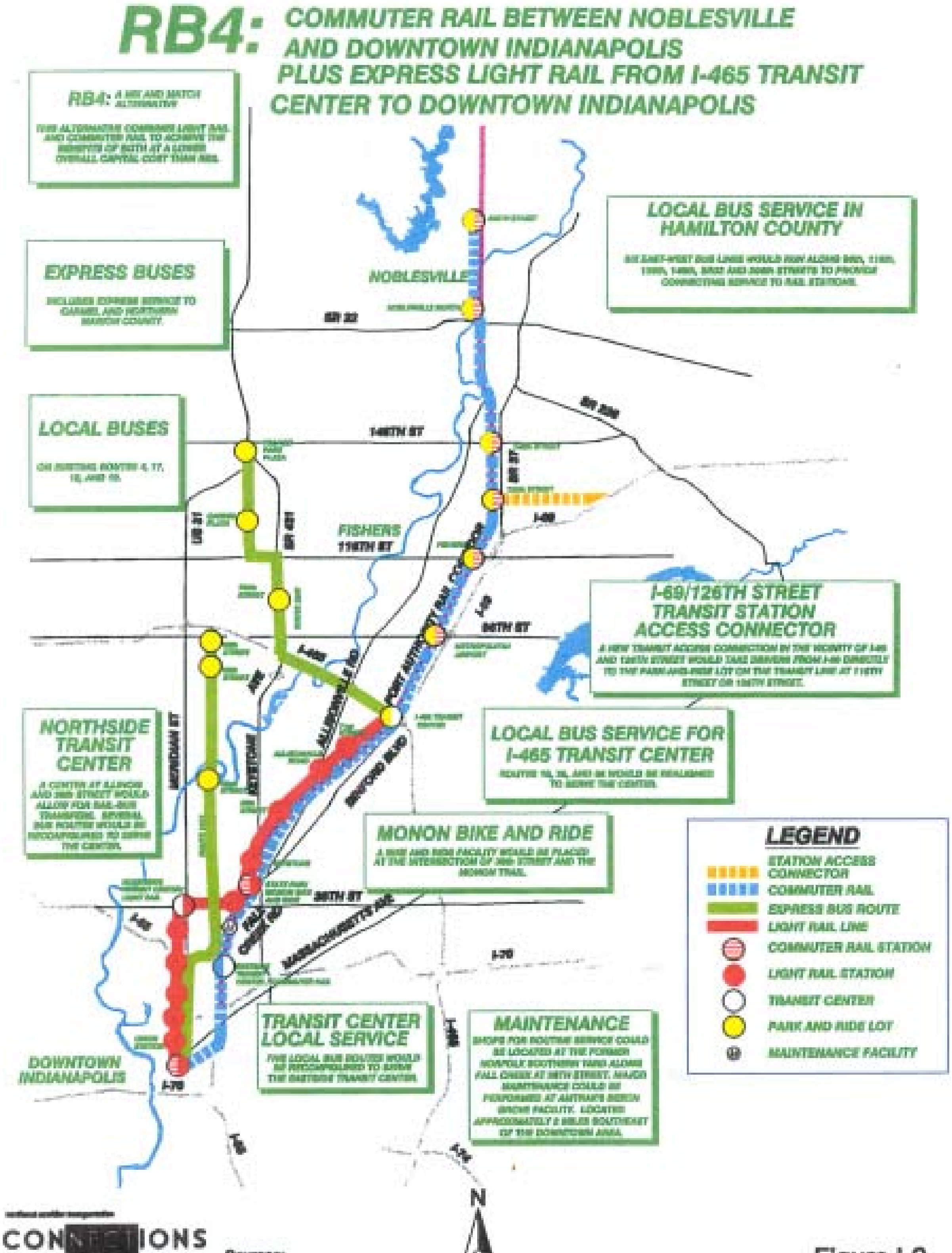


Figure I-2
Alternative RB4

Section 1 ~ PLAN REFINEMENTS

COMMUTER RAIL VEHICLE OPTIONS

In the Con**NECT**ions study the commuter rail transit alternative has primarily been presented with the "traditional" commuter rail vehicle currently used in virtually all United States systems – a diesel powered locomotive pulling (or pushing) one or more passenger rail cars. During the latter months of the study another technology began to appear feasible for further examination in the Indianapolis setting. The new technology uses self-propelled diesel powered passenger vehicles, called diesel multiple units (DMU's). Although DMU's are in use in Europe, there are currently no operating systems using this technology in the United States. This will change in 2001 when at least two systems will be operational in North America (New Jersey and Ottawa).

The biggest deterrent to the use of DMU's in the United States has been their non-compliance with U.S. Federal Railroad Administration (FRA) safety standards for crash worthiness when operating in any rail corridor where other (heavier) trains are operating. This is not an issue within the HHPA rail corridor, where current daytime freight operations are likely to cease once transit service is implemented. It is a potential issue on the section of track entering Union Station, which could be a key segment of a regional system.

Several manufacturers offer DMU vehicles, including BRE Railbus, Siemens RegioSprinter, Adtranz Regio Shuttle, and Bombadier Talent. The RegioSprinter, offered by Siemens Corporation, was demonstrated on the HHPA rail line in 1996. It is one of several vehicles potentially available for use on this system**.**

Compared with traditional locomotives, DMU's offer a number of advantages with respect to the northeast corridor, including the following:

- DMU's are smaller and less visually obtrusive to neighborhoods.
- DMU's provide better acceleration and braking due to their lighter weight.
- The size and capacity of DMU's are better suited to forecasted demand levels, without sacrificing the higher capacity available by operating multiple DMU's.
- DMU's are cheaper, quieter, and have lower emissions than locomotives.

The range of DMU equipment currently available in the North American market is varied. To simplify decision processes, the Transportation Research Board's (TRB) subcommittee on Diesel Multiple Unit Technologies suggests that DMU rolling stock be categorized in accordance with the following system:

Type I Equipment - Self-propelled vehicles that are fully compliant with the U.S. Federal Railroad Administration requirements and are designed primarily for a railroad operating environment.

Type II Equipment – Self-propelled vehicles that are not fully compliant with the U.S. Federal Railroad Administration requirements but are designed primarily for a railroad operating environment.

Type III Equipment – Self-propelled vehicles that are not fully compliant with the U.S. Federal Railroad Administration requirements and are designed to provide maneuverability for urban operating environments with mixed traffic.

A key consideration at this time is that the Federal Railroad Administration (FRA) regulations prohibit joint use of railroad facilities by non-FRA-compliant vehicles and conventional railroad trains (such as Amtrak or freight trains) without extraordinary means to maintain positive train separation.

This means that, currently, either only DMU Type I equipment could be utilized on the rail corridors with existing freight service or freight and passenger services could be separated by time of service or by location of service. This is significant in considering DMU's for regional use.

Separation by location is not likely outside the northeast corridor, given that new right-of-way would need to be utilized. However, separation by time of service could work with a railroad such as the Indiana Southern Rail line since approximately only one train per day operates on the line. If the freight service could run at night and the passenger service during the day, non-FRA-compliant vehicles could be used.

This is an important factor because it may be necessary or desirable to operate on city streets for some of the passenger operation. Type I DMU's are too large to navigate city streets and could not make most turns at typical intersections. DMU's for on street running would desirably be Type III equipment that can navigate in mixed traffic on city streets.

Separation by time on a railroad such as the CSX Crawfordsville Secondary Line may be less likely due to the frequency of freight trains (approximately twelve per day). If separation is not possible, only Type I DMU's could be utilized and thus on street running would be precluded. This would mean that the vehicles would serve Union Station (or some other logical point along the rail line) and other routes or lines would have to be routed there as well for connectivity to other portions of the city.

If Type III DMU's are considered in the Northeast Corridor and Type I DMU's for other corridors, it will need to be determined if it is cost feasible to combine equipment types for one system.

Figure 1-1 provides an illustration of the RegioSprinter DMU made by Siemens. Table 1-A provides some general advantages and disadvantages of DMU's. Table 1-B is an example of specifications for the RegioSprinter. Appendix C contains design standards and specifications for a number of transit vehicles.

The RegioSprinter DMU

Figure 1-1

Table 1-A

DMU Advantages & Disadvantages	
ADVANTAGES	**DISADVANTAGES**
▪ Best if proposed service will be less than 250 riders/trip ▪ Low floor area for easy boarding ▪ Operationally more reliable than traditional commuter rail vehicles ▪ Less expensive to operate & maintain ▪ Greater operating flexibility ▪ Less noise & vibration than standard commuter rail ▪ Faster ▪ Less expensive to purchase	▪ Only Type I equipment meets FRA requirements to operate in corridors with existing freight and/or Amtrak service ▪ Relatively new to United States – lower comfort level by railroad operators used to operating standard diesel engines

Table 1-B

Specifications and Details for Siemens RegioSprinter DMU	
Maximum speed	60 mph
Maximum weight	50 tons
Maximum width	9.7 feet
Maximum height	11.3 feet
Passenger capacity	74 seated/100 standing
Engines	Diesel
Platform needs	8-10 inches (curbs could be used)
Turning radius	80 meters for turns at 20 mph 100 meters for turns over 20 mph
Miles per gallon	3-3.4 mpg • Traditional commuter rail gets 0.3-0.5 mpg.
Total operating cost estimate	$7-8/mile • Light rail: $6-10/mile • Traditional commuter rail: $10/mile
Cost to construct lines	$9 million/mile • Light rail: $20-25 million/mile • Traditional commuter rail: $10-30 million/mile
Vehicle costs	$1.5-1.65 million • Light rail: $3.2 million for light rail • Traditional commuter rail passenger car: 1.5-2 million • Traditional commuter rail locomotive: $2.0-2.5 million)

Source: Siemens Transportation Systems

DOWNTOWN OPERATIONS

Passenger rail service from the northeast corridor will link with service from other parts of the metro area in the downtown. The northeast corridor study assumes some on-street operation (using either light rail transit or DMU vehicles) to make that segment of the system most effective. Likewise, it may be a necessity for service from other regional destinations to leave the rail right-of-way and operate on-street in order to avoid conflicts with freight service. It may be desirable from a service perspective as well, so that passenger trains can get as close as possible to the largest concentrations of downtown employees.

The key issue is whether or not DMU's can maneuver efficiently on Indianapolis streets. A preliminary examination of vehicle specifications and downtown streets shows that there is potential for on-street DMU operations, particularly if use is made of diagonal streets, such as Massachusetts or Fort Wayne Avenues, to facilitate turning movements.

Recommendations

Overall, DMU's offer many potential advantages over diesel locomotives, including cost, for use in a regional system. Future studies should refine the concept of on-street DMU operations. Based on available information, the DMU warrants careful consideration for use as the passenger technology of choice in Indianapolis. The Indianapolis MPO should continue to monitor DMU installations elsewhere in North America as they occur and incorporate lessons learned if the design and implementation of rail transit is accomplished in the Indianapolis region.

RB4 STAGING CONSIDERATIONS

Alternative RB4 evolved from other rail alternatives considered early in Con**NECT**ions to provide the greatest benefits of light rail transit (LRT) and commuter rail transit (CRT) within the northeast corridor. The areas proposed for LRT operations provide high quality service for the highest demand corridors of Marion County and maximize opportunities for associated community development. CRT is less expensive and is well suited to the longer trips and less frequent station spacing of Hamilton County and northern Marion County.

As shown in Figure I-2 for Alternative RB4, LRT service from the Castleton area to 38th Street would operate on the HHPA line. It then would operate on city streets (38th, Capital, Illinois) with frequent service and closely spaced stops to and from downtown. Commuter rail service would start at 206th Street in Noblesville and follow the HHPA rail corridor to connect with downtown and Union Station. The commuter rail would provide less frequent service with higher speeds and fewer stops.

Costs, impacts and ridership estimates have been reviewed for RB4 in its entirety. This is consistent with forecasted 2025 needs, as required for the preparation of an Environmental Impact Statement. Within this context, however, several options exist with respect to staged implementation of RB4.

Since the LRT and CRT portions of RB4 operate independently, either section could be constructed first or both could be built at the same time. LRT would generate higher initial ridership, but would do so at higher cost. In addition, it would probably take longer to design and construct due to both its on-street and off-street operations.

The commuter rail transit component could be put into operation more quickly than the LRT, but ridership would be much lower, as indicated by the ridership estimates of alternative RB1 in the Draft Environmental Impact Statement (DEIS).

In addition to the flexibility of implementing LRT and CRT components independently, RB4 provides opportunities for staging by location. For instance, the LRT portion could be constructed between downtown and the state fairgrounds area, where passengers could transfer to CRT to access points further north. Service and ridership could be impacted due to the transfer, but the expense for six miles of electrification could be postponed.

Another option would be to reduce the initial reach of service into Hamilton County. Although service as far north as 206th Street may be needed by 2025, much of the anticipated development near the northernmost sections has yet to occur. Since most Hamilton County riders will utilize park and ride facilities in any case, satisfactory service may be provided initially by establishing a northern terminus at 116th Street in Fishers. Rail bed reconstruction and transit vehicles (as needed) could be added to extend the service further north as dictated by demand.

It should be noted that these points would also apply if DMU technology is used.

Section 2 ~ SUPPLEMENTAL INFORMATION

BENEFITS OF THE CON*NECT*IONS ALTERNATIVES

The alternatives being considered in the Con**NECT**ions study will provide more travel options and will help reduce traffic congestion. Public roadways will continue to serve the majority of trips in the region, but they are unable to meet all transportation needs effectively at all times. Transit is particularly well suited to augment the highway system in this corridor since it addresses fundamental needs with respect to time and location that will not be fully accommodated by highways. During peak periods, when highway conditions are at their worst, transit ridership will be at it's highest.

The dynamic between highway and transit travel within the study area, as indicated by system modeling, suggests independent utility of these modes in solving future transportation needs in the corridor. That is, neither can be considered a "trade-off" for the other.

The fundamental finding with respect to effectiveness in serving overall system demand and congestion is that the highways should be expanded as much as possible within reasonable cost and impact constraints, and peak period service should be augmented to the extent feasible with transit. Based on this finding, it is reasonable to plan and implement future actions for both modes in a cooperative but independent fashion.

Although highway and transit alternatives lend themselves to independent evaluation and implementation, an understanding of their complementary role in addressing mobility needs is still critical to understanding the results of this study. As the highway system reaches capacity during peak periods, the provision of options and associated relief to area roadways will be increasingly important in providing an effective total transportation system. This is illustrated in the graph below.

Typical Peak Period Travel Demand
Relationship of Transit Benefits and Highway Congestion

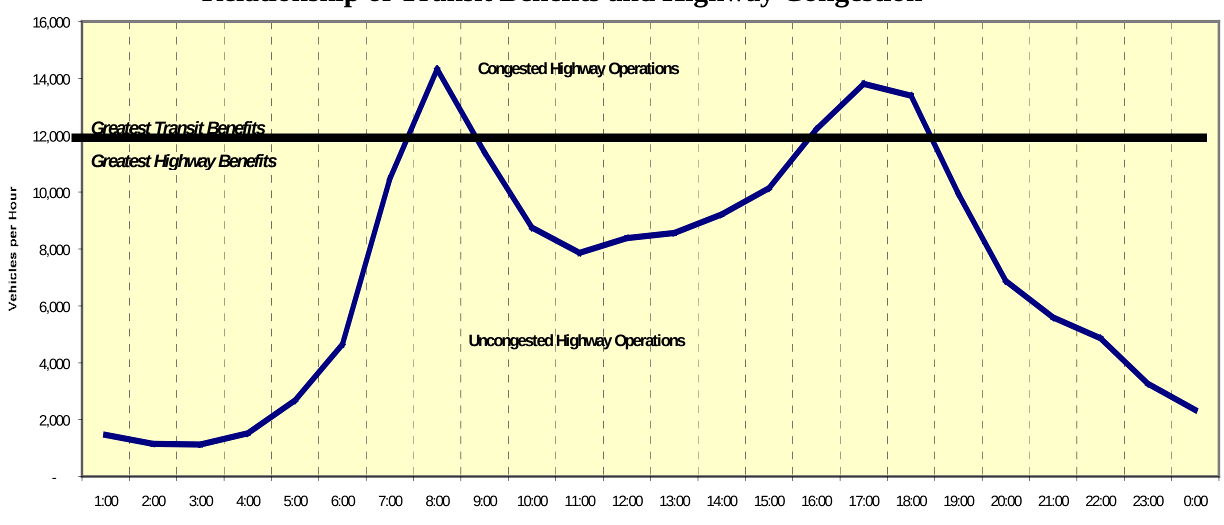


Figure 2-1

The greatest transit benefits would be achieved during the peak periods, when the highways are most congested. Either highway option (H5 or H6) would provide excellent mobility and service for most motorists during most periods of the day. However, during peak periods, when highway conditions are at their worst, transit ridership would be at its highest. Alternative RB4 is located parallel with the most congested roadways in the region, and it is forecasted to carry about 70% of its trips during the morning and evening peak periods.

HIGHWAY OPTIONS

The travel simulation model shows that the more capacity that is added to the interstate and major state facilities the more traffic they attract. For example, even if I-465 is improved to 10 lanes as proposed in Alternative H5, it will operate near or beyond its capacity. This is because the primary benefit of adding travel lanes to I-465 is the reduction of traffic on local arterial streets**.** That is, the transportation system as a whole operates more effectively.

TRANSIT OPTIONS

The Indianapolis Regional Travel Simulation Model estimates that 18,700 person trips per day would be made on the combination light rail and commuter rail service assumed in RB4. In order to assess the impact on congestion, daily person trips are converted to peak period vehicle trips. The estimated number of vehicle trips diverted to rail transit during the morning rush hour is 2,142; an equal number would be diverted during the evening rush hour. (See Appendix D for an explanation of the methodology used.)

These trips are important because they occur during the morning and evening peak periods when the greatest demand is placed on the transportation system. They also attain significance because the major arterial and freeway segments they are relieving are operating near or beyond capacity. Any additional vehicular trips on an already congested roadway can mean the difference between traffic flowing and stop-go delays.

Compared to serving trips by automobile, the vehicle peak hour trips diverted to transit by RB4 are equivalent to one freeway lane or three arterial lanes in each direction (if they were to occur in one corridor). For comparison purposes, 25 miles (the length of the rail corridor) of additional freeway capacity in each direction would cost $300 million and 25 miles of additional arterial capacity in each direction would cost $225 million. The current average construction cost per freeway lane mile is $6 million; the average cost per arterial lane mile is $1.5 million. Likewise, the cost of going from the H5 alternative (10 lanes on I-465) to the H-6 alternative (12-lanes on I-465) in only the Northeast Corridor is $400 million.

In addition to dollar cost, added travel lanes could potentially result in significant relocations of homes and businesses. This would certainly be the case in the 12-lane H-6 alternative where extensive right-of-way would be needed; requiring the relocation of an estimated 95 residents and 28 businesses.

A reduction in vehicle trips also helps improve air pollution, which is a potentially serious problem in the Indianapolis region. Marion County is currently classified as a maintenance area for the ozone pollutant. However, stricter air quality standards combined with increased trip-making threaten that designation. Lack of compliance with the National Ambient Air Quality Standards (NAAQS) can lead to negative health effects, especially for those who are susceptible to respiratory problems, the elderly and young children. In addition, non-compliance could result in added costs to the driving public in the form of higher fuel prices and potential regulations, such as mandatory vehicle inspections. Lack of compliance with air quality standards can negatively impact the area's ability to retain and attract industry, which could ultimately affect the economic viability of central Indiana.

In terms of mobility, RB4 has the added benefit of making the Indianapolis regional transportation system more multi-modal by providing options to meet travel needs. This is particularly important to persons dependent on transit to access jobs.

RB4 could also help to create a more positive image of transit overall, which could result in increased bus ridership. Additionally, the RB4 alternative has the potential to encourage transit-friendly development patterns that could better maximize public infrastructure investments. A number of case studies have highlighted the fact that quality transit systems can have a profound and positive effect on economic growth and development.

The capital cost of highway improvements provides a fixed increase in capacity, whereas, additional increases in transit capacity can be achieved through an increase in the number of transit vehicles. In other words*, future transit expansion can be accomplished at a lower cost than comparable highway expansion.*

HEADWAYS

Preliminary schedules have been developed for the two rail options under consideration in order to determine environmental impacts and to estimate travel demand. It is emphasized that these are intended to be representative. The actual schedule at the time of implementation could vary from those specified in the alternatives. The preliminary schedule also represents year 2025 operations.

Headways (the amount of time between vehicles arriving at a given rail station or bus stop) are usually set to meet demand in a cost-effective manner while providing acceptable service for users. Setting ideal headways largely depends on whether a system is seen as an express-commuter system or a light-rail local system.

Express systems are designed to serve mostly peak-hour travelers on longer trips to downtown or other economic centers. These systems run less frequently during off-peak weekday hours, and run on restricted hours or infrequent schedules during weekends. In RB4, the stations north of I-465 are intended for commuter rail service, with service running every 30 minutes during morning and evening rush hours, and hourly during other times. Express systems could also be utilized to serve special events.

Local systems would serve a broader range of traveler needs, bringing people to work, shopping, recreation, and other opportunities. To meet this demand, services need to be more frequent, and stops more closely spaced. Most light rail systems are intended for this sort of use. The light rail component of RB4 is intended to serve this type of market, and is proposed to have more frequent service: 15-minute headways in morning and evening rush hours, and 30-minute headways at other times.

Since rail service would be provided in both directions, to serve reverse-commuters and others, RB4 as currently configured would result in 12 trains an hour between 38th Street and Castleton during the morning and evening rush hours in 2025. At off-peak hours, there would be six trains per hour. These headways are not excessively short by typical standards, as shown in Table 2-A for light rail systems in peer cities.

Table 2-A

HEADWAYS OF LIGHT RAIL SYSTEMS IN PEER CITIES		
City	**Peak Headway (minutes)**	**off-peak Headway (minutes)**
Indianapolis, IN (*Proposed*)		
▪ Commuter Rail	30	60
▪ Light Rail	15	30
Baltimore, MD (MTA)	8 ½ / 17 *	8 ½ / 17 *
Buffalo, NY (NFTA)	7	10
Cleveland, OH (GCRTA)		
▪ Green Line	6	12
▪ Red Line	6	15
▪ Blue Line	6	15
Denver, CO (RTD)		
▪ Central Line	5	7½
▪ SW Line	10	15
Memphis, TN (MATA)	7	10
Philadelphia, PA (SEPTA)		
▪ Market/Frankfort (subway)	4-6	10
▪ Route 100 (Trolley)	6	20
Pittsburgh (PA Trans)		
▪ The "T", Route 42S (S. Hills Village)	4	10
Portland, OR (Tri-Met)		
▪ Max Lite Rail	5-8	15
St. Louis, MO (Bi-State)	7-8	10-15

**Baltimore's LRT service has 8½ -minute headways in sections of downtown.*
Outer areas, and sections where service is constrained by single-track corridor, have 17-minute headways.

The hours of service for RB4 were set long – 5AM to midnight – for purposes of conservative environmental impact and cost estimation. Even on Sundays, service was proposed to run from 5:30 AM to midnight. In reality, if RB4 were implemented, headways and span of service would be adjusted to best serve ridership demand, desires of local residents, and budget limitations.

Service levels can be flexible, and will be set based on rider demand and neighborhood desires. Initially the weekend hours of service would almost certainly be less in RB4, and longer headways would be likely, north of 38th Street to reflect the lower densities of that residential area.

ALTERNATIVE TRAVEL TIMES

Future travel times on the roadway system are projected to increase over time as traffic congestion increases. Travel times on the roadway system will also vary from day-to-day and hour-to-hour depending on the amount of traffic on a given roadway and prevailing conditions at any given time. On the other hand, the travel time for the fixed rail service on an exclusive right-of-way (considered in RB4) will stay the same over time and will be consistent from day-to-day and hour-to-hour regardless of volume or prevailing conditions.

The travel times in Table 2-B are from the 2025 travel simulation model and provide a relative comparison between roadway and rail travel times. They reflect relatively "*ideal*" conditions, with no incidents, inclement weather or other variation in highway operation conditions.

Table 2-B

2025 Peak Hour Travel Time in Minutes				
From Downtown to:	**LRT**	**CRT**	**Arterials**	**Freeways**
State Fairgrounds	23	10	12	--
Castleton	38	22	30	33
Fishers (116th Street)	--	32	47	46
Noblesville (North of White River)	--	45	60	59
Noblesville (206th Street)	--	50	65	64

During morning and evening rush hours, transit will provide a travel time advantage for many trips within the study corridor. In the context of a future congested highway network, the speed, stability, and predictability of rail transit will be an increasingly important benefit for users.

AUTO DELAYS AT RAILROAD CROSSINGS

The HHPA intersects 40 local roadways between Noblesville and downtown Indianapolis, prompting a concern about the potential impact of crossings on auto travel times. Since grade separations (bridges) are not currently planned, many major arterials would be potentially impacted. The HHPA intersects with the major arterials of Keystone Avenue, Fall Creek Parkway, Allisonville Road and 38th Street. North of I-465, where service would be less frequent, the line crosses 82nd, 96th, and 116th Streets, as well as several major roads in Noblesville.

Auto delay at crossings would depend on a number of factors, including speed of the crossing gates, crossing time (related to road width and train speed), and the length of the train (one or two cars in RB4). Most light rail systems currently cause a 30 to 60-second wait for cars at grade crossings. The needs of DMU commuter rail vehicles would be similar. This is comparable to the *minimum* 30-second wait time for auto traffic at a typical traffic signal, and is much less than the average wait time at major intersections operating with two- or three-minute cycle lengths.

In addition to being shorter than most traffic signals, the delay for rail transit would come less frequently. Red lights at an intersection with a 90-second cycle would occur 40 times an hour at each intersection. Examples of intersections in the Northeast Corridor with a 60-90 second red (stop) time include 82nd Street and Allisonville Road and streets intersecting with Binford Boulevard during off-peak hours. At peak hours in 2025, a maximum of 16 trains would cross each HHPA intersection, each with delay equal to or less than an additional traffic signal on the roadway.

Several of the major arterials are located next to proposed rail stations. At these locations (and perhaps at other points), rail transit vehicles might be delayed until their crossing can occur without impacting traffic signal coordination on the arterial street. This could be easily accomplished by interconnecting and coordinating traffic signal and railroad signal control equipment.

The net impact on the system should be reduced delay since many more travelers could be brought through an intersection in 30-60 seconds via rail, than could be brought through in that same time by car.

RAIL TRANSIT NOISE

Noise along the HHPA rail corridor is a concern due to the proximity of many residences and recent experience with the State Fair Train. Major sources of noise include vehicle operation and horns at crossings. Clearly, DMU's would be quieter than locomotives and the reconstruction of the track would improve conditions substantially. Regarding crossings, a "closed system" is recommended whereby four-quadrant gates and other measures could eliminate the requirement for horns.

Under the Federal Railroad Administration's current proposed rule, quiet zones can be established by installing or adopting a set of approved supplementary safety measures at every crossing in the quiet zone that "fully compensate for the absence of the audible warning provided by the locomotive horn." Approved supplementary safety measures include: four quadrant gates, medians or channelization devices at gated crossings, paired one-way streets, temporary closure (such as at night time) or use of photo-enforcement technology.

Empirical data regarding noise levels for DMU vehicles is limited due to the minimal use of the technology to date within the United States. However, some pertinent information is available from a study completed for the North County Transit District in Oceanside, California (*Noise and Vibration Technical Report for the Oceanside-Escondido Rail Project).*

As is proposed for Indianapolis, the Oceanside-Escondido Rail project proposed the replacement of the existing jointed rail with new continuously welded rails and concrete ballast-and-tie track. The DMU's in the study traveled at a rate of 20 to 55 miles per hour. The adjacent land uses were primarily high density residential with some commercial uses. In this example, freight service was being provided on the existing rail line and noise levels of each (freight and DMU) were compared.

For DMU operations the noise study found that existing noise conditions would not change perceptibly. In the quietest section of the project alignment the DMU operations would create a worst-case noise level 5dB higher than the existing noise level. The study notes that a 5dB increase is not considered to be of sufficient magnitude to perceptibly change the existing noise setting. The study also indicated that a passing freight train is approximately 20dB louder than a DMU at a distance of 50 feet from the train.

CONSTRUCTION NOISE

Construction activity associated with the removal and replacement of the existing rail line with modern rail components was also examined. It was noted that the replacement was anticipated to occur at a rate of 100 feet per day along most of the existing alignment. Construction vehicles associated with this type of activity would include miscellaneous trucks, cranes, bulldozers, backhoes and compactors.

An increase in the noise level would be expected during the construction of the proposed alignment. However, the noise would be short-term and temporary in any one place. In addition, the permitted sound level for construction activity is regulated in Indianapolis. The construction contractor would be required to comply with the applicable noise standards.

RAIL TRANSIT IMPACTS ON RESIDENTIAL PROPERTY VALUES

Research in this area is not definitive due to a limited number of studies and the wide range of factors that influence property values. Other complications are the variation among urban areas and the fact that each transit system is different.

In general, the impact of rail transit on residential property values can be both positive and negative. The positive values are associated with access to rail stations. People are willing to pay a premium for homes near rail because it improves their ability to get to jobs, shopping, and other destinations along the corridor. The potential negative values are associated with proximity to rail lines, and possible nuisance effects such as noise and vibration. See Appendix A for a discussion of several studies.

The best way to protect the property values along the rail corridor is to strengthen the positive values associated with the rail service and minimize the negative values. Noise and aesthetic issues must be addressed in system design. Examples are the use of: DMU's, double gates at railroad crossings (potentially eliminating the need for sounding horns), landscaping and screening where needed, and the attractive integration of transit stations and park and ride locations into their surroundings.

HIGHWAY NOISE

Noise along I-465 is a major issue. It is premature within INDOT's noise policy process to commit to I-465 noise barriers at this time. The final decision must be deferred to the design stage of the process. To foster community understanding, the INDOT policy is presented in Appendix B.

INDOT is aware of the issue and the concern expressed by citizens regarding highway noise in the northeast corridor. This issue will continue to be monitored by the Indianapolis MPO.

Section 3 ~ Regional System

REGIONAL RAIL SYSTEM CONCEPTS

Although the current Con**NECT**ions study is focusing on the northeast corridor, its recommendations become part of the larger regional transportation system. The combination of commuter rail/light rail proposed in RB4 is envisioned as a first step in creating a regional rail transit system. The initial service for the northeast corridor should "stand alone", but future extensions would benefit from being part of a larger regional rail transit system. Likewise, each extension would increase the utility and options for existing users.

Figure 3-1 provides a map of rail lines in Central Indiana. The lines shown in red illustrate logical segments that could be considered for a regional passenger rail system, including lines to the northeast, south and southwest. Other lines that currently provide freight service should also be monitored for potential use as passenger routes if freight services ceases in the future.

BACKGROUND

Three recent rail studies in Indianapolis have identified the need to preserve rail corridors for future mass transportation opportunities:

- The City of Indianapolis Comprehensive Rail Study conducted for the Metropolitan Planning Organization (MPO), December 1995.

- The Regional Mass Transit Service Plan for Central Indiana conducted for the Central Indiana Regional Transit Alliance (CIRTA), December 1999.

- The Central Indiana Transportation and Land Use Vision Plan conducted for the Central Indiana Regional Citizens League (CIRCL), January 2000.

These studies have been consistent in noting that there are a number of promising rail corridors with potential for passenger service at some point in the future. *The Comprehensive Rail Study* recommended monitoring all radial corridors of interest and suggested assisting in preservation of any that are threatened with full or partial abandonment.

The Regional Mass Transit Service Plan for Central Indiana identified three rail lines that rank as a high priority for preservation for future rail use (as shown on Figure 3-1 and listed below):

1. The Hoosier Heritage Port Authority line to the northeast
2. The segment of the CSX Crawfordsville Branch that extends west from the downtown to the airport and northwest to Brownsburg
3. The Louisville & Indiana Railroad that extends south from the downtown to Greenwood and beyond.

Additionally, seven rail lines (or segments of rail lines) were designated in that study as medium priority, to be monitored for future rail use.

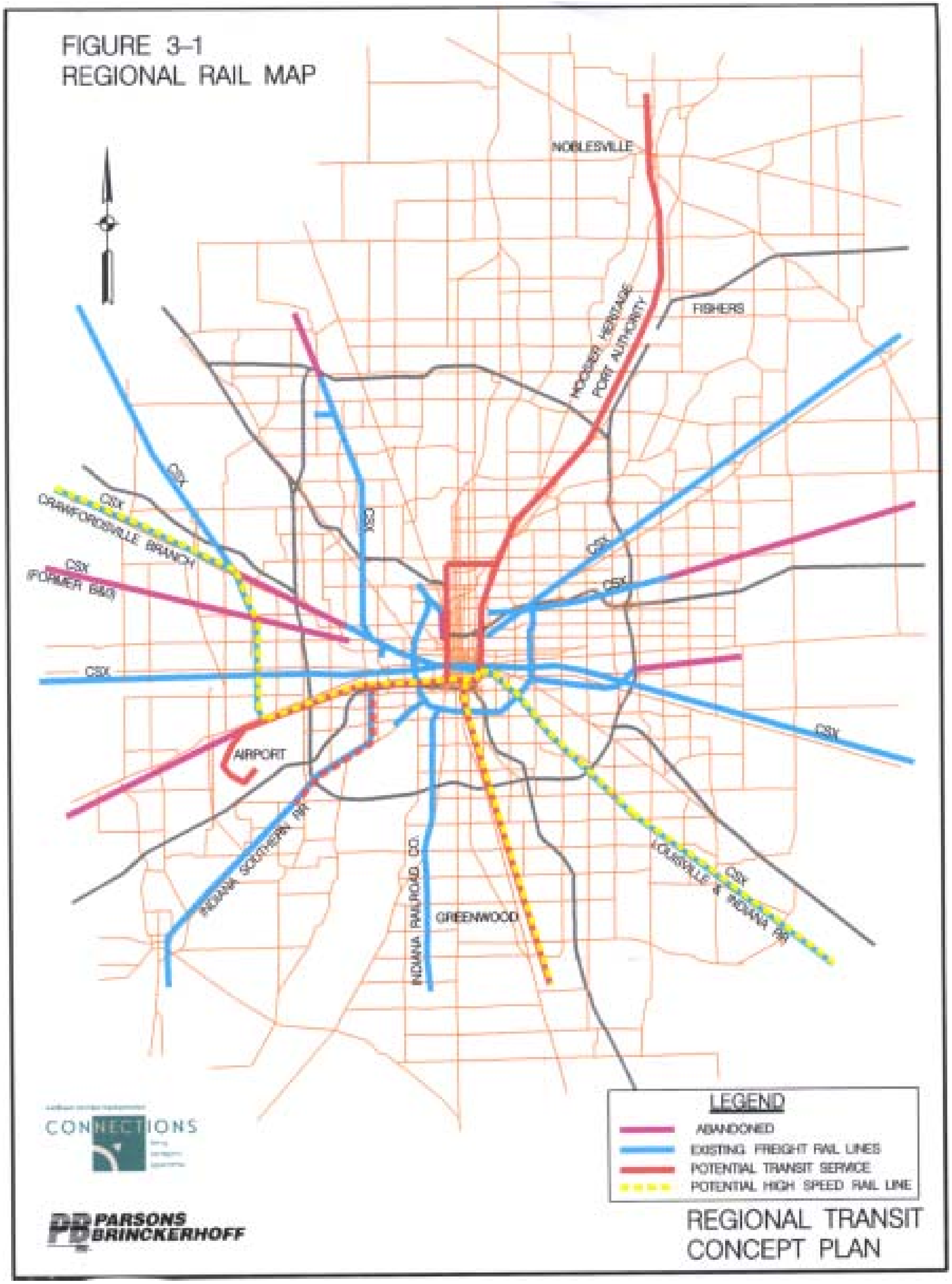


FIGURE 3-1
REGIONAL RAIL MAP
NOBLESVILLE
FISHERS
HOOSIER HERITAGE PORT AUTHORITY
CSX
CRAWFORDSVILLE BRANCH
CSX (FORMER B&O)
AIRPORT
INDIANA SOUTHERN RR
INDIANA RAILROAD CO.
GREENWOOD
LOUISVILLE & INDIANA RR
LEGEND
ABANDONED
EXISTING FREIGHT RAIL LINES
POTENTIAL TRANSIT SERVICE
POTENTIAL HIGH SPEED RAIL LINE
CONNECTIONS
PARSONS BRINCKERHOFF
REGIONAL TRANSIT CONCEPT PLAN

The Central Indiana Transportation and Land Use Vision Plan notes that "the focal point of the Plan is a transportation system that integrates good roadways with efficient and comprehensive mass transit options to help more citizens travel well in the years to come". The Plan "envisions that strategic development of Central Indiana's transportation corridors will include timesaving transit. Along with good roadways, rail transit will move Central Indiana citizens conveniently between major travel destinations and origins". The study further notes that "planners and decision-makers should be strategic in the development of Central Indiana's transportation corridors. Leaders should cooperate regionally to identify "gateway corridors" and prioritize the implementation of transit alternatives to enhance mobility for our citizenry along them".

FEDERAL REQUIREMENTS FOR RAIL SYSTEMS

As with the northeast corridor, federal funds would be necessary as a portion of the funding package for all segments of a larger rail system in Central Indiana. Under federal guidelines, all transit "fixed-guideway" (rail) projects must meet the requirements of the Section 5309 New Starts program. Section 5309(e) requires that projects be justified against a comprehensive review of the following factors:

- mobility improvements
- environmental benefits
- operating efficiencies
- cost effectiveness
- transit supportive existing land use and future patterns
- local financial commitment
- other factors (optional)

The Transportation Equity Act for the 21st Century (TEA 21) emphasizes the local financial commitment as a significant project justification criterion for evaluating potential transit investments. This means that a "strong" local financial commitment will be expected to match any federal funds that might be awarded.

In addition to financial criteria, the Federal Transit Agency also requires a review of local demographic and economic projections. These are used to gauge the reasonability of revenue estimates that will be included in the financial analysis of a detailed study/supplement to the northeast corridor. These forecasts also provide a check on the reasonability of growth rate assumptions for ridership, local tax revenues, regional inflation and other key variables. Forecasts from institutions with an independent perspective—such as universities, state agencies and private forecasting firms—represent preferred sources for these background estimates.

RAIL LINES TO THE AIRPORT AREA

Local officials are currently interested in examining the potential of passenger rail service in a regional context. The two most likely rail corridor candidates, based on growth and development activity, are an extension west to the Indianapolis International Airport and an extension south to the Greenwood area.

Demographic Overview

A review of population and employment forecasts for the year 2025 show that population density and employment activity are projected to increase around the rail lines that extend to the airport and Greenwood. This growth and activity are positive and will help support rail transit service to these areas.

Figures 3-2 and 3-3 show 1996 and anticipated 2025 employment levels for the area between downtown and the airport. Employment activity is projected to increase over that time period. The addition of passenger rail service and the growth in employment could be mutually beneficial to the area. The rail service could focus development in specific desired areas and possibly create redevelopment opportunities, and the influx of workers could help to sustain the rail system. The Indianapolis Airport Authority "Midfield Terminal Project Definition Executive Summary", completed earlier this year, notes that 7.7 million passengers used the Indianapolis airport in 2000. Projections for 2010 forecast 11.1 million passengers and 14 million for the year 2020.

Statistics from the airport area show the potential to serve a significant number of employees (with a rail system and complementary shuttle service) as development of the airport continues. Currently Federal Express (Fed Ex), located on the south side of the airport, employs 3,800 employees operating in three shifts. At maximum build out Federal Express officials estimate that the Indianapolis facility will employ 6,000 to 8,000 people, spread over three shifts. That means that the current Fed Ex employee population will double in the next 20-25 years.

South of Fed Ex and the airport is the Ameriplex Industrial Park. A shuttle or feeder bus service could provide connections to this employment center from a rail station. Current employment at Ameriplex is approximately 3,000. Total employment is projected to be 15,000 at full build-out of the complex.

A number of major employers are also located on the north side of the airport. The corporate headquarters for ATA is located in this area. Currently ATA employs approximately 2,000 people. Anticipating the addition of a third shift in the next 20 years, company representatives forecast that the existing workforce is likely to double during that period.

The United Airlines (UAL) Maintenance Facility is located in the northwest area of the airport and currently employs approximately 3,000 people. Future UAL employment is forecast to increase by 250% to 7,500 within the next 20 years. This level could be reached as early as 2005.

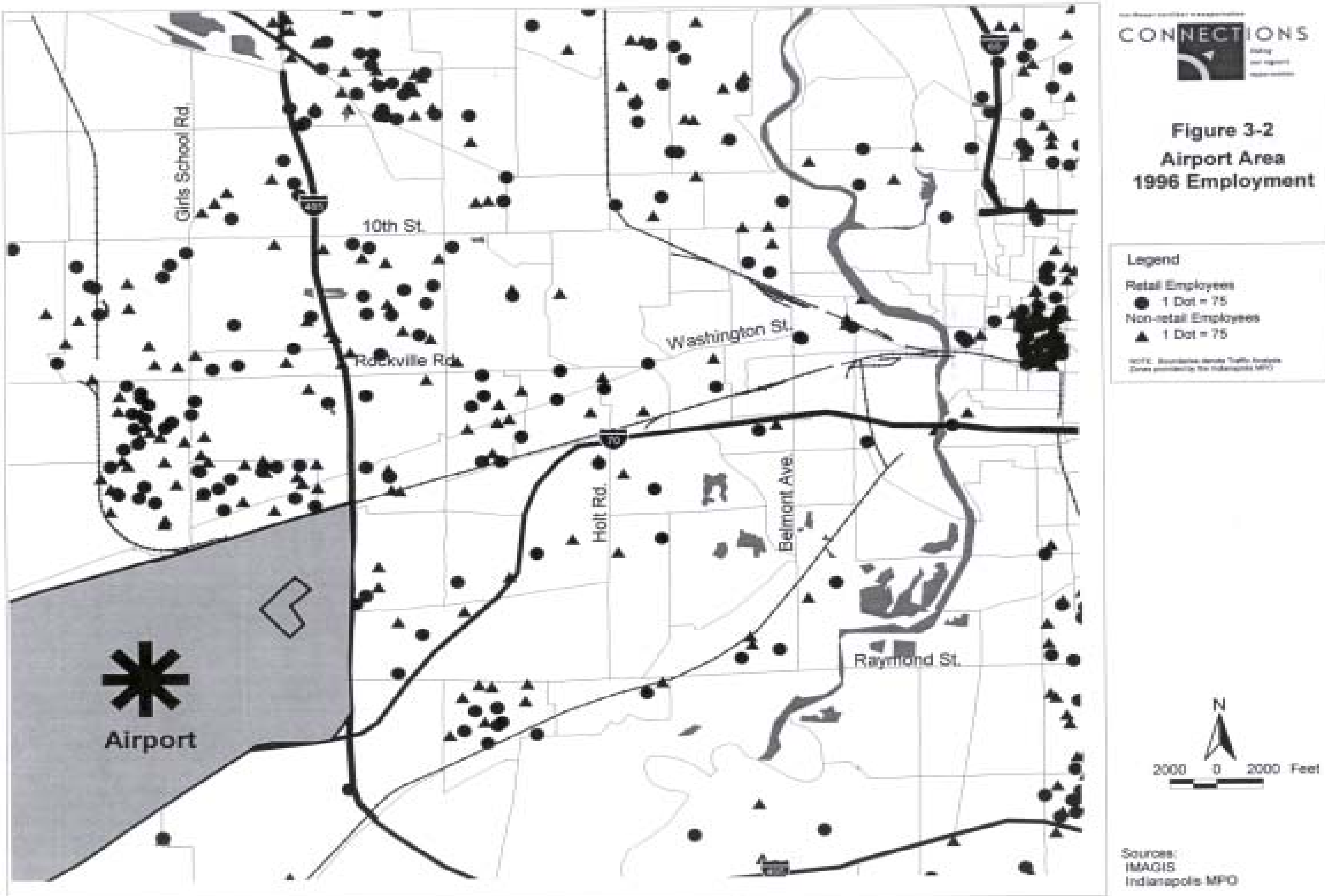
The United States Postal Service (USPS) employing approximately 1,000 people is also located in the north airport area but they have given notice of relocating. It is quite likely that another use will be found for that space very quickly.

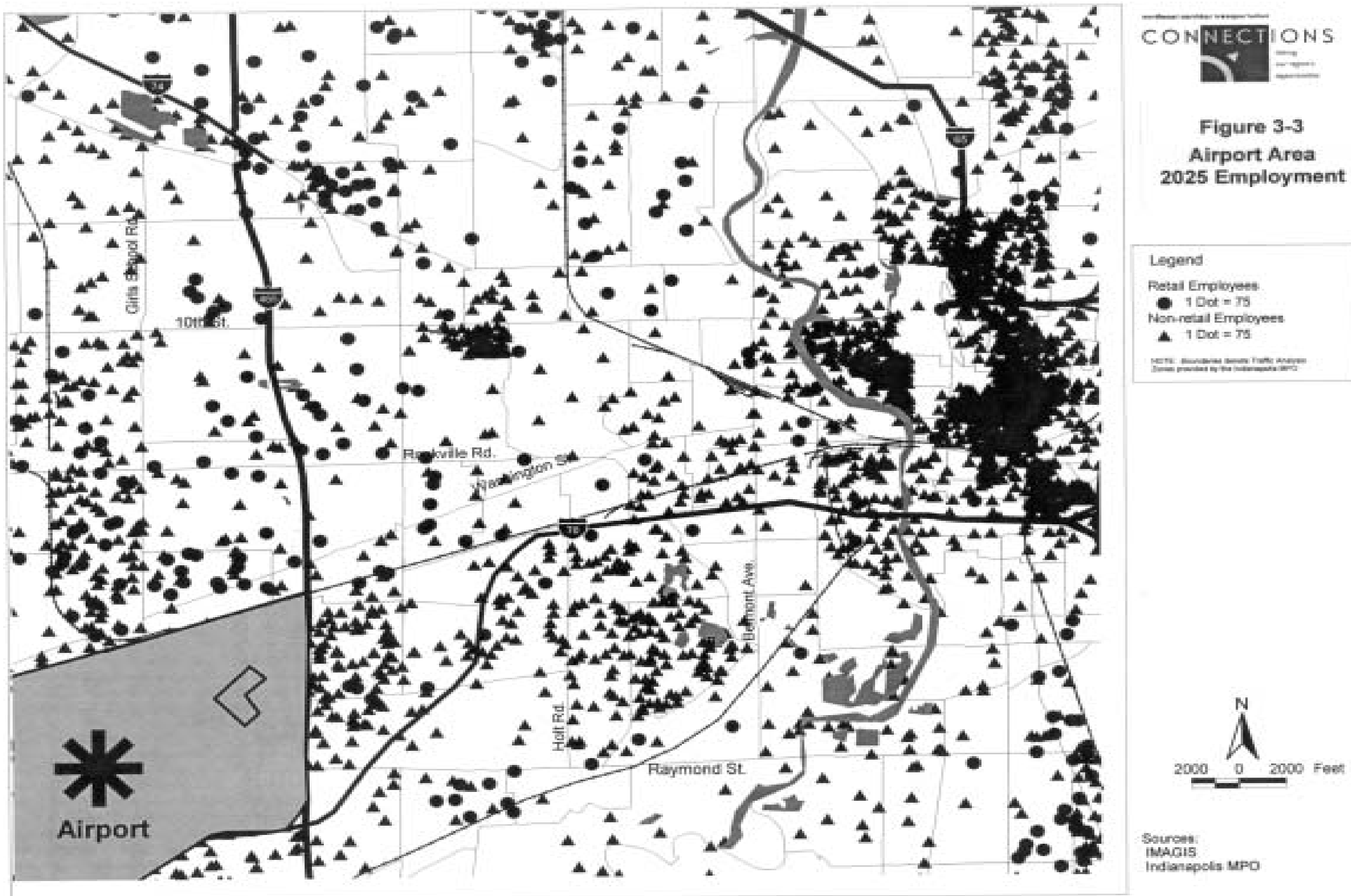
Figures 3-4 and 3-5 illustrate 1996 and projected population density levels for the year 2025. The projections for the year 2025 show that population density will remain steady for this area and employment levels will grow. A growing base of employment opportunities is a positive sign for public transit, and the stability of a passenger rail system could help to sustain that growth. These figures also show that the CSX Crawfordsville Branch line passes through areas of relatively dense residential development, which may make it attractive for passenger service.

RAIL LINE TO THE GREENWOOD AREA

Figure 3-6 illustrates 1996 employment levels and Figure 3-7 illustrates projected employment levels for 2025. Figure 3-6 shows that significant employment activity already exists near the rail line, especially around the I-465 area and the area of the Greenwood Mall. For 2025, the employment levels are projected to increase in the area between I-65 and the rail line and between the White River and the Rail Line.

Population density for 1996 is illustrated in Figure 3-8 and the projected density for 2025 is shown in Figure 3-9. As development moves south, the population density will increase, which is needed to support transit service.

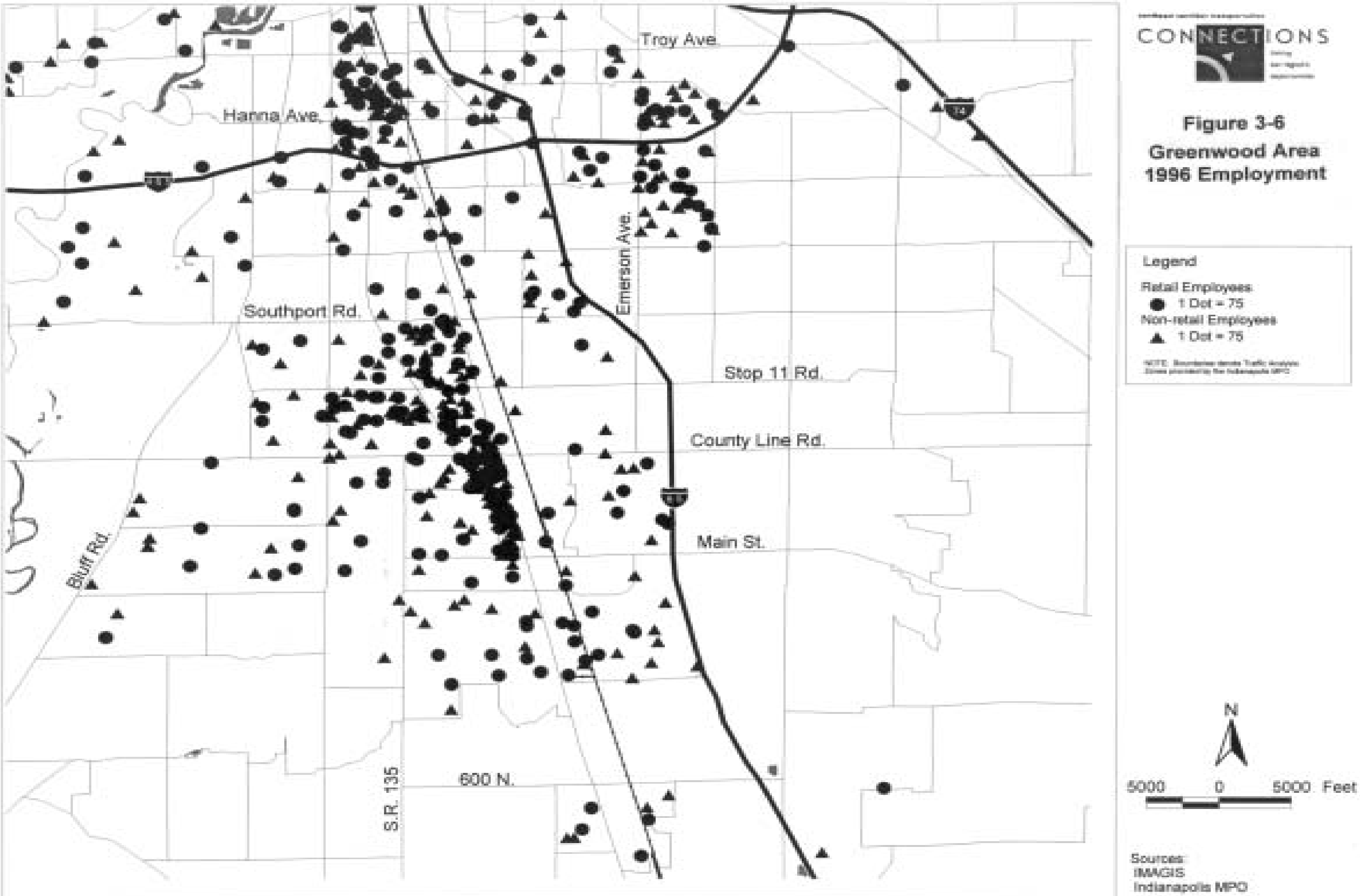

CONNECTIONS
Figure 3-2
Airport Area
1996 Employment
Legend
Retail Employees
1 Dot = 75
Non-retail Employees
1 Dot = 75
Girls School Rd.
10th St.
Rockville Rd.
Washington St.
Holt Rd.
Belmont Ave.
Raymond St.
Airport
N
2000 0 2000 Feet
Sources:
IMAGIS
Indianapolis MPO



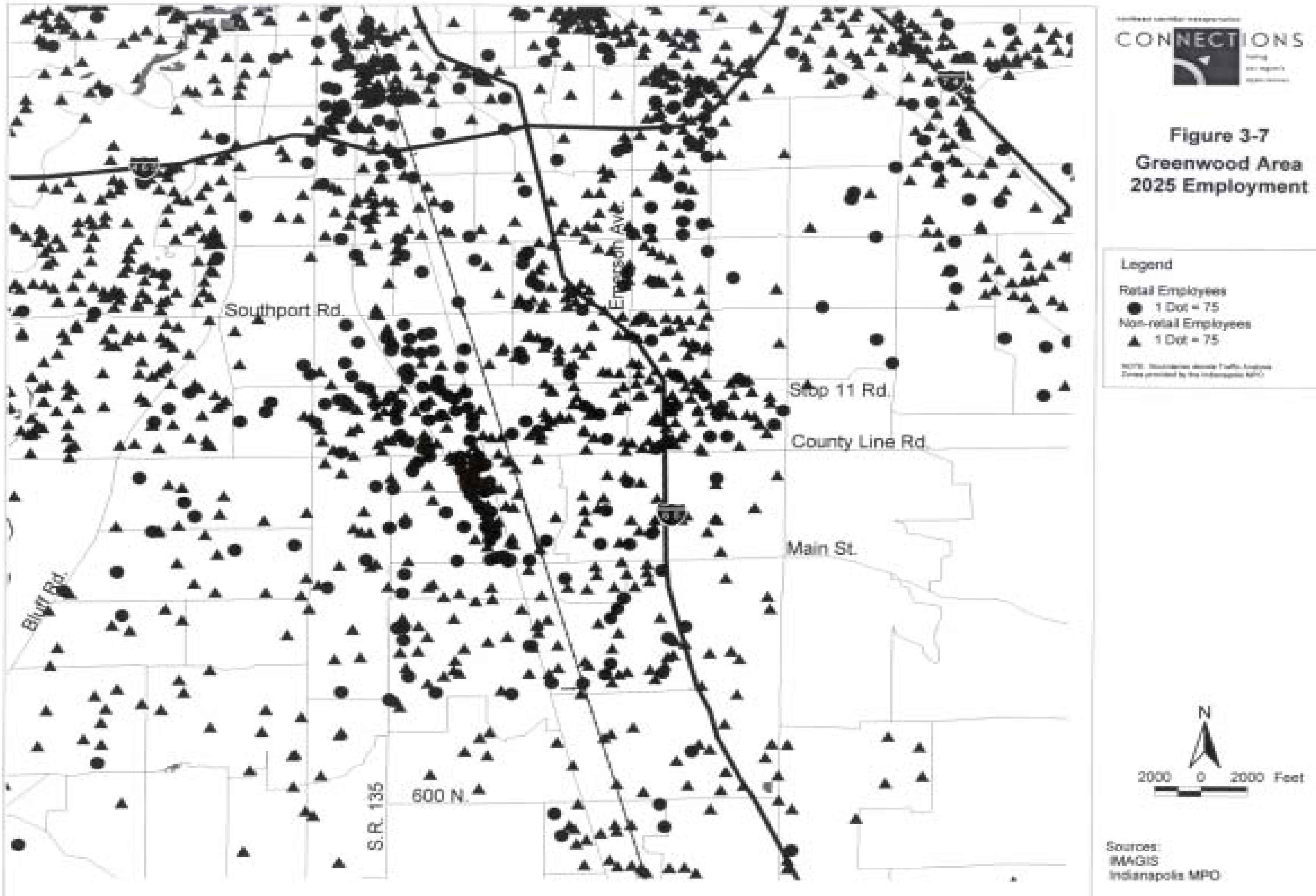
CONNECTIONS
Figure 3-3
Airport Area
2025 Employment
Legend
Retail Employees
1 Dot = 75
Non-retail Employees
1 Dot = 75
Girls School Rd.
10th St.
Washington St.
Holt Rd.
Belmont Ave.
Raymond St.
Airport
N
2000 0 2000 Feet
Sources:
IMAGIS
Indianapolis MPO

Figure 3-4
Airport Area
1996 Persons
Per Acre

Figure 3-5
Airport Area
2025 Persons
Per Acre



Troy Ave.
Hanna Ave.
Southport Rd.
Emerson Ave.
Stop 11 Rd.
County Line Rd.
Main St.
Bluff Rd.
S.R. 135
600 N.
CONNECTIONS
Figure 3-6
Greenwood Area
1996 Employment
Legend
Retail Employees
1 Dot = 75
Non-retail Employees
1 Dot = 75
N
5000 0 5000 Feet
Sources:
IMAGIS
Indianapolis MPO



CONNECTIONS
Figure 3-7
Greenwood Area
2025 Employment
Legend
Retail Employees
1 Dot = 75
Non-retail Employees
1 Dot = 75
Southport Rd.
Emerson Ave.
Stop 11 Rd.
County Line Rd.
Main St.
Bluff Rd.
S.R. 135
600 N.
N
2000 0 2000 Feet
Sources:
IMAGIS
Indianapolis MPO

CONNECTIONS
Figure 3-8
Greenwood Area
1996 Persons
Per Acre
Legend
Persons Per Acre
> 1
1 - 3
4 - 7
> 7
Troy Ave
Hanna Ave.
Southport Rd.
Emerson Ave.
Stop 11 Rd.
County Line Rd.
Main St.
Bluff Rd.
600 N.
S.R. 135
N
Sources:
IMAGIS
Indianapolis MPO

Figure 3-9
Greenwood Area 2025 Persons Per Acre

PRELIMINARY OBSERVATIONS

The logical phasing, given the demographic trends and the development activity occurring in the greater airport area, would be to extend passenger rail service to the airport area first. A subsequent phase would likely extend passenger service south to Greenwood and the employment areas around the Greenwood Mall.

Although congestion is steadily increasing, the greater airport area is not currently experiencing a congestion crisis of the severity of the northeast corridor. There is still excess roadway capacity to accommodate some growth in vehicle volumes, especially along I-70. In addition, IndyGo provides a good network of bus service to the airport area and has recently added the “Access to Jobs” service, which is experiencing growing success.

Planning ahead for better access to the greater airport area is prudent, however, given the growth in employment that is anticipated and the potential for redevelopment that exists in the area between downtown and the airport. In addition, rail service to/from the airport would be an added convenience to visitors arriving by air with destinations in downtown Indianapolis. Likewise, it would be an added convenience for people that would prefer not to park at the airport. With rail service to both the airport and the northeast corridor, the system as a whole would become more viable and efficient.

Public input has also strongly supported rail service to the airport. The topic of rail service to the airport is mentioned as a need at almost every public meeting and it has been pointed out numerous times that most other successful light rail systems have an airport connection.

As a subsequent phase, the preliminary planning for a rail corridor south to the Greenwood area also makes sense. There is currently IndyGo bus service to a number of major destinations along Madison Avenue and U.S. 31 into Greenwood. As development continues to move south, the Greenwood area will likely need other transportation options to serve the mobility needs of the community.

The following paragraphs of this section provide conceptual information about potential rail service to the airport and Greenwood. *This information is intended to provide policy-makers with general information so that they may make a decision regarding the need for a separate, detailed study of the issue. It is not intended to provide all the specifics or the technical analysis upon which to base a service decision.*

POTENTIAL ROUTE ALIGNMENTS TO INDIANAPOLIS INTERNATIONAL AIRPORT

Recently completed concept studies for the new Midfield Terminal at Indianapolis International Airport made provision for transit guideway construction (such as LRT) within the median of the entry roadway. This provision was made without the benefit of any regional studies of how the line might approach the airport. These plans should be developed concurrently in order to identify the best option for meeting community and airport needs.

Service to the airport could potentially be located on either of two rail lines that extend to that area from the downtown. The CSX Crawfordsville Secondary line extends from the downtown in a west/southwesterly direction to directly north of the airport. This line also links to the Indiana Southern Railroad over CSX trackage that extends north/south between Holt Road and Tibbs Avenue. The Indiana Southern Railroad line extends southwest toward the airport, roughly paralleling Kentucky Avenue for much of the route. The rail lines were illustrated previously in Figure 3-1 and the following paragraphs provide information about each rail line.

Indiana Southern Rail Line

The Indiana Southern Rail Line lacks a direct rail connection to the downtown due to an approximately one-mile gap between the downtown and Harding Street. It appears that the former right-of-way may have been sold because construction has occurred in the area. To link to the downtown, current freight traffic connects to the CSX Crawfordsville Secondary Line via tracks that run north/south between Holt Road and Tibbs Avenue.

One option for a passenger rail line to/from the airport using the Indiana Southern Rail Line would be for the line to leave the rail right-of-way at Harding Street and operate on city streets into the downtown via a portion of vacated Kentucky Avenue. This would necessitate traveling through the Lilly Industrial Center complex and would most likely include a stop there for Lilly employees. The line would then continue on Kentucky Avenue to South Street for service into the downtown area via Illinois and Capital.

➢ **Key Facts**

- The Indiana Southern Rail Line is currently used for freight service and carries approximately 1 train per day west of Holt Road.
- Adjacent land uses include primarily light to heavy industrial with some residential uses in the surrounding area.
- Notable locations along the rail line include:
  - Indianapolis International Airport
    - ✓ Federal Express
  - Lilly Industrial Center
  - Daimler/Chrysler plant
  - Mars Hill area (redevelopment potential with addition of passenger rail service)
  - Decatur Central High School
  - Ameriplex Industrial Park

- The suitability for passenger rail service in this line is high, especially with connections to the Northeast Corridor.

Table 3-A

Pros & Cons Of Using the Indiana Southern Rail Line For Passenger Service	
PROS	**CONS**
▪ Only 1 freight train/day currently ▪ Adjacent to Lilly Industrial Center ▪ Adjacent to Ameriplex Industrial Park ▪ Serves Indianapolis International Airport and Federal Express ▪ Strong potential for redevelopment in areas surrounding the rail line	▪ Does not directly access the airport without additional trackage & then only directly serves Federal Express ▪ Direct access to the Midfield Terminal is constrained by existing runways and taxiways. ▪ Lacks direct service to the employment centers to the north of the terminal ▪ Must cross over/go beneath I-70.

Conceptual Route To Midfield Terminal

Figure 3-10 illustrates two potential routing options from the Indiana Southern line to the Midfield Terminal. The route would operate on existing rail rights-of-way from the downtown until it reached Hanna Avenue. Then, the route would follow the alignment of Hanna Avenue to Kollman Road. At Kollman Road the line could be routed under I-70 to serve Federal Express and the Midfield Terminal (Route S-1). A shuttle service could be instituted to move people to other destinations within the airport area.

A second option (Route S-2) would extend the line further west to enter the terminal area in the median of the Midfield Terminal access road. Space was provided for this in the recent terminal area planning study, but the access route to reach the terminal access road corridor was undefined. Specific route details need to be explored to evaluate the best way to cross I-70 and enter the airport's right-of-way.

Detailed study would be required to fully evaluate the benefits and costs of Route S-1 versus S-2. Ridership would be higher for Route S-1 since it would offer the advantages of service to Federal Express and a more direct route to the new terminal. These benefits would need to be weighed against the added cost of constructing a tunnel (4,000 feet +/-) under I-70, Federal Express aprons, and Runway 5R-23L to reach the Midfield Terminal.

CSX Crawfordsville Secondary Rail Line

The CSX Crawfordsville Secondary line extends from the downtown in a west/southwesterly direction to directly north of the Indianapolis International Airport (and then extends northwest to Brownsburg and beyond). There is a direct rail connection to the downtown area (Union Station) via this line. However, due to potential conflicts with freight traffic in the downtown area, it may be best for the passenger service to leave the rail right-of-way and operate on city streets.

➢ **Key Facts**

- This line is currently used for freight service and carries approximately 12 trains per day. The line also is used for Amtrak passenger service, which serves Indianapolis two to three times per week. The frequency of freight service may compromise available passenger schedules and may make the use of diesel multiple units impractical. (See Section 1, page 8 for FRA requirements.)
- This line is a potential route for a high speed rail system that is being investigated for the Midwest. The route would either extend from Cincinnati to Indianapolis on the existing rail line that serves Indianapolis from the southeast or would extend from Louisville to Indianapolis on the existing rail line that passes through Greenwood. Either high speed route would serve the west side of Indianapolis via the CSX Crawfordsville Secondary line to access Chicago and beyond into Wisconsin. Potential high speed rail routes are identified on Figure 3-1, which presents the Regional Rail Map.
- Surrounding land uses include primarily light to heavy industrial near the downtown area with a commercial/residential mix further west.
- Notable locations along the line:
  - ➲ GM Metal Fabricating Plant
  - ➲ FMC Chain Division Plant
  - ➲ Residential uses
  - ➲ Indianapolis International Airport
    - ✓ United Airlines Maintenance Facility
    - ✓ United States Postal Service (or other tenant)
    - ✓ ATA Headquarters

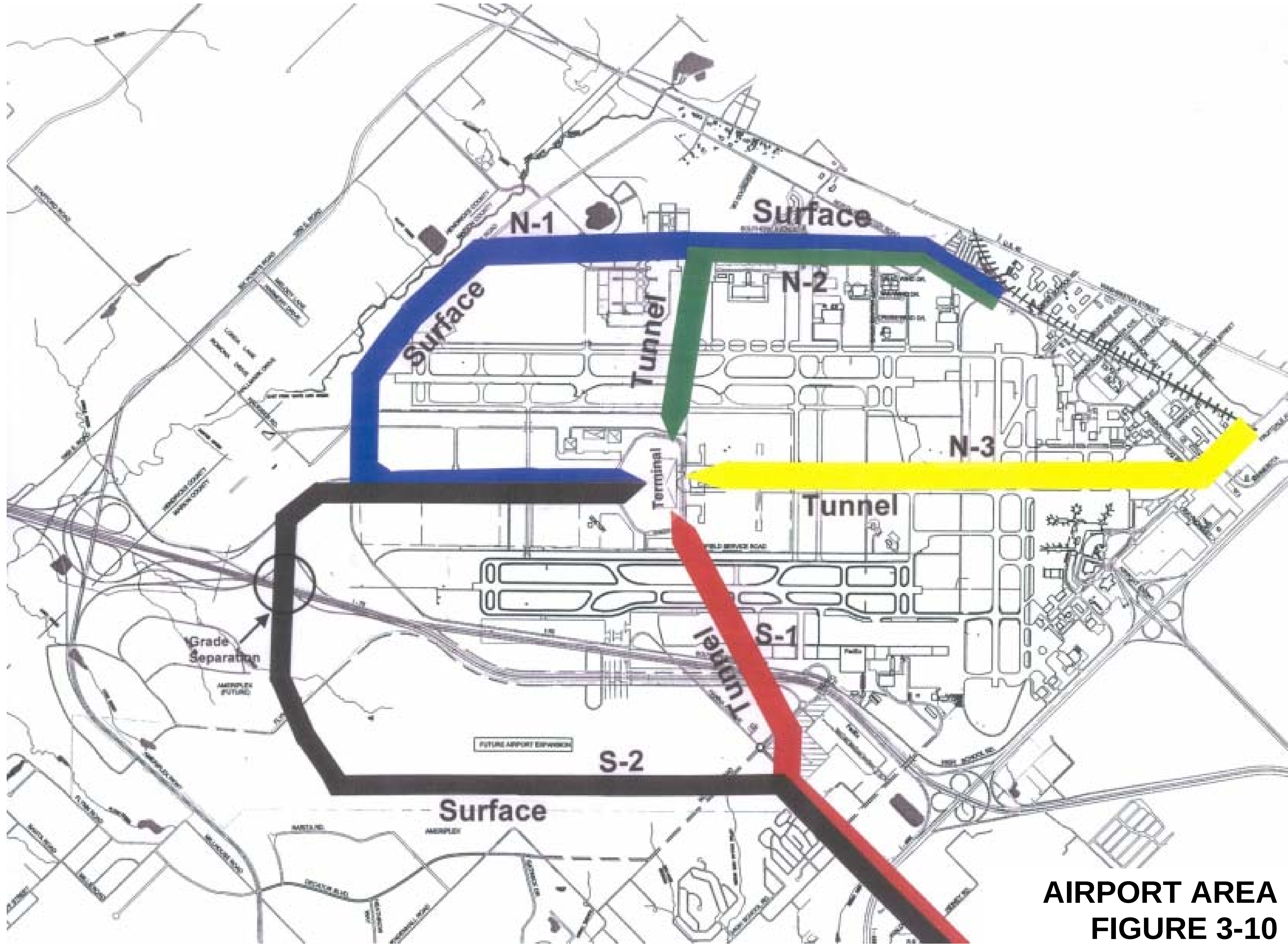
N1 - North 1, Surface route via terminal access road (all Surface)

N2 - North 2, Tunnel to terminal via Hoffman Road (2,500' Tunnel)

N3 - North 3, Tunnel to terminal via High School Road (7,500' Tunnel)

S1 - South 1, Tunnel to terminal via Hanna Avenue (4,000' Tunnel)

S2 - South 2, Surface route via terminal access road (Freeway underpass)



AIRPORT AREA
FIGURE 3-10

- The suitability for passenger rail service is high, especially with connections to the northeast corridor.

Table 3-B

Pros & Cons Of Using the CSX Crawfordsville Secondary For Passenger Service	
PROS	**CONS**
▪ Direct connection to downtown (Union Station) ▪ Serves Indianapolis International Airport ▪ Potential for redevelopment in areas surrounding the rail line	▪ Approximately 12 freight trains/day; may preclude use of DMU's. ▪ Does not provide direct access to employment centers on the south side of the airport ▪ Providing direct access to the Midfield Terminal way be constrained by existing runways and taxiways.

Conceptual Route To Midfield Terminal
As shown on Figure 3-10, this rail line would utilize the current railroad right-of-way to the north side of the airport, where it could access the Midfield Terminal via three options: Route N-1 would access the terminal from the west via the median of the terminal access road, as planned for in terminal concept studies. Route N-2 would tunnel to the terminal in the vicinity of the United Airlines Maintenance Facility and Route N-3 would tunnel to the terminal via High School Road. This option would have the greatest utility if the area of the current terminal is converted to an industrial park or other employment center. A shuttle service could also be instituted to move people to other destinations within the airport property.

Route N-1 would serve all north airport tenants. No tunneling would be required, but it would be the longest of the three options, with associated impacts on travel time and ridership. Route N-2 would also serve all north airport tenants, and would reduce the distance to the terminal by two miles (compared to N-1). N-2 would be more costly due to the tunnel under Runway 5L-23R (approximately 2,500 feet). Route N-3 would provide the most direct path to the Midfield Terminal and would serve the existing (east) terminal area. It would also be the most costly, requiring a tunnel over 7,000 feet long.

Unlike the southern routes, with the three northern options it would not be necessary to provide a new interstate highway crossing to access the terminal. Additional location studies are needed to define a specific route and to evaluate service and cost trade-offs.

POTENTIAL ROUTE ALIGNMENT TO GREENWOOD

Service to the south (the Greenwood/Franklin area) could be located on the Louisville and Indiana Railroad. This line extends south from the downtown area, paralleling Madison Avenue for much of the route. This rail line is also illustrated on the previous rail corridor map shown in Figure 3-1. The following paragraphs provide information about the rail line.

Louisville and Indiana Rail Line

This line connects to Union Station from the south. Due to potential conflicts with freight traffic in the downtown area it may be best for the passenger service to operate on city streets in the immediate downtown area.

- **Key Facts**

  - This line is used for freight service and carries approximately 2 trains per day.
  - This line is a potential route for a high speed rail system that is being investigated for the Midwest. Potential high speed rail routes were identified previously in Figure 3-1.
  - Surrounding land uses in the near downtown area include a mix of commercial uses. South of the downtown the lines passes through residential and commercial areas as well as the City of Southport.
  - Notable locations along the rail line include:
    - Lilly Corporate Center
    - Garfield Park
    - Manual High School
    - University of Indianapolis
    - City of Southport
    - Greenwood Park Mall
    - Greenwood Industrial Air Park
    - City of Greenwood
    - Craig Park (in Greenwood)
  - The suitability for passenger rail service is high, especially with connections to the northeast corridor.

Table 3-C

Pros & Cons of Using the Louisville and Indiana Rail Line for Passenger Service	
PROS	**CONS**
▪ Only 2 freight trains/day ▪ Adjacent to Lilly Corporate Center, Garfield Park, University of Indianapolis ▪ Direct connection to downtown area ▪ Directly serves Union Station	▪ Potential exists for increased freight traffic in the future ▪ Does not directly serve Greenwood Park Mall or other major employment center

<u>Conceptual Routing to Key Destinations</u>
South of the Marion/Johnson county line the rail line runs near the Greenwood Park Mall, but direct access is not provided. Service to the mall would be critical and options could include:

1. A shuttle service to a station near South County Line Road and the rail line.
2. Routing the line on-street to directly serve the Mall and the adjacent commercial and retail uses.

Routing to the center of the City of Greenwood could also be facilitated via a shuttle service or routing the line on-street (if roadway capacity is available).

SERVICE IN THE DOWNTOWN AREA

Passenger rail service to and through the downtown area is a key component in effectively linking the northeast corridor to other potential segments of rail passenger service. Options for serving the downtown will be vehicle dependent, as discussed in Section 1 of this report. Vehicle characteristics and specifications need to be tailored to local conditions so that rail vehicles can mix safely with vehicular traffic and proper turning radii and clearances can be achieved.

RECOMMENDATIONS

System concepts presented here are preliminary. These concepts have not yet been modeled for ridership potential, and costs and potential impacts have not been reviewed. Nevertheless, these two rail lines, combined with northeast service, represent the most logical future base system as indicated by existing information, and provide a rational format for considering the proposed northeast transit system in a regional context.

It is recommended that the northeast transit alternatives be considered in the context of a potential regional system and that additional studies be conducted regarding a western extension of the rail line. It will be important to work with airport planners to determine the best potential route for passenger rail service within the airport property. Likewise, downtown circulation issues should be refined based on current vehicle specifications and combined service potential from multiple routes to/from downtown.

APPENDIX A

RESEARCH OF TRANSIT IMPACTS ON RESIDENTIAL PROPERTY VALUES

Research of the transit impacts on residential property values is not definitive due to a limited number of studies, differences among existing rail systems and the wide range of factors that influence property values. The following is a brief summation of information that is currently available.

San Diego, California - The San Diego trolley is a 41-mile light rail system with two rail lines. Access to the light rail system was clearly valued by city residents. The only transportation variable that affected prices was distance to the nearest transit station. For the typical single-family home in the City of San Diego, every 100 meters (109 yards) closer to a transit station added about $272 to the home value. No nuisance effects of being immediately adjacent to stations were detected.

San Jose, California - In San Jose, the light rail line has 39 miles of track with 33 stations, 13 of which have park-and-ride lots. San Jose's light rail line is located primarily in commercial and industrial areas interspersed with older housing. Analyses showed that homebuyers preferred houses that were distant from both light rail and highways. San Jose homebuyers paid on average $197 more for every 100 meters distance from light rail. They paid even more to be distant from freeway interchanges - $436 per 100 meters. The authors pointed out that the aversion to light rail is probably due to the commercial and industrial nature of the areas along the line. Nearby homes are older and generally serve a lower income segment of the market. Some stations are also not well connected to residential areas. Thus, it may be that it is the general area, and not the presence of light rail, that San Jose homebuyers view negatively.

Portland, Oregon - Portland, Oregon's system showed mixed results in one study that analyzed home sales in two overlapping areas along Burnside Street. A light rail line runs along the middle of Burnside Street, and there are seven stations along this segment. One analysis showed that people who bought single-family homes within a one-quarter-mile walking distance of these stations valued access to light rail. They were willing to pay a premium on the typical house of $663 for every 100 feet that they were closer to the station.

A second analysis in Portland included all home sales within a quarter-mile straight-line distance of the light rail line. (Over 60 percent of these homes were more than a quarter-mile walk from stations.) The results indicated that most of these homebuyers did not value access to light rail. Overall, homebuyers were willing to pay a premium on the typical house of $187 for every 100 feet they were distant from light rail stations. It is possible that people have always been willing to pay more to live in the residential areas away from Burnside Street with its traffic and commercial activities. The study does not rule out this explanation.

Thus it appears that in Portland some people consider rail a good neighbor. These people are willing to pay a premium for houses within walking distance from stations. Others would just as soon not live close to it (or to the arterial street along which it runs), and they pay more for the same house farther away.

Philadelphia, Pennsylvania - In Philadelphia one study of a commuter rail line showed that people paid a premium of $20,566 in 1988 to live in communities with commuter rail service. In fact, the premium paid to live in communities with train service to the CBD rose between 1979 and 1988 even though employment was growing in the suburbs during this period.

San Francisco, California - A study of the Bay Area Rapid Transit (BART) system in San Francisco showed that home prices varied in three suburban counties that were examined. In Alameda County, home prices were $229 higher for every 100 meters a house was closer to a BART station. In Contra Costa County, the differential was $196 for the same distance, and in San Mateo County, proximity to rail did not have any discernable impact on home prices.

APPENDIX B

Indiana Department Of Transportation Highway Traffic Noise Policy

APPENDIX C

DESIGN STANDARDS AND SPECIFICATIONS FOR VARIOUS TRANSIT VEHICLES

Design Standards and Specifications for Various Transit Vehicles

	BUS RAPID TRANSIT	LIGHT RAIL TRANSIT	Commuter Rail (Self-Propelled) Type III DMU (LRT Compatible)	Type II DMU (LRT Compatible)	Type I DMU (FRA Compatible)	Commuter Rail (Coaches with Locomotives)
VEHICLES	Low Floor Standard and Articulated	Low Floor (70%) Articulated Car	Low Floor (up to 100%) Articulated Car *(Adtranz GTW 6/2)*	Low Floor (70%) Articulated Car (*Siemens RegioSprinter)*	High Floor Single Body Car *(Nippon Sharyo North American DMU)*	Push-pull, locomotive-hauled coaches SINGLE LEVEL (*Bombardier Comet III*) or MULTI-LEVEL (*Bombardier Coaster*)
Boarding	Floor Level (Low)	Floor Level (Low)	Floor Level (Low)	Floor Level (Low)	Floor Level (High) or Steps with Traps	SINGLE LEVEL Floor Level (High) or Steps with Traps MULTI-LEVEL Floor Level (Low)
Length	60’	103’ (maximum over couplers)	103’ (maximum over couplers)	82’	85’	
Width (at floor)	8.5’	8.75’	9.8’	9.8’	10.5’	SINGLE-LEVEL 10.5’ MULTI-LEVEL 9.8’
Height (roof)		11.5’ max.	12.8’	11.0’	13.1”	SINGLE-LEVEL 12.7’ MULTI-LEVEL 15.9’
Floor Height (above guideway)	Standard curb height	12’’ at entrance, 14” main low floor area	22”	21”	51”	SINGLE-LEVEL 51” MULTI-LEVEL 25”
Capacity						SINGLE-LEVEL MULTI-LEVEL
Seated	Varies	92	137	84	90	113 142
Standing		100	93	100	34	43 109
Total		192	230	184	124	156 251
FARE COLLECTION	Proof of Payment; but allow for on-board payment/ validation	Proof of Payment	Proof of Payment	Proof of Payment	Proof of Payment	
STATIONS	ADA Accessible					
Platform Length	Provision for 150’	300’ min.	300’ min.	300’ min.	300’ min.	
Platform Width						
Center	15’ /12’ min	15’ / 12’ min	15’ / 12’ min	15’ / 12’ min	15’ / 12’ min	
Side	10’ /8’ min.	10’ / 8’ min.	10’ / 8’ min.	10’ / 8’ min.	10’ / 8’ min	
Platform Height above running surface (rail)	Standard curb height	14” (for floor-level boarding)	22” (for floor-level boarding)	21” (for floor-level boarding)	Low-Level: 8” High-Level: 51”	
ALIGNMENT						
Conditions	Varies	Combinations of Urban Street or RR R/W with grade xings	Combinations of Urban Street or RR R/W with grade xings	Primarily RR R/W with grade xings (Urban Street running curve limited)	RR R/W with grade xings	
Min. Width Double track Single track	24’ 12’ allow for vehicle guidance and enforcement areas	24’ 15’ (approx. 10’-6” at station; platform edge approx. 4’-6” from track centerline)	24’ 15’ (approx. 10’-6” at station; platform edge approx. 4’-6” from track centerline)	24’ 15’ (approx. 10’-6” at station; platform edge approx. 4’-6” from track centerline)	x	
Minimum Radius Horizontal Curve Vertical	Same as LRT	150’ min desirable 100’ design min. Crest Curve = AV (**2)/25 Sag Curve = AV(**2)/45 Where A = algebraic difference in grade and V=speed in mph	131.2’ design minimum Crest Curve 1640 ft Sag Curve 1312 ft	263’ design minimum	480’ min. desirable 300’ design minimum	
Grades	Same as LRT	6.0%	6.0%	4.0 %	2.5%	
Minimum vertical clearance above top of running surface (rail)	13’	Overhead Contact Wire 16’ Separate ROW (13’ absolute min) 18’ in public way (16’ absolute min) 22’ RR within envelope 4’ Wire clearance to any grounded structure 24’ catenary depth	18’ min. in public way 16’ absolute min. 22’ min. in RR R/W		22’ min. in RR R/W	
PROPULSION	Diesel-Mechanical Self-Propelled (fuel for IC engine carried on board)	Electric Self-Propelled (power drawn from overhead wire)	Diesel-Electric Self-Propelled (fuel for IC generators carried on board)	Diesel-Hydraulic Self-Propelled (fuel for IC engines carried on board)	Diesel-Hydraulic Self-Propelled (fuel for IC engines carried on board)	Hauled by separate Diesel-Electric Locomotive (fuel for IC generator carried aboard)

APPENDIX D

CONGESTION ANALYSIS METHODOLOGY

18,700 daily rail transit person trips (minus) 6,931 daily rail transit person trips diverted from the bus = 11,769 daily rail transit person trips diverted from private vehicles.

11,769 daily rail transit person trips diverted from private vehicles (times) .65 peak hour percentage of the total peak period (divided by) 1.25 (1990 vehicle occupancy for downtown work trips) = 4,284 peak hour trips.

4,284 peak hour trips (divided by) 2 = 2,142 a.m. and 2,142 p.m. peak hour trips.