

THE 2020 TRANSIT REPORT: *POSSIBILITIES FOR THE FUTURE*

This report describes and documents the "**Transit Score**" indicated on NJ TRANSIT's **2020 TRANSIT MAP**. The report also describes the Fixed Guideway projects listed on the **2020 Transit Map- Possibilities for the Future**. Presented in this report are the detailed technical criteria that indicate the types of transit investment and service that are appropriate for the different categories of the Transit Score. The report is a guide to the different factors that encompass the transit score, as well as a description of criteria and standards that combine with an area's Transit Score to indicate which types (modes) of transit and types of bus service and intermodal facilities are appropriate for an area. The formula to calculate an area's Transit Score, the basis for the formula, and the relation to transit service is also documented. The existing 2020 Transit Score for each area of the state, how to change an area's transit score, and the Transit Score's relation to the State Development and Redevelopment Plan are also described in the report.

The report is divided into four sections:

Section 1- TRANSIT SCORE CRITERIA This section describes the components of the Transit Score, its application, and how it is to be used in determining the potential for transit service and new facilities. This section also documents the standards and criteria that in conjunction with the Transit Score determine which modes of transportation and types of transit service are appropriate for a geographic area. The role and use of the Transit Score in the Planning process and how it relates to on-going projects is outlined.

Section 2- TRANSIT DESCRIPTIONS This section provides two sample descriptions and more detailed information on the elements of the different types of transit. This section illustrates the process involved in developing the criteria for individual types of transit in the Transit Score. Also described is how the transit criteria relate to actual New Jersey experience and other data used to support the development of the Transit Score. This section also documents some of the sources used to develop the transit score, the fixed guideway and bus service criteria, and their justification.

Section 3- CHANGING TRANSIT SCORE & ITS RELATIONSHIP TO LAND USE This section of the report illustrates what is involved in changing an area's transit score. The actual Transit Score formula, sources of data to update transit score calculations and how to obtain individual area Transit Scores on the 2020 Transit Map are provided. An example of how to change the Transit Score based on modifying land use patterns is provided. The relationship between land use patterns, transit services, the State Plan, and the criteria for the Transit Score is explained and illustrated.

Section 4- DESCRIPTION OF 2020 TRANSIT MAP FIXED GUIDEWAY PROJECT STATUS A brief description and updated status report on each of the Fixed Guideway projects listed on the 2020 TRANSIT MAP is provided. The description includes what the objectives of the project are, and status of the project in the planning and design process. For projects to be Defined/Studied, the general project area, possible project location, project rationale and types of transit that are proposed based on the Transit Score are indicated.

SECTION 1- TRANSIT SCORE CRITERIA

This section of the report describes the components of the Transit Score, how it is calculated, and the criteria and standards that are used in conjunction with the Transit Score to determine which modes of transportation and types of transit service are generally appropriate for a geographic area. The green areas on the 2020 Transit Map indicate the "Transit Score" of an area. The darker the green, the greater the potential for more transit service and more types (modes) of transit. The Transit Score, combined with other transportation and demographic criteria, suggests where and at what level investments in three categories of transit are appropriate.

WHAT IS THE 2020 "TRANSIT SCORE"?

The Transit Score is a numerical index, which is based on the composite average of four factors that influence the potential for transit ridership. A Transit Score is estimated for each of the 1,950 Census Tracts in New Jersey. This provides a common statewide unit of geography to estimate and compare the Transit Score. The Transit Scores are based on year 2020 forecasts for each of four factors. The four factors that are examined and comprise the Transit Score are:

1. Household Density
2. Population Density
3. Employment Density
4. Zero and One-Car Household Density

All transit scores are classified into one of five categories. These five categories represent ranges based on observed land use characteristics and actual transit service patterns. Following are the five Transit Score categories and the range of transit scores for each:

- **LOW- 0 to 0.5** Transit Score. Represents 15% of 2020 statewide population and 8% of 2020 statewide employment on 66% of land area.
- **MARGINAL- 0.5 to 1.0** Transit Score. Represents 9% of 2020 statewide population and 7% of 2020 statewide employment on 11% of land area.
- **MEDIUM*- 1.0 to 3.0** Transit Score. Represents 30% of 2020 statewide population and 31% of 2020 statewide employment on 16% of land area.
- **MEDIUM-HIGH*- 3.0 to 9.0** Transit Score. Represents 28% of 2020 statewide population and 33% of 2020 statewide employment on 6% of land area.
- **HIGH*- >9.0** Transit Score. Represents 18% of 2020 statewide population and 21% of 2020 statewide employment on 1% of the state's land area.

The three categories with a * generally correspond to Planning Areas 1 and 2 in the State Development and Redevelopment Plan. Thus a Transit Score of 1.0 or greater is in most cases comparable to these Planning Areas of the state plan. These three Transit Score categories combined account for 76% of the forecast 2020 statewide population and 85% of 2020 statewide employment on 23% of New Jersey's land area. However these three categories account for only 52% of the mostly trend population growth expected between 1990 and 2020.

WHAT DOES THE TRANSIT SCORE MEAN?

The Transit Score indicates the relative likelihood and potential for different types of transit usage in a geographic area. Higher score areas can accommodate a greater range of types (modes) of transit service. The Transit Score is used to identify where three different types of transit investments may be appropriate, subject to available resources, provided certain criteria and conditions are met.

The three different types of transit investments covered by the Transit Score are:

- **Fixed Guideway Transit** (Commuter Rail/Light Rail/Ferry/Bus-Only lane)- new transit lines and extensions of existing lines. Fixed Guideway Transit requires significant capital investment, and is primarily on its own Right-of-Way, with no or limited mixing with auto traffic. Fixed Guideways often can provide timesavings compared to auto travel. Each different type of guideway project must meet certain minimum criteria, primarily related to having at least part of the line/service in an area with a "HIGH" Transit Score and a minimum number of jobs in the center or municipality. Other criteria of the mode and project include availability of right-of-way and adjacent area Transit Score.
- **Bus Service Potential** (Includes Express Bus/Local Bus/Minibus Service). Types of bus service are related to the Transit Score of an area, with a range of minimum span of service throughout the day and average daily frequency of bus service. For some services, a minimum number of jobs in a municipality/center are required, along with differences based on location of an area in the State Plan.
- **Intermodal/Access to Transit** (Includes Park-Ride, Shuttles to transit, Intermodal Terminals)- These are transit services and projects which provide access to transit service and facilitate intermodal or multi-modal service. Based on the Transit Score, peak period ridership, and other factors, minimum guidelines are outlined for park-rides, shuttle buses and other intermodal facilities such as parking structures and terminals.

Table 1-1, Summary of Transit Score Applicability for Fixed Guideway & Service/Intermodal Investments by Area summarizes for each of the three transit investment categories which modes, services, and intermodal facilities meet demographic and transportation criteria and are applicable for implementation based on a geographic area's Transit Score. A **"Y"** means **"YES"**, the service or fixed guideway mode meets all conditions and is an appropriate investment if an area is classified as having the category of Transit Score indicated. A **"C"** means **"Conditional, provided certain conditions or criteria are met"**. If the conditions or criteria are met, then the bus service or fixed guideway mode is applicable and an appropriate investment could be possible in the Transit Score area indicated in the table. A **"---** means **that service or fixed guideway mode is "not warranted"** or not an appropriate investment for that Transit Score category.

It needs to be stressed that if the Transit Score and other criteria or conditions are met and a specific fixed guideway mode or transit service is an appropriate investment, a project or service can advance to more detailed feasibility studies. The Transit Score indicates the "order of magnitude" relationship to types of fixed guideway, bus service, and intermodal investments. However, more detailed study is necessary to provide ridership estimates, costs, benefits, environmental and engineering feasibility, and

financial impacts. The more detailed studies will determine if the investment types outlined in the Transit Score are feasible. Conversely, not meeting the Transit Score criteria does not automatically indicate a project has no merit, but it does mean that the project fails to meet even a minimum level of justification. More detailed investigation or special circumstances can determine that a service or guideway project is viable outside the Transit Score criteria.

In summary, the Transit Score is a planning tool that can be used to guide transit investment and service analysis. It is not a substitute for but a supplement to detailed feasibility studies and the overall on-going transportation planning process.

HOW DO I DETERMINE THE POTENTIAL FOR FIXED GUIDEWAY PROJECTS IN MY AREA USING TABLE 1-1?

1. First determine the Transit Score category of the area you are interested in. As an example, select Medium-High, which has a transit score between 3.0 and 9.0
2. Look up the types of transit service or Fixed Guideway modes you would like to examine. For example, let's look at Medium-Low Cost LRT. Looking at the grid of Table 1-1, a "C" is indicated. This means that Medium-Low Cost LRT is an applicable Fixed Guideway project in your area, provided certain conditions are met.
3. For Bus Services, both Medium Intensity and Low Intensity Bus service are applicable, in Medium-High Transit Score areas, but High Intensity Bus service is not appropriate.
4. For Intermodal services, you want to know if shuttle-bus service to the nearby train station is appropriate. Looking up Shuttle-Bus to Line Haul Transit, Table 1-1 shows that for a Medium-High Transit Score, shuttle bus service with walk access is appropriate if certain conditions are met ("C"). However, if the area has a Low Transit Score, shuttle bus service to line-haul transit is not appropriate.

As these examples illustrate, a local official or planner can quickly determine if a type of transit service or fixed guideway facility is appropriate or possible if the Transit Score of an area is known. Table 1-1 is especially useful for quick screening of what type of transit investments are appropriate to consider in an area. The table also shows generally how much change in land use and development patterns may be necessary to change an area's Transit Score to justify other types of transit investments and modes.

HOW DO I DETERMINE WHAT DETAILED CRITERIA AND CONDITIONS MUST BE MET FOR A GIVEN TYPE OF TRANSIT INVESTMENT?

Table 1-2, Transit Score Detailed Investment Criteria & Conditions lists the detailed criteria and conditions that must be achieved for each of the three transit investment types. The criteria are shown by Fixed Guideway mode and service type for each Transit Score Category.

The detailed criteria in Table 1-2 cover the minimum conditions required for a mode or bus service for both demographic and transportation factors. If the criteria are not met, the Fixed Guideway Type, Bus Transit Service, or Intermodal Facility investment is generally not applicable or appropriate.

TABLE 1-1

SUMMARY OF TRANSIT SCORE APPLICABILITY FOR FIXED GUIDEWAY & SERVICE/INTERMODAL INVESTMENTS BY AREA

Investment Category	Transit Score Category By Area				
1. Fixed Guideway by Type	High	Medium-High	Medium	Marginal	Low
Rapid Transit	C	----	----	----	----
High Capital Cost Electric Light Rail (LRT)	C	----	----	----	----
Medium-Low Capital Cost Electric LRT	C	C	C	----	----
Commuter Rail Terminal	C	----	----	----	----
Commuter Rail/Diesel LRT	Y	Y	C	C	----
Monorail/Personal Rapid Transit (PRT)		SPECIAL	CASE		
Ferry	Y	C	C	----	----
Recreational Transit	C	C	C	----	----
Bus Lanes-Limited Access Roads	Y	C	----	----	----
Bus Lanes-Arterials	C	----	----	----	----
Bus Priority Treatment	Y	C	C	C	----
2. Bus Service Potential / Other Transit					
Express Bus as a Destination /Terminus	C	----	----	----	----
Express Bus-Walk Only Access	Y	Y	----	----	----
Express Bus- Park/Ride Access	----	Y	Y	Y	Y
High Intensity Local Bus Service	Y	----	----	----	----
Medium Intensity Local Bus Service	Y	Y	----	----	----
Minimum Intensity Local Bus Service	----	Y	Y	C	----
Local Circulator Bus-Rural Center	----	Y	Y	C	C
Local Social Service/Paratransit	Y	Y	Y	Y	Y
Mini-Bus w/Line Haul Transit	C	Y	Y	C	----
Mini-Bus Express Suburban Service	Y	C	C	----	----
Vanpools & Vanpool Subsidy	C	Y	Y	Y	Y
3. Intermodal/Access to Transit					
Shuttle Bus to Line-Haul Transit (Walk Access)	Y	C	C	----	----
Shuttle Bus to Line-Haul Transit (Remote Parking)	----	----	C	----	----
Structured Park/Ride	C	C	----	----	----
Surface Park/Ride for Rail/LRT/ Ferry	C	Y	Y	Y	----
Multimodal Terminals	Y	C	----	----	----

LEGEND for Table

Y= Yes, applicable with no conditions
C= Conditional, applicable if conditions are met
---= Not Applicable or warranted

TABLE 1-2

TRANSIT SCORE DETAILED INVESTMENT CRITERIA & CONDITIONS

TRANSIT SCORE CATEGORY (Score)	FIXED GUIDEWAY TRANSIT FEASIBILITY CONDITIONS	BUS & OTHER TRANSIT SERVICE CRITERIA	INTERMODAL/ ACCESS TO TRANSIT
HIGH (9+)	1. Rapid Transit-Only if direct connection to Philadelphia or Manhattan or 150,000+ jobs in center 2. Commuter Rail as a Destination or Terminal- Only if a Regional Center with 60,000+ jobs in municipality 3. High Capital Cost Electric LRT- 33% of line can be in tunnel or elevated. Must have 30,000+ jobs in center or municipality, 60,000 jobs preferred. 4. Medium/Low Capital Cost Electric LRT- Must have 30,000+ jobs in center or municipality to be terminal for line. 5. Bus Priority Treatment-On major arterials with 40+ buses /peak hr. direction 6. Bus Only Ramps/Lanes- On limited access roads/connectors to Regional Centers with 60,000+ jobs	1. Express Bus Service to areas as a Destination or Terminal if 60,000+ jobs in center or municipality. 2. High Intensity Local Bus Service. All day service span (16-24 hours) with average 20 minute frequency over the span of a day. 3. Ferry Services to High Score areas with 60,000+ jobs. Fixed Guideway or Local Transit connecting service. 4. "Wheels" type Express Mini-Bus service from High Score areas to suburban employment centers with 30,000+ jobs. 5. Vanpools and vanpool subsidies which do not compete with existing transit.	1. Major Multi-Modal Terminals 2. Limited Park-Ride Facilities in Structured Parking 3. Bus/Rail Transfer Centers and Feeder Bus services
MEDIUM-HIGH (3 to 9)	1. Medium/Low Capital Cost Electric LRT- At least 50% of the line must be on pre-existing rail/utility/median etc. ROW. Must connect to High Transit Score area with 30,000+ jobs in center/municipality. 2. Commuter Rail/Diesel LRT-Must connect to High Transit Score area Terminus with 30,000-60,000 jobs. 3. Bus Priority Treatment-Queue Jumps/Bus Pullouts with 6+ Buses/ Peak Hour on Arterials and at New Development. NJDOT design standards. Bus lanes and peak direction bus only use of shoulders as in High Transit Score areas.	1. Express Bus service with primarily walk access to High Transit Score Areas 2. Medium Intensity Local Bus Service- Majority of day span (12-18 Hours), with average 30 minute frequency. 3. "Wheels" Type mini-bus service to suburban employment centers from line-haul transit and local area.	1. Shuttle Bus to Rail/LRT /Express Bus if minimum of 500 peak period boarding riders 2. Structured Parking for Fixed Guideway Transit if 1000+ peak period boarding riders at stop. 3. Surface Park-Ride for All Other Fixed Guideway /Express Bus/ Ferry Service 4. Local Bus Transfer Points

TRANSIT SCORE CATEGORY	FIXED GUIDEWAY TRANSIT FEASIBILITY	BUS & OTHER TRANSIT SERVICE CRITERIA	INTERMODAL/ ACCESS TO TRANSIT
MEDIUM (1 to 3)	1. Commuter Rail/Diesel LRT to High Transit Score areas with 60,000+ jobs in center or municipality. 2. Medium/Low Cost LRT- Only if area is surrounded by Medium-High Score areas. 3. Bus Priority- Same as Medium-High except limited to Primary Arterials such as State Highways with LOS "D" or worse in Peak Hour. 4. Recreational Transit- Rail/Express Bus/Ferry to seasonal tourist areas as a destination. Must have minimum 30% of housing units in seasonal units and 1500 seasonal units in a municipality. 5. Ferry with Park-Ride access to High Transit Score Areas with 60,000+ jobs	1. Minimum Intensity Local Bus Service- Span of 8-12 Hours/Day, with average frequency of 30-60 minutes over day. 2. Local Circulator Bus Service in Rural Centers in State Plan. (PA 3, 4, & 5) Span of 8-12 Hours/Day with average frequency of 30-60 minutes 3. "Wheels" type mini-bus service to Suburban Employment Centers from line-haul transit service. Preferred minimum of 10,000 jobs in employment center. 4. "Wheels" type Express "Reverse" Mini-Bus service from High Score areas to Suburban Employment Centers with 30,000+ jobs.	1. Shuttle Bus Walk Access to Rail/LRT /Express Bus if minimum of 500 boarding riders at stop and Gross Housing Density of 2+ units per acre. 2. Remote Parking and Shuttle Bus to Rail/LRT/Express Bus if housing density not met. 3. Surface Park-Ride Only for Express Bus/ Commuter Rail/ Ferry except in constrained areas with 1000+ peak period riders
MARGINAL (0.5 to 1)	1. New Commuter Rail stations Only with service to High Transit Score areas with 60,000+ jobs 2. Extensions of Existing Commuter Rail Lines. (Only to High Transit Score areas with 60,000+ jobs).	1. Peak Period Only extensions of existing Local Bus routes. Service span of 4-6 Hours/Day, Frequency of 30-60 minutes. 2. Peak period only Mini-bus shuttles to local employment from line-haul transit. Minimum 10,000 jobs at site. 3. Local Circulator Bus Service in areas adjacent to Rural Centers to serve large trip generators such as malls and apartment complexes. Service 8-12 hours per day.	1. Surface Park-Ride for Express Bus and Commuter Rail only.

TRANSIT SCORE CATEGORY	FIXED GUIDEWAY TRANSIT FEASIBILITY	BUS & OTHER TRANSIT SERVICE CRITERIA	INTERMODAL/ ACCESS TO TRANSIT
LOW (<0.5)	1. NONE , except park-ride to existing or extended commuter rail stations which serve Marginal and above Transit Score areas.	1. Local Bus Service-NONE. Only extensions from Marginal Transit Score areas to serve major trip generators. 2. Park-Ride access to Express Bus Service to High Transit Score areas with 60,000+ jobs 3. Local Community Social Service and Paratransit. 4. Vanpools and Vanpool Subsidies	1. Bus/Vanpool/ Carpool surface Park-Ride. 2. Rural Park-Ride centers with bus /vanpool/ carpool parking where feasible.

LIST OF MUNICIPALITIES MEETING 30,000 & 60,000 FORECAST 2020 EMPLOYMENT CRITERIA

A. 60,000+ JOBS, HIGH TRANSIT SCORE (Several census tracts with High Score)

- Newark
- Jersey City
- Atlantic City
- Trenton

B. 30,000+ JOBS, MEETS HIGH TRANSIT SCORE CRITERIA (Minimum two census tracts with High Score)

- Paterson
- Camden
- Elizabeth
- New Brunswick
- Secaucus
- Hackensack
- Morristown/Morris Twp.

C. 30,000+ JOBS, has minimum of MEDIUM but not HIGH TRANSIT SCORE (Meets criteria for 2020 Suburban Employment Center for "Reverse" Wheels Mini-Bus Service)

- Paramus
- Wayne
- Clifton
- Woodbridge
- Edison
- Piscataway
- Bridgewater
- Franklin
- South Brunswick
- Lakewood
- Dover Twp. (Ocean Co.)
- Cherry Hill
- Plainsboro/ West Windsor

HOW WERE THESE DETAILED CRITERIA AND CONDITIONS DETERMINED? CAN THE CRITERIA BE CHANGED OR MODIFIED?

Criteria were developed using National and NJT experience and data. Criteria are designed to indicate the "minimum potential" and assume the lower end of financial feasibility. Most criteria have a basis in actual observed New Jersey data. However the services and investments shown are **not fiscally constrained**. This means that although a particular type of transit service may be feasible based on the Transit Score, the overall financial resources available to operate new or expanded transit service need to be identified. The Transit Score criteria indicate that a minimum level of financial viability has been met, but the overall resources needed to support additional service require further, detailed study and examination on a regional and statewide basis.

The criteria and conditions are guidelines, which are designed to indicate what type of bus transit services, fixed guideways by type and intermodal facilities, are appropriate over a general area. More detailed study is required to confirm these findings. **The transit score and criteria are designed to be an "order of magnitude" screening of where various modes of transportation and types and intensity of service are appropriate.** Exceptions and modifications to the criteria/conditions based on the Transit Score are possible under selected circumstances, particularly when more detailed analysis has been completed.

For relating bus service potential and intermodal facilities to the transit scores, actual local New Jersey transit experience and guidelines were used, along with data developed in several national studies which used the New York metropolitan area as a base. **The guidelines are designed to indicate a hierarchy of the minimum potential for different types of transit service, and what type of service is appropriate over a general area, not individual routes.** "Minimum Potential" assumes the lower end of actual cost-recovery exhibited by existing Wheels/Shuttles/Local Bus services. **The criteria and conditions represent the potential for service and still need to be subject to more detailed study and cost-benefit analysis.**

The criteria shown here can be modified based on input from detailed studies, and other information developed by actual project implementation. However, NJ TRANSIT staff believe that these criteria represent a reasonable approach to achieve order-of-magnitude guidelines for evaluating the many different types of transit services possible in New Jersey.

WHAT CAN I DO TO CHANGE THE TRANSIT SCORE OF AN AREA?

Section 3 of this report outlines an example of how to change the Transit Score of an area, and how it relates to land use and development patterns and demographic factors. This section of the report also gives the formula for the Transit Score.

IS THERE INFORMATION INDICATING THE NUMBER OF JOBS IN CENTERS AND MUNICIPALITIES? HOW CAN I OBTAIN SOME OF THE OTHER INFORMATION REGARDING THE CRITERIA INDICATED IN TABLE 1-2?

A listing of the municipalities with forecast 2020 employment of 30,000+ and 60,000+ jobs follows Table 1-2. These forecasts were developed by NJ TRANSIT using various regional

county and MPO forecasts (See Section 2). Alternative forecasts are possible and an area's revised Transit Score can be determined with different population and employment forecasts than those utilized by NJ TRANSIT. Demographic forecasts are a dynamic process, and NJ TRANSIT will work with municipal, county, Office of State Planning and MPO staff to modify and update forecasts in this report. With the release of Year 2000 Census results in mid-2001, most of the estimates in this report will have to undergo revision. NJ TRANSIT is committed to working with interested parties on revising the Transit Score to reflect the most recent data or planning assumptions.

DEFINITION OF KEY TERMS IN CRITERIA AND CONDITIONS FOR TRANSIT SCORE (TABLE 1-2)

- **High-Cost and Low-Medium Cost Electric Light Rail-** Refers to relative levels of capital investment in guideway and other capital costs. High-Cost Light Rail involves major tunnel and elevated structures. Typical High-Cost Light Rail is defined here as \$60 million to \$100 + million per mile excluding vehicle and land costs. See Section 3 for more details.
- **Line-Haul Transit-** Longer distance transit service which serves a regional function. Commuter Rail, Express Bus, some Light Rail and Ferry services meet this standard.
- **"Wheels" or "Mini-Bus " service.** "Wheels" refers to a specific group of NJ TRANSIT subsidized mini-bus route services, most of which were started in the early to mid-1990's. They typically serve suburban employment centers. Mini-Bus service refers to smaller vehicle bus service typically with between 20 and 29 passenger seats. These are usually used in shuttle service to provide access for riders to/from commuter rail, light rail, and express bus services.
- **Shuttle Bus-** In this document Shuttle Bus refers to primarily residential based dedicated feeder bus service to line-haul transit service. It is typically operated with mini-buses, but can include standard transit buses. NJ TRANSIT's M&E Challenge grant and Shuttle Bus program are examples of this mode.
- **Express Bus-**Typically a bus service that will operate non-stop for several miles to reach its downtown or final destination, where one or only a few stops are made. Most Express Bus service is to New York, Philadelphia, Newark, Jersey City, and Atlantic City. While NJ TRANSIT does not have a separate "Express Bus" category of routes, buses which operate a minimum of at least 3 miles in non-stop service are defined as express. This definition can be used for planning purposes.
- **Commuter Rail/Diesel Light Rail-** Both of these types of services are similar, except that Diesel Light Rail must be separated from freight or commuter rail service by either time separation or operation on its own tracks. This is due to the strength of the vehicle and its possible impact during collisions. Except for this difference, and some minor difference in vehicle design, these two modes are considered interchangeable for non-Electric services. There are also differences in operating costs between the two modes.

- **Intensity of Bus Service-** This refers to the span of service or hours of the day when bus service operates. The higher the intensity of the bus service, the longer the time period served. The frequency of bus service is given in an all-day frequency for the span of service indicated. As an example, Minimum Intensity Bus Service has a service span of 8 to 12 hours over a day. With a 30-60 minute frequency all day, this results in a total of 8 to 24 buses in each direction per day (8 hours at one bus per hour is the minimum (8), 12 hours at 2 buses per hour is the maximum (24)). This relates the amount of bus service to the Transit Score areas indicated for local bus service. Actual individual routes and areas will vary due to operational and other issues (garage location, minimum service standards, location of approved bus stops, ridership etc.).
- **Monorail Special Case-** Monorails and Personal Rapid Transit (PRT) are special types of transit that do not fit easily into the Transit Score categories. Monorails have capital costs and operating characteristics similar to rapid transit. Monorails also can serve a longer haul trip like a rapid transit line, or they can serve a distributor function like the Newark Airport Monorail or other types of monorail to special trip generators such as airports and sports arenas. Personal Rapid Transit (PRT) is usually used for special applications like a distributor in a downtown area, or connecting remote parking to a constrained employment site.

Based on the wide range of types of service, two types of criteria are proposed for Monorails, depending on the type of application:

1. **Regular Route Service** (typically 3 miles or greater)- Rapid Transit criteria apply. This means they should be located only in High Transit Score Areas and with direct service to an employment center of 150,000 + jobs.
2. **Distributor Service or Service to Special Generators (typically less than 3 miles).** Need to have 60,000 jobs in a center or 40,000 daily trips (20,000 one-way trips, about the number of trips to a typical arena). Applies only in High or Medium-High Transit Score areas. For Personal Rapid Transit (PRT), individual case studies would be required.

SECTION 2-- TRANSIT SCORE DESCRIPTIONS

This section provides more detailed information on some of the elements that were incorporated into developing the criteria for the different types of transit investments. Two sample investments are shown, Electric Light Rail and Shuttle Bus to Line-Haul Transit. The samples are designed to show the process and information that went into developing some of the more detailed Transit Score criteria. The samples also illustrate how actual New Jersey experience was incorporated to support the development of the Transit Score. This section also documents some of the sources of information used to develop the Transit Score, the fixed guideway criteria and bus service criteria.

SAMPLE INVESTMENT: ELECTRIC LIGHT RAIL

The following example provides documentation of some of the actual examples of New Jersey and national experience used to develop the Transit Score criteria. Table 3-1 and related information shows the conditions and process which led to the justification of the criteria for Electric Light Rail Fixed Guideway criteria. Examples for other Transit Score criteria are available.

Table 3-1
ELECTRIC LIGHT RAIL CRITERIA

Transit Score Category & Criteria	Minimum Criteria for Mode & Justification	Cost Criteria & Justification	Minimum Peak Period Ridership at Maximum Load Point
HIGH Transit Score Low/Medium Capital Cost	30,000+ Jobs for Low/Medium Cost 30,000 jobs = 9 million sq. ft. office space and support retail. 30% of workers live in one of four corridors (one for each of four directions) or 9,000 jobs. Need 22% peak period LRT transit share to reach 1,600-peak period or 800 peak hour riders in one direction. Equivalent to 16 buses or 4 minute bus headway. Newark has 25% total transit share to downtown area in peak period.	Must have at least 50% of line use existing railroad, utility, or roadway median for level Right-of-Way. Reduces cost significantly. Low/Medium Cost cannot Exceed \$50-\$60 Million per mile of line. Can include short tunnel segments(<10%) Typical Costs: \$50-\$60 million/mile Cut and Cover. \$15 -\$20 million/mile At-Grade. 50% At-Grade=\$8-\$10 million/mile 50% Cut and Cover =\$25-\$30 million/mile TOTAL= \$33-\$40 million/mile.	1,600 peak period one direction riders. Translates into 800 Peak Hour Peak Direction Riders. Zupan criteria of 950 Peak Direction Peak Hour Riders lowered.

HIGH Transit Score High Capital Cost	60,000+ Jobs for High Capital Cost Light Rail. 16 Million sq. ft. office and 3 million sq. ft. retail/other. Numbers are double since capital costs are at least double low cost figures. 15,000 jobs in corridor, with 80% in peak period. Need a 33% LRT peak period mode share to reach 4,000 peak period or 2,000 peak hour work riders in one-direction. Equivalent to 30-40 buses or 1.5 to 2 minute bus headway. Newark/Jersey City and Trenton meet criteria for jobs for High-Cost Light Rail Elizabeth, Hackensack, New Brunswick, Atlantic City, Camden, Morristown, Paterson meet criteria for Medium Cost LRT	High Cost: Up to 33% of line can be in tunnel or elevated. High-Cost lines at \$60-\$100+/million per mile construction cost excluding land and vehicles 33% tunnel at \$100-\$150 million/mile=\$33-\$50 million 67% Cut and Cover at \$34-\$40 million TOTAL=\$67-\$90 million /mile Costs based on Newark-Elizabeth and Zupan data escalated with ENR Cost Index. Costs include design/engineering.	4,000 peak period one direction riders. Translates into 2,000 peak hour peak direction riders. Approximately 2.5 times Low/Medium Cost ridership standard for peak hour.
Medium-High Transit Score	Residential density at minimum transit score for category is 7 units/acre net. Midpoint of range is well over 9 units/acre minimum from Zupan	No Cost Criteria except as above for overall line.	As above

TYPICAL HIGH CAPITAL COST PROJECTS

Existing Newark City Subway (1mi. of tunnel for 4.2 Miles or 25%)
HBLRT through Hudson County with \$900 Million Capital Cost excluding vehicles for 9.3 miles or \$97 million/mile (includes land)
Newark Broad-Penn Station (0.25 miles of tunnel for 1.0 mile extension),
With \$200 million cost including vehicles and land
Newark LRT to Camp Street (South end of CBD)
Union County LRT Elizabeth to Airport

LOW/MEDIUM CAPITAL COST EXAMPLES

Northern Branch outside Hudson County
 New Brunswick LRT to South River (portion)
 Paterson LRT to Newark Subway outside Newark and Paterson
 Trenton LRT to W. Trenton
 Union County LRT west of Elizabeth to Cranford

SAMPLE INTERMODAL SERVICE DETAILED CRITERIA: SHUTTLE BUS TO LINE-HAUL TRANSIT

Following is a description of the data used and the methodology developed to develop the Transit Score criteria for Shuttle Bus services to Line-Haul Transit. Such services include existing standard 40-foot buses used on dedicated services such as at Metropark, as well as 20-29 passenger mini-buses used on NJ TRANSIT Wheels routes or the Community Shuttle program services. These criteria can also apply to locally developed shuttles such as in Maplewood. The criteria are designed to indicate where Shuttle Buses can be expected to have some impact on providing alternative access to rail stations and express bus lines. The ridership figures are guidelines, but do illustrate the minimum ridership levels needed to have a measurable impact on station access while meeting minimum utilization and cost-recovery standards.

Criteria #1- Minimum of 500 Peak Period Riders boarding Train or Express Bus

Assume a station has 500 peak period riders. If riders come equally from four quadrants around a station, each quadrant would have about 125 riders. Assuming some concentration of riders in one quadrant, the highest quadrant would have about 40% of the Peak Period ridership or about 200 riders. A three-hour peak is assumed. With a 10% Shuttle-Bus Transit share in the concentrated area, about 20 Shuttle bus riders would use the service. With a 40% share, about 80 riders would use the service. For the station as a whole, 4% to 16% of total Peak Period rail/express bus riders would take Shuttle Bus service to Line-Haul Transit.

Here are two examples: Maplewood has about a 15% overall shuttle bus share (220 riders out of 1500 peak period boarding riders). Metropark has a 7% shuttle bus share overall, but total boarding riders are much higher. These are successful services with multiple routes (2 to 5) for each.

Using a minimum of a 5% bus access mode share as "successful", 5% of 500 riders would be about 25 riders (50 trips) a day. This is considered the minimum ridership level which would support 30 minute frequency shuttle service, translating into about 4 riders per bus trip, just under 20% utilization of seating capacity. Below this level of demand, a shared ride taxi service would be a better option. An adequate service would attract a 10% shuttle bus share, or about 50 riders (100 trips) per day.

Determining Cost-Effectiveness: As an example, using NJ TRANSIT's first year M&E challenge grant subsidy of \$50,000/year per shuttle bus as a guide, the subsidy per rider with a ridership of 25 per day would be almost \$4 per trip on an annual basis. This assumes the average 25 riders per day use the shuttle both ways for 254 weekdays per year or 12,700 annual trips. Divide the \$50,000 annual cost by 12,700 and the subsidy is \$3.93 per trip or about \$4 per day. Assuming a \$1.00 one-way fare, annual revenue would be \$12,700. This yields a farebox cost-recovery of 25%. A 25% cost-recovery is the current minimum requirement for NJ TRANSIT "Wheels" mini-bus services. Both the subsidy level and the cost recovery are the minimum typically accepted for this type of service.

The net cost per trip using the shuttle bus is \$2.94 ($\$50,000 - \$12,700 / 12,700$). If a ridership of 50 per day (100 trips) is assumed, the net cost per trip would be \$0.97 (not including the cost of the bus itself). As an alternative to the Shuttle Bus, the net annualized cost per trip for a structured parking space (assuming a capital cost of \$10,000/space) is between \$0.85 and \$1.60 per trip depending on parking fee levels in the range of \$1.50-\$3 per day. This illustrates the cost-effectiveness of different alternatives for providing access to transit, showing the need for Shuttle Bus service to achieve daily ridership of at least 25-50 people (50-100 trips).

Conclusion: A minimum of 500 peak period boarding riders at a line-haul transit station is necessary to support Shuttle Bus service averaging 25 riders (50 trips) per day. A level of 50 riders per day (100 trips) is desirable, or a 10% bus access share of station peak period trips. Ridership below these levels is not cost-effective and is better served with taxis.

Criteria #2-Residential Density

In order to support a shuttle bus service, which is largely a walk-on type service (ie. No park-ride access or lots), minimum gross residential densities are typically required. These are based on NJ TRANSIT's analysis of ridership survey data, existing shuttle bus experience, GIS data, and other data.

A Medium-High Transit Score category produces a net residential density of 7 units per acre. (See Section 4, which indicates that this is a supportive density of walk to local bus service.) Based on this residential density, most areas classified as Medium-High can support a walk-on Shuttle Bus service provided there is a minimum of 500 Peak Period Boarding riders on the Line-Haul Transit service (Commuter Rail, Light Rail, Ferry, Express Bus). A detailed analysis is still recommended, based on residential origins, local parking and access conditions, and possible bus frequency. A frequency of not more than every 30 minutes is recommended.

Criteria #3- Gross Density of Two Housing Units/Acre to Support Shuttle Bus Service in Medium Transit Score Areas Only

In areas with a Medium Transit Score category, a gross residential density of 2 housing units per acre is recommended for walk-on Shuttle Bus service. These areas have a transit score of 2.0 to 3.0, and are typified by net housing densities of about 3.3 to 4.0 units per acre. This is the minimum range of density to support walk-on shuttle bus service. However even at this density, the number of potential riders within a short walk (5 minutes or 1,000 to 1,300 foot distances) of a shuttle bus is usually supported only at the largest ridership stations. The more spread out,

lower density nature of these areas usually requires that a shuttle bus must travel a longer distance to pick up potential riders. This can lead to excessive travel times that exceed the recommended 15-20 minute one-way travel time for a shuttle bus route with stops to meet a minimum headway of every 30 minutes.

Remote Parking Shuttle Bus: In order to support shuttle bus services in those Medium areas with a gross housing density of less than two units/acre, park-ride access to shuttle buses are usually necessary. This is also called "Remote Parking". A shuttle bus route can have walk-on segments, but with a remote park-ride lot, riders can also be gathered from low-density areas to achieve a critical mass. From the park-ride, service should be express or near express. Both Middletown and Springfield Township currently support such service, and meet the criteria as outlined in this paper as being appropriate for remote parking bus access to in this case rail transit. In limited cases, Marginal Transit Score areas may also support this type of service to rail stations with very high ridership or limited parking capacity.

DATA SOURCES USED TO DEVELOP TRANSIT SCORE

Five primary data sources were used to develop the Transit Score:

- **Transit Potential in the New Jersey Counties- Delaware Valley Regional Planning Commission (DVRPC).** Developed in October, 1993. This was the primary source for the components of the Transit Score, some of the Transit Score equation, and the general theory and guidelines for developing the Transit Score ranges and concept. This source was used as a baseline for further definition of the Transit Score concept. The DVRPC guidelines related primarily to local transit potential, and did not address issues relating to fixed guideway transit, shuttle services, and intermodal and transit access services. NJT staff simplified and customized the equations to link different types of transit services and investments into a comprehensive Transit Score. The linking of the DVRPC Transit Potential with other transportation, land use, and cost criteria makes the Transit Score Index useful for various types of uses.
- **Public Transportation & Land Use Policy and Urban Rail in America.** Both are by Jeff Zupan. These books are from the 1977-1982 period but still provided useful concepts. Some of the costing standards for different types of Fixed Guideways and Peak Period ridership criteria were incorporated or modified based on more recent NJ TRANSIT experience. Also some of the land use density justifications for different types of rail and local bus service are quoted in this document.
- **Travel Estimation Techniques for Urban Planning, also know as NCHRP Report 365.** This provided useful data on zero and one-car households and the relationship to income and area population.
- **NJ TRANSIT Data.** This included recent rail surveys with shuttle bus data, GIS mapping, Bus Service Standards, Wheels and other rail/bus data, recent construction cost estimates. Also internal Planning studies conducted for various purposes, including parking expansions and Customer Satisfaction information.

- **Census Tract Forecasts of Population/Employment/Households.** This information was developed from several sources. As indicated in Section 1, regional MPO forecasts were used in most cases as a basis for the municipal and tract level forecasts. Following is a brief description of the source of the forecasts in different parts of the state:

1. North Jersey- (NJTPA Region)- The New York Metropolitan Transportation Council (NYMTC) population and employment forecasts at the county level are used as control totals for the 13 counties in this region. These forecasts were completed in 1995. The NJTPA uses some of these estimates. Individual municipal forecasts were developed as part of major transit studies for new projects. In these cases, NJ TRANSIT developed forecasts with review and input from counties impacted by these projects. This includes the counties of Bergen, Essex, Union, Somerset, and Monmouth. In other cases, Office of State Planning models and other data from NJDOT and Rutgers was used. Mercer County employment forecasts also use the NYMTC forecasts modified based on review by Mercer County.

2. Delaware Valley Region- (DVRPC) - For the counties of Burlington, Camden, Gloucester, and Mercer, the DVRPC census tract level forecasts are used for all of the variables in the Transit Score, including zero and one car households. The only exception is that the DVRPC distribution of employment was modified to use the NYMTC employment forecast. This is due to the influence of the nearby North Jersey area. All forecasts are the 1997 version of the DVRPC forecasts.

3. Southern New Jersey (SJTPO)- Covering the four counties of Salem, Cumberland, Atlantic, and Cape May. The MPO, the South Jersey Transportation Planning Organization developed 2015 forecasts for demographic variables. These were used as a base. NJ TRANSIT staff developed a trend to 2020 forecast using average growth rates and Office of State Planning data. Zero and One car households were forecast using 1990 Census data and trends from the DVRPC region.

SECTION 3- CHANGING TRANSIT SCORE AND ITS RELATIONSHIP TO LAND USE

HOW CAN THE TRANSIT SCORE BE MODIFIED?

- **Changing the land use type and density of development-** The transit score can be used to test different patterns and intensity of development. Some areas can increase their Transit Score with revised development patterns and modest increases in density. Any changes which increase housing or employment density will increase the Transit Score, and the potential for more types of transit service. The Transit Score is a good planning tool to test different land use possibilities and "what if" land development alternatives to determine the potential for expanded transit services.
- **Changing demographics-** Revised population and employment projections or changes in demographic types (particularly households with zero or only one car) will change the Transit Score.
- **Changing the geographic unit of analysis-** Census tracts defined in 1990 were used as a baseline because it is the only consistent statewide geographic unit of analysis. In addition, forecast data is available at this level of detail. A census tract typically contains between 3,000 and 4,000 people. However, if local officials, planners, or others wish to define a different geographic area, a Transit Score can be calculated. Data that needs to be provided are land area in acres and demographic information or forecasts for the four components identified in Section 1: Population, Employment, Households or Occupied Housing Units, and Zero and One Car Households.
- **Changing the transportation system-** Areas within 2,000 feet or about 1/2 mile walk of a rapid transit, commuter railroad, light rail, or ferry station can take some credit for increased zero and one car households. Studies have shown that households within this walking radius have lower amounts of auto ownership and increased numbers of zero and one car households. NJ TRANSIT is working to provide guidance on this issue, and will provide information on a case by case basis. Recent studies by Richard Voith of the Federal Reserve Bank of Philadelphia using data along the PATCO High Speed Line and commuter rail service in Pennsylvania indicate about 4.5% decrease in auto ownership for census tracts adjacent to rail stations. This guideline can only be applied to locations with new stations or new development in existing station areas.

RELATIONSHIP OF TRANSIT SCORE TO CURRENT LAND USE AND THE STATE PLAN

The ranges of the Transit Score were set to develop categories so that there were significant breaks between different types and patterns of development. Although not exact, a plotting of the 2020 Transit Score reveals that at least in most areas of the state, there is significant convergence between an area's Transit Score and its development pattern.

In the Central New Jersey area, between Trenton and New Brunswick, the older, central cities are mostly in the "High" Transit Score area with some outer areas having a Medium-High Score. Except for downtown Princeton, there are no other High Transit Score areas, even with 2020 Forecasts. Inner suburban and adjacent areas like parts of Lawrence and Ewing Townships near Trenton, and North Brunswick and East Brunswick achieve Moderate-High Transit Scores. Higher density townhouse development like Twin Rivers in East Windsor and parts of Plainsboro also receive these scores. Newer suburban development and tract housing areas in East Brunswick, Lawrence and parts of the Route 1 area are forecast to achieve a "Moderate" Transit score.

This range of Transit Scores described in the Central New Jersey area illustrates how the Transit Score has a good fit with development patterns. These Transit Score categories also encompass the range of areas that are primarily in Planning Areas 1 and 2 in the State Development and Redevelopment Plan. Although not an exact match, the three NJ TRANSIT Transit Score categories with Transit Scores greater than 1.0 generally match the State Plan development areas.

In addition, some centers in Planning Areas 3, 4, and 5, which are referred to in this document as "Rural Centers", have the potential for local circulator transit service. As outlined in the Transit Score criteria, rural centers that have moderate or above Transit Scores can support local mini-bus service comparable to Minimum Intensity Local Bus service. Areas such as Hackettstown, Flemington, Penns Grove, and Newton meet these criteria. Hackettstown currently has a mini-bus circulator, subsidized by NJ TRANSIT with some local support.

This inclusion of potential Rural Center transit circulators in the Transit Score criteria is another example of the coordination between land use planning in the State Plan and NJ TRANSIT in its *Possibilities for the Future* guidelines. Office of State Planning (OSP) staff have met with NJ TRANSIT staff and reviewed the Transit Score guidelines. OSP staff has indicated that they would like to utilize the Transit Score as a planning tool to link the potential for transit with land use planning. It would also be used to provide guidance to municipal and county planning for the next phases of the State Plan.

TRANSIT SCORE AND PREVIOUS LAND USE/TRANSIT STUDIES

A transit score of 1.0 supports Minimal Intensity levels of local bus service. Also, based on the calculation of Transit Scores, it appears that **a totally residential area with a transit score of 1.0 (Medium) requires a gross housing density of 1.5 dwelling units/acre. This translates into a net density of 2.5 units per acre** assuming residential areas cover about 60% of built-up area after accounting for non-residential uses, streets, and environmentally sensitive areas. This equates to a population density of about 2,600 people per square mile.

The minimum Transit score of 3.0 to qualify as a Medium-High category translates into a gross residential density of 4.2 units per acre. Assuming the same 60% residential coverage, **minimum net residential density in a Medium-High Transit Score area is 7 units per acre.** This is equivalent to the 7 units per Acre guideline recommended for Medium Intensity Bus service by Jeff Zupan, former Director of Planning at NJ TRANSIT in his book "Public Transportation and Land Use Policy". The Medium-High Transit Score category also has Light Rail supporting residential density, providing there is a center or employment area with at least

30,000 jobs to travel to by Light Rail. This indicates that the Transit Score is largely compatible with previous land use/transit work and the relationships established in other work.

TRANSIT SCORE FORMULA & USE

The actual formula to estimate a geographic area's Transit Score is given below:

TRANSIT SCORE INDEX=

$$(((\text{POPULATION} / \text{ACRE}) / 3.0) + (\text{HOUSEHOLDS} / \text{ACRE}) + ((\text{ZERO CAR HOUSEHOLDS} / \text{ACRE}) / 0.5) + (\text{ONE-CAR HOUSEHOLDS} / \text{ACRE})) / 3.0) + ((\text{EMPLOYMENT} / \text{ACRE}) / 2.5)$$

WHERE: Occupied Housing Units can be substituted for Households

Acres are Land Area Only

Zero and One Car Households are the number of Households with zero (0) cars and one car (1) in the entire household.

Basis for Components of Transit Score

- Household and population densities represent trip origins or productions. This reflects the home or household end of travel. The division of population by 3.0 reflects the average size of households. This parameter may be updated after the 2000 Census data is available to reflect smaller household size on a metropolitan basis.
- Use of the number of zero and one car households is intended to reflect households and people that are transit dependent. Zero car households are heavily dependent on transit for travel. This includes both low income and elderly (75+) households without access to an automobile. One car households have somewhat limited access, and some household members are dependent on transit because another family member is using the one auto. One-car households also include significant amounts of single person households. Single Person households have been shown to be somewhat more likely to utilize transit because of the lack of children, and the need to coordinate other activities within the family.
- Employment density reflects the trip attractions in an area as well as the destination of many transit trips. An area with a high density of employment is also likely to generate transit trips, just as high population and housing density also is more oriented towards transit.

SOURCES OF DATA FOR TRANSIT SCORE CALCULATION

As indicated in Section 2, various state, county, and other agencies such as the MPOs and NJ TRANSIT developed the forecasts for the components of the Transit Score. Population, employment, and household forecasts are usually available from a variety of sources. Occupied or forecast new housing development can be used as a surrogate for households, as long as vacancy rates and special circumstances such as institutional population around universities, state institutions, etc. are accounted for in the estimates.

Regarding zero and one car household forecasts and estimates, only the four county DVRPC region has 2020 forecasts for these components of the transit score. NJ TRANSIT estimated future forecasts for the rest of the state based on 1990 Census data, trendline data from Rutgers, trendline data from the DVRPC forecasts, and a slight trend decline in the overall percentage of zero and one car households over time.

In addition to the existing forecasts, NJ TRANSIT will be examining the 2000 Census data, 1998 North Jersey and 2000 DVRPC and South Jersey Household Interview data, and other data sources such as NCHRP Report 365. This report gives estimated percentages of zero and one-car households based on three income groups. For suburban areas of the state, zero car household percentages are in the 2% range, with one-car households in the 25% to 30% range. For more urban and inner suburban areas, zero car household percentages range from 7% to 20%, and one-car household percentages range from 30% to 40%. Because of the wide variation in this variable, caution is advised against significant changes in this variable.

EXAMPLE OF HOW TO MODIFY LAND USE AND TRANSIT SCORE

Following is an example of how to modify an area to change its Transit Score to be more supportive of increased transit service and potential.

Land Area of 1,000 vacant acres in a developing area. Currently zoned for 1000 housing units. Would like to increase level of bus service or possibly justify light rail service to a nearby employment center which is an older city with 40,000 jobs. Following is calculation of the Transit score with current zoning and modified Transit Score.

Existing Zoning Transit Score = Population is $2.7 * 1000 \text{ Housing Units} = 2700 \text{ people}$

$(2700/1000 \text{ acres}) \text{ means POP} = (2.7 \text{ people/acre})/3 = \mathbf{0.9}$

Households are $1000 \text{ units}/1000 \text{ acres} = \mathbf{1.0}$

2% of all households are zero-car Households, 25% one-car households

$(.02 * 1000) = 20 \text{ zero-car and } (0.25 * 1000) \text{ and } 250 \text{ one-car households}$

$((20/1000)/0.5) = \mathbf{0.04}$

$(250/1000) = \mathbf{0.25}$

Current Zoning Transit Score = $0.9 + 1.0 + 0.04 + 0.25$ or $\mathbf{2.19}$

RESULT: 2.19 is a Medium Transit Score and justifies Minimum Intensity Bus Service, about 8-12 hours of service at an average of 30 to 60 minute (45 minute) frequency. No Light Rail Service is justified to older employment center. Only local bus service.

ALTERNATIVE ZONING SCENARIO:

Zone to allow another 2,000 housing units, increasing gross residential density from 1 unit per acre to 3 units per acres. This development has a slightly lower average household size of 2.5 people per household because a wider range of housing types and incomes is available with the increased density. 2% of households are zero car households, 25% are one-car households. Changing the zoning in this development results in

7500 people/1000 acres = 7.5/acre/3= **2.5**

3000 units/1000 acres= 3/acre= **3.0**

New development adds 40 zero-car and 500 one-car households. New area totals are:

60 zero car households, which is $(60/1000)/0.5 = \mathbf{0.12}$

750 one car households, which is $(850/1000) = \mathbf{0.75}$

REVISED ZONING TRANSIT SCORE = $(2.5+3.0+0.12+0.75)$ or 6.37

RESULT: 6.37 is new Transit Score. Area is now a Medium-High Transit Score. Justifies Medium Intensity Bus service, which is 12-16 hours per day of service at a 30 minute service frequency. Area can also serve to support a Low-Medium Cost Light Rail line to older city employment center if Rights-of-Way to accommodate about 50% of the length of the line can be found or secured.

This illustration can also be conducted with employment centers and other types of land use or development patterns. This example is illustrative of the process to develop a Transit Score and what it translates into in terms of transit service and fixed guideway potential for an alternative zoning or development analysis.

OTHER AGENCY USE OF THE TRANSIT SCORE INDEX

There are several other agencies that are starting to use the Transit Score Index as a planning tool. These include:

- New Jersey Department of Transportation- For regional corridor studies as part of its Congestion Management Systems (CMS) studies, the Transit Score will be used as a screening tool to narrow the number of transit services analyzed to those appropriate for the area under study. NJDOT is also using the Transit Score in its Long-Range Plan to identify the impact of transit on the overall transportation system.
- Office of State Planning is considering using the Transit Score as a planning tool to guide land use planning coordination with transit services, particularly for local planning.
- The Central Jersey Transportation Forum, sponsored by DVRPC, will be using the Transit Score to develop alternative land use scenarios to identify the potential for different levels of transit investment and service. These scenarios will then be analyzed with a regional transportation model.

SECTION 4- DESCRIPTION OF 2020 TRANSIT MAP FIXED GUIDEWAY PROJECT STATUS

Section 4 provides a brief description and status update of the Fixed Guideway projects contained in **THE 2020 TRANSIT MAP**. This includes the Status of each Candidate project in the Planning /Design/Engineering process, a brief description of the purpose of the project, and anticipated opening year of service for each of the Committed projects. For those Projects to be Defined/Studied, a brief project description, area served, and possible types of fixed guideways that should be studied based on the Transit Score criteria are indicated.

The data contained in this section is current as of October, 2000. Project status and other information is subject to change as projects progress and more information becomes available. **Table 4-1** lists the Project Status for both the **Committed (Yellow)** projects and **Candidate (Red)** projects. A brief description of project status and project objectives is included. Each project has a Map # which refers to the project map number on the map **2020 TRANSIT: Possibilities for the Future**. Please refer to a copy of the 2020 Transit Map to locate the projects outlined here.

Table 4-2 provides a description of the projects indicated on **The 2020 Transit Map** as **Projects to be Defined/Studied (Pink)**. These projects have not undergone any formal study or definition. These projects need to have planning studies and project definitions initiated in the future. Table 4-2 gives a brief description of the fixed guideway modes possible for each project based on the Transit Score criteria. Table 4-2 also describes the project area, and the objective or need that could be served by the project. In some cases, other agencies or groups have proposed a project. Where applicable, any activity on these projects is noted. In some cases, proposals are staff generated and NJ TRANSIT is looking for comments or suggestions. **These projects are proposals for further study and analysis. Inclusion on the map does not constitute formal endorsement, and comments and input are sought.**

Note: Commuter Rail Electrification projects are not noted on the map because they involve existing lines and are improvements to the core NJ TRANSIT system. The question of electrification of lines or line segments or Dual Power locomotives to provide direct service to New York Penn station is the subject of separate NJ TRANSIT studies and is also being examined in the Access to the Region's Core (ARC) project. Also not shown are projects that would improve existing rail operations such as the Waterfront Connection Phases 2 and 3.

TABLE 4-1

2020 TRANSIT MAP COMMITTED & CANDIDATE PROJECT STATUS

PROJECT (Map #)	PROJECT STATUS (FALL, 2000)	PROJECT OBJECTIVE
COMMITTED PROJECTS	YELLOW COLOR	
Hudson-Bergen Light Rail (#1) (MOS 1 & 2 are committed and funded. MOS 3 committed but not funded).	IOS partially open to Exchange Place 4/00. Newport opening 11/00. IOS to Hoboken completion estimated for 2002. MOS-2 under design, completion to Tonnel Avenue and 22 nd Street Bayonne estimated for 2005. MOS-3 to Vince Lombardi and 5 th Street in Bayonne funding not committed.	Provide access to and distribution along Hudson waterfront, with future ties to Bergen County. Stimulate new development.
Secaucus Transfer (#2)	Under Construction. Completion Summer/Fall 2002	Provide inter-connected commuter rail network, improve access to Midtown Manhattan for Main/Bergen/ Pascack Valley lines. Improve intra-NJ rail access.
Newark City Subway Extension to New Vehicle Base Facility(VBF) (#3)	Under Construction. Opening Mid- 2001	Access VBF, expand service area. 2 new stations on extension and park-ride
Newark-Elizabeth Rail Link (First Operable Segment) (#4)	Funding Committed for this segment, known as MOS-1. Construction to begin 2001. Completion estimated for 2005	Extension of Newark Subway. Connect Newark rail stations to downtown and Performing Arts Center.
Southern New Jersey Light Rail (#5)	Under Construction. Completion estimated early 2003. Downtown Trenton extension under study & design but not included in current contract.	Serve Camden, Trenton & link to rest of rail system. Philadelphia access via PATCO transfer
Montclair Connection (#6)	Under Construction. Completion estimated for Fall, 2001	Link Boonton and Montclair lines, provide direct service to Midtown Manhattan and Newark.

Newark Airport Station (#7)	Under Construction. Completion estimated for Fall, 2001	With Monorail Link, provide rail access to airport for air passengers and employees. AMTRAK will also serve.
Belford Ferry to Manhattan (Monmouth County project) (#8)	Capital Funding in place. Negotiations with Ferry operator to finalize operating agreement. Construction bids due 1/01. Estimated completion mid- 2002. NY Waterway to operate Manhattan service	Provide terminal for expanded ferry service to Lower & Midtown Manhattan/JFK. " Load Shifter" relief to NJCL Rail Line.
Morrisville Train Storage Yard (#9)	Committed project to expand rail capacity for Northeast Corridor. Yard completion estimated 2002. Bucks County, PA starting planning studies for new station.	Will provide sufficient train storage and improve operations on NEC rail line. Bucks Co. initiated study and funding of new rail station
CANDIDATE PROJECTS	RED COLOR	
West Shore Line (#10)	MIS complete, DEIS beginning in early 2001 with Scoping meeting. Linked with projects #11,12,13,14	Provide commuter rail service to eastern Bergen Co. and Rockland County
Northern Branch (#11)	Same as West Shore #10	Provide Light Rail service to southeastern Bergen Co. and connect to HBLR.
Bergen Cross-County Connection (#12)	MIS complete. DEIS to be conducted as part of NJDOT Public-Private Partnership. DEIS to begin in early 2001. Will be coordinated with West Shore/Northern DEIS.	Provide east-west LRT service to southern Bergen Co. (Maywood) and Paterson. Link to HBLR.
Sports Complex Commuter Rail Spur (#13)	Same as West Shore #10. Can be advanced as independent project depending on outcome of Sports Complex development.	Provide access to Meadowlands Sports Complex events and development.

Newark-Elizabeth Rail Link (Second, Third Operable Segments) (#14)	Extension of First Operable segment (MOS-1) south to rest of downtown Newark and Airport rail station. Undergoing FEIS study.	Provide access to rail system for southern part of downtown and local airport access
Union County Light Rail (Part of Third Operable segment, MOS-3) (#14)	MOS-3 of Newark-Elizabeth project. Also known as Union County Light Rail . Project will connect midtown Elizabeth with Newark Airport Lot D and monorail connection to terminals. Undergoing FEIS update as part of NJDOT Public-Private Partnership. FEIS completion estimated for early-2001.	Provide access to Jersey Gardens mall, Elizabeth redevelopment, Elizabeth Ferry and airport access for remote employee parking.
Union County Cross-County Connection (#15)	Union County completed initial planning study for Plainfield-Elizabeth in 1999. NJT updated ridership forecast for Cranford-Elizabeth in 2000. Next steps TBD.	Light rail project to provide improved cross county transit service to Elizabeth & airport from either Cranford or Plainfield.
Monmouth-Ocean-Middlesex Rail Line (2 Lines) (#16)	MIS completed 1995. DEIS to start in 2001 with completion in 2002. DEIS will include MOM routings via both Monmouth Jct. & Red Bank from Lakehurst	Provide commuter rail access to fast-growing area to Urban Core and other NJ destinations.
Cape May Seashore Lines (Hammonton-Cape May Courthouse) (#17)	Initial proposal by private operator and NJ-ARP. Southern NJ Rail Study will examine ridership potential, stations, and costs to further define project. Study to commence in early 2001 under SJTPO & NJ TRANSIT funding.	Provide rail connection from Atlantic City Rail line to Cape May and serve tourist and local travel, especially to Cape May City.
Camden to Glassboro Line (#18)	MIS completed in 1995. Concept design work completed. Further planning/environmental work currently on hold pending completion of Camden-Trenton line.	Provide Light Rail transit service in Woodbury/ Glassboro/ Route 55 area. Connect to Camden-Trenton LRT line.
West Trenton Line (#19)	Undergoing concept planning, Environmental Assessment (EA). EA completion & submission to FTA in 2001.	Provide service on former commuter rail line to serve Route 206 area and provide connection to SEPTA service.

Phillipsburg Extension (Two Alternative Routes) (#20 & #21)	NJ TRANSIT planning study completed in 1996. New NJTPA corridor study proposed to begin in 2001. Two options for service, #21 via Raritan Valley Line, #22 via Boonton Line. Possible extension to Allentown, PA is part of NJTPA study.	To serve I-78 corridor and access to State Rail Museum.
New York Susquehanna & Western (NYS&W) (#22)	Environmental Assessment Complete, update underway. Under Design, negotiation to secure line from freight railroad.	Serve western Bergen county, and parts of Passaic & Sussex counties with rail service. Connects to Main line in Paterson
Lackawanna Cutoff (#23)	MIS and Environmental Assessment underway, to be completed end of 2000. FTA submission and financing under discussion between NJDOT, NJ TRANSIT and PA.	Serve Pocono area with commuter rail service to Urban Core and Morris County. Recreational trips to PA, provide transit alternative to I-80 congestion.
Perth Amboy/South Amboy Ferry service to Manhattan (#24) (South Amboy-Municipal Project with coordination with NJT) (Perth Amboy- Private Proposal)	Planning & feasibility study completed by NJ TRANSIT and South Amboy in 2000. South Amboy to advance design for ferry terminal. Private Operator proposal for Perth Amboy service 9/00. Possible service in 2002.	Serve as additional interim Trans-Hudson capacity and relief for NJCL. Stimulate redevelopment.
Elizabeth Ferry to Manhattan (#25) (Private Project)	Being advanced by private sector and Union County. Possible implementation in next 2 -3 years.	Provide access to New York for Elizabeth redevelopment. Connection to proposed Union County Light Rail. Possible relief for NEC/RVL with connection to Union County Cross County LRT

Access to the Region's Core (ARC) 2 Track Tunnel to Penn Station New York (#26)	Currently in detailed Planning Phase for new Trans-Hudson commuter rail tunnel. Three alternatives for NYC component under study. Planning study completion and selection of Preferred Alternative in 2001. Advancement to DEIS Phase after selection of preferred alternative by study sponsors (NJT, PANYNJ, MTA).	New Trans-Hudson Commuter Rail Capacity. Possible connection to Grand Central. Needed to advance several other Candidate projects. Short-Term capacity enhancements also under study.
Newark City Subway extension to Paterson (#27)	Preliminary ridership, alignment, and operating plans developed as part of Newark Subway northern extension studies in 1994-1995. Further study to begin at undetermined future date.	Extend service via to be vacated Boonton Line and existing freight railroad. Provides LRT service in area meeting Transit Score criteria to access Newark.
Bus Priority- Route 9 Corridor (#28)	MIS completed and recommended project in 1995. Currently in design and environmental study. Project consists of new bus-only ramps and bus-only usage of Route 9 shoulders in peak periods. One of recommended park-rides completed. Design and other work to be completed in 2001.	Project is intended to provide priority treatment for Route 9 bus service to minimize increased bus travel times from traffic congestion. Additional park-ride capacity to serve ridership increases.

TABLE 4-2
PROJECTS TO BE DEFINED/STUDIED

POSSIBLE PROJECT	MODES JUSTIFIED BY TRANSIT SCORE TO BE STUDIED	PROJECT DESCRIPTION	CURRENT STATUS
Pompton Branch Commuter Rail Extension (#29)	Justified in Transit Score Criteria and demand potential. Could be cost-effective alternative to full Boonton Line electrification. Could provide link to NYS&W	Extension of electrification from Great Notch via Mountain View (Wayne) up Pompton Branch to terminus near NYS&W. Provides direct electric service to Midtown Manhattan for highest ridership area, and service to Newark & Montclair. Possible non-electric service.	Currently a bike trail is planned for part of the ROW. Will be studied in the future by NJ TRANSIT as an electrification alternative to full electrification of Boonton Line from Great Notch to Denville.
Morristown Area Rail (#30)	Commuter Rail or Diesel/Electric Low-Medium Cost Light Rail justified by Transit Score, and Morristown employment. Availability of Morristown & Erie rail right-of-way	Project would start in vicinity of Roseland north of I-280 and follow Morristown & Erie Right-of-Way, which has occasional freight service. Commuter Rail project would tie in west of Morristown station area, with service continuing to Dover/Netcong or TBD on M&E. May require additional M&E station. Light Rail project would have separate track parallel to M&E and enter downtown Morristown in a short tunnel or use some street running. Study would determine options to serve Morristown and transfers to M&E. Objective of project is to serve Morristown & Roseland employment areas, link NJT M&E rail to both areas, serve local trips and act as a distributor rail line.	NJT staff proposal. Post 2001 planning study as part of NJTPA process or I-80 Congestion Task Force.

New Brunswick LRT/BRT (Map # 31)	Low/Medium Cost Light Rail or Bus Priority Treatment in 2 Corridors. Both modes justified by Transit Score, especially Light Rail. Right-of-Way available for portion of both Corridors	Two Corridors: 1. Light Rail or Bus Rapid Transit (BRT) from South River on Raritan River RR through Rutgers to downtown New Brunswick, through College Ave. campus over Raritan River to Busch/Livingston and to Piscataway 2. Millstone Branch ROW from near Middlebush in Franklin Twp., through Route 27 redevelopment area through Jersey Avenue station area and through New Brunswick via Livingston Avenue/Joyce Kilmer Ave. to downtown New Brunswick. Study to examine possibilities.	Initial Planning Study to be conducted by Middlesex County and Rutgers on one corridor. Study awaiting NJTPA funding. NJ TRANSIT to provide North Jersey Transit Model to assist study. Further study on Millstone Branch required in future as part of Jersey Avenue area study.
West Trenton-Trenton Light Rail, Extension of South Jersey Light Rail (#32)	Meets criteria for Light Rail, and old freight railroad Right-of-Way exists for majority of possible project. Potential to link NJDOT to rail transit, and West Trenton rail to downtown Trenton	Light Rail project would start near West Trenton rail station, and serve proposed Ewing redevelopment area & dense Trenton residential neighborhoods. Continue past NJDOT, Library for Blind, and Trenton neighborhoods to access downtown Trenton and link with proposed South Jersey LRT downtown extension. Possible airport link.	Proposed by NJT Staff. Also proposed by NJ Association of Rail Passengers (NJ-ARP). Southern NJ LRT downtown Trenton extension to be coordinated to allow options for expansion Follow-up study should be conducted in near future.

Atlantic City Expressway Bus Priority (#33)	Bus Priority Treatment, Bus Flow volumes, and Atlantic City Transit Score and employment justify examination of strategies to keep bus travel times competitive in long-run future.	From vicinity of Expressway Toll Plaza to downtown Atlantic City. Possible Bus Only Toll Booth/E-Z Pass lane and shoulder or other Bus-Only treatment for all or portion of segment from Toll plaza to end of Expressway by new Connector roadway to Marina.	NJT Staff Proposal Longer-Range study after opening of new casinos and Tunnel project is completed.
Atlantic City to Linwood Rail (#34)	Commuter Rail Extension, DMU, Light Rail all justified by Transit Score criteria. Project would link into either AC Rail Terminal or into downtown area on street. Historic Trolley corridor. Two branch alternative possible.	Right-of-Way exists to Linwood and west to vicinity of Shore Mall. Project could be diesel commuter rail, electric light rail or FRA compatible LRT. Project would tie to either AC Rail Terminal or follow historic Shore Fast route in Route 40 Corridor past stadium to a TBD street location in Atlantic City. Project would serve area with significant employee trip flow to Atlantic City as well as local trips to retail areas.	Study proposed by SJTPO. Also proposed by NJT staff. South Jersey Rail Study to examine potential for project in 2001.

NEXT STEPS & OTHER INFORMATION

This document is intended as a guide to the NJ TRANSIT Map, **2020 TRANSIT Map: Possibilities for the Future**. The information has been presented so that members of the public, local officials, commuters, and other interested parties can understand the purpose of the 2020 Transit Map and the Transit Score Index. The technical details provide information for a more informed discussion about the possibilities for improved transit throughout the entire state of New Jersey.

This technical guide is only a first step. This document, **The 2020 Transit Report: Possibilities for the Future**, is not a final report. Given the amount of information contained in this document, it is a beginning to further discussions. We intend to expand upon and update this report based on comments we receive. For persons with questions or comments on this report, please write or Email us at:

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For persons with detailed technical questions regarding this report, or those who would like an electronic copy of the Transit Score database, please add to the above address **ATTENTION: Thomas Marchwinski**. Mr. Marchwinski is the primary author of the Transit Score Index and this technical report. Please include your Email address. Diskette copies of the Transit Score database and this report can also be made available to those without electronic access.