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1998 LONG-RANGE CHAPTER FOUR

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IV. STATUS OF THE EXISTING TRANSPORTATION SYSTEM

In this chapter the Department's roles with respect to the State of Connecticut's airports, bridges, highways, bus systems, rail systems, water transportation services and facilities, bikeways, walkways and trails are summarized; overviews of the physical conditions of the components of these systems are presented, factors affecting the conditions of or demand on the facilities are identified and the ability of these facilities and systems to meet current and future demands is discussed.

A. AIRPORTS

1. CONNDOT'S ROLE

The Connecticut Department of Transportation's Bureau of Aviation and Ports has a primary role in ensuring the continued growth and safety of aviation in the State. The Department's many roles include; project management (overseeing projects from conception to completion) at the six state-owned airports, licensing and inspecting of all public and private airports and helipads within the state, distributing federal funding to general aviation airports for improvements and studies, and promoting economic development. The locations of the state-owned airports and the municipal and privately-owned airports in Connecticut that ConnDOT's Bureau of Aviation and Ports licenses and inspects are shown in **Figure IV-A1.**

2. BRADLEY INTERNATIONAL AIRPORT (BIA)

Bradley International Airport (BIA) is Connecticut's primary air carrier facility and New England's second largest airport. It presently occupies 2,358 acres of land in the towns of Windsor Locks, East Granby, Suffield, and Windsor. It is located equidistant between Hartford, Connecticut and Springfield, Massachusetts and serves over five million people in Connecticut and Western Massachusetts. BIA is a reliever airport for New York and Boston air traffic and functions as a base for both the Army and Air National Guard. Its location in relation to Logan Airport, John F. Kennedy Airport, LaGuardia Airport and other major airports and major cities within a 100 mile radius of Hartford is shown in **Figure IV-A2.** Services available at BIA include scheduled, domestic and international air carriers; commuter/regional airlines, charter flights, cargo and mail, and general aviation aircraft.

The Airport is owned by the State of Connecticut, is managed by ConnDOT's Bureau of Aviation and Ports, and receives input from the Bradley Commission. The Bradley Commission, whose members are appointed by State legislators and the governor, was created to allow the towns surrounding the Airport to have input into the operations of the Airport. BIA is operated on a self-sustaining basis from revenues generated by the Airport, the federal airport improvement program, and the Bradley Enterprise Fund. Comprehensive information on the services, facilities and plans for BIA is presented in the Bradley International Airport Master Plan.

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Figure IV-A 1. Connecticut Intermodal Airport and Seaport Facilities

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Figure IV-A 2. Major Conn. Airports and Other Major Airports & Cities Within 100 Mile Radius

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a) Use

Bradley International Airport is served by most of the principal U.S. airlines and a number of regional/commuter airlines. As of September 30, 1998, the following 20 air-carrier or regional/commuter airlines were operating scheduled service at the Airport:

Air Carrier Airlines: Air Tran, American, Continental, Delta/Delta Express, Metro Jet, Midway, Midwest Express, Northwest, TWA, United, US Airways.

Regional/Commuter Airlines: Air Alliance, Air Ontario, American Eagle, Continental Express, Trans International Express, TW Express, United Express, US Airways Express.

As shown in **Figure IV- A3,** in terms of total annual passenger activity, US Airways led the other airlines in 1997 with 25.9% of the market, followed by Delta (22.8%), American (14.6%) and United 9.7%). Five other airlines (Northwest, Continental, TWA , Midway, and Pan Am) accounted for 16.8% of the total annual passenger acitivity at the Airport. The commuter airlines as a group accounted for 9.2% of the passenger activity.

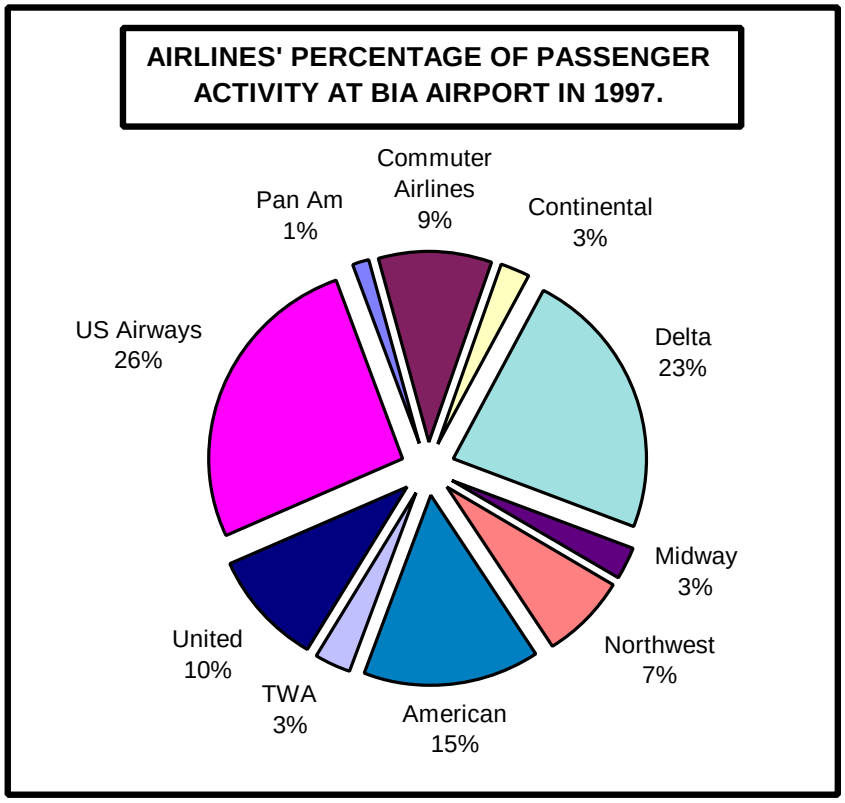

Figure IV-A 3. Airlines' Percentage of Passenger Activity

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Scheduled service is to U.S. destinations and Canada. Virtually all of the jet service is to hub cities of the various airlines. The cities to which jet service from Bradley was provided as of September 1998 are listed below.

Airline	Cities to Which Service is Provided From BIA
American	Chicago (ORD), Dallas/Ft. Worth, Miami, San Juan
Continental	Cleveland, Newark
Delta	Atlanta, Cincinnati, Palm Beach
Delta Express	Orlando
Midway	Raleigh
Northwest	Detroit, Minneapolis
TWA	St. Louis
United	Chicago (ORD), Washington (IAD), Denver, San Francisco
US Airways	Baltimore, Charlotte, Philadelphia, Pittsburgh, Washington (DCA)

Commuter destinations to which service is provided from BIA include Boston, Buffalo, Montreal, Newark, New York (JFK and LGA), Rochester, Syracuse, Toronto.

One new scheduled air carrier, Shuttle America, is expected to inaugurate new service in November 1998. Historical and projected forecasts for annual air carrier, commuter, military, and air cargo operations from 1985-2015 are presented in the following tables.

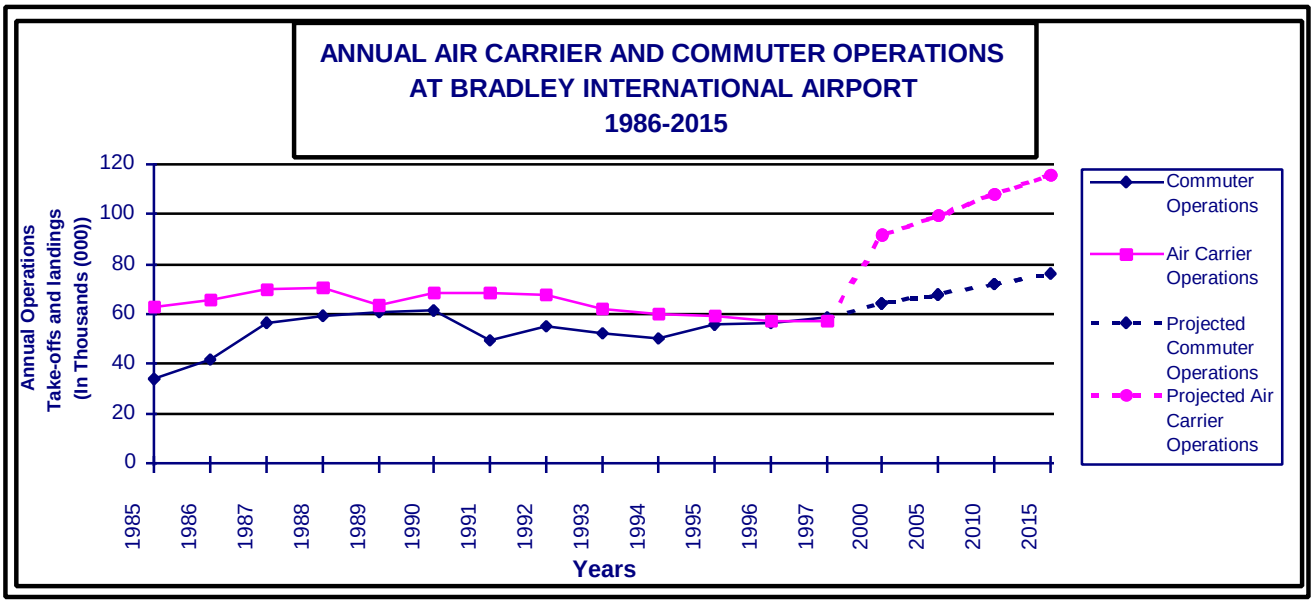

Figure IV-A 4. Annual Air Carrier and Commuter Operations

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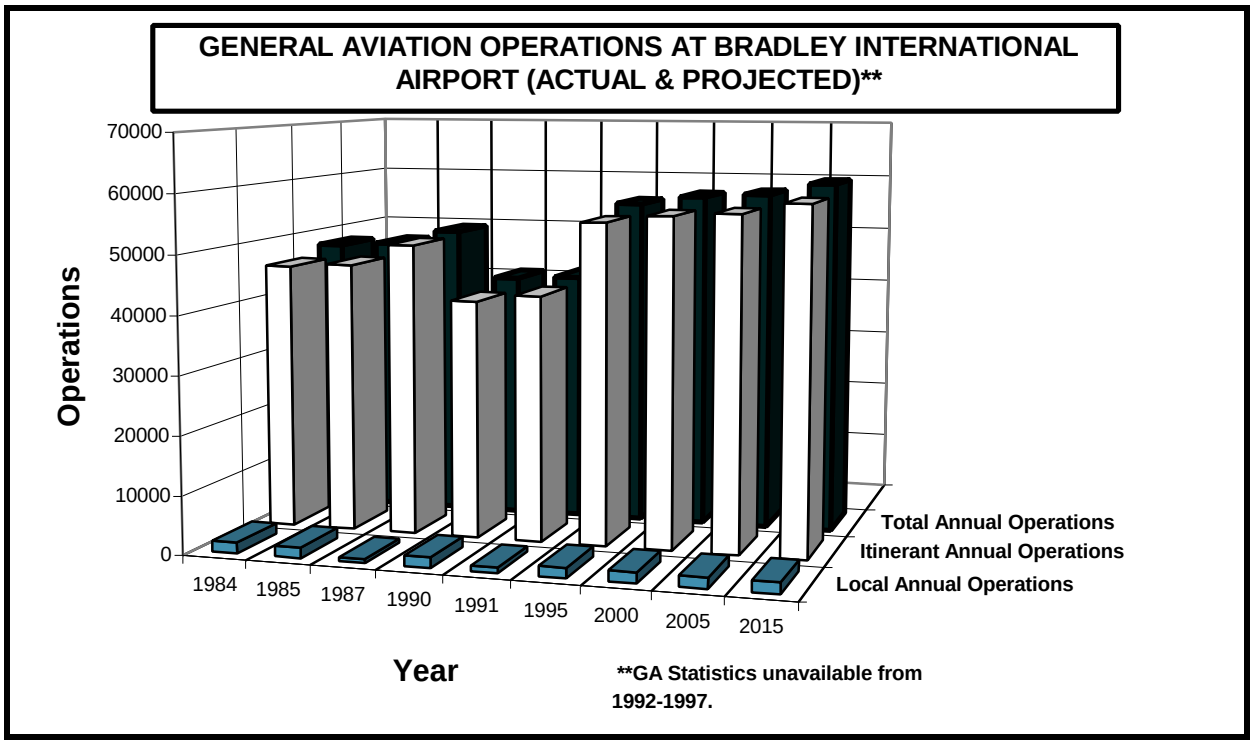

Figure IV-A 5. General Aviation Operation

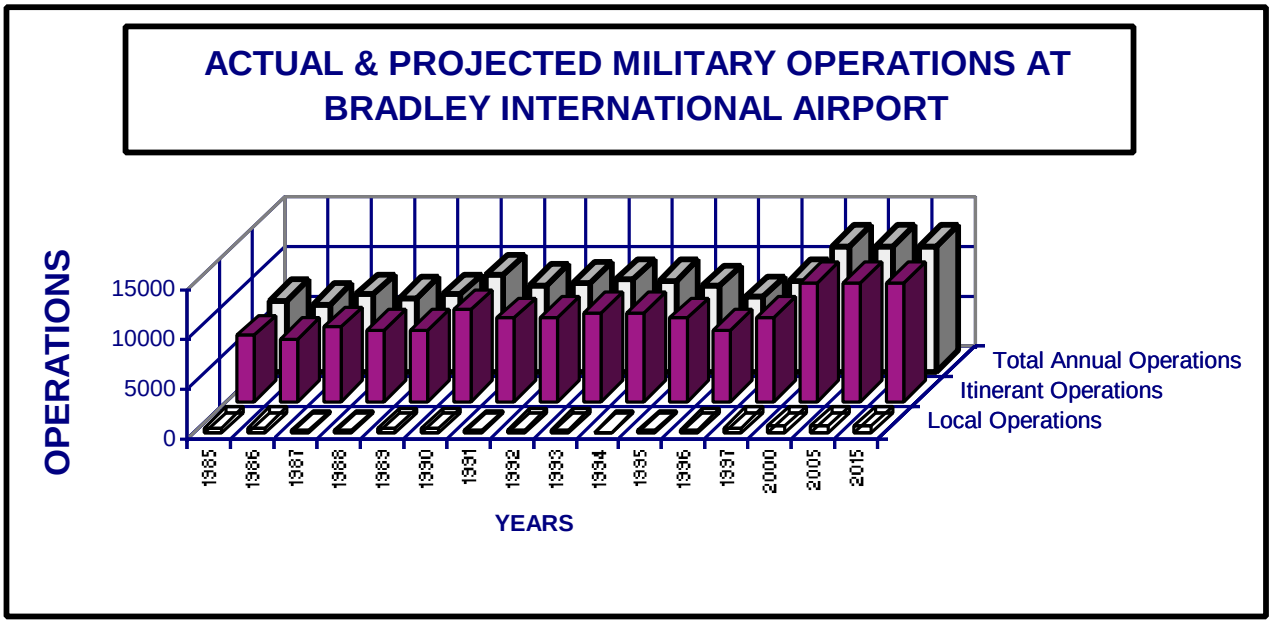

Figure IV-A 6. Military Operations

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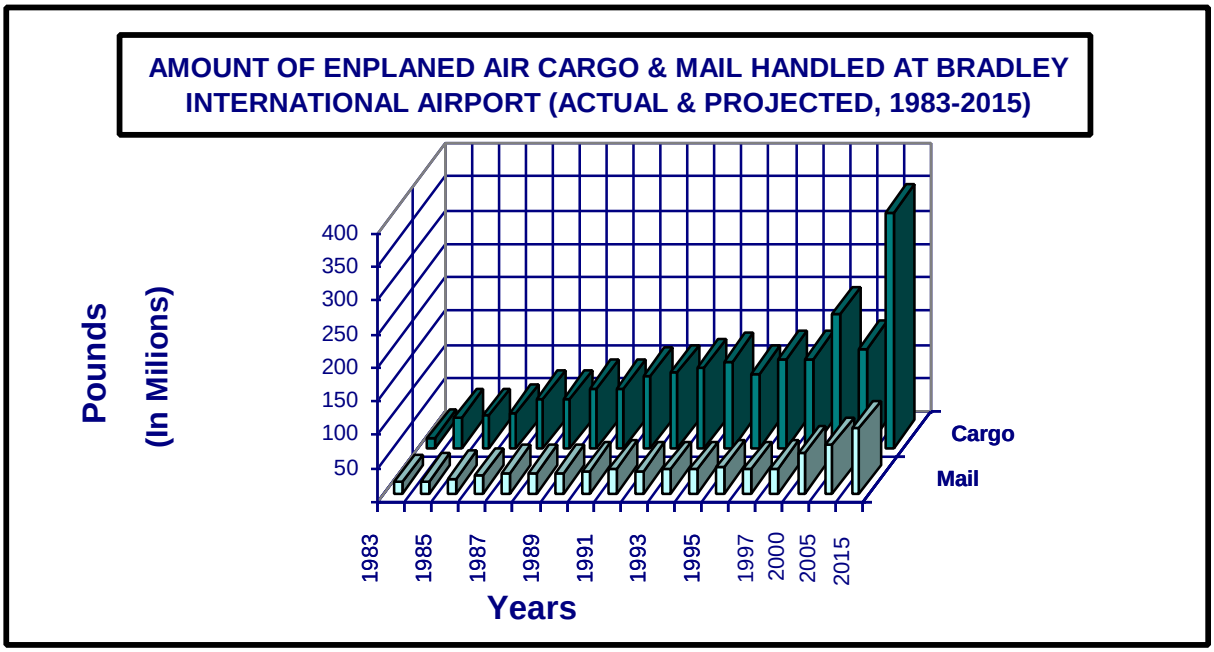

Figure IV-A 7. Air Cargo and Mail

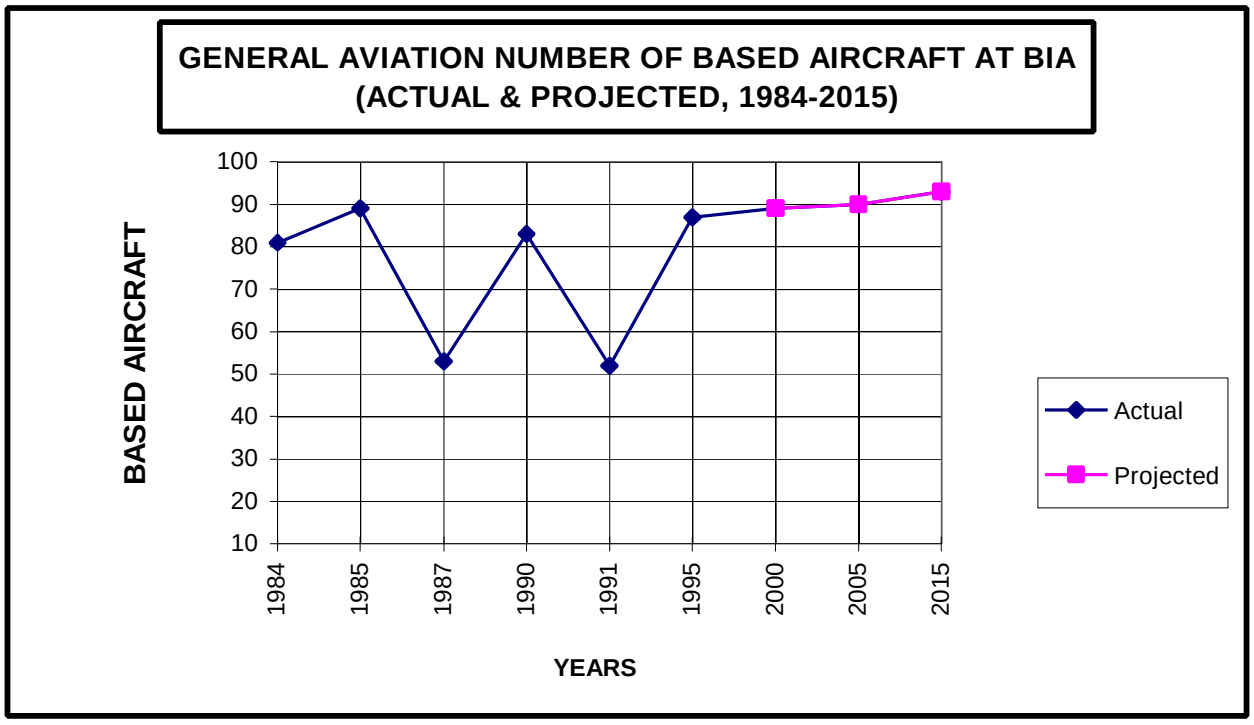

Figure IV-A 8. Number of Based Aircraft

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b) Existing Facilities: Airside and Landside Components

The existing facilities at BIA consist of three physical pavements with connecting taxiways and apron areas, a passenger terminal, three air-cargo complexes, a general aviation terminal, a fire rescue training facility, a maintenance facility, and two military areas belonging to the Air National Guard. These facilities and their components are discussed below.

(1) Pavement

Bradley International Airport has three runways with the following characteristics:

Runway	Length	Width
Runway 6-24	9,502 ft	200 ft
Runway 15-33	6,846 ft	150 ft
Runway 1-19	5,141 ft	100 ft

These runways are serviced by a network of 16 taxiways. This network of pavement comprises an equivalent of 70 miles of roadway pavement.

Condition of Pavement. The pavement used is an approved FAA mix which is close to, but not the same as, the Department of Transportation's Class 1 pavement mix. The pavement condition was analyzed in a published study done by Envirodyne Corp. in 1989. This study led to an extensive pavement reconstruction program to rehabilitate all the pavements at Bradley over a five year time period. Since this pavement plan was completed, a new taxiway and aircraft aprons were constructed. The pavement condition was evaluated using existing condition plans and non-destructive testing to formulate a PCI (Pavement Condition Index) for each section of pavement. The sections were then prioritized using this rating. The final priority is used in the selection of future paving projects.

The structural life for the constructed pavement is 20 years. Bureau of Aviation and Ports' personnel are in the process of implementing a pavement analysis plan. A pavement analysis summary is presented as Table I in Appendix A.

Factors Affecting the Condition of Airport Pavement. There are many factors that affect the condition of pavement at airports. The most significant are:

- Traffic. The wheel load impacted by the aircraft fatigue the pavement structure. The allowable load is the theoretical maximum gross weight of the design aircraft at a particular pass level that will not cause further load-induced damage to a pavement system. Any additional load over the allowable load on the aeronautical pavements will significantly reduce the remaining structural life of the pavement.
- Snow and Ice Removal. Chemicals put on the pavement slowly deteriorate the pavement and could reduce the structural life of the pavement.
- Rubber Deposits and Grooving. The runway pavements are grooved for increased drainage. Over time, rubber deposits form on runways and fill in the grooves. These rubber deposits need to be removed by high pressure water. Over time, this can loosen stones in the pavement allowing water to saturate the pavement and cause a loss in load bearing capabilities.

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- Construction Practices. It is crucial that all pavements be constructed with materials specified and in accordance with FAA specifications. The longevity of a pavement can be impacted by poor construction processes.

Ability of Runways and Taxiways to Meet Current and Future Demand. Future studies will have to be initiated and completed to determine whether the taxiways and runways are wide enough and structurally sound enough to accommodate the newer, larger, and heavier aircraft expected to be used by the airlines.

(2) Pavement Markings

Bradley International Airport maintains pavement markings in accordance with FAA Advisory Circular 150/5340-1G, which depicts how an airport should be marked according to runway categories.

Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths and the volume of traffic that passes over the marking.

Pavement markings provide guidance during both day and night operations. The markings are reflectorized for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Ability of Pavement Markings to Meet Current and Future Demands. The Department uses durable pavement markings on airport pavements. When these markings are installed during a resurfacing project, they exhibit longevity. Markings which have been installed this way can last from three to eight years. It is anticipated that all pavement markings will be repainted within the next five years.

Factors Affecting Condition of or Demand for Pavement Markings:

- Environment. Snow plowing and deicing chemicals greater deteriorate the pavement markings.
- Traffic. The number of aircraft and vehicles which pass over the markings affects the rate of deterioration of the pavement markings. The greater the volume of traffic, the faster the rate of deterioration.

(3) Airport Signing

Signing is an integral part of aircraft operations at Bradley International Airport. All runways and taxiways are signed in accordance with FAA Advisory Circular 150/5340-18C to insure that all aircraft are aware of their location at all times.

After the aircraft has landed, the tower controls all its movements to the gate with taxiway designations and the aircraft, in turn, use signing to follow the path.

Ability of Signs to Meet Current and Future Demands. Bradley Airport completed a project in 1992 to replace all signs to meet current FAA regulations.

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The FAA is constantly working on better signs, sign locations, sign materials, and visibility to make airports safer.

As of February 1998 the signs on the airport worked very well. If maintained properly, they should last many years.

Factors Affecting the Condition of or Demand for Signs:

- Airport Expansion. As the airport expands in the future, there will be a need to sign all new pavement improvements to meet FAA regulations.
- Weather. Snowy weather can result in a need to replace signs at airports. Signs covered by snow are sometimes hit and damaged by plows and blowers. The damaged signs must be replaced to ensure safe operations.

(4) Landing Aids

During periods of inclement weather, when the vertical visibility (ceiling) is less than 1000 feet or forward visibility (RVR - Runway Visual Range) is less than three miles, an airport is operating under Instrument Flight Rule (IFR) conditions. IFR weather occurs about 13% of the time at Bradley International Airport.

Bradley is well equipped to accommodate aircraft operations during IFR conditions. The table below indicates the various Instrument Landing System (ILS) approaches for the runways at the airport.

ILS APPROACHES FOR RUNWAYS AT BRADLEY INTERNATIONAL AIRPORT (BIA)

RUNWAY	TYPE APPROACH	CEILING	RVR
6	CAT III B ILS	100'	600'
24	CAT I ILS	200'	1800'
15	VOR	909'	2.75 miles
33	CAT I ILS	250'	0.75 miles

Table IV-A 1. ILS Approaches For Runways at Bradley International Airport

Airport lighting also serves an integral function in the daily operations at Bradley International Airport. Bradley utilizes a complex system of runway, taxiway, and approach lighting to aid aircraft in landings and departures during night and/or inclement weather operations. It is the Bureau's goal to maintain the current level of landing and lighting aids standards at the airport while studying the implementation of additional aids to more efficiently serve the public using the airlines that fly to and from Bradley International Airport.

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(5) Passenger Terminal Facilities

Passenger terminal facilities include the Murphy Terminal with 20 aircraft gate positions, Terminal A with ten aircraft gate positions, and the International Arrivals Building (IAB) with three aircraft gate positions. These facilities include many amenities for the traveler, including restaurants, duty-free shopping, at-grade parking lots, shuttle service, and ground transportation to all points within Connecticut and western Massachusetts.

Condition of Terminals. Currently BIA has three passenger terminals: Murphy Terminal (built in phases during the late 1940's into the early 1950's), the International Arrivals Building (built in 1968), and Terminal A (built in 1985). A decision has been made to replace Murphy Terminal because it is old, does not meet current commercial standards, and is becoming too costly to refurbish. The Bureau of Aviation and Ports conducted a feasibility study for the construction of a new terminal to be located next to Terminal A. A project to construct a new terminal is currently in the design phase. The new terminal will be a state-of-the-art 472,000 square foot facility with thirteen aircraft gates. After completion of the new terminal project, Murphy Terminal will be razed to provide additional apron space for aircraft.

The International Arrivals Building (IAB) and Terminal A will undergo extensive renovations under the new terminal project to modernize and increase operational efficiency.

(6) Air Freight Facilities

Currently Bradley has three cargo complexes: the Roncari Freight Facility, USAirports, and the UPS Air Express Sorting Hub. The Roncari Freight Facility was constructed in 1984, the USAirports facility was constructed in 1992, and the UPS building was completed in 1997. These facilities are in excellent condition.

Ability of Freight Facilities to Meet Current and Future Demand. Based on forecasts of demand for air cargo buildings and all-cargo aircraft parking aprons, a significant increase in cargo facilities will be required. On-airport cargo facility development should emphasize apron areas for all-cargo aircraft and cargo buildings which take advantage of direct access to these apron areas. Other air cargo buildings may be located off-airport, as certain existing operators have chosen to do, when the functional requirements allow.

One potential area is north of Runway 15-33 adjacent to the new ATCT and fire school. This site (of 20-30 acres) would have airfield access from Taxiway J, but its usable area is limited by the restricted area associated with the VORTAC. Landside access would also require roadway improvements. Another area is opposite the US Airports facility east of Runway 15.

Two other possible areas have been identified as suitable for possible air cargo facility development. One area includes approximately 30 acres north of the Canadair hangar along Taxiway E, and extending east to the Army National Guard facility. Also, in this same general area is a parcel east of the Business Express hangar of approximately 5 acres which could be used for belly freight cargo facilities.

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The aforementioned areas are estimated to have sufficient capacity to meet the forecast needs of the airport through the planning period of 2015.

During 1998 Bureau of Aviation and Ports has been negotiating with developers to construct new freight facilities at the airport. The ability of the airport to meet the future air cargo demands will rely on the construction of these new freight facilities.

(7) General Aviation (GA) Facilities

Bradley International Airport plays an important role in general aviation in Connecticut. It has two fixed base operators, AMR Combs and Signature Flight Support, as well as private facilities for corporate aircraft for companies based in the greater Hartford area. These GA facilities include storage and maintenance hangars, aircraft aprons for based and transient aircraft, and GA terminal facilities. The present GA terminal facilities are in good condition and of adequate size to serve anticipated levels of activity.

Ability of GA Facilities to Accommodate Current and Future Demand. Since the airport has had close to 90 based aircraft in the past without any additional hangar or apron facilities, it is expected that forecasted based aircraft can be accommodated with a minimum of additional facilities. One change in GA, however, may be to provide additional hangar space for based aircraft. This is predicated on the based aircraft forecast which projects an increase in size and value of these aircraft. Additional private corporate hangars are expected to account for the increase in hangar capacity.

(8) Air Operations Facilities

The Federal Aviation Administration (FAA) which controls air operations, operates a 24-hour air traffic control tower and a terminal radar approach and departure center. A new control tower is currently under construction on the west side of the airport and is scheduled to be fully operational by the spring of 1999.

(9) Parking at Bradley International Airport

At-grade parking is provided on-airport for passengers, visitors, and employees. On-airport parking consists of Short-Term Parking Lots A and B; Long-Term Parking Lots 1, 2, 3, and 4; and one employee parking lot. The numbers of handicap spaces and total spaces available in each lot are indicated in **Table IV-2**.

The short and long-term lots are both revenue-generating and are privately managed by APCOA, Inc. In addition to on-airport parking, 11 privately-owned off-airport parking lots operate "valet" parking services using shuttle vans to the terminals.

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PARKING SPACES AT BRADLEY INTERNATIONAL AIRPORT

Type of Parking	Handicap Spaces	Total
Short Term		
A	16	444
B	11	366
Long Term		
1	11	520
2	27	1530
3	18	728
4	6	457
Employee Lot	10	499

Table IV-A 2. Parking Spaces at Bradley International Airport

Ability of Parking Facilities to Meet Future Demands. Additional on-airport parking will be required to meet future demand, given the steady growth of enplanements and deplanements over the last several years, the projected continuation of these growth trends and the construction of the new terminal building.

To meet the expected demand for the immediate future, the Bureau of Aviation and Ports has initiated a construction project to construct a new long-term parking lot along Light Lane Road to accommodate 459 vehicles, including nine handicap spaces. This new lot will feature a bus shelter with scheduled shuttle service to and from the terminals. Construction began the summer of 1998 and is expected to be completed in the fall of 1998. To meet the ultimate forecast of enplanements and deplanements, a parking garage structure has been proposed as part of the new terminal study.

c) Ability of Bradley International Airport to Meet Current and Future Demands

The ability to meet the future aviation demands at Bradley International Airport will become increasingly challenging to ensure the continued level of service at the airport. Some key factors that will effect the ability of the airport to meet the current and future aviation demands are increasing air traffic, the introduction of larger aircraft, new environmental concerns and regulations, new and improved navigational aids, funding and airport expansion. These factors and their effect on the airport are discussed below.

Increased Air Traffic. Over the next twenty years experts predict that air traffic will increase at a very rapid pace (**see Figure IV-A4, Annual Air Carrier Operations**). Airports will be hard pressed to ensure the safety of the flying public without a clear, concise plan to meet such increases in traffic. Bradley International Airport has recognized this need and has such a plan**.**

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Murphy Terminal, which is functionally obsolete and becoming too costly to refurbish, will be replaced. A new terminal will be constructed next to Terminal A. The new terminal will be a state-of-the-art 472,000 square foot facility with thirteen aircraft gates. This project is currently in the design phase. Construction is scheduled to begin in the year 2000 with completion in the year 2002. Upon completion of the new terminal, Murphy Terminal will be torn down and the space will be used for additional aircraft parking.

Subsequent projects directly associated with the new terminal project will increase the efficiency of passengers using the airport. To increase the number of aircraft gates, additions will be constructed onto Terminal A and the International Arrivals Building to allow a larger number of aircraft to enplane/deplane concurrently. Improvements are scheduled to Route 20 and Schoephoester Road including a proposed fly over to Terminal Road alleviating stop and go traffic at that entrance. A multi-level parking structure has also been proposed to be built in front of Terminal A to increase parking capacity within walking distance to all terminals.

Larger Aircraft. The current industry trend has been for airlines to replace their aging fleets of aircraft with new, larger and more efficient aircraft. It has been forecasted that air carriers will be utilizing larger aircraft like the new Boeing-777 more frequently. These new aircraft have different design standards for airport facilities than the current aircraft being flown. Old terminals throughout the country will have to be refurbished and renovated to meet these new standards or new terminals will have to be built. Future studies will have to be initiated and completed to determine whether the taxiways and runways are wide enough and structurally sound enough to accommodate the newer, larger, and heavier aircraft expected to be used by the airlines. Proper planning will be required to enable Bradley International Airport to meet these future demands. The new terminal and renovations to the existing terminals will accommodate the air carriers serving the airport.

Environmental Concerns. New environmental regulations and mandates will need to be addressed as to their impact on expansion and continual operation of the Airport. A major environmental concern at the airport has been the deicing of aircraft during inclement weather operations. Runoff from the areas where the aircraft were being deiced was slowly leaching into the watershed that surrounded the southern part of the terminal complex. To address this problem the Airport initiated a project to construct a Remote Deicing Facility (RDF) where aircraft could be deiced in one location immediately prior to takeoff. This RDF will be comprised of an apron that will ultimately allow five Boeing-757 type aircraft to be deiced simultaneously. The RDF will have a closed drainage system that will collect the byproduct of the deicing procedure and store it in underground holding tanks.

Other environmental concerns facing the Airport include clearing and developing areas within inland wetlands, endangered bird species nesting at the airport, and noise pollution from arriving and departing aircraft.

Funding. A major factor that affects the Airport's ability to meet these current and future demands is funding. The Airport will be able to meet these demands only to the extent that funding is available to do so.

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3. HARTFORD-BRAINARD AIRPORT

Hartford-Brainard Airport presently occupies 206.5 acres of land located approximately two miles southeast of downtown Hartford along the western bank of the Connecticut River. It is classified by the Federal Aviation (FAA), in its National Plan of Integrated Airport Systems (NPIAS), as a reliever airport for Bradley International Airport in Windsor Locks. The Airport is home to the Air National Guard and one FBO, Million Air, who provides air taxi service and services for general aviation aircraft.

The Airport is owned by the State of Connecticut and is currently operated by ConnDOT's Bureau of Aviation and Ports. It receives funding from the State's General Transportation Fund and federal assistance from the Federal Aviation Administration (FAA). Comprehensive information on the services, facilities, and plans for Hartford-Brainard Airport is presented in the Hartford-Brainard Airport Master Plan.

a) Use

Although Hartford-Brainard Airport is classified as a reliever airport for Bradley International Airport, it is utilized to a great extent for general aviation, with 133 based aircraft. Military and air taxi operations account for the remaining operations. Listed below are the number of operations at the Airport during a 12-month period from 1996-1997. This information was taken from the FAA's Airport Master Record, Form 5010.

Type of Operation	No. of Operations	% Total Operations
Air Carrier	1	0.0%
Commuter	0	0.0%
Air Taxi	1,336	1.2%
GA Local	41,710	38.3%
GA Itinerate	65,345	60.0%
Military	388	0.5%
Total	108,780	100.0%

b) Existing Facilities

The existing facilities at Hartford-Brainard Airport consist of two physical pavements with connecting taxiways and apron areas, one turf runway, a general aviation terminal, an administration building, a fire rescue and maintenance facility, an FAA control tower, and a military area belonging to the Air National Guard. These facilities and their components are discussed below.

(1) Pavement

Hartford-Brainard Airport has three runways with the following characteristics:

Runways	Length (ft)	Width (ft)
Runway 2-20	4,418	150
Runway 11-29	2,315	70
Turf (NE/SW)	2,350	250

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These runways are serviced by a network of nine taxiways.

Condition of Pavement. The pavement used is an approved FAA mix which is close to, but not the same as, ConnDOT's class 1 pavement mix. The pavement conditions at the airport were analyzed in February 1995 by engineers at the Bureau of Aviation and Ports and summarized in a Pavement Management Plan. A copy of this plan is on file at the Airport. Since the completion of the Pavement Management Plan, Taxiway "A" has been rehabilitated. Runway 11-29 and taxiways "B" and "V" are scheduled to be rehabilitated in 1998.

The structural life for the constructed pavements are 20 years. Bureau of Aviation and Ports' personnel are continually re-evaluating the Airport's pavements to implement future pavement improvement programs.

Factors Affecting the Condition of Airport Pavement. There are many factors that affect the condition of pavement at airports. The most significant are:

- Traffic. The wheel load impacted by the aircraft fatigue the pavement structure. The allowable load is the theoretical maximum gross weight of the design aircraft at a particular pass level that will not cause further load-induced damage to a pavement system. Any additional load over the allowable load on the aeronautical pavements will significantly reduce the remaining structural life of the pavement.

- Snow and Ice Removal. Chemicals put on the pavement slowly deteriorate the pavement and could reduce the structural life of the pavement.

- Rubber Deposits and Grooving. The runway pavements are grooved for increased drainage. Over time rubber deposits form on runways and fill in the grooves. These deposits then need to be removed by high pressure water. Over time, this can loosen stones in the pavement allowing water to saturate the pavement and cause a loss in load bearing capabilities.

- Construction Practices. It is crucial that all pavements be constructed with materials specified and in accordance with FAA specifications. The longevity of a pavement can be impacted by poor construction processes.

(2) Pavement Markings

Hartford-Brainard Airport maintains pavement markings in accordance with FAA Advisory Circular 150/5340-1G, which depicts how an airport should be marked according to runway categories.

Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths and the volume of traffic that passes over the marking.

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Pavement markings provide guidance during both day and night operations. The markings are reflectorized for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Ability of Pavement Markings to Meet Current and Future Demands. The Department uses durable pavement markings on airport pavements. When these markings are installed during a resurfacing project, they exhibit longevity. Markings which have been installed this way can last from three to eight years. It is anticipated that all pavement markings will be repainted within the next five years.

Factors Affecting Condition of or Demand for Pavement Markings:

- Environment. Snow plowing and deicing chemicals deteriorate the pavement markings.
- Traffic. The number of aircraft and vehicles that pass over the markings affects the rate of deterioration of the pavement markers. The greater the volume of traffic the faster the deteriorarion.

(3) Airport Signing

Signing is an integral part of aircraft operations at Hartford-Brainard Airport. All runways and taxiways are signed in accordance with FAA Advisory Circular 150/5340-18C to insure all aircraft are aware of their location at all times.

After the aircraft has landed, the tower controls all its movements to the aircraft apron with taxiway designations and the aircraft, in turn, use signing to follow the path.

Ability of Signs to Meet Current and Future Demands. Brainard Airport completed a project in 1992 to replace all signs to meet current FAA regulations.

The FAA is constantly working on better signs, sign locations, sign materials, and visibility to make airports safer.

As of February 1998 the signs on the airport work very well and if maintained properly, should last many years.

Factors Affecting the Condition of or Demand for Signs:

- Rehabilitation of Pavement. There will be a need to re-sign all new pavement to meet FAA regulations as the airport rehabilitates pavements that have come to the end of their useful design life.
- Winter Weather. Signs covered by snow are sometimes hit by plows and blowers and then must be replaced to ensure safe airport operations.

(4) Landing Aids

During periods of inclement weather, when the vertical visibility (ceiling) is less than 1000 feet or forward visibility (RVR - Runway Visual Range) is less than three miles, an airport is operating under

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Instrument Flight Rule (IFR) conditions. IFR weather occurs about 13% of the time at Hartford-Brainard Airport.

Brainard Airport has only one runway equipped to accommodate aircraft operations during IFR conditions. The table below indicates the various Instrument approaches for Runway 2 at the airport.

INSTRUMENT APPROACHES FOR RUNWAYS AT HARTFORD-BRAINARD AIRPORT

RUNWAY	TYPE APPROACHES
2	LDA, VOR, GPS
20	NONE
11	NONE
29	NONE

The NE/SW Turf Runway has no instrument landing system and is mainly used by aircraft without nose landing gear.

Table IV-A 3. Instrument Approaches for Runways at Hartford-Brainard Airport

Airport lighting also serves an integral function in the daily operations at Hartford-Brainard Airport. Brainard utilizes a complex system of runway, taxiway, and approach lighting to aid aircraft in landings and departures during night and/or inclement weather operations. It is the Bureau's goal to maintain the current level of landing and lighting aids standards at the airport while studying the implementation of additional aids to more efficiently serve the public using the airport.

(5) General Aviation (GA) Facilities

Hartford-Brainard Airport plays an important role in General Aviation in Connecticut. It has one fixed base operator, Million Air, who provides storage and maintenance facilities, an aircraft apron for based and transient aircraft, and GA terminal facilities. The present GA facilities also include three t-hangars which provide storage area for additional based aircraft. The State presently is involved in negotiations to lease these t-hangars to a private second party. The GA facilities are in good condition with the exception of the t-hangars which will be rehabilitated in the summer/fall of 1998. The facilities are of adequate size to serve the anticipated level of service in the future. Currently the airport has 133 based aircraft and if the need arises, the second party leasing the t-hangars has an agreement with the State to build an additional three more adjacent to the existing t-hangars.

(6) Air Operations Facilities

The Federal Aviation Administration (FAA), which controls air operations, operates a 24-hour air traffic control tower. The tower is equipped and staffed to provide VFR (Visual Flight Rule) separation of arriving and departing aircraft and separation of aircraft on the ground at aircraft

movement areas, i.e. runways and taxiways. IFR operations are handled by Bradley International Airport's FAA control tower.

c) Ability of Airport to Meet Current and Future Demands

The ability to meet the future aviation demands at Hartford-Brainard Airport will become increasingly challenging to ensure the continued level of service at the Airport. Some key factors that will affect the ability of the Airport to meet the current and future aviation demands are new environmental concerns and regulations, new and improved navigational aids, funding, and runway safety improvements. These factors and their effect on the Airport are discussed below.

Environmental Concerns. New environmental regulations and mandates will need to be addressed as to their impact on safety area improvements and to the continual operation of the Airport. A major concern to the continual operation of the airport are trees penetrating the FAA-mandated Federal Aviation Regulations (FAR) Part 77 imaginary flight surfaces. These imaginary surfaces rise from the Airport's runway environment at certain slopes, based on the type of approach, and must be clear of all obstructions. Currently trees penetrate all four runway approaches at the airport. The major concern is the trees growing in the Connecticut River flood plain. The removal of these trees will require permits from the Connecticut DEP, the Army Corps of Engineers, and local coordination with city officials and the public. Another concern will be the ability of the Airport to improve and expand the runway safety areas. These improvements will enhance the safety of the general public using the airport's facilities. The Airport will need to acquire land rights from the Metropolitan District Commission (MDC) and will need to acquire permits from the Connecticut DEP and the Army Corps of Engineers to fill and grade within regulated wetlands.

New and Improved Navigational Aids. The Airport will need to address updating the current navigational aids to be able to meet the future demands that may be placed on the airport due to increased corporate jet traffic. To meet this demand, the Airport will look into implementing new GPS approaches for runways 2 and 20 and installing an approach lighting system. The Airport will be able to attract more corporate service by implementing these navigational aids which in turn will lower the approach minimums and allow more traffic that currently gets diverted to Bradley International Airport in inclement weather to land at Hartford-Brainard Airport.

Funding. A major factor that affects the Airport's ability to meet these current and future demands is funding. The Airport will be able to meet these demands only to the extent that funding is available to do so.

4. GROTON-NEW LONDON AIRPORT

Groton-New London Airport is one of six State-owned airports. It occupies approximately 407 acres in southeastern Connecticut in the Town of Groton. It lies along the Long Island Sound coastline at the inlet of the Poquonnock River. It is located 89 air miles southwest of Boston, 53 miles southeast of Hartford/Springfield and 108 miles northeast of New York. It is classified in the FAA's National Plan of Integrated Systems as a commercial service-primary airport. Its role is categorized as a short-haul airport, providing commercial service to destinations of up to 500 miles.

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The Airport is currently operated by ConnDOT's Bureau of Aviation and Ports. It receives funding from the State's General Transportation Fund and federal assistance from the FAA. Comprehensive information on the services, facilities, and plans for the airport is presented in the Groton-New London Airport Master Plan.

a) Use

Groton-New London Airport is used mostly for general aviation, military, and air taxi, with one major airline, USAirways Express operating five flights daily. Listed below are the number of operations at the airport for calendar year 1997.

OPERATIONS - 1997

Operations	Number	% Total Operations
Air Carrier	6,987	9.77%
General Aviation	60,204	84.15%
Military	4,349	6.08%
Total	71,540	100.00%

b) Existing Facilities: Airside and Landside Components

The existing facilities at Groton-New London Airport consist of two paved and one water runway with connecting taxiways, apron areas, a terminal building with administration offices, a fire/rescue building and a maintenance building. The military presence at the airport is the Connecticut Aviation Classification Repair Activity Depot (CT-AVCRAD) operated by the Connecticut Army National Guard. These facilities and their components are discussed below.

(1) Pavement

Groton-New London Airport has two runways: Runway 5-23 and Runway 15-33. A third paved runway, Runway 10-28, was closed in 1986. In addition to the paved runways, there is also a water lane established on the Poquonnock River to serve seaplanes (Runway 5W-23W). The three runways have the following characteristics:

Runways	Length (ft)	Width (ft)
Runway 5-23	5,000	150
Runway 15-33	4,000	150
Runway 5W-23W	4,000	300

These runways are serviced by a network of seven taxiways.

Condition of Pavement. The pavement used is an approved FAA mix which is close to, but not the same as, ConnDOT's class 1 pavement mix. The pavement conditions at the Airport were analyzed in July 1995 by engineers at the Bureau of Aviation and Ports and summarized in a Pavement Management Plan. A copy of this plan is on file at the Airport. Since the completion of the Pavement

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Management Plan, Runway 5-23 has been rehabilitated and Runway 15-33 has been scheduled to be rehabilitated in 1998.

The structural life for the constructed pavements are 20 years. Bureau of Aviation and Ports' personnel are continually re-evaluating the Airport's pavements to implement future pavement improvement programs.

Factors Affecting the Condition of Airport Pavement. There are many factors that affect the condition of pavement at airports. The most significant are:

- Traffic. The wheel load impacted by the aircraft fatigue the pavement structure. The allowable load is the theoretical maximum gross weight of the design aircraft at a particular pass level that will not cause further load-induced damage to a pavement system. Any additional load over the allowable load on the aeronautical pavements will significantly reduce the remaining structural life of the pavement.
- Snow, Ice, and Shell Removal. Chemicals put on the pavement slowly deteriorate the pavement and could reduce the structural life of the pavement. Due to the Airport's geographical location, seagulls drop shells on the pavement, requiring the runways to be plowed or broomed daily. This slowly deteriorates the structural integrity of the pavement.
- Rubber Deposits and Grooving. The runway pavements are grooved for increased drainage. Over time, rubber deposits form on runways and fill in the grooves. The deposits then need to be removed by high pressure water. Over time, this can loosen stones in the pavement allowing water to saturate the pavement cause a loss in load bearing capabilities.
- Construction Practices. It is crucial that all pavements be constructed with materials specified and in accordance with FAA specifications. The longevity of a pavement can be impacted by poor construction processes.

(2) Pavement Markings

Groton-New London Airport maintains pavement markings in accordance with FAA Advisory Circular 150/5340-1G, which depicts how an airport should be marked according to runway categories.

Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths and the volume of traffic that passes over the marking.

Pavement markings provide guidance during both day and night operations. The markings are reflectorized for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Ability of Pavement Markings to Meet Current and Future Demands. The Department uses durable pavement markings on airport pavements. When these markings are installed during a resurfacing project, they exhibit longevity. Markings which have been installed this way can last from three to eight years. It is anticipated that all pavement markings will be repainted within the next five years.

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Factors Affecting Condition of or Demand for Pavement Markings:

- Environment. Snow plowing and deicing chemicals deteriorate the pavement markings. Conditions that necessitate frequent plowing and deicing at the airport increase the rate of deterioration of the pavement markings.
- Traffic. The number of aircraft and vehicles that pass over the markings affects the rate of deterioration of the pavement. The greater the volume of traffic the faster the rate of deterioration.

(3) Airport Signing

Signing is an integral part of aircraft operations at Groton-New London Airport. All runways and taxiways are signed in accordance with FAA Advisory Circular 150/5340-18C to insure all aircraft are aware of their location at all times.

After the aircraft has landed, the tower controls all its movements to the aircraft apron with taxiway designations and the aircraft, in turn, use signing to follow the path.

Ability of Signs to Meet Current and Future Demands. Groton-New London Airport completed a project in 1993 to replace all signs to meet current FAA regulations.

The FAA is constantly working on better signs, sign locations, sign materials, and visibility to make airports safer.

As of February 1998 the signs on the airport worked very well and, if maintained properly, should last many years.

Factors Affecting the Condition of or Demand for Signs:

- Rehabilitation of Pavement. There will be a need to re-sign all new pavement to meet FAA regulations as the Airport rehabilitates pavements that have come to the end of their useful design life.
- Winter Weather. Signs that become covered by snow are sometimes hit by plows and blowers and then must be replaced to ensure safe airport operations.

(4) Landing Aids

During periods of inclement weather, when the vertical visibility (ceiling) is less than 1000 feet or forward visibility (RVR - Runway Visual Range) is less than three miles, an airport is operating under Instrument Flight Rule (IFR) conditions. IFR weather occurs about 30% of the time at Groton-New London Airport.

Groton-New London Airport has only one runway equipped to accommodate aircraft operations during IFR conditions. **Table IV-A-4** indicates the various Instrument approaches for runways at the airport.

Airport lighting also serves an integral function in the daily operations at Groton-New London Airport. Groton utilizes a complex system of runway, taxiway, and approach lighting to aid aircraft in landings

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and departures during night and/or inclement weather operations. It is the Bureau's goal to maintain the current level of landing and lighting aids standards at the Airport while studying the implementation of additional aids to more efficiently serve the public utilizing the Airport.

INSTRUMENT APPROACHES FOR RUNWAYS AT GROTON-NEW LONDON AIRPORT

RUNWAY	TYPE APPROACHES
5	VOR, GPS, ILS
23	VOR, GPS
13	NONE
33	GPS

Table IV-A 4. Instrument Approaches for Runways at Groton-New London Airport

(5) Passenger Terminal Facilities

The passenger terminal facility was originally constructed in 1963 and is structurally sound. The terminal was renovated in 1997. The renovations included a new roof, a new heating and ventilation air conditioning system, Americans with Disabilities Act (ADA) compliance, new carpeting, and other improvements. The building has an area of 10,593 square feet and houses the commuter and charter airlines, rental car offices, a flight school, and a restaurant.

(6) General Aviation (GA) Facilities

There is presently one fixed-base operator located at Groton. Columbia Air Services, located north of the terminal building, provides aircraft services, aircraft sales, maintenance, and fueling services. As the only fuel provider on the field, Columbia services airlines, general aviation, and the Connecticut Army Guard. Columbia's facilities consist of two 15,000 square foot conventional hangars used mainly for aircraft maintenance, combined office space that comprises approximately 9,750 square feet. Parking for 76 automobiles is available adjacent to the hangars. A new above ground fuel storage facility is located northwest of the new hangar on Tower Avenue. The new facility meets current federal tank construction requirements, is housed in its own building, and provides storage for 20,000 gallons of Jet-A fuel and 12,000 gallons of 100 low-lead aviation gasoline.

(7) Air Operations Facilities

Groton-New London Airport is located within the jurisdiction of Boston Air Route Traffic Control Center (ARTCC). Due to Groton's proximity to Providence, the traffic outside the immediate Groton Airport traffic area is under control of Providence Approach/Departure Control. Groton-New London Airport's tower was originally manned by FAA personnel. Since November 1994, however, federal budget cuts and low traffic activity forced the FAA to eliminate services at the tower. ConnDOT subsequently contracted with Robinson-Van Vuren Associates for air traffic control tower

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services. The tower is equipped and staffed to provide Visual Flight Rules (VFR) separation of arriving and departing aircraft movement areas, i.e. runways and taxiways. IFR operations are handled by Groton's tower whose hours of operation are 7:00 a.m. to 10:00 p.m.

(8) Parking

At-grade parking is provided on-airport for passengers, visitors, and employees. On-airport parking consists of 245 parking spaces with 8 handicap spaces. The parking lot currently is in good condition and is of adequate size to meet the projected future demand. Overhead lighting was upgraded during the spring of 1998.

c) Ability of Airport to Meet Current and Future Demands

The growth in operations experienced in the 1980s reflects the growth in the economy during that period and the healthy level of commuter service at the Airport. The decline in operations stems from the recession experienced during the early 1990s and a drop in commuter service. Overall, the operational trends (except the loss in air service) experienced at Groton Airport occurred at many other airports throughout the State, as well as the nation.

It will become increasingly challenging to ensure the continued level of service at the Airport and to meet the future aviation demands at Groton-New London Airport. Proposed improvements include Runway 5-23 safety area improvements, rehabilitation of Runway 15-33, replacement of the Blackjack Ramp being taken by the Connecticut Army National Guard, t-hangar development for aircraft based at Groton, additional aircraft services, and expansion of the Aircraft Rescue and Fire Fighting (ARFF) facility. Several projects which will be developed in the long term are the rehabilitation/relocation of Taxiway "B", expansion of the terminal building, and construction of new FBO/hangars.

Some key factors that will affect the ability of the Airport to meet the current and future aviation demands are new environmental concerns and regulations, new and improved navigational aids, funding, and runway safety improvements. These factors and their effect on the Airport are discussed below.

Environmental Concerns. The impact of new environmental regulations and mandates on safety area improvements and the continual operation of the Airport will need to be addressed. A major concern relative to the continual operation of the Airport are trees penetrating the FAA-mandated Federal Aviation Regulations (FAR) Part 77 imaginary flight surfaces. These imaginary surfaces rise from the Airport's runway environment at certain slopes, based on the type of approach, and must be clear of all obstructions. Currently trees penetrate three runway approaches at the Airport. The removal of these trees will require permits from the Connecticut DEP, the Army Corps of Engineers, and local coordination with city officials and the public. Another concern will be the ability of the Airport to improve and expand the runway safety areas. These improvements will enhance the safety of the general public using the Airport's facilities.

Improved Navigational Aids. The updating of the airport’s current navigational aids to meet the future demands on the airport due to increased air traffic, including scheduled air service, will need to be addressed.

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Runway Safety Improvements. Recent FAA studies show that most on-airport aircraft accidents occur within 1000' of the runway ends. FAA Advisory Circular 150/5300-13 requires 500' wide runway side safety areas and 1000' long extended runway safety areas for a runway comparable to Runway 5-23. This may not be entirely realistic with the Poquonnock River to the west and south of the runway.

Funding. A major factor that affects the Airport's ability to meet these current and future demands is funding. The Airport will be able to meet these demands only to the extent that funding is available to do so.

5. WATERBURY-OXFORD AIRPORT

Waterbury-Oxford Airport, one of six State-owned airports, presently occupies 411.3 acres of land in the towns of Oxford and Middlebury. It is classified in the FAA's National Plan of Integrated Airport Systems as a general utility, general aviation airport. (The role and service level are determined by the type of aircraft the airport can accommodate.) It is home to one fixed-base operator, Keystone Aviation, one multiple services operator, Executive Flight (a multiple services operator has similar rights as a fixed base operator, excluding fuel sales), and a 12 unit t-hangar complex.

This airport currently is operated by ConnDOT's Bureau of Aviation and Ports. It receives funding from the State's General Transportation Fund and federal assistance from the Federal Aviation Administration (FAA). Comprehensive information on the services, facilities, and plans for the Airport is presented in the Waterbury-Oxford Airport Master Plan.

a) Use

Waterbury-Oxford Airport is used to a great extent by private corporations for business travel. As of 1997, Waterbury-Oxford Airport had a total of 202 based aircraft. Listed below are the number of operations at the Airport during a 12 month period from 1996 to 1997. This information was taken from the FAA's Airport Master Record, Form 5010.

Type of Operation	Number of Operations	% Total Operations
Air Carrier	0	0.0%
Commuter	0	0.0%
Air Taxi	2,200	1.5%
GA Local	100,000	67.8%
GA Itinerate	44,750	30.3%
Military	470	0.4%
Total	147,420	100.0%

b) Existing Facilities: Airside and Landside Components

The existing facilities at Waterbury-Oxford Airport consist of one runway with connecting taxiways, apron areas, a general aviation terminal, an administration building, and a fire-rescue and maintenance facility. These facilities and their components are discussed below.

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(1) Pavement

Waterbury-Oxford Airport has one runway with the following characteristics:

Runway	Length (ft)	Width (ft)
Runway 18-36	5000	100

Condition of Pavement. The pavement used is an approved FAA mix which is close to, but not the same as, ConnDOT's class 1 pavement mix. The pavement conditions at the Airport were analyzed in February 1995 by engineers at the Bureau of Aviation and Ports and summarized in a Pavement Management Plan. A copy of this plan is on file at the Airport. Since the completion of the Pavement Management Plan, Runway 13-31 has been closed and a new aircraft apron has been constructed on the west side of the Airport on the former Runway 13 and Taxiway "B".

The structural life for the constructed pavements are 20 years. Bureau of Aviation and Ports' personnel are continually re-evaluating the Airport's pavements to implement future pavement improvement programs.

Factors Affecting the Condition of Airport Pavement. There are many factors that affect the condition of pavement at airports. The most significant are:

- Traffic. The wheel load impacted by the aircraft fatigue the pavement structure. The allowable load is the theoretical maximum gross weight of the design aircraft at a particular pass level that will not cause further load-induced damage to a pavement system. Any additional load over the allowable load on the aeronautical pavements will significantly reduce the remaining structural life of the pavement.
- Snow and Ice Removal. Chemicals put on the pavement slowly deteriorate the pavement and could reduce the structural life of the pavement.
- Rubber Deposits and Grooving. The runway pavements are grooved for increased drainage. Over time, rubber deposits form on runways and fill in the grooves. The deposits then need to be removed by high pressure water. Over time, this can loosen stones in the pavement allowing water to saturate the pavement and cause a loss in load bearing capabilities.
- Construction Practices. It is crucial that all pavements be constructed with materials specified and in accordance with FAA specifications. The longevity of a pavement can be impacted by poor construction processes.

(2) Pavement Markings

Waterbury-Oxford Airport maintains pavement markings in accordance with FAA Advisory Circular 150/5340-1G, which depicts how an airport should be marked according to runway categories.
Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths and the volume of traffic that passes over the marking.

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Pavement markings provide guidance during both day and night operations. The markings are reflectorized for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Ability of Pavement Markings to Meet Current and Future Demands. The Department uses durable pavement markings on airport pavements. When these markings are installed during a resurfacing project, they exhibit longevity. Markings which have been installed this way can last from three to eight years. It is anticipated that all pavement markings will be repainted within the next five years.

Factors Affecting Condition of or Demand for Pavement Markings:

- Environment. Snow plowing and deicing chemicals deteriorate the pavement markings.
- Traffic. The number of aircraft and vehicles which pass over the markings affect the rate of deterioration of the pavement markings.

(3) Airport Signing

Signing is an integral part of aircraft operations at Waterbury-Oxford Airport. All runways and taxiways are signed in accordance with FAA Advisory Circular 150/5340-18C to insure all aircraft are aware of their location at all times.

After the aircraft has landed, the pilot uses the runway and taxiway signs to guide him/her to a destination on the Airport.

Ability of Signs to Meet Current and Future Demands. Waterbury-Oxford Airport is continually replacing signs to meet all current FAA regulations, during pavement reconstruction and routine maintenance.

The FAA is constantly working on better signs, sign locations, sign materials, and visibility to make airports safer.

As of February 1998 the signs on the airport worked very well. If maintained properly, they should last many years.

Factors Affecting the Condition of or Demand for Signs:

- Rehabilitation of Pavement. There will be a need to re-sign all new pavement to meet FAA regulations as the Airport rehabilitates pavements that have come to the end of their useful design life.
- Weather (Snow). Signs covered by snow are sometimes hit and damaged by plows and blowers. The damaged signs must be replaced to ensure safe airport operations.

(4) Landing Aids

During periods of inclement weather, when the vertical visibility (ceiling) is less than 1000 feet or forward visibility (RVR - Runway Visual Range) is less than three miles, an airport is operating under

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Instrument Flight Rule (IFR) conditions. Information on IFR operations is unavailable as there is no control tower at the Airport.

Waterbury-Oxford Airport has only one runway equipped to accommodate aircraft operations during IFR conditions. The table below indicates the various Instrument approaches for the runways at the airport.

INSTRUMENT APPROACHES FOR RUNWAYS AT WATERBURY-OXFORD AIRPORT

RUNWAY	TYPE APPROACHES
18	NDB, GPS
36	ILS, NDB, GPS

Table IV-A 5. Instrument Approches for Runways at Waterbury-Oxford Airport

Airport lighting also serves an integral function in the daily operations at Waterbury-Oxford Airport. The Airport utilizes a complex system of runway and taxiway lighting to aid aircraft in landings and departures during night and/or inclement weather operations. It is the Bureau's goal to maintain the current level of landing and lighting aids standards at the Airport while studying the implementation of additional aids to more efficiently serve the public using Waterbury-Oxford Airport.

(5) General Aviation (GA) Facilities

Waterbury-Oxford Airport plays an important role in general aviation in Connecticut as it is the only general aviation airport in the state with a 5000' runway. (There are only six runways in Connecticut greater than 5000' in length: three of them are at Bradley International Airport.) Waterbury-Oxford Airport has one fixed base operator, Keystone Aviation, and one multiple services operator, Executive Flight, who provides storage and maintenance facilities and apron areas for based and transient aircraft, and general aviation terminal facilities. The present general aviation facilities also include a 12-unit t-hangar which is presently leased to a private second party. The general aviation facilities are in good condition and of adequate size to serve current levels of activity. One change in general aviation, however, may be to provide additional hangar space for based aircraft. This is predicated on the based aircraft forecast which projects an increase in size and value of these aircraft. Additional private corporate hangars are expected to account for the increase in hangar capacity.

c) Ability of Airport to Meet Current and Future Demands

The ability to meet the future aviation demands at Waterbury-Oxford Airport will depend on the State of Connecticut to accomplish several improvement projects at the Airport. Some key factors that will affect the ability of the Airport to meet the current and future aviation demands are new environmental concerns and regulations, improved navigational aids, funding, and runway safety area improvements. These factors and their effect on the Airport are discussed below.

Environmental Concerns. The impact of new environmental regulations and mandates on safety area improvements and the continual operation of the Airport will need to be addressed. Regulated

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wetlands surround the perimeter of the Airport and any improvements to the runway overrun areas and to the runway safety areas will require careful planning by ConnDOT with permitting from the Connecticut DEP and the Army Corps of Engineers. The Airport also has numerous penetrations into the FAA FAR Part 77 imaginary flight surfaces. A large percentage of these penetrations are trees. The removal of these trees (i.e. clear cutting) also will require careful planning and coordination with the Connecticut DEP and the Army Corps of Engineers regardless of whether the trees are growing in a regulated wetland or not.

Improved Navigational Aids. To better accommodate IFR conditions, Waterbury-Oxford Airport will need to address complementing its existing ILS on Runway 36 with additional landing aids to lower the existing minimums. An approach lighting system and upgrading the existing middle marker will enhance the Instrument Landing System for Runway 36 and provide the additional safety required by pilots. An additional consideration that is necessary to enhance the ILS for Runway 36 is the relocation or burial of the high tension power lines at the approach end. At their present location the power lines would impair any improvements to the Airport's ILS to Runway 36.

Runway Safety Area Improvements. Recent FAA studies show that most on-airport aircraft accidents occur within 1000' of the runway ends. FAA Advisory Circular 150/5300-13 requires 500' wide runway side safety areas and 1000' long extended runway safety areas for a runway comparable to Runway 18-36. This may not be entirely realistic with the existing ground contours at either end of the runway, but an effort must be made to enhance the safety areas to benefit the pilots at the Airport. However, careful consideration must be made so that the improvements do not outweigh the financial cost.

Funding. A major factor that affects the Airport's ability to meet these current and future demands is funding. The Airport will be able to meet these demands only to the extent that funding is available to do so.

6. WINDHAM AIRPORT

Windham Airport is one of six State-owned airports. It presently occupies 280 acres of land in the town of North Windham. It is classified in the FAA's National Plan of Integrated Airport Systems as a general utility, general aviation airport. (The role and service level are determined by the type of aircraft the airport can accommodate.) Although State-owned, the Airport is managed by Windham Aviation. Windham Aviation , the sole fixed base operator at the Airport, provides maintenance, flight instruction aircraft rental, and fuel for the based and itinerant aircraft at the Airport.

a) Use

Windham Airport is used primarily for general aviation. Listed below are the number of operations at the Airport during a 12 month period from 1996 to 1997. This information was taken from the FAA's Airport Master Record, Form 5010.

Type of Operation	Number of Operations	% Total Operations
Air Carrier	0	0.0%
Commuter	0	0.0%

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Air Taxi	475	2.0%
GA Local	22,515	73.0%
GA Itinerate	7,450	24.0%
Military	250	1.0%
Total	30,690	100.0%

b) Existing Facilities: Airside and Landside Components

Windham Airport has two paved runways with connecting taxiways, apron areas, and t-hangars. These facilities and their components are discussed below.

(1) Pavement

Windham Airport has two runways with the following characteristics:

Runway	Length (ft)	Width (ft)
Runway 9-27	4,278	100
Runway 18-36	2,797	75

These runways are serviced by a network of four taxiways.

Condition of Pavement. The pavement used is an approved FAA mix which is close to, but not the same as, ConnDOT's class 1 pavement mix. The pavement conditions at the Airport were analyzed in July 1995 by engineers at the Bureau of Aviation and Ports and summarized in a Pavement Management Plan. A copy of this plan is on file at the Airport. Since the completion of the Pavement Management Plan, Runway 9-27 and Runway 18-36 have been rehabilitated and Taxiway "B" has been extended to the threshold of Runway 36. The structural life for the constructed pavements is 20 years. Bureau of Aviation and Ports' personnel are continually re-evaluating the Airport's pavements to implement future pavement improvement programs.

Factors Affecting the Condition of Airport Pavement. There are many factors that affect the condition of pavement at airports. The most significant are:

- Traffic. The wheel load impacted by the aircraft fatigue the pavement structure. The allowable load is the theoretical maximum gross weight of the design aircraft at a particular pass level that will not cause further load-induced damage to a pavement system. Any additional load over the allowable load on the aeronautical pavements will significantly reduce the remaining structural life of the pavement.
- Snow and Ice Removal. Chemicals put on the pavement slowly deteriorate the pavement and could reduce the structural life of the pavement.
- Rubber Deposits and Grooving. The runway pavements are grooved for increased drainage. Over time, rubber deposits form on runways and fill in the grooves. These deposits then need to be removed by high pressure water. Over time, this can loosen stones in the pavement allowing water to saturate the pavement and cause a loss in load bearing capabilities.

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- Construction Practices. It is crucial that all pavements be constructed with materials specified and in accordance with FAA specifications. The longevity of a pavement can be impacted by poor construction processes.

(2) Pavement Markings

Windham Airport maintains pavement markings in accordance with FAA Advisory Circular 150/5340-1G, which depicts how an airport should be marked according to runway categories.

Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths and the volume of traffic that passes over the marking.

Pavement markings provide guidance during both day and night operations. The markings are reflectorized for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Ability of Pavement Markings to Meet Current and Future Demands. The Department uses durable pavement markings on airport pavements. When these markings are installed during a resurfacing project, they exhibit longevity. Markings which have been installed this way can last from three to eight years. It is anticipated that all pavement markings will be repainted within the next five years.

Factors Affecting Condition of or Demand for Pavement Markings:

- Environment. Snow plowing and deicing chemicals deteriorate the pavement markings. Conditions that necessitate frequent plowing and deicing at the airport increase the rate of deterioration of the pavement markings.
- Traffic. The number of aircraft and vehicles that pass over the markings affects the rate of deterioration of the pavement markings. The greater the volume of traffic over the markings the faster the rate of deterioration.

(3) Airport Signing

Signing is an integral part of aircraft operations at Windham Airport. All runways and taxiways are signed in accordance with FAA Advisory Circular 150/5340-18C to insure all aircraft are aware of their location at all times.

After the aircraft has landed, the pilot uses the runway and taxiway signs to guide him/her to a destination on the Airport.

Ability of Signs to Meet Current and Future Demands. Windham Airport is continually replacing signs to meet all current FAA regulations, during pavement reconstruction and routine maintenance.

The FAA is constantly working on better signs, sign locations, sign materials, and visibility to make airports safer.

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As of February 1998 the signs on the airport worked very well. If maintained properly, these signs should last many years.

Factors Affecting the Condition of or Demand for Signs:

- Rehabilitation of Pavement. There will be a need to re-sign all new pavement to meet FAA regulations as the Airport rehabilitates pavements that have come to the end of their useful design life.
- Weather (Snow). Signs covered by snow are sometimes hit and damaged by plows and blowers. The damaged signs must be replaced to ensure safe airport operations.

(4) Landing Aids

During periods of inclement weather, when the vertical visibility (ceiling) is less than 1000 feet or forward visibility (RVR - Runway Visual Range) is less than three miles, an airport is operating under Instrument Flight Rule (IFR) conditions. IFR weather occurs about 30% of the time at Windham Airport.

Windham Airport has four runways equipped to accommodate aircraft operations during IFR conditions. The table below indicates the various Instrument approaches for the runways at the airport.

INSTRUMENT APPROACHES FOR RUNWAYS AT WINDHAM AIRPORT

RUNWAY	TYPE APPROACHES
9	VOR, GPS-A
27	VOR, GPS-A, LOC
18	VOR, GPS-A
36	VOR, GPS-A

Table IV-A 6. Instrument Approaches for Runways at Windham Airport

Airport lighting also serves an integral function in the daily operations at Windham Airport. The airport utilizes a complex system of runway and taxiway lighting to aid aircraft in landings and departures during night and/or inclement weather operations. It is the Bureau's goal to maintain the current level of landing and lighting aids standards at the airport while studying the implementation of additional aids to more efficiently serve the public utilizing Windham Airport.

(5) General Aviation (GA) Facilities

Windham Airport's fixed base operator, Windham Aviation, is located in the southeast part of the Airport. It provides aircraft services, aircraft sales, and maintenance for planes and avionics, fueling, flight training, and air charter services. Windham Aviation's facilities consist of one 9,828 s.f. hangar

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and office space and one 5,610 s.f. hangar. Parking for 34 automobiles, including two handicap spaces, is adjacent to the office/hangar facility. Also Jet-A and 100 LL fuel is available on site. Currently the Airport has 64 based aircraft.

c) Ability of Airport to Meet Current and Future Demands

The ability to meet the future aviation demands at Windham Airport is contingent on the State of Connecticut to accomplish several improvement projects at the Airport. Some key factors that will affect the ability of the Airport to meet the current and future aviation demands are new environmental concerns and regulations, improved navigational aids, funding, and runway safety area improvements. These factors and their effect on the Airport are discussed below.

Environmental Concerns. The impact of new environmental regulations and mandates on safety area improvements and the continual operation of the Airport will need to be addressed. The trees penetrating the FAA-mandated Federal Aviation Regulations (FAR) Part 77 imaginary flight surfaces are a major concern to the continual operation of the Airport. These imaginary surfaces rise from the Airport's runway environment at certain slopes, based on the type of approach, and must be clear of all obstructions. Currently trees and ground surfaces penetrate all four runway approaches at the Airport. Another concern will be the ability of the Airport to improve and expand the runway safety areas. These improvements will enhance the safety of the general public using the Airport's facilities.

Improved Navigational Aids. The need to update the current navigational aids to enable the Airport to meet the future demands that result from increased traffic must be addressed.

Runway Safety Area Improvements. Recent FAA studies show that most on-airport aircraft accidents occur within 1000' of the runway ends. FAA Advisory Circular 150/5300-13 requires 500' wide runway side safety areas and 1000' long extended runway safety areas for a runway comparable to Runway 18-36. This may not be entirely realistic with the existing ground contours at either end of the runway, but an effort must be made to enhance the safety areas to benefit the pilots at the Airport. However, careful consideration must be made so that the improvements do not outweigh the financial cost.

Funding. A major factor that affects the Airport's ability to meet these current and future demands is funding. The Airport will be able to meet these demands only to the extent that funding is available to do so.

7. DANIELSON AIRPORT

Danielson Airport presently occupies 257 acres of land in the town of Killingly, 2 miles northwest of Danielson center. It is classified in the FAA's National Plan of Integrated Airport Systems as a general utility, general aviation airport. (The role and service level are determined by the type of aircraft the airport can accommodate.) It is home to one fixed base operator, Northeast Air Management, and has airside access to Harvard Ellis Regional Technical School, one of two facilities in Connecticut providing training for aviation mechanics.

The Airport is owned by the State of Connecticut and is privately managed by Northeast Air Management. The Airport receives funding from the State's General Transportation Fund and federal

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assistance from the FAA. Comprehensive information on the services, facilities, and plans for Danielson Airport is presented in the Danielson Airport Master Plan.

a) Use

Danielson Airport is used to a great extent for local, single engine, general aviation operations. In 1997 Danielson Airport had a total of 55 based aircraft. Listed below are the number of operations at the Airport during a 12 month period from 1996 to 1997. This information was taken from the FAA's Airport Master Record, Form 5010.

Types of Operations	Number of Operations	% Total Operations
Air Carrier	0	0.0%
Commuter	0	0.0%
Air Taxi	24	0.1%
GA Local	13,600	66.5%
GA Itinerate	6,840	33.4%
Military	0	0.0%
Total	20,464	100.0%

b) Existing Facilities: Airside and Landside Components

The existing facilities at Danielson Airport consist of one runway with connecting taxiways, two apron areas, a general aviation terminal, and one t-hangar building. These facilities and their components are discussed below.

(1) Pavement

Danielson Airport has one paved runway with the following characteristics:

Runway	Length (ft)	Width (ft)
Runway 13-31	2700	75

Condition of Pavement. The pavement used is an approved FAA mix which is close to, but not the same as, ConnDOT's class 1 pavement mix. The pavement conditions at the Airport were analyzed in July 1995 by engineers at the Bureau of Aviation and Ports and summarized in a Pavement Management Plan. A copy of this plan is on file at the Airport. During the summer/fall of 1998 the entire Airport will undergo pavement reconstruction. The design structural life for this pavement will be 20 years. Bureau of Aviation and Ports' personnel will continually inspect the new pavement for any sign of fatigue and implement the proper maintenance procedures to ensure it reaches and exceeds its design life.

Factors Affecting the Condition of Airport Pavement. There are many factors that affect the condition of pavement at airports. The most significant are:

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- Traffic. The wheel load impacted by the aircraft fatigue the pavement structure. The allowable load is the theoretical maximum gross weight of the design aircraft at a particular pass level that will not cause further load-induced damage to a pavement system. Any additional load over the allowable load on the aeronautical pavements will significantly reduce the remaining structural life of the pavement. However, at Danielson Airport due to the size of the aircraft able to utilize the runway length, the critical design factor is the wheel loads of the snow removal equipment.
- Snow and Ice Removal. Chemicals put on the pavement slowly deteriorate the pavement and could reduce the structural life of the pavement.
- Construction Practices. It is crucial that all pavements be constructed with materials specified and in accordance with FAA specifications. The longevity of a pavement can be impacted by poor construction processes.

(2) Pavement Markings

Danielson Airport maintains pavement markings in accordance with FAA Advisory Circular 150/5340-1G, which depicts how an airport should be marked according to runway categories.

Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths and the volume of traffic that passes over the marking.

Pavement markings provide guidance during both day and night operations. The markings are reflectorized for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Ability of Pavement Markings to Meet Current and Future Demands. The Department uses durable pavement markings on airport pavements. When these markings are installed during a resurfacing project, they exhibit longevity. Markings which have been installed this way can last from three to eight years. All pavement markings will be repainted this fall during the pavement reconstruction.

Factors Affecting Condition of or Demand for Pavement Markings:

- Environment. Snow plowing and deicing chemicals deteriorate the pavement markings.
- Traffic. The number of aircraft and vehicles which pass over the markings accelerate the deterioration. The greater the volume of traffic over the markings the more rapid the rate of deterioration.

(3) Airport Signing

Signing is an integral part of aircraft operations at Danielson Airport. Runway 13-31 and taxiways A and B are signed in accordance with FAA Advisory Circular 150/5340-18C to insure all aircraft are aware of their location at all times.

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Ability of Signs to Meet Current and Future Demands. Danielson Airport will install new signs under State Project 68-183. All new signs will meet current FAA regulations.

The FAA is constantly working on better signs, sign locations, sign materials, and visibility to make airports safer.

Factors Affecting the Condition of or Demand for Signs**:**

- Safety, Maintenance or FAA Conditions. As required in the future for safety, maintenance, or new FAA regulations, the Airport will implement changes in its Signing.
- Weather (Snow). Signs covered by snow are sometimes hit and damaged by plows and blowers. The damaged signs must be replaced to ensure safe operations.

(4) Landing Aids

During periods of inclement weather, when the vertical visibility (ceiling) is less than 1000 feet or forward visibility (RVR - Runway Visual Range) is less than three miles, an airport is operating under Instrument Flight Rule (IFR) conditions.

Currently Danielson Airport has no facilities to accommodate IFR landings.

Airport lighting also serves an integral function in the daily operations at Danielson Airport. The Airport utilizes a system of runway and taxiway lighting to aid aircraft in landings and departures during night operations. It is the Bureau's goal to maintain the current level of landing and lighting aids standards at the airport while studying the implementation of additional aids to more efficiently serve the public using Danielson Airport.

(5) General Aviation (GA) Facilities

Danielson Airport plays an important role in General Aviation in western Connecticut, primarily in Windham County. The Airport has one fixed base operator, Northeast Air management, who provides storage and maintenance facilities, apron areas for based and transient aircraft, flight instruction, and general aviation terminal facilities. The present general aviation facilities also include a privately-owned, ten-unit t-hangar facility. The current general aviation facilities are adequate for the level of activity at the Airport. Improvements to these facilities may need to be addressed in the future as needs arise.

c) Ability of Airport to Meet Current and Future Demands

The ability to meet the future aviation demands at Danielson Airport will rely on the increase in general aviation activity at the Airport. Factors that will affect the ability of the Airport to meet these demands are new environmental concerns and regulations, installing navigational aids, and funding. These factors and their affect on the Airport are discussed below.

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Environmental Concerns. The impact of new environmental regulations and mandates on the continual operation of the Airport will need to be addressed. Factors affecting the continual operation of the Airport include tree penetrations into the Airport's approach and transitional flight surfaces, regulated wetlands and the Quinebaug River within close proximity to the runway environment. Removal of the trees and any construction in or near the regulated wetlands and floodplains of the Quinebaug River will require permitting and careful coordination with the Connecticut DEP, Army Corps of Engineers and the public.

Installation of Navigational Aids. To accommodate operations during inclement/IFR conditions, navigational aids will need to be installed at the Airport.

Funding. A major factor that affects the Airport's ability to meet these current and future demands is funding. The Airport will be able to meet these demands only to the extent that funding is available to do so.

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B. STATE BRIDGE PROGRAM

1. CONNDOT'S ROLE

The Connecticut Department of Transportation (ConnDOT) has a primary role in protecting the state's capital investment in bridges and ensuring the safety of the traveling public. The Department inspects, evaluates and maintains an inventory of the structural condition and functional capacity of 5,451 state, local, and other types of bridges in Connecticut and is responsible for maintaining 3,824 of these bridges. Additionally, the Department provides to the Federal Highway Administration (FHWA) reports on bridges meeting certain criteria, such as having a span longer than 20 feet, that are part of the National Bridge Inventory. The following table lists the types and numbers of bridges that ConnDOT inspects and maintains.

Connecticut Bridge Inventory

Type of Bridge	Total	National Bridge Inventory	DOT Responsible
State Bridges	3,663	2,758	3,663
Local Bridges	1,229	1,227	0
Railroad Bridges	375	0	0
Orphaned Bridges	88	86	88*
Adopted Bridges	63	60	63
Pedestrian	16	0	9
DEP Bridges	14	14	14
Buildings over Roadway	2	0	0
Tunnel	1	0	1
Total	5,451	4,145	3,824

Note: Orphaned Bridges are bridges over a railroad that support a municipal road and whose ownership is in dispute. Adopted Bridges were originally Orphaned Bridges in which the State has subsequently taken responsibility for. *ConnDOT is responsible for maintenance of structural components only.

Table IV-B 1. Connecticut Bridge Inventory

Bridges are inspected on a rotating schedule and must be inspected at least once every two years. Certain deficient bridges require interim inspections on a more frequent basis. The State is seeking permission from the FHWA to extend the inspection frequency to a four-year interval for smaller concrete bridges rated in a good condition. Due to the design of these concrete bridges, there is very little change in their condition over a two-year period. The Department believes that this would result in a better allocation of resources and would not compromise the safety of the state's bridges.

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2. BRIDGE RATINGS

Bridges are rated by two primary measures. These involve the bridges' structural condition (including its strength) and its functional capacity. Rating a bridge's structural condition involves evaluating its constituent parts. The functional capacity of a bridge relates to its traffic capacity, clearances, roadway alignment, and other geometric features. ConnDOT uses the FHWA's Recording and Coding Guide to evaluate and rate each of the main critical components of a bridge. The main components include the deck (riding surface), the superstructure (structural elements under the deck), and the substructure (piers and abutments). Each of these components are made up of a number of sub-elements. The evaluation of the sub-elements will result in a numerical rating from zero (failed condition) to nine (excellent condition) for the main component. The lowest rating among the three main components becomes the bridge's overall rating. These ratings are Excellent, Good, Fair, and Poor. Definitions of the descriptive ratings are found in **Table IV-B3. Figure IV-B1** gives an overview, by planning region, of the conditions of all State, Local, and orphaned bridges. The status has been narrowed down to three ratings: Excellent/Good, Fair, and Poor.

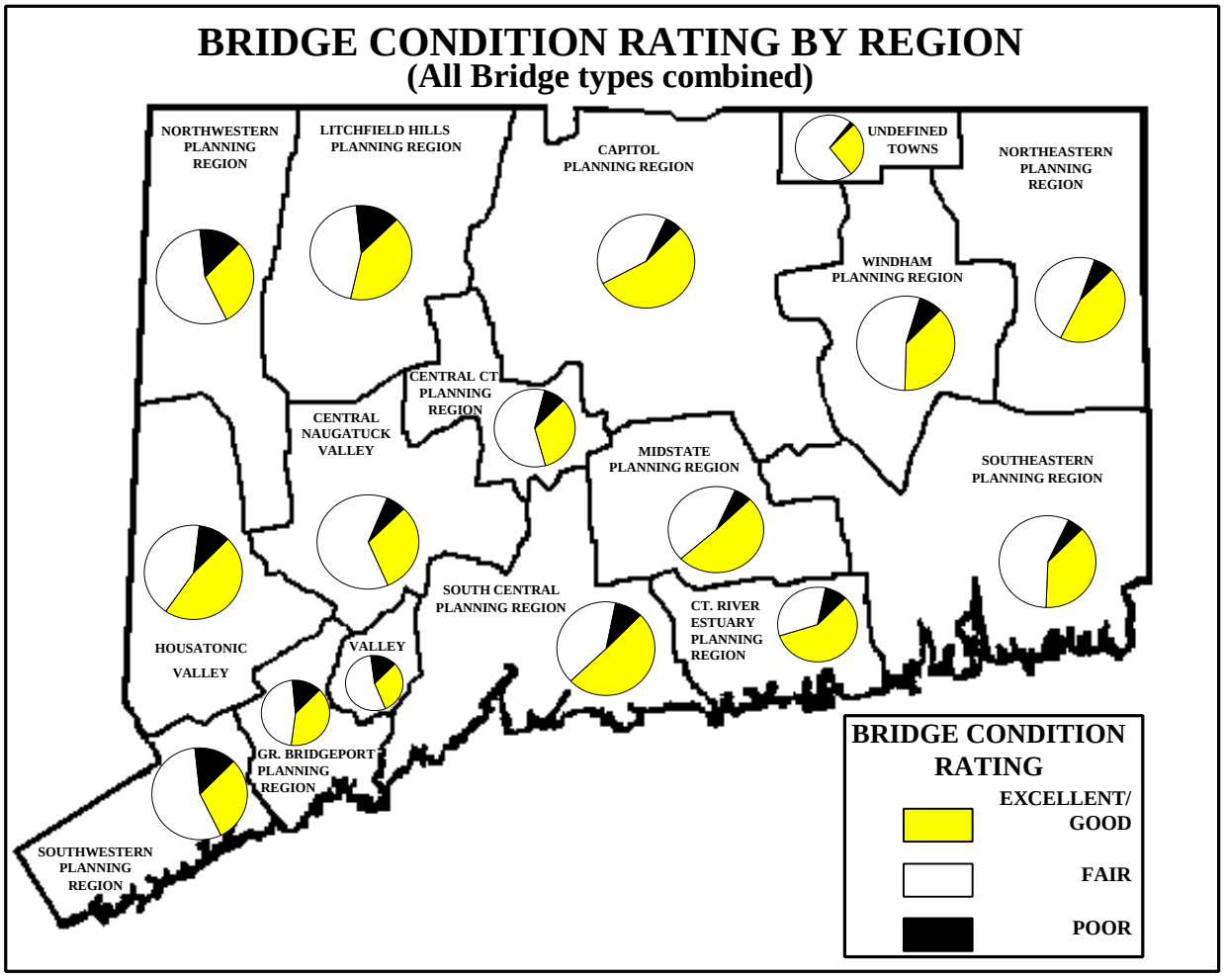

Figure IV-B 1. Combined Bridge Rating per Planning Region

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3. FACTORS AFFECTING THE PHYSICAL CONDITION OF BRIDGES.

The weather, salt from deicing operations and heavy trucks cause Connecticut's bridges to deteriorate, sometimes fairly rapidly. As the bridges deteriorate, their condition ratings gradually fall until they are rated "poor." Delays in rehabilitating or replacing bridges also can affect the physical condition of structures. In some instances, it may take the Department several years to resolve environmental, right of way, and traffic control problems before construction can take place. In this time frame, the condition of structures may further deteriorate. The Department estimates that approximately 45 bridges annually will fall into the poor category .

4. STATE-MAINTAINED BRIDGES

The design life of a structure is 50 years. Currently, the average State-owned bridge is 41 years old. The safety of the structures is monitored and any necessary strengthening or load postings are performed as they become in need of rehabilitation or strengthening. This structural rehabilitation can extend a bridge's life by approximately 20 years.

Of the 3,824 State-maintained bridges, approximately 60% have been rehabilitated, or replaced since the infrastructure renewal program began in FY 85. Annually, ConnDOT performs maintenance repairs on approximately 320 bridges. An overview of the condition of state and orphan bridges by planning region is presented in **Table IV-B2.**

ConnDOT's bridge database is used to identify projects for inclusion in the capital program. A number of structurally-deficient (usually rated poor) bridges needing major repair or replacement are pulled from the list approximately every six months. (A total of about 40 bridges are pulled annually from a listing of about 225 to 300 poor bridges). These candidates are sent to the Bridge Design unit, where proposed rehabilitation, repair, or reconstruction plans are developed. A rough estimate of the costs and time frame to complete the project is also determined by the design unit. These proposed projects are then subjected to a series of reviews for approval by various members of the Department including the Commissioner. Projects are sorted out for short-term or long-term consideration during this process based on need, seriousness of deficiencies, and available funding.

Functionally-deficient bridges (bridges that are inadequate with respect to geometry and traffic capacity, roadway alignment, load carrying capacity, and waterway adequacy) are also identified through the bridge database. These bridges are a lessor priority for DOT, as structural integrity of the bridge is usually not the issue. However, functional deficiencies will be addressed if the roadway is considered for widening or rehabilitation, or if traffic safety becomes a significant concern.

5. LOCAL (TOWN) BRIDGES

ConnDOT inspects, but is not responsible for maintaining local bridges. Because municipalities usually do not have the expertise to perform the necessary evaluations, ConnDOT inspects all local bridges with a length of 20 feet or greater. ConnDOT provides the town with its evaluation, noting any deficiencies, but the town is responsible for implementing any repairs. The DOT has, on a one-time basis, inspected all local bridges between six and 20 feet in 1992. In addition, the

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state has established a loan program and a grants-in-aid program to assist local governments in rehabilitating and reconstructing local bridges.

The average town-owned bridge is 62 years old. The towns have replaced or rehabilitated approximately 40% of their structures over the past ten years. An overview of the condition of local bridges by planning region is presented in **Table IV-B2.**

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Table IV-B 2. Bridge Ratings by Planning Region

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Structural Condition Ratings for Bridges		
Classification	**Rating**	**Condition**
Excellent	9	Excellent condition (new).
Good	8	Very good condition - no problems noted.
	7	Good condition - some minor problems.
Fair	6	Satisfactory condition - structural elements show some minor deterioration.
	5	Fair condition - all primary structural elements are sound, but may have minor section loss, cracking, spalling or scour.
Poor	4	Poor condition - advanced section loss, deterioration, spalling, or scour.
	3	Serious condition - loss of section, deterioration, spalling or scour have seriously affected primary structural components.
	2	Critical condition - advanced deterioration of primary structural elements.
	1	Imminent failure condition - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability.
	0	Failed condition - out of service - beyond corrective action.

Table IV-B 3. Structural Condition Ratings for Bridges

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C. HIGHWAY SYSTEM

Section 1 explains ConnDOT's role with respect to the highway system. Section 2 contains summary information on the physical condition of individual highway system components: pavement, traffic signals, pavement markings, traffic signs, highway lighting, guide rail, intelligent transportation systems (ITS), highway rest areas, commuter parking facilities and highway maintenance facilities. Section 3 is a discussion of the ability of the highway system to meet current and future demand.

1. CONNDOT'S ROLE

The Connecticut Department of Transportation is responsible for all aspects of the planning, development, maintenance and improvement of the transportation in the State (Section 13b-3 C.G.S.). With respect to the 20,600* public road miles (33,151.58 KM) comprising Connecticut's highway system, ConnDOT is responsible for approximately 9,687* lane miles (15,589 KM) of state highways and 3,824 state bridges and other bridges (See Table IV-B1). ConnDOT is directly responsible for overseeing all design, construction, maintenance and improvements for the 3,732* route miles (6,005.91 KM) of State-maintained roads which include 962* route miles (1,548.15 KM) of National Highway System roadway in Connecticut. The network of highways for which ConnDOT is directly responsible is shown in **Figure IV-C1.** With respect to town-maintained roads, the Department insures that the 2,134* miles (3,434.25 KM) of town-maintained roads, classified as either collector or arterial are designed and constructed to AASHTO specifications. ConnDOT also inspects all town bridges on a biennial basis and provides written assessments to the local government responsible for maintenance and repair.

ConnDOT's specific maintenance and improvement responsibilities include removing snow and ice from interstate highways and State roads, resurfacing damaged roadway pavement, replacing damaged guiderail; maintaining signalization, illumination, and bridges for the existing highway system; inspecting overhead sign supports; performing geotechnical engineering services; analyzing projects in construction; conducting annual pavement condition surveys; providing safety improvements along the State transportation system and revising traffic control signals for safety and traffic flow.

Other highway-related Department responsibilities include: reviewing major traffic generators for State Traffic Commission compliance, evaluating highway engineering projects for environmental compliance and potential involvement with hazardous and/or contaminated materials and implementing various programs designed to promote travel safety.

2. HIGHWAY SYSTEM COMPONENTS

a) Pavement

The state highway network comprises 4,096.07* miles (6,591.81 KM) of roadway and ramps**.** The current condition of the pavement of this network is published annually in a report entitled "(Year) Pavement Condition Report for All State Highways." This report lists the average

* as of December 31, 1996.

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Figure IV-C 1. Network of State-Maintained Roads

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condition is a weighted average of the measured structural condition (distress) and the measured functional condition (IRI - roughness). The sections are then prioritized using functional and structural condition and traffic volumes. The final priority is used in the selection of future paving projects.

In 1997, the determination of the structural condition was largely automated with the addition of a new technology called Wisecrax®. This process involves using specially equipped vans that videotape the roadways with high-speed downward facing cameras. The taped images are digitized and "read" by a state-of-the-art computer. The computer is programmed to identify and classify the distress in the pavement surface. Additional equipment in the vans collects corresponding roughness data concurrently.

The overall condition of the State Highway network for the years 1987 to 1997 is depicted in **Figure IV-C2**. This chart shows the percentage of the state highway network (expressed in two-lane miles) in good or better and less than good condition. In 1997, 71% of the state highway network was in good or better condition, an increase of 7% from 1987. As indicated in the chart, there is an upward trend in the percentage of pavement in good and better condition.

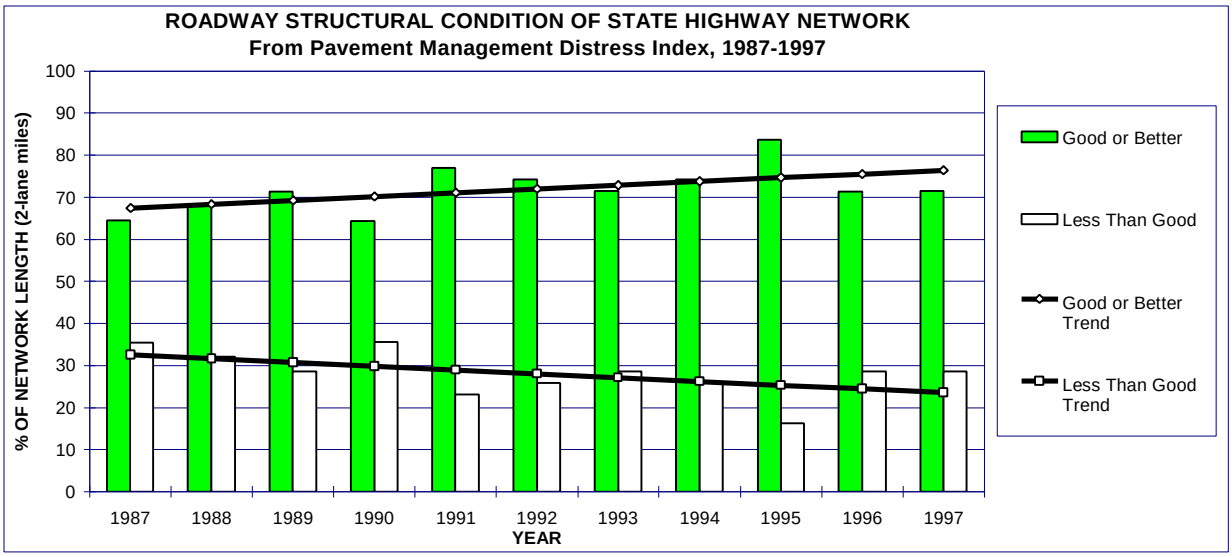

Figure IV-C 2. Structural Condition of State Highway Network

Factors Affecting the Physical Condition of Pavement. Many factors affect the condition of pavement on the roadways in Connecticut. The most significant ones are the type and volume of traffic, environmental conditions and construction practices.

- Traffic. The cyclic wheel loads imparted by vehicles fatigue the pavement structure. This cumulative damage is measured in the number of Equivalent Standard Axle Loads (ESAL's). One ESAL is equal to an 18,000 pound axle load. The larger the vehicle, the larger the ESAL factor. One truck loaded to the legal maximum can have the same damage effect on the pavement as 1000 cars. In addition to the ever increasing number of trucks on our roadways, there is the problem of overweight vehicles. The damage caused by these vehicles can lead to premature pavement failure and is not easily quantified. Continued enforcement of maximum weight restrictions is critical to the long-term performance of pavements.

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- Environmental. Environmental factors can affect the performance of the pavement. In the spring, saturated pavement structures lose some of their load-bearing capabilities and are more susceptible to damage from heavy vehicles. This can result in the formation of potholes and localized pavement failures.
- Design Practices. The most recent development in paving is called Superpave (Superior Performing Asphalt Pavements). Superpave is a performance-based design process that was a product of the Strategic Highway Research Program (SHRP). An experimental section was placed on Route 2 in Colchester during the summer of 1997.
- Construction Practices. It is crucial that all of our pavements be constructed with the materials specified and in accordance with the Department's specifications. The longevity of a pavement can be significantly impacted by poor construction practices.

The Department established the Pavement Advisory Team (PAT) in 1995. The purpose of this team is to improve the quality of our pavements through increasing Department and industry awareness of pavement problems. In 1994, a Task Force on Pavements was also formed with representatives from the Department and industry to discuss and resolve a variety of issues. The PAT are members of the Task Force; however, most of their efforts are focused on assisting field staff by providing feedback on paving problems and practices. The team members provide training, conduct pavement evaluations and recommend policy and specification changes.

b) Traffic Signals

The Connecticut Department of Transportation maintains approximately 2,375 traffic signals, 255 flashing beacons and 330 flashing signs. Annually, approximately 40 new traffic signals are added to the number of traffic signals maintained by the State. The traffic signals, once installed are sometimes revised, where certain components may be replaced. Traffic signal hardware may have a useful life of 20 years or more and then require replacement. The traffic signal electronics have a useful life of 7 to 10 years and then require replacement. The Department does not maintain a database of age of equipment, however, traffic signals are upgraded in projects and components are upgraded by maintenance as the need arises. In general, the traffic signals are in good condition.

Ability of Signals to Meet Current and Future Demand. All traffic signal electronics should be replaced on an 7 to 10 year cycle. All traffic signal hardware should be replaced on a 20-year cycle. Currently, maintenance has limited funds to replace damaged and worn out electronic equipment. Traffic signals are replaced as part of roadway reconstruction projects, congestion mitigation projects, intelligent vehicle highway system projects, and traffic signal projects using STP funding or other funding sources that may be available. As the number of traffic signals increases and more sophisticated traffic control systems are put in place, additional funds will be needed to keep the systems operational.

Factors Affecting Physical Condition or Demand for Signals. New technologies are being developed in traffic signal control, that may cause existing technologies to be incompatible and require replacement. This will be most noticeable when IVHS strategies are implemented.

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c) Pavement Markings

The Connecticut Department of Transportation maintains 4,096.07 miles (6,591.80 KM) of roadway and ramps resulting in approximately l6,000 miles (25,750 KM) of pavement markings. Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths and the volume of traffic that passes over the marking.

Pavement markings provide guidance during both day and night. The markings are made reflectorized for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Snow plowing and road sanding greatly accelerate the deterioration of certain types of pavement marking material. Because of environmental requirements and climatic conditions, pavement markings cannot be successfully installed during the winter months. During those time periods, pavement markings in some areas may be considered to be in fair or poor condition. In the spring, when painting can commence, the markings that have deteriorated over the winter are repainted. After repainting, the markings are in good condition. Durable pavement markings wear slowly and do not need replacement for several years.

Ability of Pavement Markings to Meet Current and Future Demand: The Department utilizes durable pavement markings on interstates and expressways. When these markings are installed while the highway is being resurfaced, they exhibit longevity. Markings which have been installed this way can last from 3 to 8 years.

The Department utilizes durable epoxy paints to the extent funds are available. Durable markings have been used for special types of markings, such as crosswalks and markings at railroad at-grade crossings. Pavement markings on other roads are painted with water borne paints. Approximately one-half of all markings are of durable material.

Factors Affecting Condition of or Demand for Pavement Markings: Currently there are no reflectivity standards for pavement markings.

The Federal Highway Administration is promoting the establishment of minimum reflectivity standards for pavement markings. Mobile devices are being developed by the industry to measure the reflectivity of pavement markings while traveling at highway speeds.

If minimum standards are developed, the Connecticut Department of Transportation may be required to monitor pavement markings reflectivity and maintain markings to that minimum level of reflectivity. The annual funding level required to maintain pavement markings at this level is estimated to be $7,000,000.

d) Traffic Signs

The following discussion of the Department's Long-RangePlan for signing deals only with the major signs found on the State's expressway system. Non-expressway signing is normally installed and replaced on an "as needed basis" and would not tend to be included in a capital improvement plan.

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The State's expressway system was originally signed as these roadways were constructed. As other construction projects affect the expressway system, signing and its associated supports is often revised and in effect replaced to reflect new roadway configurations. In those areas not impacted by such projects, signs with deteriorated reflectivity and/or structurally deficient supports are replaced/repaired on a priority basis. In some cases this practice results in sign installations whose supports and sign faces have different ages. The overall condition of the signing on the State's expressway system therefore ranges from brand new to those installations approaching their service life (normally 15-20 years).

Ability of Traffic Signs to Meet Current and Future Demands: Signs on the State's expressway system are intended to aid unfamiliar motorists with the driving task. The signs make motorists aware of the laws that must be obeyed, of major destinations and changing roadway features that require adjustments by the driver. The next twenty years are not expected to change this philosophy. However, as the country's population ages demands for signing to become more conspicuous and legible probably will increase. Because there are practical limits to sign size, sign face materials will be looked upon to enhance both of these features As technology progresses in this area, the Department will continue to reassess the sheeting costs, service life, and where each type of sheeting will be used.

It is also anticipated that a large demand for supplemental signing on the State's expressways will continue. Past experience has shown that virtually every facility, business and attraction desires signs on the expressway. In order to assure that essential signing remains noticeable, the number of signs and their proximity to each other must continue to be evaluated when deciding to add a sign program or an individual installation.

Factors Affecting the Condition of or Demand for Traffic Signs: A sign installation is made up of the sign face which contains the message that is intended to be relayed to motorists and the structure which holds up the sign face. Both of these components deteriorate with the passage of time. As sign faces age, the reflectivity of the sign diminishes. Currently sign faces with lower reflectivity are selected for replacement based on engineering judgment. The Federal Highway Administrative (FHWA) is currently in the process of developing reflectivity standards for signs. In the future the Department may need to implement a program to test signs for reflective adequacy based on FHWA standards.

Sign structures are also exposed to the elements and can be weakened by a variety of factors including corrosion and wind loads. The Department, therefore, periodically assesses all sign's structural adequacy. This effort produces a list of sign installations where repairs and/or replacement work is necessary. Such work is undertaken on a priority basis.

e) Highway Lighting

ConnDOT's goal is to provide efficient, quality, well-maintained highway lighting on portions of the State Highway System where required. The Department maintains approximately 25,000 individual lights along State highways. The ages of the various lighting systems vary. The date of installation or major replacement spans from the early 1960's to the present. The overall useful life of the lighting systems averages about 25-30 years. The useful life is based on normal

deterioration; aside from physical damage, normal maintenance, changes in safety standards, or technology advances. The overall condition of the lighting systems is mostly 'GOOD,' however, there are a few locations in need of work, some of which is scheduled.

Ability to Meet Current and Future Demands. The Highway Lighting Systems meet current demand; and with proper adjustments for maintenance, obsolescence, and growth will meet future demand.

Factors Affecting Physical Condition of Highway Lighting:

- Environmental elements and conditions such as water, snow, ice, salt, heat, cold, wind, lightning can negatively affect the physical condition of highway lighting by causing corrosion, physical damage, and deterioration.
- Electrical component malfunction by the lamp, ballast, wiring and service components.
- Physical damage or knockdown by errant vehicles.
- Vandalism.

Factors Affecting Demand for Highway Lighting:

- Changes in traffic patterns, or traffic volumes, or identification of high accident locations, can lead to warranting the need for additional highway lighting.
- Project scoping, including construction of new roadways, reconstruction of roadways, or other roadway improvement can lead to the need for new, extended or revised highway lighting.
- Advances or revisions in technical standards such as illumination criteria, breakaway standards; or new technology such as new lamp sources, or new materials, can lead to conversion or replacement of lighting systems or components.
- Public support in the form of requests for highway lighting, or public opposition for various reasons: financial, or special interest such as the "Dark Skies Legislation."

f) Guide Rail

In 1993, new performance criteria for roadside safety hardware identified as, National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance and Evaluation of Highway Features", was published. On September 29, 1994, the Federal Highway Administration (FHWA) issued "Traffic Barrier Safety Policy and Guidance", which outlined specific mandates regarding installations of guide rail and crash-worthy end treatments.

On March 22, 1996, FHWA issued "Testing and Certification of Roadside Safety Hardware" which listed longitudinal barriers that passed and failed NCHRP Report 350 Test Level-3 (TL-3) guidelines. As a result, Connecticut's W-Beam guiderail types R-I, MD-I, R-B, MD-B, and corresponding guide rail transitions to bridge parapets do not meet current FHWA mandated standards.

The new FHWA mandates required the Department to develop and adopt an FHWA approved policy and procedure for longitudinal barriers and crash-worthy end treatments on all high-speed, high-volume, National Highway System (NHS) roadways. The policy and procedure is currently

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being implemented throughout the Department. The AASHTO 1996 Roadside Design Guide is being used to assist the Department with the design and placement of roadside safety appurtenances.

The Connecticut Guide Rail Program was instituted to support the Department's efforts in the execution of the FHWA mandates. The program began with an inventory of all deficient guide rail systems on the NHS. In corroboration with the Department's Office of Research and Materials, software was developed to facilitate yearly guide rail inventories. Computer hardware was also purchased to work in conjunction with the Department's photolog system. Moreover, photolog inventories will be performed annually to augment the ongoing Connecticut Guide Rail Program. A series of guide rail improvement projects have been designed and, in the summer of 1998, were being scheduled for construction.

g) Intelligent Transportation Systems (Physical components of systems)

The current systems, involving cameras, motion sensor detectors, Variable Message Signs (VMS) and coordinated signal systems have been installed and operated within the last five to ten years. The components are all subject to regular maintenance and, except for the signal systems, are under contract. There has not been the need for wholesale replacement of the system elements, and it is not anticipated that such replacement would be necessary.

h) Highway Rest Areas (Non-Income Producing)

For the convenience of the motoring public, the Connecticut Department of Transportation maintains seven highway rest areas that have parking facilities, lavatories, telephones, vending machines, an information booth, picnic tables, K-9 areas, and dumping facilities for recreational vehicles (RVs). They are referred to as "non-income producing" rest areas because there are no restaurants, fuel or convenience store facilities on the premises. Summary information on these non-income producing highway rest areas is presented in the following table.

REST AREAS (NON-INCOME PRODUCING)

Town	Building Location	Current Number	Year Constr.	Condition
*DANBURY	I-84 E/B	81-295	1971	GOOD
*SOUTHINGTON	I-84 E/B	81-323	1972	GOOD
WEST WILLINGTON	I-84 E/B	81-572	1977	GOOD
*WEST WILLINGTON	I-84 W/B	81-573	1977	GOOD
*MIDDLETOWN	I-91 N/B	81-076	1979	GOOD
*WALLINGFORD	I-91 S/B	81-301	1973	GOOD
NORTH STONINGTON	I-95 S/B	81-296	1971	GOOD

* Dumping facilities for RVs are available only at these facilities.

Table IV-C 1. Rest Areas (Non-Income Producing)

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The inside of each rest area building was rehabilitated in 1995. The parking lot of the Danbury rest area was resurfaced in 1995. The parking lots of the Middletown and Wallingford facilities were resurfaced in 1997. The North Stonington facility was connected to water and sewers in 1997.

All of these rest areas are in good condition. With proper maintenance they should not need any major repairs or renovations within the next 20 years.

i) Highway Rest Areas (Income Producing Service Areas)

The State of Connecticut has 23 rest areas that offer fuel and restaurant or convenience store facilities in addition to lavatories, telephones and parking facilities. Ten of these facilities are adjacent to I-95, three are adjacent to I-395 and ten are adjacent to Route 15. Information on the location, lessee, age and condition of these rest areas is presented in **Table IV-C2**.

Food and Fuel Facilities.

The ten I-95 facilities originally were constructed in 1958. They are currently leased out to McDonald's Corporation and Mobil Oil Corporation. Food concession areas had major renovations in 1985 and minor renovations in 1995. Fuel concessions had major renovations in 1988. Pavement areas were last overlaid 1985 and are in fair to poor condition, with the exception of the Madison northbound and southbound facilities which had pavements rehabilitated in 1998.

Key factors affecting the ability of these facilities to meet future demands are:

- High traffic counts
- Insufficient overnight truck parking areas
- Aging facilities

These facilities should be able to accommodate current and future demands through the end of the current lease agreements with the exception of truck parking at all locations and car parking at the Darien Northbound site during peak summer hours. Complete site redevelopment should be considered for several key locations for the next lease contract. (The food concession lease expires in the year 2005: the gasoline concession lease runs through the year 2003 with a 5-year renewal option.)

I-395 Fuel/Convenience Store Facilities.

The three I-395 facilities originally were constructed in 1958. They are leased out to Mobil Oil Corporation and had major renovations in 1988. Pavement areas are in fair to poor condition.

Key factors affecting the ability of these facilities to meet future demands are:

- Insufficient overnight parking areas for trucks
- Limited capacity subsurface sewage disposal, heavy demand

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- Increased traffic counts
- Aging facilities
- Installation of a new septic system at a facility

In the summer/fall of 1998 new septic systems were installed at the Plainfield northbound and southbound facilities and will enable these facilities to meet future demand. The Montville facility has limited capacity relative to waste water disposal and will have difficulty accommodating future demands relative to providing public restrooms. All three facilities have limited automobile parking available and are well over capacity for truck parking during overnight hours. Complete site redevelopment should be considered for the next lease agreement. (The the gasoline concession lease runs through the year 2003 with a 5-year renewal option.)

Route 15 Fuel/Convenience Store Facilities.

The ten Route 15 facilities originally were constructed during the 1940's. They are leased out to Mobil Oil Corporation and had major renovations in 1988. Pavement areas were last overlaid in the 1980's and are in fair condition. The lease on these facilities expires in 2003 with a 5-year renewal option. The Greenwich northbound and southbound facilities were repaved in 1998.

Key factors affecting the ability of these facilities to meet current and future demands are:

- Public parkway advocacy groups somewhat resistant to changes/expansion of existing facilities located along the section of Route 15 designated as the Merritt Parkway.
- Existing building too small for current volumes and patronage.
- Outdated plaza designs for:
    1. Entrance and exit lanes
    2. Parking areas
    3. Buildings
- Aging facilities.

These facilities have limited ability to meet current and future demands. Seven out of ten sites are currently operating with old (limited capacity) subsurface sewage disposal systems. Existing designs include relatively short acceleration and deceleration lanes at entrances and exits. Existing conditions also offer very little separation between pump areas and adjacent travel lanes. Parking is inadequate at one location. Alternative designs should be considered for future lease agreements.

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REST AREAS (INCOME-PRODUCING SERVICE AREAS)

Town	Location	Building. Number	Current Lessee	Year Constr.	Condition
Darien	I-95 N/B	81-101	Mobil	1958	Fair
Darien	I-95 N/B	81-186	McD	1958	Fair
Darien	I-95 S/B	81-102	Mobil	1958	Fair
Darien	I-95 S/B	81-187	McD	1958	Fair
Fairfield	I-95 N/B	81-118	Mobil	1958	Fair
Fairfield	I-95 N/B	81-188	McD	1958	Fair
Fairfield	I-95 S/B	81-151	Mobil	1958	Fair
Fairfield	I-95 S/B	81-189	McD	1958	Fair
Milford	I-95 N/B	81-152	Mobil	1958	Fair
Milford	I-95 N/B	81-190	McD	1958	Fair
Milford	I-95 S/B	81-154	Mobil	1958	Fair
Milford	I-95 S/B	81-191	McD	1958	Fair
Branford	I-95 N/B	81-163	Mobil	1959	Fair
Branford	I-95 N/B	81-192	McD	1959	Fair
Branford	I-95 S/B	81-594	Mobil	1958	Fair
Branford	I-95 S/B	81-193	McD	1958	Fair
Madison	I-95 N/B	81-595	Mobil	1958	Fair
Madison	I-95 N/B	81-194	McD	1958	Fair
Madison	I-95 S/B	81-168	Mobil	1958	Fair
Madison	I-95 S/B	81-195	McD	1958	Fair
Montville	I-395 S/B	81-197	Mobil	1958	Fair
Plainfield	I-395 N/B	81-198	Mobil	1958	Fair
Plainfield	I-395 S/B	81-199	Mobil	1958	Fair
North Haven	Rte 15 N/B	81-140	Mobil	1949	Fair
North Haven	Rte 15 S/B	81-139	Mobil	1949	Fair
Orange	Rte 15 N/B	81-138	Mobil	1950	Fair
Orange	Rte 15 S/B	81-137	Mobil	1950	Fair
Fairfield	Rte 15 N/B	81-117	Mobil	1941	Fair
Fairfield	Rte 15 S/B	81-116	Mobil	1941	Fair
New Canaan	Rte 15 N/B	81-111	Mobil	1940	Fair
New Canaan	Rte 15 S/B	81-112	Mobil	1940	Fair
Greenwich	Rte 15 N/B	81-119	Mobil	1942	Fair
Greenwich	Rte 15 S/B	81-120	Mobil	1942	Fair

Table IV-C 2. Rest Areas (Income-Producing Service Areas)

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j) Commuter Parking Facilities

The statewide network of commuter parking facilities consists of 233 parking facilities containing a total of 35,436 parking spaces currently available for use by commuters. Out of the total of 233 commuter parking facilities, commonly referred to as "Park and Ride " lots, 49 are located at railroad stations, including the New Haven Commuter Line, the Connecticut Commuter Rail, and Amtrak stations, and provide parking for rail commuters. For additional information on railroad stations and their parking facilities, reference the Rail System Components section of this Plan.

There are currently 184 non-rail commuter parking facilities containing a total of 17,461 parking spaces for use by commuters. Based on usage counts taken in 1996, the average utilization rate was approximately 7,050 vehicles parked per day or forty percent for the non-rail commuter parking facilities. The locations of the non-rail commuter lots are shown on a map in **Appendix B.** There are 49 commuter parking lots with express bus service and 57 lots with local bus service, with ten of these lots offering both local and express bus service. The remaining commuter parking facilities are used exclusively for carpooling and vanpooling purposes. The locations of lots from which express bus service is provided are shown in **Figure IV-D4**.

With respect to the general condition of the 184 non-rail commuter parking facilities, ninety-seven percent of the lots are paved and ninety-two percent of the lots are lighted. Of the 178 lots that are paved, eighty percent are deemed to have pavement conditions that are either excellent or good, and seventy-three percent have pavement markings that were rated as either excellent or good. Bus shelters are located in fifty-eight of the lots, with seventy-four percent of the shelters rated to be in excellent or good condition. **Appendix B** is a complete listing of the commuter parking facilities and their current conditions**.**

k) Salt Storage Sheds & Other Highway Maintenance Facilities

The Connecticut Department of Transportation (ConnDOT) has over 93 district office, maintenance, and repair facilities located throughout the State. Following is a list of the types and numbers of these facilities:

58 Maintenance Facilities
14 Repair Facilities
4 Highway Electrical Facilities
7 Bridge Repair Facilities
4 District Headquarters Facilities
1 Main Headquarters Facility
1 Central Warehouse Facility
36 Salt Storage Facilities

In the past ten years ConnDOT has renovated 24 of these facilities to provide the access required by the Americans with Disabilities Act (ADA), to comply with revised building codes and/or to improve energy efficiency. The renovations were made at a fraction of the cost of replacing these buildings. Where operational needs have changed, ConnDOT has built or added on to 17 repair or maintenance facilities. Additionally, 36 salt storage sheds have been constructed as part of environmental site improvements and fueling facilities at 60 ConnDOT maintenance repair or district facilities have been upgraded.

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ConnDOT has completed a significant number of its construction projects and facilities renovations, some of which included the installation of new roofs and overhead doors. Many sites, however, still will need more extensive renovation, relocation or replacement after the year 2000. Facilities that will need to be renovated, relocated or replaced include:

The Fairfield (Tunxis Hill) Maintenance Garage
Union Maintenance
Westbrook Maintenance
Occum (Norwich) Maintenance
Plainfield Maintenance
Wethersfield Maintenance (Goff Road.)
Litchfield Maintenance
Groton Maintenance
Waterford Maintenance
Putnam Maintenance and Repair
East Haven Repair
Brookfield Maintenance
Danbury Maintenance
Norfolk Maintenance
Simsbury Maintenance
East Granby Repair
West Willington Maintenance (in process)
Southbury Maintenance
Lisbon Repair
Montville Electrical
New Milford Maintenance
Franklin Bridge Repair
Cornwall Bridge (Sharon)
Marlboro Maintenance
Guilford Maintenance
Pomfret Maintenance
Canterbury Maintenance
Old Saybrook Bridge (Bokum Rd.)
Orange Maintenance
East Hartford Signs and Markings

Most of these facilities have been in service well beyond their designed life cycle and some of them will need to be replaced or renovated in the near future. More detailed information on the numbers and conditions of ConnDOT's maintenance facilities and salt storage sheds is presented in the ConnDOT Facility Plan published in September 1994.

The primary factors that will determine the extent to which these facilities can meet current and future needs are the availability of funding and staff to make the required renovations or replacements.

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3. ABILITY OF HIGHWAY SYSTEM TO MEET CURRENT AND FUTURE DEMAND

It will become increasingly challenging during the next twenty years to enable the State of Connecticut's highway system to accommodate new and additional demands. Some key factors that will affect the extent to which the State's highway system can be maintained and improved to meet current and future mobility demands are patterns of behavior and demography; highway capacity; new or improved technology and innovative ways of managing traffic flow; changes in the design standards for various highway system components; changes in the sizes, designs of and fuels required by vehicles using the highways; environmental concerns and mandates; increasing demand to address drivers' needs associated with aging; changes in locations and types of businesses in Connecticut; changes in intra and interstate commuting patterns; the extent to which passengers and goods can be transported by rail or other non-highway modes; public support or opposition to projects; and the availability of funding to meet various needs and to apply new technology. Some of these factors are discussed below.

Behavioral and Demographic Patterns. Factors such as time pressures on multi-worker households and the consequent need to "work trip-chain" (to link the work trip with other trips to meet household needs), continued dispersal of populations out from metropolitan areas, the number of households in which workers commute to different locations, the changing nature of work (job dispersal resulting from more work being done in small work units of a few people or even one person), the number of service-oriented jobs requiring workers to work at odd hours and on weekends and the "humanizing" of the work place and consequent flexibility in work scheduling combine to make use of the private vehicle the most desirable means of travel for a significant majority of individuals. Alan Pisarski in Commuting In America II, concludes that "there is little in present patterns of behavior and demography to suggest that there will be a significant reversal in the private-vehicle orientation of commuters." Pisarski feels that "as long as the private vehicle remains at all affordable to own and operate, the pattern will continue. Shifts in age structure of commuters abet this trend." If such patterns continue, traffic volumes on roads throughout the State will continue to increase.

Highway Capacity. Within the next twenty years, if the present patterns of demography and behavior continue and there is little change in the factors affecting goods movement, the number of vehicles on the state's highways will increase, the number of miles these vehicles are traveling will increase and, consequently, the number of transportation corridors experiencing congestion will increase. The Federal Government has identified a National Highway System (NHS), a network of routes it considers to be of prime importance to regions throughout the nation. **Figure IV-C3** shows Connecticut's National Highway System. **Figures IV-C4a through IV-C4c** show the capacity status in 1996 and the projected capacity status in 2015 of Connecticut's NHS Expressways, NHS Non-Expressways and the remainder of the state route system. In 1996 21% of Connecticut's NHS Expressways, 34% of the State's NHS Non-Expressways and 8% of Connecticut's Non-NHS State routes were over capacity and, respectively, 10%, 7% and 3% of these systems were approaching capacity. As shown in **Figure IV-C4d**, Statewide, in 1996, 14.1% of all state routes were over capacity and 4.6% were approaching capacity. With the current funding and resources available, the portions of Connecticut's NHS and non-NHS routes which are over capacity due to congestion will continue to grow. By the year 2015, it is projected that 41% of the NHS Expressways, 50% of the State's NHS Non-Expressways and

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15% of Connecticut's Non-NHS State routes will be over capacity and, respectively, 8%, 6% and 4% of the aforementioned systems will be approaching capacity.

Extent to Which Roads in Suburban and Rural Areas Can Be Maintained, Improved or Enhanced to Respond to Needs of Drivers, Bicyclists and Pedestrians. In many areas of the state, the shift of jobs and workers to the suburbs and beyond in conjunction with the increased use of the private automobile in response to personal time pressures and the continued use of trucks for a significant percentage of goods movement in Connecticut, has resulted in and will continue to result in significant increases in the traffic volumes and a more diverse mix of vehicles on many state and municipal roads and bridges that were not designed to handle such volumes and mixes. Many of these roads will require higher levels of maintenance; improvements (such as the addition of turning lanes, intersection improvements to increase turning radii, and signalization to maintain and improve traffic flow); and modifications and enhancements (such as sidewalks, wider shoulders, bike lanes, medians and crosswalk signals) to address safety and pedestrian access issues. The extent to which the State and municipalities will be able to address such current and future highway-related mobility needs is affected by public support for or opposition to projects; environmental factors such as impact on air quality and the presence of wetlands, watersheds, endangered species, and historic structures; and availability of funds to undertake such projects.

Application of Technology and Innovative Approaches to Maintain Traffic Flow. Intelligent Transportation Systems (ITS), formerly called Intelligent Vehicle Highway Systems (IVHS), applies advanced technologies to transportation needs to increase the efficiency and mobility of existing transportation systems. Incorporating ITS into an intermodal strategic transportation system provides a number of benefits, including more efficient use of our infrastructure, energy resources and improvements in safety, mobility, accessibility and productivity. The continued advancement and expansion of Intelligent Transportation Systems (ITS) are critical aspects of future transportation needs and mobility requirements. ConnDOT's ITS initiatives and plans are discussed in Chapter VI.

ConnDOT will continue to explore and implement, when feasible, new approaches and technology to meet the mobility needs and address traffic flow problems in Connecticut.

Changes in Vehicles and Means of Maintaining Highways. Within the next twenty years, innovation and new technology will result in the changes in the types and designs of vehicles that use the highway system and in the materials and means used to maintain and improve the highway system. Such advances will impact, probably both positively and negatively, the Department's ability to meet current and future needs. Vehicle types and designs which further increase the diversity of sizes and weights of vehicles using the highways will make it more challenging to maintain and improve the highway system to meet the safety needs of all highway users. New materials, techniques and equipment that would enable ConnDOT to maintain the highways more cost-effectively or with less disruption to traffic flow would expand and improve the Department's ability to meet the mobility needs of highway users.

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Figure IV-C 3. Connecticut's National Highway System

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Figure IV-C 4. Capacity Status of Expressways & State Routes in Connecticut

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Aging of the Population. In 1994, 15 percent of the licensed operators in Connecticut were 65 and older. By 2020, 17 percent of the population will be 65 or older, and almost half of these older persons will be 75 or older. This upcoming change in demographics is significant. With respect to transportation, it is resulting in examining ways for actions to improve the mobility and safety of older persons as drivers, passengers and pedestrians. A considerable amount of research is being conducted to provide more insight into the needs of older drivers and the types of measures that tend to facilitate their use of the streets and highways. As research data becomes available and standards and assumptions are reevaluated and revised, ConnDOT will need to implement cost-effective measures that have the potential to improve the mobility and safety of older persons.

Changes in How and Where Businesses Operate and Locate. Technological innovations have resulted and will continue to result in changes in how and where businesses locate and operate. Changes in how businesses can operate, in turn, trigger changes in the transportation needs of businesses. For example, within the past decade, innovations in the telecommunications industry and in the development of containers have enabled many companies to compete in global markets, to shift to "just in time" delivery of inventory and to realize cost savings by using multimodal transportation.

Alternative Fuels. The transportation industry has traditionally relied upon fuels which are inexpensive and readily available. Petroleum has dominated the fuel market during the past century, and despite growing concerns about pollution, it will no doubt continue to play a major role as a transportation fuel for many years to come. At the present time, a significant amount of time and money is being spent on research to develop alternative fuels which are cleaner and less expensive than those presently in use. Environmental concern over the pollution caused by the use of traditional fossil-based fuels is the driving force behind this research. Two technologies which hold promise are natural gas and electric vehicles. As cleaner and less expensive fuels make their way into the marketplace, the transportation industry will no doubt adapt to make use of them as it has in the past. Greater use of such fuels will require that the State of Connecticut eventually make capital investments to renovate fueling facilities to make these fuels available at its rest areas, highway maintenance facilities and transit facilities.

Extent to Which Passengers Can be Transported Via Rail and other Non-Highway Modes. The larger the percentage of passenger and goods movement trips made in Connecticut by rail (as opposed to automobile or truck), the more effective the existing highway system can be in handling the high volumes of automobile and truck traffic on various highways in the State. As discussed in the Section E. Rail Systems, the ability of Connecticut's rail passenger system to increase ridership on the New Haven Line and hence, reduce highway congestion on I-95 in Connecticut, is largely a function of the availability of parking at or within reasonable walking distance of the rail stations. Should parking be available within a reasonable walking distance of a rail station, the cost and convenience of making a trip by rail versus by automobile are the major factors that determine which mode will be chosen.

Extent to Which Goods Can be Transported Via Rail and other Non-Highway Modes. The extent to which rail is used to transport goods within or through Connecticut is influenced by factors such as the types of businesses and industries in Connecticut, the types of goods they use or

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produce; the ways in which goods are manufactured, shipped and received; the locations of intermodal facilities; and available capacity and adequacy of clearance on rail lines. The State of Connecticut increasingly is oriented to business and service activities which do not generate large volumes of freight. With respect the way goods are manufactured, shipped and received, it is now common for manufacturing to be dispersed over several locations with any one plant having a limited role. Changes in materials management, specifically, just-in-time delivery, mean that sites are getting smaller, more frequent deliveries of materials, and are doing the same with their outbound shipments. The continuation of these business and industry trends will further weaken the demand for direct rail service, and will increasingly require local shipments to be made by truck.

The extent to which the types of businesses and industries in Connecticut change, the extent to which businesses and industries are able to use the highway system to efficiently and cost-effectively ship and receive goods, the accessibility of major intermodal facilities **(see Figure IV-E10. Rail Lines and Intermodal Freight Facilities within a 100 Mile Radius of Hartford)** and the adequacy of capacity and clearance on rail lines in the State are key factors that will influence the extent to which Connecticut sees primarily the truck portion of intermodal shipments of goods. Unless there are significant changes in the types of businesses and industries in Connecticut, the types of goods they use or produce; the ways in which goods are manufactured, shipped and received; the locations of and access to intermodal facilities; and available capacity and adequacy of clearance on rail lines, the majority of goods will be transported within or through Connecticut via truck.

Funding. A major factor that affects ConnDOT's ability to respond to transportation system-related mobility needs is funding. ConnDOT will be able to respond to demands to maintain and improve the transportation system to meet current and future needs only to the extent that funds are available to do so.

The Connecticut Department of Transportation and the State of Connecticut must recognize and plan to efficiently and effectively allocate adequate resources to meet the State's increasing mobility needs if the State is to maintain the levels of accessibility and the quality of life that contribute to making it a desirable place to live and conduct business.

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D. TRANSIT AND RIDESHARING

1. OVERVIEW OF CONNDOT'S ROLE

The Department's Bureau of Public Transportation through the Office of Transit and Ridesharing, oversees and financially supports bus and ridesharing services for the citizens of Connecticut. Through Connecticut Transit, the Department-controlled bus operation, seventeen local transit districts, private bus operators, and the rideshare brokerages the Department is able to maintain fixed-route bus services, Americans with Disabilities Act (ADA) paratransit services, commuter express bus services, rural transit services and ridesharing services.

2. BUS TRANSIT SERVICES

The Department owns urban fixed-route bus systems operating in the Hartford, New Haven, Stamford, Waterbury, New Britain, Bristol, Meriden, and Wallingford urban areas. Connecticut Transit, which is managed for the Department by Ryder ATE, is the largest bus transit operator in Connecticut. Connecticut Transit operates local fixed-route and commuter bus service in the Hartford, New Haven, and Stamford service areas. Other private contractors provide bus service in the other five urban areas, as well as additional commuter express bus services into Hartford. **Figure IV-D1** shows Connecticut Transit service areas and State-operated service areas.

In addition, there are seventeen transit districts, fifteen of which operate the remaining urban, rural and ADA paratransit bus service in the State. A transit district is a governmental designation under Chapter 103a of the Connecticut General Statutes, which provides regional transportation organizations with broad powers to acquire, operate, and finance land transportation. The transit districts can operate their own services or they may contract service to a private operator. Most transit districts also serve as the local agency for the receipt of federal, State, and local grants. A transit district can also elect to be the regulatory agency for private transportation companies, such as taxis, operating within their boundaries although none do at this time. Such regulatory responsibility currently resides within the Regulatory and Compliance Unit of the Department's Office of Ridesharing. **Figure IV-D2** shows the boundaries of the transit districts. **Figure IV-D3** shows the fixed, local bus routes in Connecticut.

The Department provides funding to cover the vast majority of the operating deficits of all the bus services. The Department also provides the non-federal share of federal capital grants for maintenance facilities, rolling stock, and other miscellaneous capital items.

3. RIDESHARING SERVICES

The Department funds three private non-profit ridesharing organizations to develop and implement programs that promote carpooling, vanpooling and mass transit in order to reduce the number of single occupancy vehicles on the highways. The Department looks to ridesharing programs as a complement to transit programs, for their contributions to quality of life issues; economic development; air quality; the conservation of fuel; and more efficient use of Connecticut's highways.

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Figure IV-D 1. Connecticut Transit Service Areas and State Operated Service Areas

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Figure IV-D 2. Boundaries of Transit Districts and State-Operated Service Areas

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Figure IV-D 3. Fixed, Local Bus Routes in Connecticut

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Since the energy shortage of the early 1970s, the Department continually has been expanding its efforts to encourage people to rideshare and to use transit. For example, throughout Connecticut, the Department has established Park & Ride facilities which enable commuters to leave their cars at the lots and travel by vanpool, carpool or bus. **Figure IV-D4** shows the locations of park and ride lots from which express bus service is provided. There are also 135 other park and ride lots available to customers for informal carpooling and vanpooling. The locations of all the park and ride lots in Connecticut are shown in Appendix B, **Figure B1.**

The Department, in conjunction with the brokerages is developing new programs to encourage ridesharing and transit use. The direction of the program is to encourage individuals to choose to rideshare rather than providing service subsidies to the ridesharing modes. Programs include outreach to employers to deliver the ridesharing message to employees at the work site, developing and distributing materials espousing the value of transit and ridesharing for the commuter, facilitating the establishment of telecommuting programs and, enticing employers and commuters to try transit and ridesharing using various financial and non-financial mechanisms. For example, recently the new "Ride Stuff" program was implemented. This program allows commuters who rideshare, use transit or some other non-automotive mode such as biking, walking or telecommuting, at least once a week, to be eligible to receive discounts from various merchants in New Haven and Fairfield Counties. The "Ride Stuff" program is being supported by advertising and outdoor billboards, public service announcements, promotional materials provided to corporations and by the outreach efforts of the regional rideshare brokerages and transit operators. The Department also encourages employers and employees to take advantage of the federal employee commute benefit program by using Transit Chek, a transit voucher program that provides up to $65 monthly in tax-free benefits to employees.

4. BUS TRANSIT FACILITIES

The Department owns the bus garage and maintenance facilities for the three divisions of Connecticut Transit in Hartford, New Haven and Stamford. The Department also owns the bus garage and maintenance facility at the Southeast Area Transit District (SEAT) in Norwich. In Waterbury the Northeast Transportation Company leases its garage and maintenance facility. All of the other service providers control their own facility or their contract operators control a facility.

Through the Public Transportation Management System (PTMS) bus transit facilities have been inventoried. A physical condition survey and operational evaluation of the facility was done. The evaluation was done for both the Department-owned and all the Transit District-owned facilities. A rating scale was used to measure the condition and operating capability of each facility. Based on the condition of the facility, improvements are programmed in the Public Transportation Capital Management Plan. The facilities are inspected and evaluated every five years and the capital plan is updated accordingly. The following is a listing of facilities and their condition.

a) Department-Owned Facilities

Connecticut Transit - Hartford Division. The Hartford Bus Garage and Maintenance Facility was opened in 1990. The facility is in excellent condition. It was designed for a 280-bus fleet and also houses the Ryder/ATE management personnel. The facility appears suitable for future estimated growth.

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Figure IV-D 4. Locations of Park & Ride Lots From Which Bus Service is Provided

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Connecticut Transit - New Haven Division. The existing Bus Garage and Maintenance Facility was built in 1948. The facility is in fair condition but the site is undersized for today's operation. It has been determined that rehabilitation and expansion on the existing site is not economically viable. A Site Selection Study is currently underway to find a site for a new facility. Design funds are programmed for 1998 and 1999 and construction funds are programmed for the 2000-2005 period. The new facility will be designed to accommodate the current operation and for future estimated growth.

Connecticut Transit - Stamford. The Stamford Bus Garage and Maintenance Facility was opened in 1983. The facility is in good condition but is undersized for today's operation. A condition assessment and needs analysis was recently completed for the facility. A rehabilitation and modest expansion project is programmed for 1999. The expanded facility will be suitable for the current operation and for future estimated growth.

Southeast Area Transit – Norwich. The SEAT Bus Garage and Maintenance Facility was opened in 1982. The facility is in good condition. A capital maintenance project to repair/replace the roof is programmed for 1998. The transit district is embarking on a service expansion plan for both public and tourism-related transit services. Both the district and the state are examining facilities options for the future.

Connecticut DOT Bus Garage - Waterbury. The Waterbury Facility is leased from a private owner and operated by Northeast Transportation Company. The facility is a converted foundry located on a 3.2 acre site and undersized for today's operation. The facility is in operable condition but was not designed for a bus maintenance operation. Many of the bus-related mechanical and electrical functions are lacking and do not have the capacities needed to effectively run a bus garage. Since the building is leased and is inefficient for a bus operation, the Department has decided to build a new facility at a different location. Currently the Department is conducting a Site Selection Study to determine the best location for a new facility. The Study is scheduled for completion in late 1998. The new facility will be suitable for the current operation and for future estimated growth.

b) Transit District Maintenance Facilities

Listed below are the transit districts that own their facility. If a transit district is not listed it contracts for service and the contractor owns the facility.

Greater Bridgeport Transit District. Bridgeport Transit District's Bus Garage and Maintenance Facility was built in 1987. It also houses the Transit District's administrative offices. The facility is in very good condition. A capital maintenance project to repair/replace the roof is programmed for the 1998-2000 period. The facility is suitable for the current operation and for future estimated growth.

Housatonic Area Regional Transit (HART). The Housatonic Area Regional Transit operation had outgrown their Bus Garage and Maintenance Facility and their administrative offices were in a separate building away from the garage. A project to expand their existing facility, including adding space for the administrative offices was completed in early 1998. The expanded facility will be suitable for the current operation and for future estimated growth.

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Milford Transit District. The Milford Transit District's administrative offices and maintenance garage are located in two separate buildings. The maintenance facility is a one-bay garage that is inadequate. A new facility is under design. Construction is scheduled for 1998. All functions will be located in the new building. The new facility will be suitable for the current operation and for future estimated growth.

Valley Transit District. The Valley Transit District's Bus Garage and Maintenance Facility was built in 1981. The facility is good condition and also houses the administrative offices. The facility is suitable for the current operation and for future estimated growth.

Middletown Transit District. The Middletown Transit District's Bus Garage and Maintenance Facility is a converted factory/warehouse and is in good condition. Many repairs were done in 1992 to many areas of the maintenance garage. There is a trailer in the maintenance garage used as an office for the mechanic and the facility manager. The administrative offices are located in a separate building. Overall, the facilities are suitable for the transit district's current operation and for the anticipated needs in the near future.

Northeastern Connecticut Transit District. The District's Bus Garage and Maintenance Facility is located in Killingly. The facility was built in 1994 and is in excellent condition. The administrative offices, maintenance garage, and bus storage functions are all in one building. The facility is suitable for the current operation and for future estimated growth.

c) Rolling Stock

The Department maintains an inventory of all the bus rolling stock operated by systems that receive capital and/or operating funds from the Department. The inventory is maintained in the Public Transportation Management System (PTMS) and vehicle replacements are programmed in the Public Transportation Capital Management Plan. Vehicle replacements are programmed according to Federal Transit Administration (FTA) guidelines. A standard size bus (35 ft - 40 ft) has a service life of 12 years. A medium (30 ft) bus has a service life of 10-12 years. A small bus (under 30 ft) has a service life of 7-10 years. All other vehicles (such as regular and specialized vans) have a service life of 4 years or 100,000 miles. The average ages of standard and medium buses in Connecticut Transit Division fleets and transit district fleets are presented in **Table IV-D1**.

d) Bus Shelters and Bus Stop Signs

Bus stop signs are provided by the local transit operator and usually installed by the locality in coordination with the transit operator. Bus stop shelters have been funded by various sources including federal and special state funds, but no DOT operating or transit capital funds are used. Some localities offset maintenance costs by selling advertising on the shelters.

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AVERAGE AGES OF CONN. TRANSIT DIVISION FLEETS	
DIVISION	**AVERAGE AGE OF ROLLING STOCK**
HARTFORD	5.0 YEARS
NEW HAVEN	4.6 YEARS
STAMFORD	6.2 YEARS
SYSTEMWIDE AVERAGE OF ROLLING STOCK: 5.3 YEARS	
AVERAGE AGES OF TRANSIT DISTRICT FLEETS	
TRANSIT DISTRICT	**AVERAGE AGE OF ROLLING STOCK**
GREATER BRIDGEPORT	9 YEARS
HOUSATONIC AREA	5 YEARS
MIDDLETOWN	7 YEARS
MILFORD	9 YEARS
NORWALK	7 YEARS
SOUTHEAST AREA	6 YEARS
WINDHAM REGION	3 YEARS

Table IV-D 1. Age of Transit Rolling Stock

5. FACTORS AFFECTING PHYSICAL CONDITION OF SYSTEMS COMPONENTS

The main transit system components are rolling stock and transit facilities. The Bureau of Public Transportation keeps track of the age and condition of the State transit fleet and the transit facilities in the Public Transportation Management System (PTMS). The vehicles are programmed for replacement in the Bureau's capital plan according to their mileage and/or age. Through the capital plan review process the fleet information is kept up-to-date. Similarly, a rating system is used to program the transit facilities for their reconstruction, renovation, expansion and, if warranted, the construction of new facilities. Generally, the FTA funds 80% of the capital project with the Department providing the 20% non-federal share.

The maintenance of the vehicles-in-service is the operator's responsibility. Through the approved budgets included in annual operating agreements, the Department funds preventive maintenance and running repairs for services provided by all transit and paratransit service operators. The Department subsidizes the deficit, or 67% of total expenses for the urban transit districts, whichever is less. The State funds 33% of the deficit for the rural transit districts; 50% of the rural transit operating deficit is federally funded, with the remaining 17% funded by the localities.

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6. FACTORS AFFECTING DEMAND FOR TRANSIT & RIDESHARING SERVICES

Personal preference, convenience, availability and accessibility of transit, ownership of an automobile, the ability to use an automobile, cost and reforms in the federal and state welfare programs are some of the primary factors affecting the demand for transit. Some of these factors are discussed below.

Personal preference, convenience and necessity. The automobile is the mode of choice for many Americans because of the independence it gives and the convenience it offers. The suburbanization of Connecticut over the past several decades and shifts in job locations, hours of work and commuting patterns coupled with changes in family structures and needs have made life without an automobile difficult or undesirable. Most individuals would not have access to jobs, shopping or entertainment without one. As discussed in Chapter III, a significant lifestyle factor is the increasing numbers of women, particularly women with young children, in the work force. Women, who now make more trips than men do, are more likely to "trip-chain" - to link together a series of trips for different purposes in one outing. The desire and necessity for individuals, particularly women, to "trip-chain" to meet child care and household needs are the reasons many individuals drive alone as opposed to taking the bus or carpooling.

Ownership of and/or Ability to Use an Automobile. Many bus riders are transit-dependent people who may not have their own means of transportation for a particular trip. This type of rider has limited modal choices. Included in this group are individuals who cannot afford alternative means of transportation, individuals who are too young to drive an automobile; individuals who have physical or mental impairments that restrict, temporarily or permanently, their ability to drive an automobile; and individuals (such as tourists, visitors or students) who do not have the use of or do not want to use an automobile while they are in a particular location.

Changes in federal and State welfare programs have resulted in increased demand for transit by transit-dependent individuals needing transportation to look for or get to and from jobs.

The aging of the general population will increase demand for urban and rural transit and ADA paratransit services. The number of older persons who are able to live in their own homes but who are unable to drive is growing. These trends will occur gradually and will need to be adapted to over the course of the next decade or two. Better and more efficient, specialized transportation services will be needed for this group to allow them to maintain their mobility and independence.

7. ABILITY TO MEET CURRENT AND FUTURE DEMAND

a) Rolling Stock

Current Demand. The State transit fleet has the capacity to satisfy current demand. Ridership in some areas of the state has increased up to 3.5% in this fiscal year with no need for additional rolling stock.

Future Demand. Based on existing routes and current usage trends it is anticipated the fleet is capable of satisfying reasonable future ridership growth. Innovative services using smaller or

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alternative-fuel vehicles will need to be purchased. Any major expansions in service levels in peak periods would require fleet expansions.

b) Areas Served

With respect to ability to meet demand in areas not currently served by fixed-route bus service, the Department is attempting, to the extent possible with existing transit funding, to meet demands for bus service in areas or during hours where there are unmet transportation needs. The growth of suburban home and work sites and the change from the traditional spoke-and-hub commute patterns to suburb-to-suburb commute patterns are costly and difficult to address with traditional fixed-route bus service due to the fractured nature of the trip pattern and the central business district focus of most transit systems. The Department's Office of Transit and Ridesharing is encouraging the development of alternative transit operations, such as those operated with flexible routing and smaller vehicles. Additional service changes have gone into effect recently improving reverse commute and evening and weekend services, thus aiding those looking for work in the non-traditional work shifts and outlying employment sites.

Recently, the Access to Jobs program funded additional service in the Hartford, New Haven and Lower Fairfield County regions to accommodate the transportation needs of the low-income working poor and welfare recipients going back to work. Funding is being provided by the Department of Social Services, with some additional funding being provided by the DOT and the Department of Labor. Additional funding may be available from the new federal reauthorization, the Transportation Equity Act for the 21st Century (TEA 21). The Act provides a competitive grant program for improved access-to-jobs transportation, beginning at a guaranteed funding level nationally of $50 million in federal fiscal year 1999, jumping up to $150 million in federal fiscal year 2003.

The bus transit systems are adaptable to changes in job locations, land usage, travel patterns and service needs in general. **Figure IV-D5** shows areas with significant levels of employment in relation to local and intercity bus routes in Connecticut. If the need for added or modified service is warranted, additional funding would be required to subsidize any increases in operating deficits.

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Figure IV-D 5. Areas of Employment in Relation to Local & Intercity Bus Routes

VIEW FIGURE IV-D5

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E. RAIL SYSTEMS: PASSENGER & FREIGHT

1. CONNDOT'S ROLE: RAIL PASSENGER SYSTEMS

Connecticut is served by three passenger rail operations – the New Haven Line commuter service which operates between New Haven, Connecticut and Grand Central Terminal in New York City with connecting branches to New Canaan, Danbury and Waterbury; the Shore Line East commuter service which operates between New Haven and New London; and Amtrak intercity passenger service along the Northeast Corridor between New York and Boston, and the Inland Route between New Haven and Springfield, Massachusetts.

ConnDOT's Bureau of Public Transportation through it's Office of Rail oversees and financially supports the provision of two of the passenger services: the New Haven Line and the Shore Line East services. The Department contracts with the Metro-North Railroad to operate the New Haven Line (NHL) and with Amtrak to operate the Shore Line East (SLE). The Department sets fares and service levels on the Connecticut portion of the New Haven Line and Shore Line East. The Department does not regulate or subsidize the Amtrak intercity passenger service within Connecticut.

ConnDOT provides both capital and operating funding for the NHL and the SLE services. The Department is a designated recipient of Connecticut's share of the Federal Transit Administration (FTA) Section 5309 (formerly Section 3) Capital Funding Program for the NHL and is a designated recipient of the State's share of the FTA Section 5307 (formerly Section 9) Capital and Operating Program. ConnDOT uses the FTA funds and state capital to make capital infrastructure improvements and to acquire rolling stock for the NHL and SLE.

2. COMMUTER RAIL PASSENGER SERVICES

The New Haven Line. ConnDOT and the Metropolitan Transportation Authority (MTA) of New York jointly oversee and subsidize the operation of the New Haven Line (NHL). Metro-North Railroad is the contract operator under an agreement with ConnDOT and MTA.

ConnDOT owns the 106 miles of the New Haven Line between New Haven and Greenwich and the three branch lines within Connecticut and is responsible for maintaining and rehabilitating its infrastructure. The Department also owns over 60% of the NHL's rolling stock; MTA owns the remaining NHL rolling stock. ConnDOT uses State funds, together with a limited amount of FTA funds, to cover the State of Connecticut's share of the operating subsidy for the NHL.

The New Haven Line service is considered a vital transportation link, in that it relieves traffic on the most congested portion of I-95 between New Haven and the New York State line and also provides access to highly-paid jobs in New York City. Based on the 1990 Census journey to work data, the New Haven Line captures about 75% of the work trips bound for New York City. There are 35 station stops on the Connecticut portion of the New Haven Line and more than 66,000 passenger trips are made on this line segment each weekday. As shown in **Figure IV-E1,** annual ridership on the NHL has increased significantly since 1986. In 1997 the total New Haven Line ridership was approximately 29.3 million. Of this number, 18.6 million used Connecticut stations. A large majority

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of these travelers are daily commuters to New York City. A small percentage of these travelers are making intrastate work trips and an even smaller percentage are making intrastate non-work trips.

Parking is a vital component of the New Haven Line rail commuter service. Seventy percent of Connecticut New Haven Line customers drive or car pool to their rail station and park.

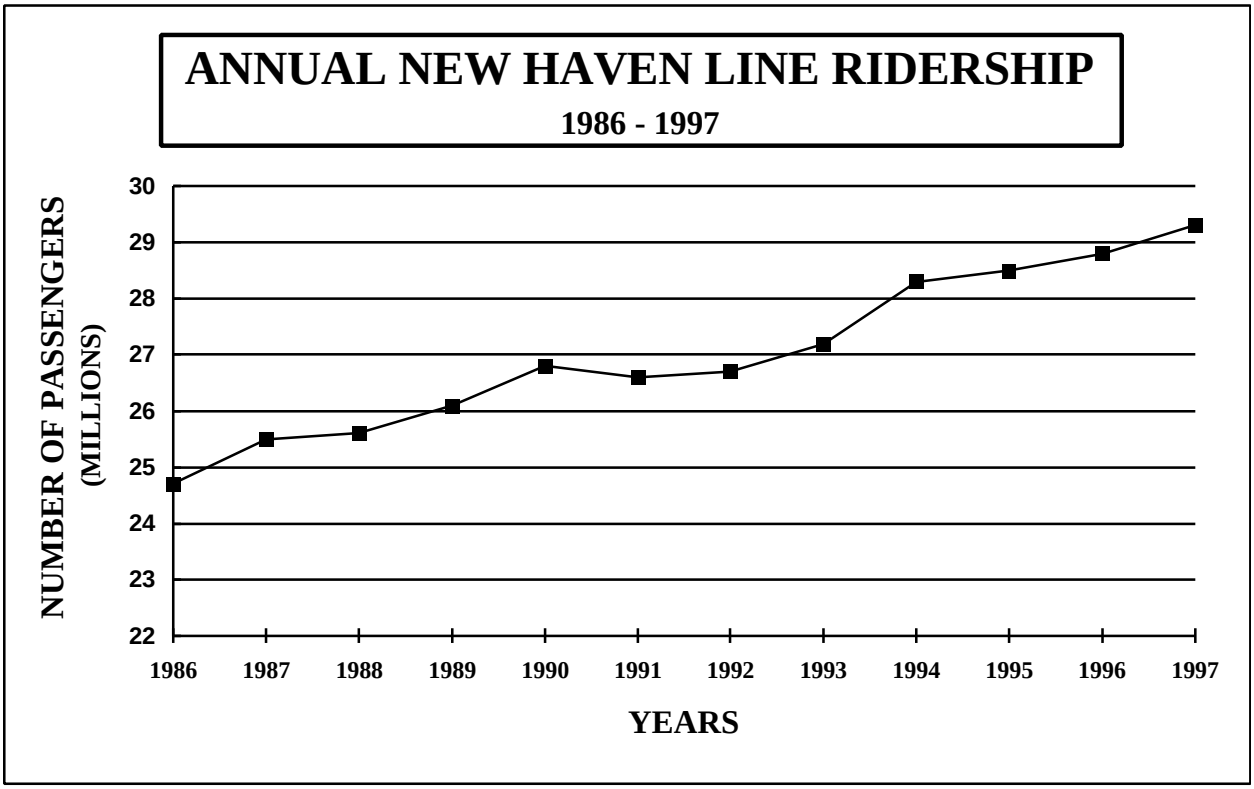

Figure IV-E 1. Annual New Haven Line Ridership

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Shore Line East. ConnDOT contracts with Amtrak to operate the Shore Line East (SLE) commuter rail service between New Haven and New London, a service area that is located within Amtrak's Boston Division of the Northeast Corridor. ConnDOT provides equipment (rolling stock) and funding for the operation and oversees Amtrak's performance as a service provider. The Department uses 100% State funds to cover the operating deficit and to fund capital projects for this service.

There are a total of seven passenger stations with connecting service to the NHL and points west provided at New Haven. As shown in **Figure IV-E2,** total annual ridership on this line increased from approximately 260,000 in 1992 to 309,375 in 1996. In 1997 daily ridership was approximately 1,153.

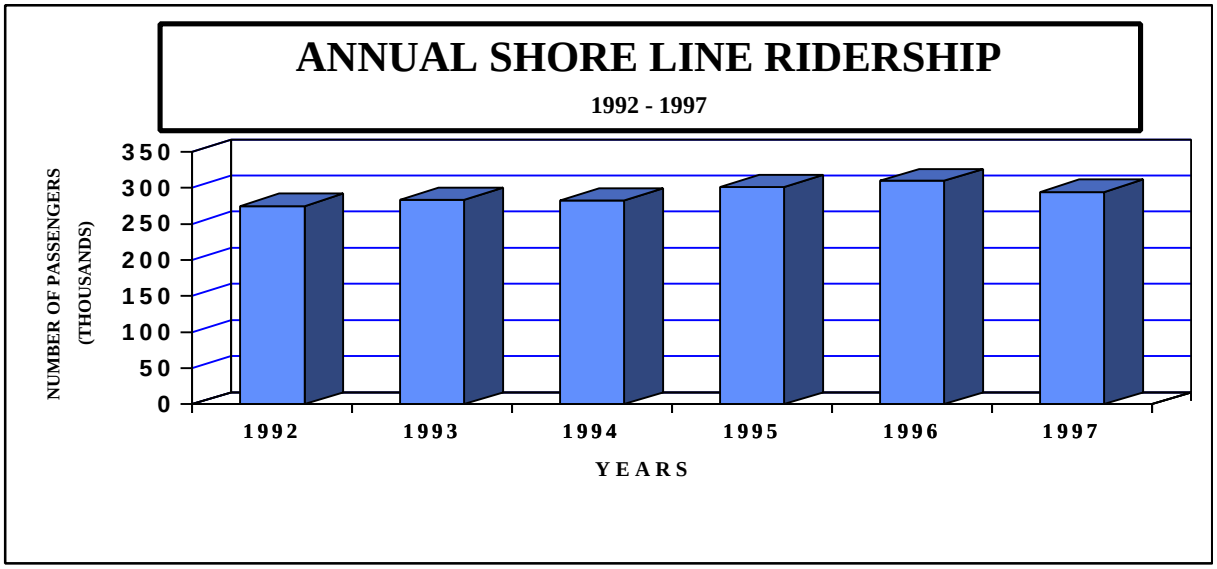

Figure IV-E 2. Annual Shoreline Ridership 1992 - 1997

Amtrak Intercity, Rail Service. Amtrak intercity, rail service through Connecticut is provided along the Northeast Corridor (NEC) (Boston - New York City - Washington D.C.) and along the New Haven-Springfield Line (New Haven -Hartford -Springfield). Amtrak operates over its own right of way east of New Haven and between New Haven and Springfield and operates over the ConnDOT owned NHL between New Haven and Greenwich. Amtrak's intercity service serves a total of twelve rail-passenger stations in Connecticut. These stations are listed in **Table IV-E1** which shows Amtrak Connecticut Ridership By Station for Federal Fiscal Year 1997.

As shown in **Figure IV-E3,** during the past ten years, annual Connecticut Amtrak ridership has significantly decreased. Ridership peaked at approximately 1,225,000 in 1988 and decreased to approximately 879,448 in Federal fiscal year 1997. During this time, the number of trains on the Springfield Line was reduced from nine trains in each direction to six trains in each direction. On the Northeast Corridor, the number of trains in each direction, both east and west of New Haven, was similarly reduced.

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AMTRAK
Connecticut Ridership By Station
FEDERAL FISCAL YEAR 1997

STATION	BOARDINGS	ALIGHTINGS	TOTAL
Berlin	13,340	14,109	27,449
Bridgeport	24,023	26,042	50,065
Hartford	72,085	72,922	145,007
Meriden	11,603	12,929	24,532
Mystic	9,246	11,024	20,270
New Haven	120,360	121,266	241,626
New London	56,415	58,248	114,663
Old Saybrook	21,730	22,480	44,210
Stamford	89,197	93,185	182,382
Wallingford	4,469	5,394	9,863
Windsor	2,793	3,200	5,993
Windsor Locks	6,235	7,153	13,388
TOTAL	**431,496**	**447,952**	**879,448**

Table IV-E 1. Amtrak Ridership By Station for FFY 1997

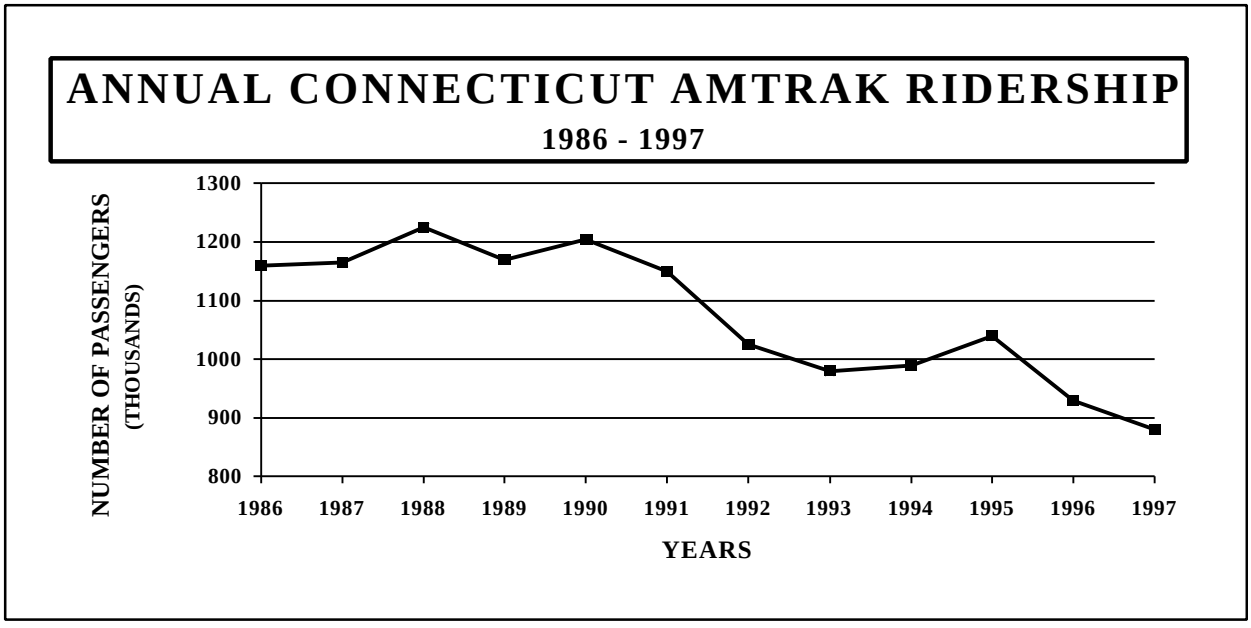

Figure IV-E 3. Annual Connecticut Amtrak Ridership 1986 -1997

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3. CONNDOT'S ROLE: RAIL FREIGHT

The Department oversees the following rail freight programs: the Gross Earnings Tax Exemption Program, the Rail Preservation and Improvement Program and the Rail Regulatory Program. These programs are discussed below.

Gross Earnings Tax Exemption Program. In accordance with Section 12-249 of the Connecticut General Statutes, each corporation operating a railroad in the State of Connecticut shall pay a tax computed upon its gross earnings within the State as disclosed in an annual return to the Department of Revenue Services. Gross earnings have been determined to be all receipts classified as railway operating revenues by the Interstate Commerce Commission. Section 12-255 CGS states that the gross earnings tax shall be in lieu of all other taxes in the State, except for taxes assessed on property not used exclusively for railroad purposes.

Section 13b-226 CGS declares the improvement of railroads transporting freight or passengers within Connecticut or between Connecticut and other states to be a "public purpose" and that the gross earnings tax may be exempted on a dollar for dollar basis with expenditures made to effect specific railroad improvements in a given calendar year.

On or before November 1 each year, a railroad company wishing to participate in the Gross Earnings Tax Exemption Program must submit for approval a list of projects to be undertaken in the upcoming calendar year. The Rail Administrator, properly designated by the Commissioner of Transportation, will then issue an approved list of projects to the participating railroads on or before the 31st of December.

The list of projects may be amended from time to time throughout the year at the request of the railroad. A company need not complete all of the approved projects during the year since a provision has been made for partial exemption. However, expenditures which exceed a company's gross earnings tax liability in any year may not be carried over to subsequent years.

In the administration of the program, a monthly reporting requirement has been established to track the progress of each railroad's effort to complete projects from the approved list Following year's end, an auditor's review is performed to determine each company's actual expenditures to determine the amount to be certified by the Commissioner of Transportation as eligible to be exempted. A formal certification of eligibility by the Commissioner of Transportation must be provided to the Governor and the Chairpersons of the Transportation and Revenue Finance and Bonding Committees by March 1 of the following year.

Generally, each of the freight railroads operating in the State participates in the Gross Earnings Tax Exemption Program. Amtrak and the Metro-North Commuter Railroad do not participate, as each enjoys its own legislative tax exemption. Of the freight companies participating, gross earnings tax liabilities (and annual exemptions) range from one thousand to several hundred thousand dollars annually.

Rail Preservation and Improvement Program. The Rail Preservation and Improvement Program was formally established in 1983. In its present form, the program is a remnant of Connecticut's many

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activities before, during and after the restructuring of the rail system in the Northeast during the mid 1970s. At that time, ConnDOT purchased abandoned rail rights of way, financially assisted railroads in rehabilitating lines, and rehabilitated and subsidized operations on branchlines which were excluded from the Final Systems Plan. (The Final Systems Plan was a Congressionally-mandated plan that designated which of the lines that were owned by bankrupt railroads in the Northeast would be operated by Conrail or other railroads.)

By the early 1980s, the federally-funded Local Rail Service Assistance Program that was established in 1973, had been substantially revised by Congress. The level of federal funding was reduced and the use of federal funds for operating assistance was prohibited. As a consequence of reduced federal funding, ConnDOT developed its own rail capital assistance program.

Under the provisions of its capital grant program for freight railroads, ConnDOT continues to provide 70% of the cost of eligible capital projects, with the participating railroad funding the remaining 30%. On State-owned rights of way, ConnDOT may, at its option, prescribe an alternate funding ratio, including a higher State share.

In the early years of this program, the Department would regularly solicit projects from all freight railroads operating in the state. At that time, when dwindling federal funds were still being used in combination with State funds, project eligibility was generally based on a benefit to cost methodology approved by the FRA. However, in more recent years when no federal funds have been involved, projects have been selected based upon obvious merits and the degree to which a project will contribute to the preservation or improvement of rail freight service in Connecticut.

Though smaller scale projects continue to be completed under this program, the following is a listing of major projects that have been completed:

- Rehabilitate Derby/Shelton Bridge; Conrail; $2.0 million
- Rehabilitate Poquetannuck Cove bridge; P&W; $2.0 million
- Install CWR on Palmer Subdivision; CV; $780,000
- Construct run-around track in Plainfield Yard; P&W; $230,000
- Reconstruct passing siding on Palmer Subdivision; CV; $160,000
- Rehabilitate track Waterbury-Berlin; GTI; $2.5 million
- Rehabilitate Berkshire Rail Line; HRR; $1.7 million
- Acquire and rehabilitate State-owned Middletown Cluster; CCCL; acquisition $1.15

Rail Regulatory Program. The transfer of the Rail Regulatory function to ConnDOT from the Public Utilities Control Authority (PUCA at that time, Department of Public Utilities today) was first suggested by the Committee on the Structure of State Government in its report to Governor Grasso dated December 20, 1976. The report identified the specific functions to be transferred as "the control of railroad bridge construction and the alteration of railroad facilities due to highway construction, annual inspection of all railroad track in the state, and the review of railroad income to provide tax exemption."

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In 1977 the General Assembly included this recommendation in Public Act 77-614 and, effective January 1, 1979, ConnDOT assumed all Rail Regulatory tasks associated with Chapters 245, 245a and 245b of the Connecticut General Statutes. Today, in accordance with these statutes, ConnDOT's Bureau of Public Transportation administers the regulation of all 13 railroad companies operating in the State of Connecticut.

ConnDOT's authority in the Rail Regulatory area extends to all matters relating to railroad construction and operations that are not specifically governed by federal law or regulation. The major statutory responsibilities of the program include annual inspections of all active railroad rights of way; administration of the railroad Gross Receipts Tax Exemption Program; at-grade rail crossing safety and construction; and statewide railroad complaint and accident investigation. As required by state statute, dockets are established, formal hearings are conducted, and legally binding decisions are rendered in relation to these matters.

4. RAIL SYSTEM COMPONENTS

The rail systems in Connecticut comprise tracks, power systems, signal systems, rolling stock, rail stations and platforms, parking lots and structures, and maintenance facilities. Summary information on the condition of these components, factors affecting the conditions of or demand on the specific components, and the ability of these components to meet current and future demand, is presented in this subsection. For more detailed information on these transit assets refer to the transit inventory which is included as Appendix D of Connecticut's Public Transportation Management System.

a) Tracks

There are 575 route miles of railroad track in Connecticut. The locations and ownership of the various segments of track in Connecticut are shown in **Figure IV-E4** and listed in **Table IV-E2. Table IV-E2** also indicates whether the track is used for passenger and/or freight service. As of December 1997 rail tracks in Connecticut were owned by the following eleven entities: National Railroad Passenger Corporation (Amtrak), Boston & Maine Corporation, Branford Steam Railroad, Connecticut Department of Environmental Protection, the Connecticut Department of Transportation, Consolidated Rail Corporation (Conrail), Connecticut Southern Railroad**,** Maybrook Railroad Company, New England Central Railroad Company, Providence & Worcester Railroad Company and Tilcon Connecticut, Inc.

Condition of Tracks. For the NHL ConnDOT has condition measures for evaluating rail track structure. These measures are based on a cyclical program for replacement of track, ties and surfacing. Tangent track and curves 1° and under have a 40 year replacement cycle: track with curves over 1° have a 20 year replacement cycle. The Department has a seven year renewal program for maintaining and replacing existing ties on the main line and a ten year renewal program for addressing existing ties on branch lines. There is a 30 year replacement schedule for new ties and a 50 year replacement schedule for new concrete ties. With respect to surfacing, inspection is performed every 3 to 5 years. On average, 50 percent of the track will need resurfacing after 4 years.

Trackage owned by the private operators is maintained according to similar standards set by each company.

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Table IV-E 2. Active Rail Lines

VIEW TABLE IV-E2

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Figure IV-E 4. Railway Ownership

(MAP SHOWING RAILWAY OWNERSHIP)

VIEW FIGURE IV-E4

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As of December 1997 tracks in Connecticut statewide ranged in FRA classification from Class 4 (maximum allowable operating speeds of 80 m.p.h. for passenger trains and 60 m.p.h. for freight trains) along the Northeast Corridor route and on the segment from New Haven to Springfield to Class 1 (maximum allowable operating speeds of 15 m.p.h. for passenger trains and 10 m.p.h. for freight trains) on three freight line segments. The classifications of the track segments are listed in **Table IV-E2** and indicated on **Figure IV-E8.**

Factors Affecting Condition of Tracks. Factors affecting track condition are volume of traffic, type of traffic, drainage, and curvature. Each segment is different. Lines with limited freight service are usually maintained at Class 1 or 2, while passenger lines owned by ConnDOT or Amtrak are maintained at Class 4.

Ability to Accommodate Current and Future Needs. The condition of the various track segments are able to accommodate current and future needs for the foreseeable future.

b) Power Systems

Trains on the New Haven main line and New Canaan Branch are electrically powered. They pick up electricity from overhead wires, known as catenary. The system is approximately 13 Kv at 60 cycles. Supply is the from the electric utility company at 3 points at 115 Kv. Thirteen railroad substations distribute the power over the rail line.

The electric catenary system was originally constructed in 1906 from New York to Stamford and about 10 years later from Stamford to New Haven. Power was generated by the railroad's coal burning power plant at Cos Cob. In the mid-1980's the system was converted to commercial power.

Condition of Power System. The catenary system between New Haven and the Connecticut-New York State Line is 75-80 years old. Maintenance and inspection costs per/track mile are over twice as much as they would be if the proposed replacement catenary system was in place. Catenary wires have lost their elasticity and are subject to breakage which could be catastrophic for train operations and employee/customer safety.

Factors Affecting Condition and Ability of System to Meet Current and Future Demand. Preliminary design has begun. The cost of construction has been programmed by the Department to replace the system over the next 10 years. It is imperative that the new auto-tension technology be implemented to preclude the continually declining reliability of the system and the lack of replacement components. Approximately 150 track miles of the catenary system needs replacement.

Ability to Meet Current and Future Demand/Needs. Speeds are inherently restricted to 75 mph and are further reduced by timetable special instruction at certain curves particularly in extreme hot or extreme cold weather. Studies have concluded there is concern for the capability of the thermal characteristics of the catenary wires and feeder capacity to support future high speed trains along with projected increases in commuter traffic.

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c) Power System Substations

Condition of Substations. Substations housing oil filled circuit breakers on the New Haven Line were built at the beginning of the twentieth century and have gone through minor modifications during the past 75 years. Circuit breakers are marginal for operation at 60 hertz. Since conversion of the system to 60 hertz operation in September 1986 several circuit breakers have exploded sending shrapnel through the immediate vicinity. The procurement of off-the-shelf replacement parts is not possible.

Factors Affecting Condition - Ability of System to Meet Current and Future Demands. The upgrades of three substations are nearing completion. Design of another and design of an additional substation are complete and construction will begin in the fall of 1998. Seven substations remain to be replaced. The cost of construction for the remaining substations has not been adequately programmed by the Department to meet the projected life expectancy of the power system.

It is imperative that the new ground-mounted, indoor, draw-out type breaker technology be fully implemented to preclude the continually declining reliability of the power system and the lack of replacement components.

Ability to Meet Current and Future Demand/Needs. Studies have forecasted that the Connecticut power supply system will not ensure the reliability or provide the capacity needed to operated future levels of Amtrak and Metro-North rail service. All remaining substations (circuit breakers) must be upgraded to improve reliability and fault-clearing capabilities.

An additional supply substation will be needed on the East End of the New Haven Line to meet the power demands of increased Amtrak High Speed Rail, Shore Line East and Metro-North electric train service.

d) Signal Systems

The Signal Control System on the New Haven Main Line is a Centralized Traffic Control (CTC) with signal control passage of trains at Control Points (CP) formerly referred to as Interlockings. Train speeds are indicated by Cab Signals and Go-No-Go automatic train control. The New Canaan Branch is a continuation of CTC with automatic train control, cab signals and Go-No-Go signals. While the Danbury Branch currently is manual block territory it will soon be converted to be the same as the main line and New Canaan Branch. The Waterbury Branch is manual block with no current plans to update this branch line.

Condition of Signal System. The first signal system upgrade took place along with the 60 cycle conversion of the traction power system between 1980 and 1985 in Connecticut. Subsequent modifications have been ongoing. The completion of a complete CTC System was accomplished in the mid-1990's.

A railroad signal system traditionally lasts about 30 years. The following are the expected and useful life of some of the system components. A switch machine must be rebuilt every 15 years and replaced every 30 years. Signal cable will last about 30 years. Batteries/battery chargers and related systems last about 15 years. For the CTC office equipment, the following applies: CRT's last about 4 years before they need to be replaced; the CPU needs to be replaced every 5 years; UPS Batteries last about

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10 years; the control software and program logic, about 10 years; and the operating consoles, about 5 years.

There are other high-cycle replacement parts such as continuous-working code relays, 100 Hz converters, code-following relays, flasher relays, lights, bulbs, and control panels. Wayside buildings and cases need repair and support every 15 years with possible replacement at 30 years of age. Generally speaking, the present system is at half its expected life.

System's Ability to Meet Current and Future Needs. Assuming the 30-year expected life, replacement should be considered for the 2010-2015 period. Many components will require maintenance and/or replacement at shorter periods as previously noted. The current system is sufficient to operate, according to the rules and regulations in effect, with the present and on-order trainsets.

e) Rolling Stock

ConnDOT owns 317 vehicles (rolling stock units). The equipment type, book count, average age, unit size, unit seating (if applicable) and service that the vehicles are used for are presented in **Table IV-E3,** RAIL ROLLING STOCK UNIT SUMMARY. As shown in **Table IV-E3,** 270 of the 320 vehicles are passenger vehicles and 47 are work equipment. Of the passenger vehicles, 121 are M-2 coaches, 34 are M-4 coaches and 30 are M-6 coaches for a total of 185 electric coaches; 67 are push/pull coaches and 18 are passenger diesel locomotives. Pictures of and detailed information on this equipment are presented in the publication, CONNECTICUT DEPARTMENT OF TRANSPORTATION RAIL ROLLING STOCK, prepared by ConnDOT's New Haven Office of Rail Operations.

Of these vehicles, 215 passenger units, 10 locomotives and 47 work units are dedicated to providing service on the New Haven Line; 31 passenger units and 8 locomotives are dedicated to the Shore Line East service; and 6 passenger units (Pullman Standard Coaches) are leased to the City of Danbury and Falls Village-Cannan Historical Society.

Condition of rail rolling stock. As part of its Public Transportation Management System, ConnDOT maintains a database that contains the information necessary and required to program the future replacement or rehabilitation of the rolling stock. ConnDOT also has condition measures for evaluating rail rolling stock. These measures are based on specific replacement criteria for the rail rolling stock. These replacement criteria have been developed and refined over the years. The criteria are based on past ConnDOT experience as well as industry standards. Electric multiple unit equipment, locomotives and coaches are on a 30-year replacement schedule for new equipment and a 15-year replacement schedule for equipment which is remanufactured. However, the useful life of rail rolling stock may be extended beyond 30 years based if properly maintained.

The rail rolling stock used to provide service in Connecticut is in good condition. As shown in **Table IV-E3,** with the exception of the six Pullman Standard Coaches (leased to the Danbury Rail Museum), the passenger vehicles having an average age of 16 years or more have been completely remanufactured or overhauled.

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Table IV-E 3. Rail Rolling Stock Unit Summary

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Factors Affecting the Condition of Rail Rolling Stock and Ability to Meet Demand/Needs

Miles traveled is the basic factor that effects the condition of the equipment. To minimize this effect NHL and SLE equipment are rotated to equalize miles traveled. In addition, to ensure the equipment is in safe working order, the passenger rolling stock is maintained in a state of good repair through regular maintenance and safety inspections required by the FRA.

Ability of Rail Rolling Stock to Meet Current and Future Demand/Needs

The current number of passenger cars are programmed to meet expected demand through about 2007. An equipment study is programmed for 2003 to determine what additional equipment will be needed at that time and what type of equipment it should be.

Rolling Stock Safety Enhancements. Rail rolling stock design safety enhancements for current and future equipment are being determined by the American Public Transit Association Passenger Rail Equipment Safety Standards Task Force (APTA Press Task Force). The APTA Press Task Force was initiated during 1996 as a result of pending Federal Railroad Administration (FRA) regulations pertaining to passenger rail car safety issues. Its purpose is to better address the safety issues under consideration and to minimize economic impacts of proposed new rules. ConnDOT's Office of Rail representatives regularly participate in the APTA Press Task Force effort.

The APTA Press Task Force, comprising representatives of 17 member passenger railroads, rolling stock equipment manufacturers, rail labor unions and FRA personnel work jointly together to develop the most efficient standards and recommended practices to increase safety for various elements of rail vehicle design, maintenance, inspection and emergency preparedness.

Members participate in Construction/Structural, Electrical, Mechanical and Passenger systems sub-committees to develop the standards and practices. A total of 30 new standards/practices have been adopted to date and approximately 20 additional standards/practices will be developed by March 1999. After these standards and practices are developed, a residual core group will review and resolve issues that may result after incorporation of the new standards and will continue to assess future safety needs of the rail passenger industry.

f) Maintenance of Equipment Facilities (MOE)

The Department is responsible for the MOE facilities of the NHL and SLE commuter rail services. The NHL has repair and inspection MOE facilities in New Haven and Stamford. The SLE has a repair and inspection facility in New Haven.

The NHL facility in New Haven is used to make periodic inspections and running/intermediate repairs that require less than 3 days to do. The facility is in fair condition. An engineering evaluation and study is currently underway to determine if the facility should be expanded and rehabilitated or replaced.

Stamford has two NHL MOE facilities, an inspection/running repair facility and a heavy repair facility. The inspection/running repair facility opened in the fall of 1997 and is state-of-the-art. This facility in conjunction with the rehabilitated or new facility in New Haven will have the capacity to accommodate the inspection and repair needs of the NHL for the foreseeable future.

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The NHL heavy repair shop in Stamford was in fair condition and has been replaced and opened. The new facility will accommodate the heavy repair needs for the foreseeable future.

The SLE MOE facility in New Haven is in poor condition and is not ideally set up to maintain diesel locomotive and coaches. Construction of a new facility will begin in 1998. The new facility will be able to accommodate all types of equipment and will be able to handle maintenance needs for the foreseeable future.

ConnDOT has in place measures and standards for evaluating the condition of transit assets such as rail maintenance facilities. The major components of rail maintenance facilities such as the roof, heating, ventilation, air conditioning, windows, doors, siding, floor, ceiling, interior walls, bathrooms, etc. are inspected and rated on a scale of 1 to 5, with 1 being new or like-new condition and 5 being very serious deterioration or dangerous. Facilities are inspected every five years and improvements are programmed based on the condition reports.

Factors Affecting the Condition of Rail Maintenance Facilities & Ability to Meet Demand
Normal use affects the conditions of the MOE facilities: routine maintenance is done to reduce this affect. The buildings were designed to accommodate current and foreseeable future equipment.

g) Rail Stations and Platforms

A total of 49 stations (7 Amtrak stations, 35 NHL stations, and 7 SLE stations, excluding the New Haven station) provide access to the various passenger rail lines in Connecticut. The locations of these stations are shown in **Figure IV-E5**. Each of these stations has some degree of auto access and parking. Almost all of the stations have taxi service available. Several stations - Stamford, Westport, Bridgeport, Danbury and New Haven - also have reasonably convenient connections available to local bus service. Others, such as Hartford, Waterbury, Norwalk, New London, Greenwich, and Fairfield, have access provided by only one or two routes.

Three of seven fixed route bus systems New Haven, Stamford, and Bridgeport operate into the late evening, approximately 11:30 p.m. and provide good connections with the train. The other four Milford, Norwalk, Danbury, and Westport cease operations between 6:30 p.m. and 7:30 p.m. thus serving trains less well. **Figure IV-E6** shows the rail stations to and from which there are shuttle bus/commuter connections. Additional information on support facilities and physical attributes of individual stations is presented in Connecticut's Public Transportation Management System.

The ownership, maintenance responsibility and conditions vary among the New Haven Line, Shore Line East and Amtrak intercity rail stations. Most New Haven Line rail stations are owned by the Department and leased to the city or town in which they are located. The Shore Line East-only stations are owned and maintained by Amtrak pursuant to an agreement with ConnDOT. There are no parking fees at these SLE stations.

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Figure IV-E 5. Connecticut Rail Passenger Services and Stations

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Figure IV-E 6. Passenger Rail Stations with Shuttle Service

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The ownership, maintenance responsibility, conditions and parking fees vary at Amtrak intercity facilities. The Department does not routinely maintain a conditions assessment or detailed parking data for Amtrak intercity facilities.

Condition of Facilities. In accordance with the Bureau of Public Transportation's state-of-good-repair policy, funding is programmed annually in the Bureau's Capital Project Management Plan to ensure that all facilities owned or controlled by the Department are maintained, upgraded, or overhauled as industry standards and equipment life cycles require. The leases for the New Haven Line rail stations which are owned by the Department and leased to cities or towns require that the stations be maintained in a state of good repair by the municipality. Fees collected for parking and subleases are expected to be used for this purpose. Major building improvements and repairs are generally funded by the Department. Detailed information on the conditions of these rail facilities is presented in a transit facilities inventory which is included as Appendix D of Connecticut's Public Transportation Management System.

Station Usage. Daily ridership at the 49 rail stations in Connecticut ranges from 5-10 daily passengers at lower volume Amtrak stations to over 5,000 daily passengers at Stamford. **Figure IV-E7,** Rail Ridership at Selected Stations, shows passenger counts at stations having over 50 people per either on or off peak boarding periods.

h) Rail Station Parking

A total of 15,716 parking spaces are available at the state's 49 rail stations. The number of parking spaces provided at each station varies from approximately twenty spaces at Seymour's New Haven Line station to over 1,000 at the New Haven, Greenwich, Stamford, Westport and Fairfield stations. Some of the stations in urban area locations such as Stamford, Norwalk, Bridgeport and New Haven have parking structures. But, the majority of the parking facilities are surface lots constructed parallel to the rail lines. While technically owned by ConnDOT, most of the lots are actually leased and operated by the individual towns in which they are located. Parking fees typically cover a portion of the cost of upkeep, snow removal and policing, but capital improvements, such as major rehabilitation and construction, are funded by the state.

Condition. In accordance with the Bureau of Public Transportation's state of good repair policy, funding is programmed annually in the Bureau's Capital Project Management Plan to ensure that all facilities owned or controlled by the Department are maintained, upgraded, or overhauled as industry standards and equipment life cycles require. However, most New Haven Line rail stations are owned by the Department and leased to the city or town in which they are located. Such leases require that the stations be maintained in a state of good repair by the municipality. Fees collected for parking and subleases are expected to be used for this purpose..

The Shore Line East-only stations are owned and maintained by Amtrak pursuant to an agreement with ConnDOT. There are no parking fees at these stations.

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Rail Ridership at Selected Stations

(For Passenger Counts of Over 50 People per Either On or Off Peak Boarding periods)

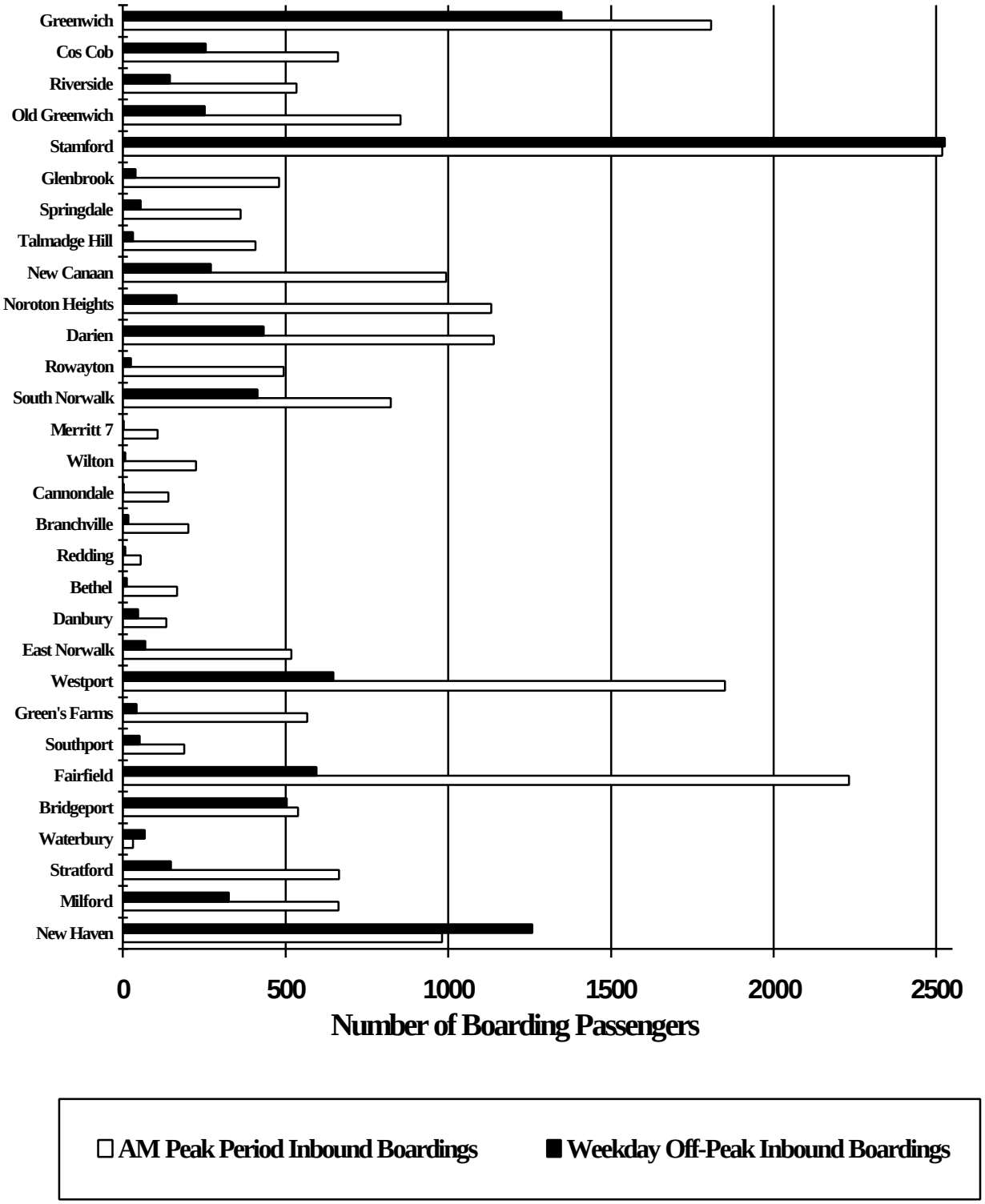

Figure IV-E 7. Rail Ridership at Selected Stations

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The ownership, maintenance responsibility, conditions and parking fees vary at Amtrak intercity facilities. The Department does not routinely maintain a conditions assessment or detailed parking data for Amtrack intercity facilities.

Use. Overall, the average utilization of parking spaces at the rail stations in Connecticut is approximately 12,660 or eighty one percent. According to ConnDOT's 1995 Rail Parking Study, utilization on the mainline ranges from 144% at East Norwalk to 17% at Bridgeport. On the Waterbury Branch, utilization ranges from 67% to a low of 3%. On the Danbury Branch, utilization ranges from a high of 100% to a low of 72%. On the New Canaan Branch, utilization ranges from 91% to 46%. On the Shore Line East Branch, utilization ranges from a high of 113% to a low of 22%.

Many towns which control these parking facilities issue parking permits for reserved spaces. Because each parking permit holder does not use the space every day, it is common practice to over sell parking permits: more permits are sold than there are spaces. The level of permits issued must be constantly monitored to insure that spaces are available for all permit holders.

Factors Affecting Ability to Meet Demand For Parking

- Availability of land. Most of the easy options for expanding parking capacity have been exhausted. Undeveloped parcels suitable for parking expansion in reasonable proximity to New Haven Line stations are extremely limited. Significant expansion of rail parking will require either parking structures or conversion of developed land.

- Public opposition. In a few places, where parcels are available for surface parking expansion, the Department has encountered local opposition to its efforts to expand parking on such parcels. Local opposition to parking structures also has been very strong and local concern about losing taxable property to public transit use has been expressed.

- Cooperation of towns in which rail stations are located. The cooperation of towns along the New Haven Line will be necessary to carry out the parking expansion proposals contained in the report entitled, 1996 Report On New Haven Line Parking Expansion. Residents in the towns and cities in which New Haven Line stations are located must develop an understanding of the importance of the New Haven Line as a regional transportation resource. They must understand and accept the fact that New Haven Line stations exist to serve the regional transportation demand and are not the sole resource of the community in which they are located.

- Funding. The federal Congestion Mitigation and Air Quality (CMAQ) program and State bond funds are the primary sources of funds for New Haven Line parking projects. If the CMAQ program were funded at a substantially reduced level, rail parking projects would have to be deferred or eliminated since sufficient funds cannot be reprogrammed from higher priority projects to meet the demand for expanded parking.

- Use of Parking Lot Revenues. The lease agreement with the towns for stations and parking provide for no lease payment to the State, however, all revenues generated by the facilities that are not used for the operation and maintenance are deposited in a "Reinvestment Fund". This fund is to

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be used, with the State's approval, for improvements to the station buildings, station services and parking facilities at each location.

5. FACTORS AFFECTING ABILITY OF RAIL PASSENGER SYSTEM TO MEET CURRENT AND FUTURE DEMAND

A number of factors affect the ability of the rail passenger system in Connecticut to meet current and future demand. They are as follows:

Availability of Parking.. The availability of parking is a factor for all rail commuters. However, the availability of parking for the intrastate rail commuter or the occasional user is a significant factor in selecting rail as the means of travel. After the AM peak, spaces are often limited. Given the traffic congestion and cost to park in Manhattan, driving is seldom considered as a viable option for the Manhattan commuter. Generally speaking, the more captive Manhattan commuter will go to greater lengths to access a New Haven Line station (i.e. ridesharing, kiss and ride, shuttle service from satellite lots).

Cost of Parking at Rail Stations. The cost for parking is a factor for all rail commuters. However, the cost to park may often be less a factor for Connecticut commuters destined for Grand Central Terminal than for intrastate commuters since the parking fee represents a greater percentage of the total trip cost for intrastate commuters. The intrastate commuter is not generally considered to be a captive rider and is more sensitive to the trip cost, including parking fees. The total trip cost must be considered by the Department when developing strategies to attract commuters from I-95 and the Merritt Parkway.

Management Arrangements For the Parking Facilities. As is the case with New Haven Line station management, in most cases station parking facilities are owned by the Department and leased to the city or town in which the station is located. Parking fees and regulations are established by the affected municipality subject to the approval of the Department. The Department has no authority to regulate those station parking facilities which are privately owned.

Availability of Public Transportation Service at Rail Stations. Most major rail stations (Greenwich, Stamford, South Norwalk, Westport, Bridgeport and New Haven) are well-supplied with connecting bus service. In areas served by fixed-route bus service, feeder/distributer bus service is coordinated with trains particularly in the peak hours. Schedules of Metro-Morth trains are subject to change every four months and are typically coordinated with other carriers. This means that there are almost always buses ready to meet trains. There is a need to have a high profile marketing of the availability of train and bus connections during these times.

Funding. To provide more bus service to rail stations by increasing the operating hours of fixed-route bus services, the transit districts and the CT TRANSIT would require additional funding from the state or local sources.

Comfort of Waiting Areas. The waiting areas at some stations are not enclosed or heated. This situation may deter people from using these facilities in inclement weather and having them attain full intermodal capacity.

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ADA accessibility. Several of the passenger train facilities have not been renovated or upgraded to meet the new requirements of the Americans with Disabilities Act. However, this upgrading is scheduled and will be accomplished to meet federal mandates.

Transit Funding Policies. On May 22, 1998 the House and Senate approved a six-year reauthorization act referred to as the Transportation Equity Act for the 21st Century (TEA-21). On June 9, 1998, President Clinton signed the bill into law. For fiscal years 1998-2003, TEA-21 authorizes $42 billion for transit and at least $175 billion in highway funding.

Though the basic program structure remains unchanged, numerous TEA-21 modifications will affect funding strategies for the construction and maintenance of transit facilities and equipment. For example, TEA-21 eliminates operating assistance for urbanized areas with populations over 200,000. Urbanized areas with populations under 200,000 remain eligible for operating assistance with no limitation at a 50-50 ratio. To mitigate the impact of the elimination of operating assistance to large urbanized areas, TEA-21 adds preventive maintenance for facilities and equipment to the list of capital expenditures allowable under the formula program. There is no cap on the amount of funds that can be used for preventive maintenance, but the use of preventive maintenance funds is a dollar for dollar drawdown on capital funds.

In addition, one percent of formula funds distributed to urbanized areas with 200,000 or more people must be spent on transit enhancements. Such enhancements include historic preservation, rehabilitation, and related activities; bus/rail shelters; landscaping; pedestrian access and walkways; bicycle access and storage; signing; and enhanced access to transit for persons with disabilities.

6. ABILITY OF RAIL PASSENGER SYSTEM TO MEET CURRENT AND FUTURE DEMAND

ConnDOT's Public Transportation Management System. The rail passenger system in Connecticut is able to meet current and future demand. Performance measures, developed as part of ConnDOT's Public Transportation Management System, have been established to ensure that all transit assets are managed and monitored to provide safe, reliable, and efficient public transportation. The performance measures include on-time performance and seat availability. When ridership increases above pre-determined levels contained in the seat availability performance measures, schedules are reviewed and analyzed. Based on these reviews and analyses schedules, bus schedules or rail consists and or schedules are adjusted accordingly to ensure that safe, reliable and efficient public transportation is provided.

ConnDOT, in cooperation with the RPAs and Transit Operators, has developed a comprehensive inventory of all transit assets. The inventory consists of a series of computerized data bases grouped by transit asset. Each data base contains specific information which is needed to properly monitor and manage the asset. For each type of asset in the inventory, information collected includes age, condition, remaining useful life, and replacement. This transit asset data is collected at a frequency and level of detail appropriate to the type of capital stock of the transit system.

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7. RAIL FREIGHT

Freight service in Connecticut is provided by the following railroads: Consolidated Rail Corporation (Conrail), Providence & Worcester Railroad Company, Housatonic Railroad Company, Springfield Terminal, Connecticut Southern Railroad, Connecticut Central Railroad, Branford Steam Railroad, New England Central Railroad and Central New England Railroad. The lines (tracks) on which these companies operate are indicated in **Table IV-E2** and on **Figures IV-E4 and IV-E8.** The locations of freight rail lines, major highways, intermodal freight hubs and intermodal freight junctions are shown on **Figure IV-E-9. Figure IV-E10** shows the locations of rail lines and intermodal freight facilities within a 100 mile radius of Hartford, Connecticut.

Usage. Most rail shipments entering Connecticut fall within a limited range of bulk commodities: crushed stone, lumber, rolled paper, steel, chemicals, and waste products. The manufacturing and distribution companies who currently receive these goods by rail accept significantly longer shipment times than would be required for truck shipment of their low-value, non-time-sensitive raw materials and products. Shipments from the west are generally routed via Selkirk, NY, then pass through either Conrail's Oak Point Yard in New York City, or its West Springfield, Yard, before reaching much of the state's rail network.

In recent years, annual rail shipments originating or terminating within the state have amounted to 50,000 carloads carrying about three to four million tons. More detailed information on rail freight traffic in Connecticut is presented in the 1996 State of Connecticut Rail Plan Update.

8. FACTORS AFFECTING DEMAND FOR RAIL FREIGHT SERVICE IN CONNECTICUT

The following factors affect or have affected the volume of freight transported in Connecticut by rail:

- Freight Rail Access. The dearth of Hudson River rail crossings makes through shipping of freight impractical for many commodities and products.
- Small Size of State. The strong competitive position of the trucking industry due to the short distances involved in movement into and through the state.
- Types and Sizes of Businesses and Services in Connecticut. The state increasingly is oriented to business and service activities which do not generate large volumes of freight. Cutbacks in defense spending have reduced output in this key industrial sector.
- Unbalanced traffic flows. Connecticut is a net consumer of goods. That is, we receive more commodities than we produce and ship out. In the future, however, the volume of goods shipped out via rail may increase.
- Competitive Access for Class 1 Carriers. It remains ConnDOT's position that the introduction of competitive rail freight access to southern New England is necessary to correct a historic competitive imbalance created by the longstanding regional dominance of a single Class I carrier. Not only would competitive access by one or more Class I carriers improve and increase local rail freight service, it would follow that such improvements would result in reduced truck traffic and improved air quality in the I-95 Corridor. While the conditions set by the STB in approving the CSX/NS transaction do not go as far as the conditions recommended by ConnDOT, the

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Department is optimistic that the specific conditions set for the region east of the Hudson River can achieve modest traffic congestion and air quality improvements in the I-95 Corridor. The following are highlights of the STB decision as it relates to Connecticut:

a. CSX and NS are required to monitor origins, destinations, and routings for the truck traffic at their intermodal terminals in northern New Jersey and in Massachusetts and report to the STB on a quarterly basis. With the STB retaining jurisdiction in the matter for a five year period, this monitoring will identify any increased truck volume in the I-95 Corridor and, hopefully, bring about additional conditions if the volume is increased.

b. CSX is directed to initiate discussions with the Providence & Worcester Railroad (P&W) regarding expanded P&W service between Fresh Pond, New York and New Haven. Though CSX and P&W have already executed a marketing agreement which provides P&W unrestricted revenue factors for the movement of general freight between New Haven and Fresh Pond, further discussions may effect even greater service expansions.

c. CSX is directed to cooperate with the "New York interests" in studying the feasibility of upgrading cross harbor float and tunnel operations to facilitate cross harbor rail freight moments to alleviate vehicle congestion and air pollution in New York City and along the I-95 Corridor east of New York City.

- The State and Regional Economy. The recovery of the New England economy from the recession of the early 1990's has been slow.
- Manufacturing Needs: The increase in the use of just-in-time delivery. This is a method by which manufacturing and transportation methods are coordinated to ensure that the materials needed for manufacturing are delivered to the plant just at the time they are needed. This requires a high degree of sophistication and cooperation, but it drastically reduces the amount of supplies needed to be kept on hand, thus limiting the amount of inventory and warehousing needed.
- Fundamental Changes in the Way Goods Are Manufactured, Shipped and Received. The weakening and dilution of the State's industrial base, and the shortening and tightening of the product stream have lead to fundamental changes in the way goods are manufactured, shipped and received. Rarely do plants receive rail cars full of materials to be converted into finished products, with all phases of manufacturing and assembly taking place under one roof. Rather, manufacturing is dispersed over several locations with any one plant having a limited role. And the changes in materials management, specifically, just-in-time delivery, mean that sites are getting smaller, more frequent deliveries of materials, and are doing the same with their outbound shipments.
- Location of Rail Freight Routes and Intermodal Terminals in Adjacent States. One of the major container ports in the world, and one of the largest intermodal rail yards in the country are located in northeastern New Jersey, within one hundred miles of central Connecticut. A major intermodal yard with connections to the west is located just over the State line in West Springfield, Massachusetts. The close proximity of these facilities to business and industries in Connecticut and the fact that Connecticut does not have a direct freight connection to the western and southern United States (The main rail line for New England is the Boston to Albany Line that runs through southern Massachusetts, within ten miles of our border.) results in a significant percentage of the goods originating in or destined for Connecticut being handled at these intermodal facilities and transported to or from Connecticut locations by truck.

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- Rail Connections to Ports. The lack of a direct rail connection to the port of New Haven continues to require drayage of commodities by some shippers using that facility. Although the new Tomlinson Bridge across the Quinnipiac River will have a rail line, the existing rail line along Waterfront Street in the port area is old, in disrepair and does not provide the specifications needed to use modern railroad equipment. The City and the regional planning agency are meeting with the port operators and the local electric company to design and plan for development of an adequate rail connection to the port terminals.
- Clearance Problems. There are some vertical clearance problems on the line between New York City and New Haven. Many of the highway bridges that cross the rail line leave inadequate clearances for certain types of equipment to safely operate under the electric catenary system.
- Freight Trackage Rights Fees. High Amtrak freight trackage rights fees discourage railroads such as Guilford Rail Systems from providing more service to Connecticut.

9. ABILITY OF RAIL FREIGHT SYSTEM TO MEET CURRENT AND FUTURE DEMAND

To compete effectively, rail freight must respond to customer service requirements. The existing rail freight service providers and the rail freight system in Connecticut presently are able to meet the service requirements of current and potential customers in Connecticut. Both the providers and system should also be able to meet future demand for rail freight service in Connecticut.

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Figure IV-E 8. Active Freight Railway Lines

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Figure IV-E 9. Intermodal Facilities - Freight Systems

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Figure IV-E10. Rail Lines and Intermodal Freight Facilities within 100 Miles of Hartford

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F. BIKEWAYS, WALKWAYS, AND TRAILS

1. FEDERAL POLICY AND GOALS

Congress, in passing the federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) recognized and provided support to develop bicycling and walking as integral elements of a multi-modal approach to transportation. This support continues in the Transportation Equity Act for the 21st Century (TEA-21). To implement provisions of the ISTEA and the TEA-21, the FHWA developed a new policy which places increased emphasis on bicycling and pedestrian modes of transportation. The FHWA has a goal to double the percentages of transportation trips made by bicycling and walking. The National Bicycling and Walking Study prepared by the FHWA reported that 7.2 percent of all travel trips are made by walking and 0.7 percent by bicycling. Using the 1990 census data for trips to work and nationwide survey data, it has been estimated that in Connecticut, 6.6 percent of all travel trips were made by walking and 0.37 percent were made by bicycling. Nationwide surveys also found that almost 50% of all trips are less than three miles in length. Given that three miles is well within the range of bicyclists, if not walkers, there appears to be a significant number of trips that could be switched from the automobile.

In addition to its goal to double the percentage of trips made by bicycling and walking, the FHWA also has a goal to reduce by ten percent, the number of injuries and fatalities to bicyclists and walkers. The FHWA reported that, in 1995 in the USA, 5,585 pedestrians and 830 bicyclists were killed in accidents involving motor vehicles and an estimated 84,000 pedestrians and 61,000 bicyclists were injured. In Connecticut for the same period, 48 pedestrians and 7 bicyclists were killed and 1,424 pedestrians and 1,030 bicyclists were injured in accidents involving motor vehicles.

2. CONNDOT'S ROLE

ConnDOT's role with respect to bicycle and pedestrian facilities largely has been determined by federal legislation. This legislation has encouraged states to develop bicycling and walking as integral elements of their transportation systems, requires states to develop bicycle and pedestrian elements and incorporate them into the transportation plans for the state. Additionally, as a condition of receiving ISTEA and TEA-21 funds, the states are required "to fund within the State department of transportation a position of bicycle and pedestrian coordinator for promoting and facilitating the increased use of non-motorized modes of transportation...." In 1998 Section 7 of Public Act 98-91 was enacted by the Connecticut Legislature to encourage bicycling and walking. This law states in part that the commissioner shall, whenever possible, encourage the inclusion of areas for bicycles and pedestrians when creating the layout of a state highway or relocating a state highway.

3. FACILITIES

The American Association of State Highway and Transportation Officials (AASHTO) defines "bikeway" as any road, path or way which in some manner is specifically designated as being open to bicycle travel. Generally there are three main classes of bikeways that are recognized: 1) bike path - a bikeway physically separated from motorized vehicular traffic by an open space or barrier

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and either within the right of way or within an independent right of way; 2) bike lane - a portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists; and 3) shared roadway - any roadway upon which a bicycle lane is not designated and which may legally be used by bicycles. In Connecticut, the majority of bicycling takes place on this third type of bikeway where bicyclists share the road or roadway with motorized vehicles. A map showing both on-road and off-road bicycle routes in Connecticut can be obtained, while supplies last, by calling the Department's Bicycle Coordinator at 594-2150.

The location, length, surface and status of off-road multi-use trails in Connecticut are listed in Table IV-F1. These trails range in length from .3 miles to 21 miles. Of the 26 off-road multi-use trails open (as of January 31, 1998), 17 are paved, 3 are gravel, 3 are dirt and 2 are stonedust. For additional information on these trails contact the towns in which they are located.

Presently, there are over 50 bicycle and pedestrian-related projects under various levels of design and construction in Connecticut. These projects are funded primarily by the FHWA under ISTEA's enhancement program and by the local communities in which the facilities are located.

OFF-ROAD MULTI-USE TRAILS

Location	Length	Description	Surface	Status
East Hartford	1.4 mi.	Multi-Use Trail Forbes St.-Spencer St.	Paved	Open
Htfd. - E. Htfd.	1.0 mi.	Charter Oak Bridge & approaches	Paved	Open
Cheshire	2.6 mi.	Farmington Canal Rail-Trail	Paved	Open
North Canaan	0.6 mi.	Bike/Ped path along N.Elm St.		Design
Plainville	2.0 mi.	Bike/Pedway along Northwest Dr.	Paved	Open
Middlebury	4.3 mi.	Trolley line conversion to Multi-use	Paved	Open
Manchester	4.1 mi.	Charter Oak Greenway along I-384	Paved	Open
Manchester	2.8 mi.	Capt. John Bissell Greenway along I-291	Paved	Open
South Windsor-Windsor	1.3 mi.	Seperate Bike/Ped path on Bissell Bridge	Paved	Open
Old Saybrook-Old Lyme	0.9 mi.	Seperate Bike/Ped path on Baldwin Bridge	Paved	Open
Killingly	0.3 mi.	Multi-Use Path along Quinebaug River	Paved	Open
Vernon-Bolton	5.9 mi.	Rail-Trail - Hop River-Rockville Spur	Stonedust	Open
Canton	16.0 mi.	Multi-Use Trail System		Planning
Coventry	1.0 mi.	Multi-Use Trail along Mill Brook		Planning
East Lyme	0.5 mi.	Bikepath/Boardwalk along Rte. 156	Paved/Wood	Open

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Monroe	4.5 mi.	Rail-Trail Pequonnock River Greenway	Dirt	*Open
Hamden	2.4 mi.	Farmington Canal Rail-Trail	Paved	Open
Hamden	4.5 mi.	Farmington Canal Rail-Trail		Const. '98
Killingly	1.0 mi.	Quinebaug Riverwalk Multi-use Trail		Planning
Madison	0.3 mi.	Tunxis Pond Bike/Pedway	Paved	Open
Norwich	1.0 mi.	Heritage Park along Yantic River	Paved	Open
Manchester	4.1 mi.	Charter Oak Greenway along I-384		Design
Madison	1.2 mi.	Hammonasset State Beach	Stonedust	Open
Putnam	2.0 mi.	Quinebaug River Trail		Design
Woodbury	3.8 mi.	Multi-Use Trail on former trolley line	Dirt	*Open
Simsbury	6.3 mi.	Farmington Valley Greenway	Paved	Open
Trumbull	3.7 mi.	Rail-Trail on former Housatonic R.R.	Dirt	*Open
Thompson	0.75 mi.	Riverside Park Trail	Paved	Open
Bolton-Coventry-Andover-Columbia	12 mi.	Hop River State Park Rail-Trail	Gravel	Open
Waterbury	0.7 mi.	Brass Trail		Planning
Middletown	1.0 mi.	Bike/Ped path Westlake section		Open
Windsor	1.0 mi.	Multi-Use Trail near town center	Paved	Open
Windsor Locks	4.2 mi.	Canal Towpath	Paved	Open
Windham-Chaplin Hampton-Pomfret-Putnam	22.1 mi.	East Coast Greenway	Gravel	Open
Plainfield Sterling	5.6 mi.	East Coast Greenway	Gravel	Open
Windham	0.5 mi	Multi-Use Trail near Rte. 6		Const.
TOTAL	127.35 mi.			

* These trails are open but have not yet been formally developed.

Table IV-F 1. Off Road Multi-use Trails

4. USAGE

The use of bikeways, walkways and trails has increased within the past ten years and may increase in the future as various trail segments are connected. The success of the Farmington Canal Rail-Trail in Chesire and the Captain John Bissell Greenway and Charter Oak Greenway (the multi-use trails along I-84, I-291 and I-384 in East Hartford and Manchester) can only serve to increase the public's demand for more of these facilities and for safer accommodations on the existing roadways. To increase the percentage of travel trips in Connecticut made by bicycle, bike lockers have been placed in commuter parking lots and at key bus stops. According to the Rails-to-Trails

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Conservancy, rails-with-trails is a growing trend in the 1990's and may be an important way for communities to provide auto-free pathways for transportation and recreation.

5. FACTORS AFFECTING DEMAND FOR AND USE OF BIKEWAY FACILITIES

As stated by the Litchfield Hills Regional Planning Agency, technological advances in bicycle design and changes in public attitudes are significant factors contributing to the renewed interest in bicycling. The development of lightweight, multispeed bikes has made modern bikes considerably easier to pedal than older models. This is particularly important in hilly areas such as the Litchfield Hills and Northwestern regions of Connecticut. Public attitudes in support of recreation, physical fitness, energy conservation, and other environmental inititiatives have contributed to the growth of bicycling.

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G. WATERWAYS

1. CONNDOT'S ROLE

The Connecticut Department of Transportation (ConnDOT) is engaged in the oversight and coordination of water transportation, as well as the actual operation of a water transportation service. ConnDOT's Bureau of Aviation and Ports is responsible for regulation of the State's harbor masters and harbor pilots; the operation of two Connecticut River ferry services and the operation of the Admiral Harold E. Shear State Pier in the Port of New London, one of three deep water ports in Connecticut.

2. CONNECTICUT RIVER FERRY SERVICE

ConnDOT's Bureau of Aviation and Ports operates the Connecticut River Ferry Service. This service comprises two separate, seasonal ferry services across the Connecticut River between the towns of Chester and Lyme and Rocky Hill and Glastonbury. These ferry services provide a necessary highway link across the Connecticut River between Chester and Lyme on Route 148 and between Rocky Hill and Glastonbury on Route 160. The ferries load directly from Route 148 and Route 160 where the roadways meet the river. The Chester-Hadlyme ferry service operates from April through November: the Rocky Hill-Glastonbury ferry service operates from May through October. Both services are operated seven days a week. Occasionally, however, service is temporarily suspended when the river is exceptionally high.

a) Use

The Connecticut River Ferry Service is used by both daily commuters and tourists but the predominate use is by tourists and residents for social and recreational trips. The numbers of crossings made and numbers of vehicles and passengers carried between FY1990 and FY1997 by the two ferries are shown in **Figures IV-G1 and IV-G2.**

The ridership is not projected to increase significantly. The capacity of these two ferries will continue to limit the overall daily capacity at each of these sites.

b) Ability to Meet Current and Future Demand

The Chester-Hadlyme ferry has a carrying capacity of 52 passengers and 9 vehicles. Vehicles up to 5 tons can be transported. Operating at full capacity, this ferry could carry approximately 1,000 vehicles per day.

The Rocky Hill-Glastonbury ferry, the nation's oldest continuously operating ferry service, has a carrying capacity of 21 passengers and three or four cars. This ferry would be capable of carrying approximately 500 vehicles per day operating at full capacity.

The Connecticut River Ferry Service has been maintained at a level which will enable it to continue to meet the demands of the traveling public. Each of the vessels is required to undergo periodic inspection by the United States Coast Guard, which ensures that the proper operational, manning and safety requirements are in place. The land site access at the Chester-Hadlyme ferry

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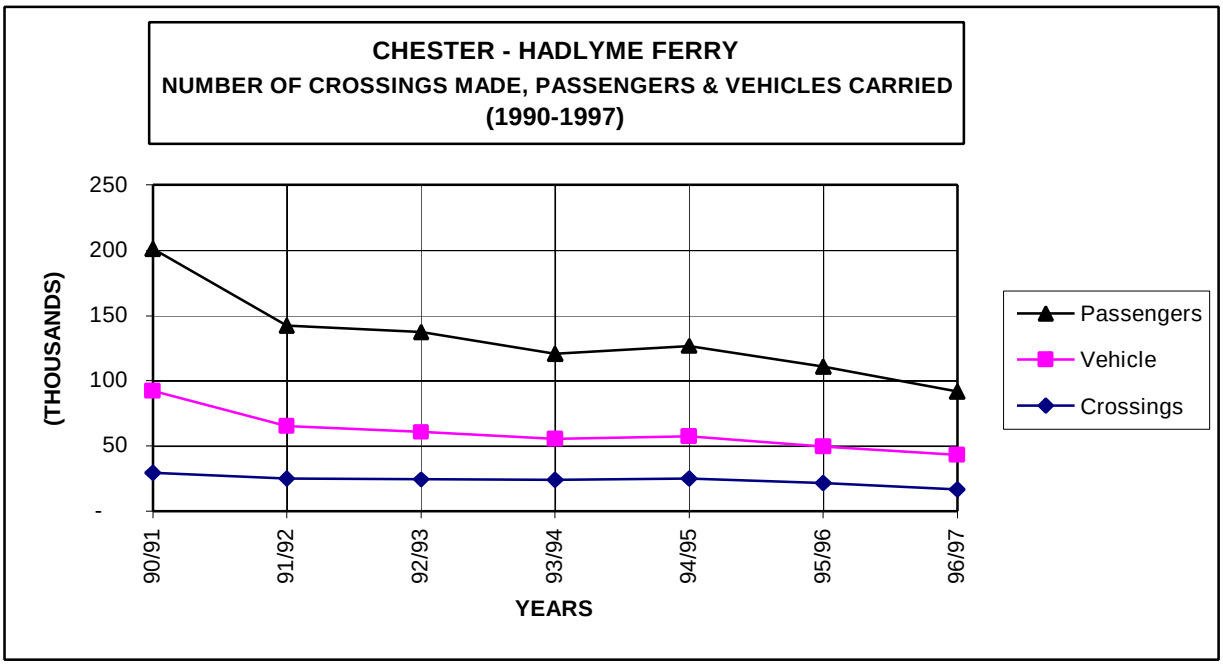

Figure IV-G 1. Chester-Hadlyme Ferry Use

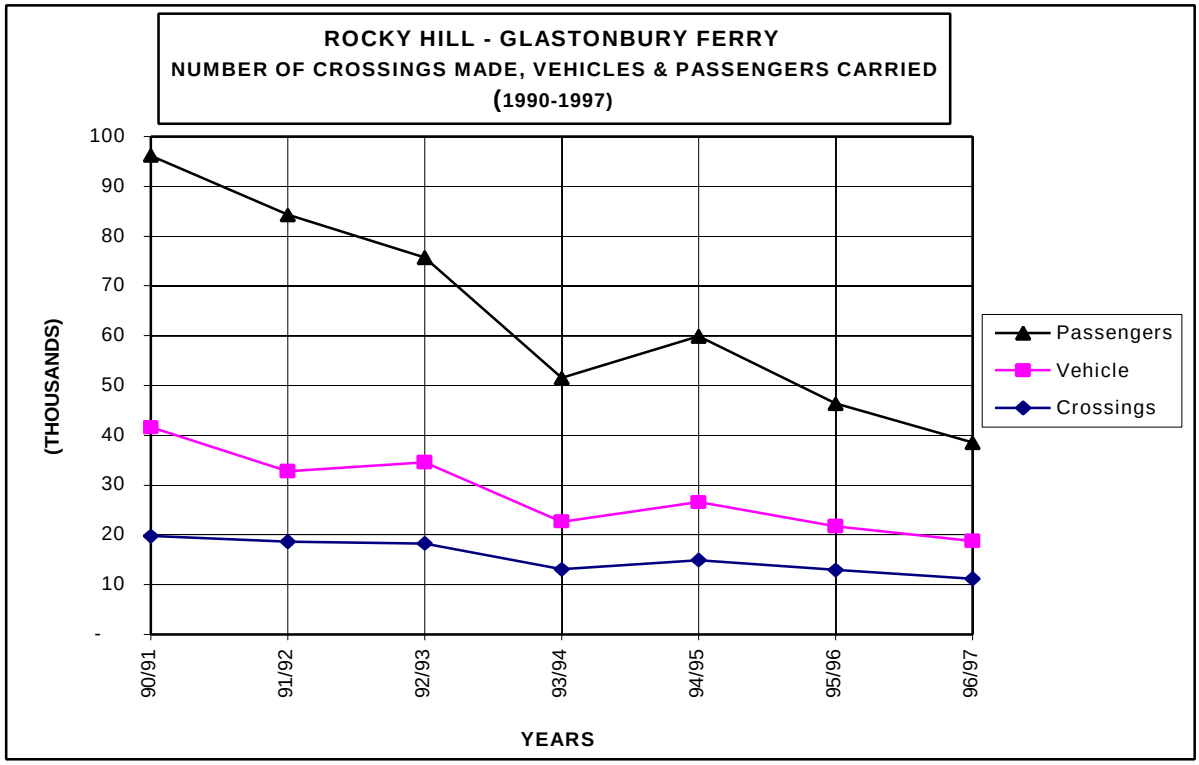

Figure IV-G 2. Rocky Hill - Glastonbury Ferry Use

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site was recently inspected and a project to replace and upgrade the existing ramps, pulley system and abutments is being considered for initiation.

3. ADMIRAL HAROLD E. SHEAR STATE PIER (STATE PIER)

The Admiral Harold E. Shear State Pier is located in New London, Connecticut in the upper part of New London Harbor. New London Harbor, the best natural harbor in Connecticut, is at the mouth of the Thames River which is near the east end of the Long Island Sound. Via the main entrance channel, the State Pier is approximately 3.8 miles from the deep water in the Long Island Sound. The location of the State Pier is shown in **Figures IV-G3 and IV-G4**.

ConnDOT's Bureau of Aviation and Ports, which oversees the contract operation of the State Pier, has initiated an agreement with a private stevedore, Logistec Connecticut, to manage the State Pier cargo operations for the next ten years.

a) Facilities

The State Pier has two berths alongside the 1000 foot concrete pier. The advertised controlling depth is 34 feet (MLW) alongside the east side. Additionally there is a Quay providing 500 feet of wharf space with controlling depths of 14 - 16 feet at MLW. Water is available on the pier. Electricity and sewer lines are available along with potable water at the Quay.

There is a 50,000 square foot warehouse available with a dry sprinkler system, and another 50,000 square foot warehouse is planned. Both warehouses will be equipped with truck loading doors. The facility currently offers approximately five acres of open storage.

An on-dock rail line will be connected to rail siding which provides connections via New England Central Railroad Inc. to Canada and the U.S. industrial heartland. Access will also be provided to a privately-owned railway yard with 150 car capacity.

In the spring of 1993 a portion of the pier collapsed under the weight of material stored there. Since that time, the State has invested in the infrastructure of the State Pier. Reconstruction of the East side of the pier was completed in November 1997. During the reconstruction, an on-dock rail line was built into the pier center. This line will be connected to the existing rail system in 1998, which will increase the market available to the shipping community through New London. The East side of the pier will be open to commercial shipping in the spring of 1998.

b) Use

Several different organizations are or will be using the State Pier facility. Logistec, Connecticut currently has a contract to operate a marine terminal at the pier facility for a ten-year period.

Cargo. Chemicals, wood pulp, corestock, copper, lumber and general cargo are all principal waterborne commodities targeted to be handled at the pier.

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A small area at the pier facility is leased to one of the pilot associations which operates two pilot boats from alongside the quay out to the pilot boarding areas. This agreement is in place for five-year intervals.

An undeveloped portion of the pier facility property, is leased to White Oak Corporation as an area for construction. This is a short-term, temporary lease. White Oak, Inc. is under contract to ConnDOT to construct a bridge over the Quinnipiac River in New Haven, known as the Tomlinson Bridge, which carries Route 1 and a freight rail. White Oak plans on using the leased areas to stage and connect steel members needed for the Tomlinson Bridge project. These large members will be transported, by barge, from New London to the construction site in New Haven.

The pier facility will also be used by the Mashantucket Pequot Tribal Nation as a terminal for their High Speed Ferry, Sassacus, and a second vessel which was launched in July of 1998. The Mashantucket Tribal Nation, through a subsidiary company, has leased property on a short-term temporary basis.

In addition to the activities already mentioned, several offices in the Administration Building have been leased to businesses for marine transportation support.

c) Future Use of State Pier

A study was conducted by ConnDOT to focus on the highest and best use of the pier facility owned by the State in New London. The "Transportation and Land Use Compatibility Study", revised forecasts for goods to be handled at the pier into the three categories as shown in **Table IV-G1.**

NEW LONDON STATE PIER
CARGO PROJECTIONS AND FULL TIME EQUIVALENT JOBS

Scenario	1994 Study Estimated Cargo Volume Potential (metric tons)	Current Update Estimated Cargo Volume Potential (metric tons)	1994 Study Number of Jobs (FTE)	Current Update Number of Jobs (FTE)
Low-range estimate	150,000	150,000	81	81
Mid-range estimate	350,000	250,000	174	125
High-range estimate	506,000	350,000	268	174

FTE = Full time equivalent Source: Fitzgerald & Halliday, Inc., 1997

Table IV-G 1. New London State Pier Cargo Projections & Full Time Equivilent Jobs

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d) Ability to Respond toCurrent and Future Demand

The "Transportation and Land Use Compatibility Study," pointed out that certain historic trends may preclude achieving the mid-range and high-range volumes shown in this table. These trends were defined as:

- The continued trend in the New London hinterland away from manufacturing.
- The continued trend toward containerization and larger vessels has drawn cargo business away from traditional breakbulk ports such as the Port of New London, to larger, load center ports.

The recently-selected terminal operator for New London, Logistec, Connecticut has not identified the estimated mid-range and high-range volumes as achievable short-term goals, particularly given potential cargo storage limitations at the site. In addition, only one side of the State Pier will be operational, which could pose some constraints on operation, particularly with achieving high cargo volumes.

e) Ability of State Pier to Meet Current and Future Demand

The State Pier facility is nearing a point at which it will adequately meet the demands of the shipping community for commodities that were traditionally handled through the port of New London. A project is underway which will destroy a dilapidated warehouse and replace it with a modern 50,000 square foot marine terminal style warehouse. This project will also connect the on-dock rail lines with the existing freight rail system, adding a new dimension to the intermodal interchanges available by allowing direct movement between ship and rail.

In order to meet the future needs for the shipping community, recommendations that were made in the recent "Transportation and Land Use Compatibility Study" will need to be evaluated and implemented. These recommendations include an increase in acreage available for the marine terminal; more warehouse facilities, including some refrigerated space; relocation of passenger ferry service and a formal segregation of traffic caused by the marine terminal and vehicles queuing up or parking for boarding the ferry.

There is also a need to consider a project to dredge to the maximum depth available alongside the pier. The trend in ocean shipping is towards larger vessels, in order to reduce the rates charged to shippers to move between sea ports. This issue of dredging is a sensitive one in many areas of the country, and in particular here in Long Island Sound for environmental protection reasons. There are several forums available for the public, commercial marine activities and environmental protection groups to discuss the concerns relative to dredging projects. Dredging, and the disposal of dredged sediment, is a topic which ConnDOT will continue to be confronted with, and strategies and policies for these projects need to be studied and constructed.

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4. CONNDOT'S FUTURE ROLE RELATIVE TO WATER TRANSPORTATION

One of the most important roles that ConnDOT must play in the future is one of coordination. The interest in developing commercial, recreational and scenic uses for Connecticut coastal property is at an all time high. Connecticut's port facilities, including the New Haven and Bridgeport marine terminals, traditionally have been operated by privately held firms. In recent years, however, some of the facilities have deteriorated, and the companies operating them have met financial difficulties which have prevented needed maintenance and upgrades from occurring. The State agencies involved with waterfront development -- the Department of Transportation, the Department of Environmental Protection, and the Department of Economic and Community Development -- are being asked to participate in the municipal planning of commercial port facilities and recreational ports. This participation has included review of municipal harbor management plans; review of regional transportation improvement programs; supporting municipal port district/authority initiatives; allocating funds for port access and commercial development.

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Figure IV-G 3. Map of New London Harbor

VIEW FIGURE IV-G3

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Figure IV-G 4. Map Showing Location of State Pier

VIEW FIGURE IV-G4

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