**Testimony of Mr. Arthur Gruhn, PE**
**Transportation Chief Engineer**

**Proposed 345kV Transmission Line (Segments 3 & 4)**

**1. Would you state your name, title, duties and responsibilities with the Connecticut Department of Transportation (ConnDOT)?**

- My name is Mr. Arthur Gruhn, and I am the Transportation Chief Engineer for the ConnDOT. I am a registered Professional Engineer in the state of Connecticut. My duties and responsibilities include the administration of staff and operations for the design, construction, reconstruction and maintenance of state highway network and engineering projects; develop, implement and evaluate bureau policies, goals and objectives; design and develop bureau programs and activities; implement new procedures and procedural revisions; direct testing of highway materials and execution of transportation contracts; determine appropriate staffing levels and direct management and coordination of staff; design and implement performance review standards for bureau staff; prepare bureau budget; maintain contacts with individuals within and outside of bureau who impact on policy or program activities, such as bureau heads, the Governor's Office, the Legislature, town officials, construction organizations, the general public, and answer questions regarding scope, funding, priority, scheduling and status of transportation program projects; act as engineering consultant to the Deputy Commissioner and other bureaus of the Department as needed; and serve as a chairman or member of various committees.

**2. Do you have any concerns about Northeast Utilities (NU) underground 345 kV proposals?**

- Yes. The ConnDOT has numerous concerns about the installation of high voltage transmission lines longitudinally within the right-of-way of State maintained highways. Let me summarize these as follows:

    A. Underground transmission lines are extremely costly to install, and future relocation or readjustment of these lines will likely be even more expensive than the original installation.

    B. The ConnDOT's infrastructure improvement program routinely impacts the various utilities that are present within the highway right-of-way. The ConnDOT typically reimburses the utility companies for engineering and relocation costs at a rate of 50% for unlimited access

highways and 100% for “limited access” highways. The extremely high cost of underground transmission line relocations or adjustments would add significant costs to the ConnDOT’s capital program.

C. The potential financial burden that relocation or readjustment to underground transmission lines would add to the ConnDOT’s infrastructure improvement program is of monumental concern. As such, the ConnDOT desires to enter into a formal agreement with NU, to ensure that the cost for future relocation or adjustments would not be eligible for reimbursement and the total cost would be NU’s.

D. The high costs associated with transmission line relocations or adjustments would, in and of themselves, cause certain ConnDOT projects to be canceled. In other words, if a relatively small transportation improvement project requires an adjustment to an underground transmission line, the high costs of the utility relocation may not be justified due to the high cost involved, especially when compared to comparable locations elsewhere, where no underground transmission line exists. Certain roadways in this state will be saddled with a physical feature that will limit feasible and prudent improvements that would normally be easily accomplished and funded.

E. The high costs associated with transmission line relocations or adjustments would, in and of themselves, cause certain ConnDOT projects to be delayed for several years.

F. The ConnDOT’s engineers view the presence of any existing utility as an obstacle that must be overcome or properly addressed during design. History has shown that very expensive utility infrastructure often becomes a major design control, and, as such, the actual design is significantly influenced by the presence of utilities. For example, the presence of an underground transmission facility could very easily limit changes made to the roadway profile. The resultant profile may not even meet design minimums, but may be the best that can be achieved when utility relocation costs are taken into account.

G. State-maintained roadways quite often handle high volumes of traffic. As such, the ConnDOT has routinely resorted to night construction, since the traffic volumes are typically much lower then. Any work that occurs within the State highway right-of-way that has an adverse effect on traffic flow would be subject to the same limitations and restrictions.

H. Underground transmission lines are spliced together at strategically placed junction chambers. Splicing operations can last for several continuous days. As such, the placement of these junction chambers is critical in terms of their effect on traffic flow.

I. Desirably, it is better from the ConnDOT's viewpoint to locate any underground transmission line outside the limits of the paved traveled way. Cutting the pavement to install or maintain a transmission line can measurably decrease the life expectancy of the pavement.

J. The depth of any transmission line is an issue that needs to be addressed. A review of certain Route 7 improvement projects reveals that an 8' installation depth (measured from the ground surface to the top of the utility conduit) would likely place the utility line in a position to avoid the majority of impacts associated with roadway cuts and drainage installations. It is difficult, if not impossible, to predict the scope of future roadway improvements. The deeper the installation, the less likely a future impact will occur from a transportation improvement project.

K. The ConnDOT may have projects within the limits of NU's underground transmission line proposals. Depending upon the level of design completion, NU should be subject to the following requirements:

   a. For projects that are in the planning phase or in preliminary design, NU should coordinate with the prime designer to minimize any potential conflicts.

   b. For projects that are in final design, NU should design their facilities to avoid improvements proposed by the ConnDOT.

   c. Any work that takes place within the ConnDOT's right-of-way will need an Encroachment Permit from the ConnDOT.

## 3. Would you define "limited access" highway?

- "Limited access" highways are defined as those that the Commissioner of Transportation, with the advice and consent of the Governor and the Attorney General, designates as limited access highways to allow access only at highway intersections or at designated points. This is provided by Section 13b-27 of the Connecticut General Statutes (CGS).

**4. Can you provide an example of limited access highways?**

- Yes. Interstate 95 and the Merritt Parkway (Route 15) are two examples of limited access highways. In both cases, access onto and off of these highways only occurs at selected locations or interchanges. This is done to exert a high level of control on vehicles entering or exiting the facility in order to improve safety, while accommodating a high volume of traffic flow.

**5. Does the ConnDOT have a list of "limited access" highways?**

- Yes. The ConnDOT has a list of all "limited access" highways. The information is contained in the report titled "2003 Limited Access State Numbered Highways," dated December 31, 2002. This report is updated annually and published by the ConnDOT. DOT Exhbitit 1.

**6. Does the ConnDOT have any established criteria concerning the installation of utilities with the ROW of "limited access" highways?**

- Yes. The ConnDOT has a publication titled "A Policy on the Accommodation of Utilities on Highway Rights-of-Way," dated April 1, 1977 (DOT Exhbiit 2) ,which is incorporated by reference into the Regulations of Connecticut State Agencies, Section 13b-17-17. This document contains definitive restrictions concerning the installation of utilities within "limited access" highways. A summary of these restrictions follows:

    A. Except for special cases, under strictly controlled conditions, new utilities will not be permitted to be installed longitudinally within the non-access lines.

    B. It is desirable that public service facility crossings shall be made at grade separation structures and not across the limited access highway.

    C. It is desirable that no poles or other aerial facilities shall be located within the right-of-way of the limited access highway or within traffic interchange areas.

    D. Utilities crossing between highway grade separation structures shall be placed underground on a line generally perpendicular to the

highway alignment, with manholes, other access points and appurtenances preferably located outside the non-access line.

E. All facilities passing under a limited access highway shall be constructed of durable materials, installed in such a manner as to virtually preclude the necessity of disturbing the roadways for the performance of utility maintenance or expansion operations.

F. Reasonable consideration shall be given for further expansion of utilities in the design of structures crossing limited access highways.

G. Access for normal servicing of a utility on or across a limited access highway shall be limited to (a) frontage roads where provided, (b) nearby or adjacent public roads or streets, (c) trails along or near the highway right-of-way lines connecting only to an intersecting road.

H. Emergency maintenance procedures and special maintenance which may be required within the non-access lines shall be allowed by permit only and under the terms of the agreement for the maintenance of public utility facilities crossing or located within the right-of-way of limited access highways.

**7. Why are the restrictions for "limited access" highways more stringent than for other State-maintained highways?**

- Safety and congestion are the primary concerns. Limited access highways typically carry high volumes of traffic at high speed. Access to these highways is tightly controlled and only allowed at specific points. Any construction or maintenance activity on roads of this type has the potential of disrupting the free flow of traffic and possibly compromising safety.

**8. On March 25, 2004, an event occurred on Interstate 95 in the City of Bridgeport that affected the I-95 bridge over Howard Avenue. Can you briefly describe the event and then offer your opinion on what would have occurred if a 345kV transmission line were physically attached to the underside of the Howard Avenue structure?**

- Basically, a vehicular accident occurred that resulted in the release of home heating oil. This oil ignited and burned for a long period of time. The heat from the fire destroyed the structural carrying capacity of the I-95 bridge

over Howard Avenue. The bridge sagged 3-4 feet since the steel beams softened due to the high heat that was produced by the fire. In fact, an overhead transmission line was damaged during the fire. Replacement of the line involved two days of work by a UI subcontractor. If a liquid-cooled 345 kV line had been involved, the replacement of this line would have taken a significantly longer period of time, possibly affecting the ability of the Department to re-open I-95 to traffic in a timely manner. Such a delay would have had a disasterous affect on the economy of the Bridgeport region and the northeast region due to the disruption of the vital I-95 transportation corridor.

- Now, if a 345kV line had been attached to the underside of this structure, one can only speculate how much worse it would have been. Would the high voltage present any undue safety hazard to the traveling public or to the emergency workers who responded to the emergency? Would the cooling liquid for the 345kV line have added to the fire? We really don't know the answer to these questions. However, we can speculate that the already difficult situation would have been more complicated and probably worse had a 345kV line been present.

  We should learn from history, and this event has added a new dimension to the prospect of installing a 345kV transmission line within any transportation corridor.

**9. If you had the choice of installing an underground transmission line longitudinally within the right-of-way of a State maintained highway versus a town road, which choice would you make?**

- Generally speaking, State-maintained highways carry high volumes of traffic at higher speed, and are the most likely to be widened, improved or reconstructed. On the other hand, local roads are quite often lower volume roadways, carrying traffic at lower speeds, and are less likely to see major changes due to reconstruction. Therefore, my choice would be to use a local road whenever possible.

**10. Is there any existing longitudinal underground transmission line facilities within the State highway right-of-way? Can you briefly describe these installations?**

- Yes, currently there is a 115 kV underground transmission facility owned by the United Illuminating Company (UI) in the City of New Haven on Water Street (U.S. Route 1).

**11. Did this 115 kV underground transmission facility pose any substantial issues (hardships) to its State highway project?**

- Initially, the answer was yes. The preliminary drainage design created a situation in which all utility facilities were going to see substantial utility conflicts. However, ConnDOT's greatest concern was the impact to the 115kV underground transmission facility, and the primary concern was the cost. The initial cost estimate from UI for the relocation of this transmission facility was between $2,000,000 and $2,500,000 (approx. 1,300 feet). This translates to a cost of approximately $1,300 per foot! This portion of U.S. 1 is a "not limited access" highway, However, UI would have been reimbursed 100% of its engineering and construction costs since the State highway project was initiated under I-95 which is a "limited access highway". In essence, this had the potential of escalating the net total cost of the State highway project significantly. After many weeks of review, analysis and design, a drainage design was developed that eliminated the need to relocate the 115kV underground transmission facility. In this case, a tremendous financial burden to the State and its taxpayers was averted. However, one must be acutely aware that the installation of miles of underground transmission lines will inevitably be a financial issue for the ConnDOT to contend with.

**12. Does the Department have any concerns about the impact on the Department's systems, such as traffic signals?**

Yes. The operation of the traffic signals along the proposed path of the 345kV line will certainly be effected. The vehicle detectors and their homeruns, conduit, and any other equipment in the path of the underground line will need to be relocated or replaced. The potential problems in the operation of the equipment that controls the intersection timing, the communications to the intersections, and the L.E.D. lamps are all unknown territory. The applicants will have to insure that the design and operation of the system meet all the requirements so as to not effect any user equipment adjacent to the 345kV line path.

**Testimony of Charles F. Roman**

Director of Fiscal/Special Projects for the Department of Transportation

**Proposed 345kV Transmission Line (Segments 3&4 – underground)**

The 345kV transmission line is being proposed along Routes 1, 7, 57, 123, 130, 809 and I-95 as well as local roads.

**13. What are your concerns regarding the proposed transmission line?**

My concerns with regard to the construction of the proposed transmission line relate to the financial impacts on the Department of Transportation and its mission to provide a safe, efficient and cost-effective transportation system that meets the mobility needs of its users.

**14. Why does the proposed construction of the transmission line have a financial effect on the Department of Transportation?**

Although the Department does not participate in the cost of the construction of the transmission line, the Department is concerned about the possible costs associated with reimbursing the Utility Companies for relocating their facilitates when they are impacted by a Highway relocation project. Because the estimated cost associated with an impact on the proposed transmission line is significantly greater with proposed facilities than facilities currently in use, there will be a financial effect on the Department.

**15. Will the Department have difficulty in absorbing the additional costs associated with Utility reimbursements related to the proposed transmission line?**

The Department has currently identified a wide variety of locations within the State that are programmed for roadway construction in the years to come. These projects have been selected because they will reduce accidents and congestion for the traveling public by providing improvements in safety and efficiency. Funds for design and construction are obtained from the Federal Highway Administration (FHWA) supplemented with State funds, and are not anticipated to significantly increase in the near future. Although the Department's program is very dynamic, a comparison of the projects currently programmed for construction with the available funding reveals that the Department has identified improvements within the State that significantly exceed our anticipated funding levels. The task of determining which projects can go to construction and which must be delayed until adequate funding is available is always a difficult one for the Department. Increases in the amount the Department expends for reimbursements to Utilities will exacerbate the situation and will directly reduce the funding available for other projects. See attached "Grouped Project Report"

**16. What is the estimated financial impact to the Department with regards to future construction projects planned in the area of the proposed transmission line?**

A cursory review of the construction currently scheduled by the Department in the area of the underground transmission line, identifies at least 17 intersections where construction may impact on the proposed underground transmission line (see attached). Estimates provided by our Utility Unit of an average cost of $2 million per conflict with the transmission line and two conflicts per intersection result in an estimated additional cost to identified projects of $68 million, with the Department's share being 34 million for the proposed route. As stated in the previous answer, this will have a direct effect on the amount of construction the Department will be able to undertake. If for example, the Department decided to absorb the estimated additional costs by reducing the amount of roadway resurfacing it performed, the result would be that up to 388 miles of roadway would go unpaved.

**17. Would you like to summarize the financial impacts to the Department associated with the construction of the proposed transmission line?**

The answers presented to the previous questions identify that the construction of the proposed underground transmission line will have a significant financial effect on the Department. The additional costs the Department will be required to pay for utility relocation will directly effect the amount of construction that can be performed. Whether the Department chooses to absorb the additional costs by reducing resurfacing, or eliminating some of the intersection improvement or bridge rehabilitation projects, there will be an impact on it's overall mission to provide a safe and efficient transportation system.

**Testimony from Keith R. Lane, P.E.**
**Director of Research and Materials**
**Connecticut Department of Transportation**

**Proposed 345-kV transmission line for Docket 272**

The installation of the proposed 345-kV High Pressure Fluid-Filled line (HPFF), Middletown to Norwalk, will affect the condition of various State Roads (SRs). To assure the serviceability of Connecticut Department of Transportation CTDOT SRs, the following questions need to be addressed.

**18. How will trenching, patching, and final restoration be accomplished.**

Daily trenching and patching of areas will be performed on a daily basis in accordance with all CTDOT specification. At the conclusion of a section, as determined by CTDOT, NU shall restore pavement surfaces full lane width, or curb to curb, by milling and

replacing a minimum of 2 inches of Hot Mix Asphalt (HMA); specific mix will be determined by the traffic level for each section. All materials used for this item shall comply with the Form 814A and latest supplemental specifications and be approved by the DOT prior to their use. Traffic pavement marking shall also be restored as per form 814A and latest supplemental specification.

## 19. How will road restoration requirements be incorporated?

Indications by NU, are that most of the underground portion will be under the pavement surface throughout its installation. NU has indicated throughout their application that they will restore all disturbed SRs to the same or better condition than encountered using only approved methods and materials.

The CTDOT requires that all roadways where this transmission line will be installed be restored in accordance with Form 814A, the latest supplemental specifications and applicable special provisions.

## 20. How will Quality Control by NU, or the Contractor, be provided?

Thirty days prior to trenching any SRs, a quality control plan shall be submitted to the DOT for review and approval. The QC plan shall include all aspects of construction activities and use of quality materials, including but not limited to welding operations, the method of transportation and disposal of all sub-grade & sub-base materials from trenching, details of method of refilling trench, providing elevations of flow-able fill or other suitable sub-grade up to 19 inches from bottom of bound layer (or thickness required to match pre-existing roadway conditions), providing required compaction of processed aggregate base (PAB), and the use and proper placement of HMA mixtures to bring trench up to grade, and finally mill and pave full lane width or curb to curb.

## 21. Will NU be required to notify and receive pre-approval of materials, mix designs and contractor personnel?

Unbound layer materials: All sources for unbound materials (sub-grade, sub-base, PAB, flow-able fill, etc.) shall be pre-approved by CTDOT and tested for physical properties for determination of in-place density, as needed, in accordance with the NU Quality Control Plan. If existing native materials are to be reused for trench backfilling, NU shall ensure that materials are free from any contaminants or injurious materials and conform to the specification requirements for which they are intended

Flow-able fill: If flow-able fill is to be used, NU, or their representative, shall provide a mix design to the DOT for review that meets the requirements of NU and provides similar permeability characteristics as insitu materials.

Welding of steel pipes: Prior to welding of any item including plates, pipe, etc., NU shall ensure that all welders conform to all applicable American Welding Society (AMS) and American Society Mechanical Engineers (ASME) criteria as stated in the QC plan. All welders and applicable AWS and ASME certifications shall be provided to the DOT.

Precast items: The facility used for the manufacture of pre-cast items shall be a CTDOT approved fabricator. Pre-cast items used in this project shall be manufactured in accordance with DOT specifications Form 814A prior to incorporation into roadway.

Density of unbound layers: All compaction of unbound layers shall conform to CTDOT specifications Form 814A when compacted in 6 inch layers as required to bring elevations to bottom of bound layer grade.

## 22. Will NU be required to provide inspection and documentation of all work?

NU, or their representative as per their Quality Control Plan, shall ensure that inspection and testing of all materials is in compliance for State roadways in accordance with the Form 814A and latest supplemental specifications. All inspections and testing reports shall be provided to the CTDOT during the progress of the project.

## 23. How will the heat generated by the cables affect the pavement structure?

A differential in the pavements environmental conditions, heat and moisture, affect the structural performance of that pavement. A frozen pavement structure responds differently than a non frozen pavement. Pavements perform well as long as all factors influencing the pavement are uniform. If one half of the lane is frozen and the half is thawed then forces induced by the differential in moisture and temperature will adversely affect the pavement performance. NU needs to provide information on the temperature dissipation and the environmental effect the condition transmission lines have on the pavement

structure. We, CTDOT, can then assess the impact within the pavement structure.

### 24. What specific detail will be followed by NU for trench backfilling?

NU will restore all roadway pavements to match preexisting layouts of all specific unbound and bound layers. The following diagram shall be followed, unless otherwise approved by CTDOT.

| Existing Pavement | Typical thickness | Typical Patching for Trench Backfilling |
|---|---|---|
| **Bound Layer-Class 1 (or equivalent) or Concrete** | 1-1/2 to 3 inches | Restore with HMA to match existing site conditions with equivalent materials as approved by CTDOT |
| **Bound layer- Class 4 (or equivalent) or Concrete** | 3-1/2 to 8 inches | |
| **Processed Aggregate Base or Subbase** | 8-16 inches of various approved materials | Restore to minimum of 10 inches in two lifts |
| **Subgrade** | Site specific | Restore with approved backfill material or flow-able fill to 19 inches from final grade |

**Testimony of Pat Rodgers**
**Department of Transportation Office of Maintenance**

Proposed 345kV Transmission line (Segments 3 & 4)

**25. What is the role of the DOT office of Maintenance relative to utility work on state highways?**

The office of Maintenance is responsible for the issuance of encroachment permits, which allow the use of the state highway right of way by other than the DOT for other than travel purposes. This would include the aerial or buried installation of utilities.

**26. What governs encroachment permits?**

The Highway Encroachment Permit Regulations of 1992.

**27. What is the DOT attempting to accomplish through the encroachment permit process?**

To ensure the safety of the travelling public during and after utility construction work, and to ensure that the taxpayer's investment in the highway infrastructure is not compromised by utility construction activity.

**28. How is this accomplished?**

By requiring anyone wishing to occupy the state highway right of way to apply for and be issued an encroachment permit and inspection of permitted work.

**29. What is the relationship between the encroachment agreement and the encroachment permit?**

The encroachment permit allows for the construction of the facility and the restoration of disturbed areas of the state highway right of way. The encroachment agreement defines in more specific detail the terms of existence of the encroachment, particularly with respect to relocation.

## 30. What is the process by which a utility company receives an encroachment permit?

An Application for Permit is filed with the District Maintenance Director of the maintenance district in which the work will take place. The application shall include between three and ten sets of detailed 40 scale plans showing plan and profile views. The plans shall indicate the exact location of the proposed work in relation to features in and along the highway right of way such as property lines, pavement markings, sidewalks, curbs, trees, intersecting streets, drainage facilities, traffic control appurtenances and other existing utilities. The plans shall be detailed to the extent that the DOT can determine the exact locations of various segments of the work. Work zone traffic control (maintenance and protection of traffic) must be included as well as standard details for various construction methods.

The DOT will conduct a review of the plans and require revisions if the planned materials or methods of construction are not in conformance with those established by the DOT as acceptable or are in conflict with the goals of the DOT as stated in A4. The applicant must revise the plans to address the DOT's concerns and resubmit them to the District Maintenance Director. The DOT will work closely with the applicant during the review process to ensure that the plans are approved as expeditiously as possible. Once the plans are approved, an encroachment permit can be issued.

## 31. What establishes acceptable materials and methods of construction?

The Highway Encroachment Permit Regulations, The DOT Standard Specifications for Roads, Bridges, and Incidental Construction, and various other publications and manuals.

## 32. What type of standard details need to be included in the plans?

Typical detail sheets should include erosion and sedimentation control plan, maintenance and protection of traffic plan, trench cross section, temporary and permanent trench pavement, roadway milling and resurfacing, pavement marking, drainage and guiderail replacement, and any other aspect of the construction that would impact the state highway right of way.

## 33. What is contained in the actual permit?

The encroachment permit contains language allowing the permittee to perform work within the right of way for the sole benefit of the permittee or the permittee's agent. The permit will specify hours of work, traffic control personnel requirements, holiday work restrictions, and other language deemed necessary in order to protect the investment in the highway and those who use it. The application, the plans, and any other supporting documents are attached to the permit and are incorporated by reference into the permit.

### 34. Can work begin before the permit is issued?

No. Additionally, any pre-conditions of work, as stated by the DOT in its approval letter, permit, or pre-construction meeting, must be satisfied.

### 35. How long is the permit good for?

One year, however, the permit can be extended.

### 36. What role does DOT take during construction?

DOT will monitor and inspect the construction activity. We may require changes in material, equipment or workmanship if the above is not being carried out within the terms of the encroachment permit.

### 37. How long is the utility responsible for the facility?

The utility has continuing responsibility for the facility.

## Testimony of John F. Carey
## the Division of Traffic Engineering

## Proposed 345-kV Transmission Line (Segments 3&4 -underground)

### 38. What is the Division of Traffic Engineering and what is the function of the Division of Traffic Engineering within the Department of Transportation?

The Division of Traffic Engineering is a unit within the Bureau of Engineering and Highway Operations of the Connecticut Department of Transportation (DOT).

Traffic Engineering, located in the DOT headquarters in Newington, CT., is staffed by a group of Civil and Electrical Engineers. The Division's primary responsibility is to promote highway safety and efficiency. This is accomplished by the review of accident history and traffic volumes and through the implementation of appropriate remedial action.

The Division of Traffic Engineering evaluates the need for traffic control devices such as traffic signals, signs and pavement markings to improve safety and the flow of traffic on the state highway system. By evaluating accident history and traffic volumes, traffic studies supplied by commercial developers or by investigating concerns expressed by state and local officials and the general public, Traffic Engineering becomes aware of potential roadway deficiencies. Implementation of recommended action is accomplished through construction projects or by the Department's maintenance forces. The traffic-related design of those improvements is either performed or overseen by the Division's engineers. In addition, Department traffic engineers develop plans and specifications for construction and maintenance operations to ensure the safe and efficient flow of traffic through work zones and to protect the workers within these zones.

As a Department of Transportation, we are not only concerned with the through movement and safety of cars and trucks, but also the safety of pedestrian, bicyclists, public transportation modes, emergency vehicle movement and safe access to and from private developments and businesses.

**39. From a transportation perspective, describe the roadways being considered for the proposed routing of the underground 345-kV transmission line along US Route 1, Route 130, SR 809 and short sections of Routes 123 and 57?**

The new power line is proposed to be located underground along a 2.3 mile section of Route 1 in Norwalk, 4.23 miles in Westport, 2.88 miles in Fairfield and 1.79 miles in Stratford for a total of 11.2 miles. It will also traverse a 1.65-mile segment of Route 130 in Fairfield and Bridgeport a 0.75-mile section of SR 809 in Norwalk and a 700-foot section of Route 123 in Norwalk. There is an alternate path proposed that would be along Route 57 in Westport.

The area that the transmission line would traverse is a highly urbanized area with much commercial development and multiple curb cuts, both signalized and unsignalized, to access businesses. There are continuous sidewalks throughout

much of the length indicating pedestrian usage and quite a bit of the roadside is landscaped with well-maintained trees and plantings. There is also on street parking in some sections. Three sections of Route 1 found in Norwalk, Fairfield and Stratford, totaling 2.1 miles of the 11.2 miles are striped for 1 lane in each direction with turn lanes at signalized intersections. The remaining 9.1 miles are striped with two lanes in each direction with turn lanes at most signalized intersections. There are 61 signalized intersections along this section of Route 1. Of these, 14 exhibit a higher than expected accident rate. Additionally, there are 23 sections or unsignalized intersections along Route 1 in the project limits that also exhibit high accident rates when compared to similar sections.

The expected rate is determined first by categorizing the locations in question. Categories are broken down by the following characteristics; the number of lanes, signalized or unsignalized, length of the section, urban or rural. Next the number of accidents statewide that have occurred in areas that fall within a given category are tallied along with the volume of traffic of those areas. The expected accident rate is established by dividing the number of accidents by the volume of traffic. It is expressed in the number of accident per million vehicle miles traveled for a section of road and per million vehicles for intersections. Study sites with rates exceeding the expected rate are considered candidates for further review.

The Average Daily Traffic (ADT) for Route 1 varies considerably. Most of Route 1 along the proposed route has an ADT of 18,000 to 25,000 vehicles per day. However, there are sections in Stratford in the area of Route 110 with ADTs of 32,000 to 42,000 vehicles per day.

The 1.65-mile section of Route 130 is a four-lane roadway. One half mile is located in Fairfield while the remainder is in Bridgeport. The portion in Bridgeport is divided by a raised median with ornamental trees. Of the ten intersections that are signalized, six exhibit above average accident rates. Nine additional sections of Route 130 within the project limits also have a greater than expected rate of accidents. The ADT on this section varies from 15,000 to 26,000 vehicles per day.

SR 809 and Route 123 are both two-lane roadways with traffic signals at either end. The ADT on SR 809 is 8100 vehicles per day and 16,800 vehicles per day on Route 123. The entire 400-foot section of Route 57 in Westport exhibits higher than average accident rates with an ADT of 13,600 vehicles per day.

See “Table 2”

**40. Do you foresee any public safety issues with the proposed routing of the transmission line?**

YES. The sections encompass approximately 21.2 miles of heavily developed and congested state highways. Within these limits there are 53 intersections and sections of road that have higher than expected rates of accidents. This has been determined by comparing these locations to similar locations around the state. Twenty of those sites are signalized intersections. During the three-year period from January 1, 2000 to December 31, 2002, 3,443 accidents occurred on the state highways being considered.

It is a goal of the Department of Transportation to identify areas of the highway system that experience extraordinary accident history and to evaluate those locations in order to reduce the occurrences of crashes. The frequency of incidences along the proposed routing should also be of concern to the construction aspect of the transmission line. Accidents in the area would be expected to delay construction and prolong the impact to the area road network. A long duration of construction and the anticipated lane blockages that would result during maintenance would just exacerbate the conditions in an area already recognized for safety concerns. Such construction and its associated congestion could also hinder emergency vehicle response to such accidents.

**41. What future issues should be considered in the placement of the proposed transmission line along state roadways?**

Based upon computer modeling of projected traffic volumes, the level of congestion is not expected to decrease on these roadways. The Department of Transportation expects future construction of capacity improvements on these routes will be needed. The presence of the transmission line along these routes will complicate the design and construction of such improvements.

The potential for and significant time delays in future DOT projects is evident if the transmission lines require relocation in order to avoid conflicts with roadway improvements.

## 42. Could you explain what highway capacity is and if there is any potential impact to the capacity of the existing roadway system due to the proposed location of the transmission line?

Highway capacity is the maximum amount of traffic that can be carried through a highway at a given point. As capacity is approached, flow is reduced to a point where gridlock will occur.

Under normal circumstances, based upon existing conditions, sections of Route 1 and Route 130 within the limits of the proposed transmission line project, experience traffic volumes that exceed the capacity of the roadway. Based upon experience traffic volumes in Connecticut and in particular on these sections of Route 1 and Route 130, can be expected to grow in the future. However, right of way, financial and local constraints will limit the ability to make roadway improvements commensurate with the road usage demands. By 2025 many sections of the proposed transmission line routing that are not currently at capacity, will approach that threshold. Therefore, breakdown of traffic flow will be expected. Because of heavy traffic volumes, the work hours and allowable lane closures for construction and maintenance of the transmission line should be limited. If construction and maintenance activities are not restricted during the highest traffic hours severe congestion will occur, impeding emergency vehicles and the movement of goods and services as well as impacting local business and the economy. Additionally, when main thoroughfares are severely congested, motorists seek alternate routes around the blockage in an attempt to avoid delay. Therefore this diversion will affect an area much greater than just the proposed transmission line route. Consideration should be given to selecting a route with less volume, such as along local roads, and in turn less impact to the community.

## 43. What is incident management and how would it be affected by the proposed project?

Traffic incident management is the planned and coordinated program process to detect, respond to and remove traffic incidents and restore traffic capacity as safely and quickly as possible. This coordinated process involves a number of public and private sector partners including: Law Enforcement; Fire and Rescue; Emergency Medical Services; Transportation; Public Safety Communications; Emergency Management; Towing and Recovery; Hazardous Materials Contractors, and; Traffic Information Media.

At times when there is an incident on I-95, portions of Route 1 and Route 130 are used as a designated alternate route. In instances of a complete closure of I-95, those portions become diversion routes and carry the full volume of I-95 traffic. The Average Daily Traffic on I-95 in this area ranges from 112,000 to 149,200 vehicles per day. During those instances diverted volume, added to the already congested roadway network far exceeds capacity and it can take the roadway quite a bit of time to recover from an incident even after the blockage is removed.

Department records show that there was a need to activate the motorist advisory system within the limits of the proposed construction on nine separate occasions from January 2003 to February 2004. Such action is taken when the Department becomes aware of an accident or other event that results in the closure of one or more lanes of I-95. Along with displaying messages on the interstate, to make motorist aware of the incident and what alternate route to take, timing of traffic signals are adjusted to help move the increased volume of traffic. Often times, local or State police are needed to direct traffic at signalized and unsignalized intersections. In addition, State and local authorities put out signs indicating the detour route. The duration of implementation of this system can vary from two to five hours or more depending on the nature of the event. The oil truck crash and resulting fire in Bridgeport on the night of March 25, 2004 which closed I – 95 in both directions for several days and in one direction for almost a week, resulted in diverting an average of 120,000 vehicles per day off of the interstate to other roadways. Although an incident of such magnitude is uncommon, the after affects can last days or weeks. From the material reviewed to date, the Department has concerns about the utility contractor's ability to cease operations and restore the travel-way in a timely manner in the event of an incident.

The nine occasions of activation of the motorist advisory system do not reflect the times when motorists take it upon themselves to find an alternate route due to congestion unrelated to an incident. Although the Department does not have quantitative data to reflect the frequency with which that happens, experience has shown that it does occur. Along with the obvious inconvenience to motorists, the queues created by diverted traffic make it difficult to access business and services along the alternate route and can impede the movement of emergency vehicles.

**44. What are some of the issues the Department would like a contractor to consider in building the transmission line along the proposed route?**

Independent of the specific routing of the transmission line, it will be necessary for the contractor to maintain all existing traffic control signals, pedestrian traffic and pedestrian access, business traffic and business access during construction. Any guide rail, fencing, stone walls and landscaping along the roadside that is disturbed by the construction would need to be replaced in kind.

One of the Department's objectives is to maintain a clear roadside environment. Clear zone distances vary depending on roadway conditions, but the purpose is to provide an unobstructed, relatively flat area for run-off-the-road vehicles to recover. In urban areas an operational offset distance of at least 1.5 feet should be provided. Recognizing that the area of proposed work is in a highly urbanized area, during active construction, equipment and vehicles must be parked outside of the traveled way wherever possible. Construction equipment and vehicles may not be parked in the clear zone when the Contractor is not actively working unless they are adequately protected with guide rail or barrier and temporary impact attenuation systems.

Maintenance & Protection of Traffic (M&PT) plans and specifications are included in every roadway project. They are developed using information from the Manual on Uniform Traffic Control Devices and the Department's own standards. The purpose of the M&PT plans is to develop a concept for the safe and efficient movement of traffic through a highway or street construction zone. They include a written specification on how the contractor is to handle traffic during construction and plans that may range from in scope from a set of plans that describes every detail of traffic accommodation to the standard temporary traffic control plan sheets developed by the Division of Traffic Engineering. The scope of the M&PT plans depends upon the complexity and duration of the construction project. Since most of the proposed route is through a highly commercialized and congested area, the M&PT requirements would be significant and the development and review of those plans would mandate a high level of effort by Department staff. If the depth of the installation requires sheet piling, the sheet piling will constitute a fixed object in the roadway and therefore would require adequate protection. The sheet piling could also create a sightline obstruction that would need to be addressed. Temporary traffic signal revisions as well as policemen used for traffic control during construction will be required.

**45. Do you have any concerns with the proposed work hours for construction of the transmission lines?**

YES. Based upon the construction proposal for a similar facility in other parts of the state, the anticipated request for normal work hours would be 7:00 a.m. and

7:00 p.m. Monday through Saturday and the splicing process would be a continuous 24 hour operation lasting up to two weeks. It would be unacceptable to have construction activities during the peak traffic periods or continuous long-term lane closure on certain roadways for purposes other than an unavoidable incident. The Department's experience with unavoidable lane closure during peak hours and also with long term lane closures in high volume areas has shown that we receive numerous calls from the motoring public strongly expressing their dissatisfaction with the inconvenience. We would expect no less from a project of this magnitude. Based upon our experience, the motoring public would not tolerate such an inconvenience due to construction. The Department lacks sufficient staff to field the number of phone complaints that are to be expected and would require the applicants to address the concerns of the motoring public.

**46. Do you have any specific concerns regarding the sequencing of construction activities?**

YES, there are three specific items to focus on.

First, in Volume 1, section J.2.2, page J-14 of the utility company's proposal it is stated that "...plans would be devised for the temporary or permanent relocation of other facilities such as electric, gas, water, sewer, telecommunications facilities, utility poles, traffic signals, hydrants and bus stops." It is unreasonable to assume traffic signals could be relocated. Federal guidelines govern the placement of signal indications over the roadway so as to give clear indication to motorists. In many areas, right-of-way constraints and existing utilities both above and below the ground already create difficulties for the placement of traffic signal appurtenances. The depth of a foundation for a traffic signal support pole is 10 feet. The transmission line would need to be below that depth or beyond the area needed for pole installation.

Second, during construction, Volume 1, section J.2.2, page J-14 of the utility company's proposal states that "....most storage areas would be along a parking lane in the road. Storage needs are typically 5,000 square feet for every 1,000 linear feet of installation, equivalent to at least a city block." It is presumed that this storage area is in addition to the area needed for actual construction and the area required for deliveries by a special tractor-trailer with a truck-mounted winch and cable handling equipment. Storage of materials in the roadway will create a fixed object hazard, most likely block driver's sightline from roads and driveways and severely impact business in the area that rely on the parking for their customers.

The utility company's proposal requires a 40-foot wide work area for construction that includes a 15-foot wide permanent easement and a 25-foot wide temporary construction easement. It is unclear that the full roadway width in some areas is sufficient to accommodate all the contractor needs. Forty feet of pavement is equivalent to more than three travel lanes. This would virtually require the complete closure of the state highways in some areas, which would be unacceptable.

Finally, based upon Volume 1 Section J.2.1, page J-12 of the applicant's submittal the splicing process is a twenty-four hour a day, seven-day a week undertaking that can last 10 – 14 days per vault. Vaults are required every 2,000 feet along the approximately 24 mile underground route. That is approximately 64 vaults or 128 weeks (2 weeks per vault) of continuous closure while an enclosed structure or vehicle (tractor-trailer) is located on top of the vault.

**47. What should be considered regarding nighttime construction of the transmission lines?**

Due to the congestion normally experienced on these routes, the Department requires most construction to take place during off peak hours. In these areas, traffic does not normally subside to the level that would allow travel lane or shoulder reductions on the roadway until late in the evening. We know, from experience, that night construction will raise noise abatement concerns with the towns. Additional construction costs will result from the need for temporary illumination as well as increased labor costs due to the off shift work hours. The brightness of temporary illumination can also be a nuisance to residents in the area. It is anticipated that the Applicant can expect to encounter similar issues with regard to nighttime construction on this project.

**48. What traffic concerns do you have regarding future maintenance of the underground transmission line?**

Maintenance of the proposed transmission line poses the same types of traffic concerns as the original construction proposal. Manholes should be located outside the paved roadway so that lane and shoulder closures are not needed for maintenance purposes. Maintenance vehicles would need to be parked so that they do not block sightlines from drives and streets. Any blockage of the travel

way would be expected to cause severe backups, which would severely impact transportation and access to businesses and residences in the area. Seeking an alternate route along local roadways would reduce those impacts.

**49. Would there be any advantage to looking at local town roads for the underground installation of the transmission lines?**

YES. If underground is the preferable option for location of the 345-kV electric transmission lines through Stratford, Bridgeport, Fairfield, Westport and Norwalk then locations other than along state highways should be considered.

Traffic on local roads is not, generally, as congested as on Route 1 and other state roadways. Also, the need for future construction or reconstruction is reduced on local routes avoiding possible utility relocation costs in the future. Alternating one way traffic during maintenance of the cables is more feasible on local roads and there will probably be fewer conflicts with existing utilities, both now and in the future.

The Route 1 installation will have a major impact from a transportation perspective due to the congestion that occurs in that corridor. Most of the route is highly commercialized and construction and maintenance of the line will have a major impact on traffic and the economy of the area whenever the traffic is impacted. In addition, if alternate routes are utilized (i.e.: local roads) future impacts would be minimized for both the utility and traffic in the region.

In summary, the Department recommends locating the underground transmission line on roads other than state highways so as to minimize impact to traffic, the community
and the utility itself.

**TESTIMONY OF SOHRAB AFRAZI**

Transportation Principal Engineer of Utilities Section

**Proposed 345kV Transmission Line (Segments 3 & 4-underground)**

The 345kV transmission line is being proposed along Routes 1, 7, 57, 123, 130, 809 and I-95, as well as local roads.

**50. Is there a unit within ConnDOT which handles utility related issues?**

Yes, the function of the Utilities Section is to insure the safety of the traveling public, protect the operation and integrity of the highway system, and minimize the potential impacts on the present and future use of the state highway system.

**51. What are the responsibilities of the ConnDOT's Utilities Section in achieving this function?**

The Section's primary responsibility is to ensure that the transportation funds for utility relocation on state highway improvement projects are expended in a cost-effective manner, which will result in the relocation of utility facilities on a timely basis. Other responsibilities are to ensure compliance with current policies and procedures; develop cost sharing agreements between the Department and utility companies, provide expertise on complex utility proposals and cost estimates; and develop policies and procedures in conformance with state and federal laws, statutes and regulations.

**52. What are the rules and regulations that govern the decision-making process within the Utilities Section for the utility relocations and installations on state highway improvement projects?**

A Policy on the Accommodations of Utilities on Highway Rights-of-Way" – April 1, 1977 (see attached PDF file).

**53. What are the common causes for underground utility relocation?**.

**(1)** Changes to the profile of the roadway (cut & fill)
**(2)** Drainage modifications
**(3)** Rehabilitation and/or replacement of existing bridge and its foundation.

**54. What are the concerns to ConnDOT due to the proposed installation of the underground transmission facility?**

**(1)** The increase in the number of potential utility conflicts, based upon the depth of the proposed underground transmission facility and the possibility of being attached to or on bridge structures.

**(2)** The increased financial impact to the State on future state highway improvement projects as a result of this proposed underground transmission facility.

**(3)** Increase significant impact of material order and schedule delays to ConnDOT's construction.

The proposed underground transmission facility should be placed at a significant depth and not be on or attached to any bridge structures. Thus, the common causes associated with underground utility relocations would be virtually nonexistent. In doing so, the future financial implications to the utility company and the State, not to mention the restrictions placed on future state highway projects, may be eliminated or greatly reduced. This is a benefit that would be realized by the ratepayers and taxpayers in the state of Connecticut.

## Testimony of Greg Dorosh
## Regarding Contaminated Soils

**55. What percentage of soils excavated by the DOT during highway construction projects is contaminated?**

Answer: Five (5) projects along Route 1 between Orange and Norwalk indicate that 83% of the soils are contaminated. Please see the Contaminated Soils Summary – U.S. Route 1 Attachment. (Subsurface investigation reports are available if you need them).

**56. Utilizing existing DOT Contracts, what is the range of costs to treat or dispose of contaminated soils? Again, this should be based on the amounts contained in existing contracts that could be introduced into evidence as documentary support to back up the numbers.**

Answer: The following summarizes the range of costs to transport, treat and dispose of contaminated soils: Item No. 202315A Disposal of Controlled Materials.

| Standard Projects (U.S. Unit of Measure) | Unit | Unit Price $ | # Projects |
|---|---|---|---|
| Major Const. Projects (Over 1 Million) | | | |
| Bridge Construction & Rehabilitation | ton | $66.15 | 5 |
| Road Construction | ton | $51.59 | 3 |
| Transportation Facilities | ton | $54.54 | 10 |
| Railroad Facilities | ton | $54.84 | 5 |
| Minor Const. Projects (Under 1 Million) | | | |
| Intersection Improvements | ton | $48.00 | 1 |

The range of unit prices for disposal of controlled materials was obtained from a manual titled Connecticut Department of Transportation, Weighted Unit Prices, January 1, 2001 to December 31, 2003. This manual was prepared to provide weighted unit prices of highway construction items for the purpose of comparison and evaluation of cost trends, and the preparation of preliminary cost estimates. The weighted unit prices have been developed from bids on contracts awarded during the period of January 1, 2001 to December 31, 2003. This report can be accessed through the ConnDOT web site.

**57. Based upon the cost given in answer to question 2, what is the cost to dispose of the 18,773.33 cu. yds. (the applicants' 20% estimate) of contaminated materials?**

Answer:

| Standard Projects (U.S. Unit of Measure) | Tons | Unit Price | Cost |
|---|---|---|---|
| Major Construction Projects (Over 1 Million) | | | |
| Bridge Construction & Rehabilitation | 30,037 | $66.15 | $1,986,948 |
| Road Construction | 30,037 | $51.59 | $1,549,609 |
| Transportation Facilities | 30,037 | $54.54 | $1,638,218 |
| Railroad Facilities | 30,037 | $54.84 | $1,647,229 |
| Minor Construction Projects (Under 1 Million) | | | |
| Intersection Improvements | 30,037 | $48.00 | $1,441,776 |

NOTE: To calculate tons, multiply c.y. X 1.6 tons/c.y.
(18,773.33 c.y. x 1.6 tons/c.y. = 30,037.33 tons)

**58. In your professional opinion and based upon your experience with DOT projects as represented in your response to number 1, what percentage of the 93,866.67 cu. yds. to be excavated by the applicants would you expect to be contaminated? (Answer to Number 1 X 93,866.67 cu. yds.)**

Answer: 93,866.67 c.y. X 83% contaminated = 77,909.35 c.y.

**59. Utilizing the range of costs in number 2, what are your cost estimates to dispose of the contaminated soil you would expect to be contaminated as contained in your response to number 4? (Answer(s) to Number 2 X Answer to Number 4.)**

Answer:

| Standard Projects (U.S. Unit of Measure) | Tons | Unit Price | Cost |
|---|---|---|---|
| Major Construction Projects (Over 1 Million) | | | |
| Bridge Construction & Rehabilitation | 124,654 | $66.15 | $8,245,862 |
| Road Construction | 124,654 | $51.59 | $6,430,900 |
| Transportation Facilities | 124,654 | $54.54 | $6,798,629 |
| Railroad Facilities | 124,654 | $54.84 | $6,836,025 |
| Minor Construction Projects (Under 1 Million) | | | |
| Intersection Improvements | 124,654 | $48.00 | $5,983,392 |

NOTE: 83% contaminated x 93,866.67 c.y. = 77,909.35 c.y.
To calculate tons, multiply c.y. x 1.6 tons/c.y.
(77,909 c.y. x 1.6 tons/c.y. = 124,654 tons)

Attachments

## GROUPED PROJECT REPORT

*07-Apr-04*

| Project | Route | Town | Description | Phase | Program | Fiscal Year | Region | EST. ADV |
|---|---|---|---|---|---|---|---|---|
| 15- 296 | CT 130 | BRIDGEPORT | Reconst Under M-N Bridge | C | **STPA** | **2008** | 7 | TBD |
| 102- 285 | US 1 | NORWALK | Various Int Improvements - Operational Lanes | ROW | **STPZ** | **2006** | 1 | |
| 102- 285 | US 1 | NORWALK | Various Int Improvements - Operational Lanes | C | **STPZ** | **2007** | 1 | 3/21/07 |
| 102- 303 | RT 123 | NORWALK | Br#1664, Norwalk River | C | **STPA** | **2008** | 1 | TBD |
| 138- 211 | US 1 | STRATFORD | Int Improve @ W Broad & Noble | ROW | **STPA** | **2005** | 7 | |
| 138- 211 | US 1 | STRATFORD | Int Improve @ W Broad & Noble | C | **STPA** | **2007** | 7 | 12/13/06 |
| 138- 212 | US 1 | STRATFORD | Int Improve @ CT 108 & CT 113 | ROW | **STPZ** | **2005** | 7 | |
| 138- 212 | US 1 | STRATFORD | Int Improve @ CT 108 & CT 113 | C | **STPZ** | **2007** | 7 | 12/13/06 |
| 138- 221 | I-95 | STRATFORD | Br#135, Moses-Wheeler | C | **NHS** | **2008** | 7,8 | 8/13/08 |
| 138- 221 | I-95 | STRATFORD | Br#135, Moses-Wheeler | C | **NHS** | **2009** | 7,8 | 8/13/08 |
| 138- 221 | I-95 | STRATFORD | Br#135, Moses-Wheeler | C | **NHS** | **2010** | 7,8 | 8/13/08 |
| 138- 221 | I-95 | STRATFORD | Br#135, Moses-Wheeler | C | **NHS** | **2011** | 7,8 | 8/13/08 |
| 138- 221 | I-95 | STRATFORD | Br#135, Moses-Wheeler | C | **NHS** | **2012** | 7,8 | 8/13/08 |
| 158- 191 | US 1 | WESTPORT | Int Improve @ CT 136 | C | **STPY** | **2004** | 1 | 2/4/04 |
| 158- 192 | US 1 | WESTPORT | Various Int Improvements - Operational Lanes | ROW | **STPZ** | **2006** | 1 | |
| 158- 192 | US 1 | WESTPORT | Various Int Improvements - Operational Lanes | C | **STPZ** | **2007** | 1 | 3/21/07 |
| 158- 193 | US 1 | WESTPORT | Int Impr @ Grand Union & Turkey Hill | ROW | **STPA** | **2006** | 1 | |
| 158- 193 | US 1 | WESTPORT | Int Impr @ Grand Union & Turkey Hill | C | **STPA** | **2007** | 1 | 3/21/07 |

TABLE 2

| Town | Route | Mileage | | 2002 ADT | 2002 Pk Hr | Capacity | 2002 v/c | 2025 ADT | 2025 Pk Hr | 2025 v/c |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 1 | 15.69 | 15.78 | 17000 | 765 | 1358 | 0.56 | 21250 | 956 | 0.7 |
| 102 | 1 | 15.78 | 15.81 | 18200 | 819 | 1358 | 0.6 | 22750 | 1024 | 0.75 |
| 102 | 1 | 15.81 | 15.9 | 18200 | 819 | 1358 | 0.6 | 22750 | 1024 | 0.75 |
| 102 | 1 | 15.9 | 15.96 | 18200 | 819 | 1358 | 0.6 | 22750 | 1024 | 0.75 |
| 102 | 1 | 15.96 | 16.02 | 15100 | 815 | 1358 | 0.6 | 18875 | 1019 | 0.75 |
| 102 | 1 | 16.02 | 16.17 | 15100 | 815 | 679 | 1.2 | 18875 | 1019 | 1.5 |
| 102 | 1 | 16.17 | 16.45 | 17100 | 770 | 708 | 1.09 | 21375 | 962 | 1.36 |
| 102 | 1 | 16.45 | 16.54 | 17100 | 684 | 679 | 1.01 | 21375 | 855 | 1.26 |
| 102 | 1 | 16.54 | 16.62 | 23300 | 1111 | 1358 | 0.82 | 29125 | 1389 | 1.02 |
| 102 | 1 | 16.62 | 16.73 | 23300 | 1111 | 1358 | 0.82 | 29125 | 1389 | 1.02 |
| 102 | 1 | 16.73 | 17.16 | 23300 | 1165 | 2684 | 0.43 | 29125 | 1456 | 0.54 |
| 102 | 1 | 17.16 | 17.44 | 18400 | 894 | 1697 | 0.53 | 23000 | 1118 | 0.66 |
| 102 | 1 | 17.44 | 17.99 | 18400 | 920 | 1873 | 0.49 | 23000 | 1150 | 0.61 |
| 158 | 1 | 17.99 | 18.67 | 18400 | 920 | 1355 | 0.68 | 23552 | 1178 | 0.87 |
| 158 | 1 | 18.67 | 18.75 | 18400 | 960 | 1697 | 0.57 | 23552 | 1229 | 0.72 |
| 158 | 1 | 18.75 | 19.1 | 12500 | 675 | 1697 | 0.4 | 16000 | 864 | 0.51 |
| 158 | 1 | 19.1 | 19.23 | 12500 | 675 | 1578 | 0.43 | 16000 | 864 | 0.55 |
| 158 | 1 | 19.23 | 19.46 | 15600 | 842 | 849 | 0.99 | 19968 | 1078 | 1.27 |
| 158 | 1 | 19.46 | 19.52 | 15600 | 842 | 1697 | 0.5 | 19968 | 1078 | 0.64 |
| 158 | 1 | 19.52 | 19.57 | 15600 | 842 | 1646 | 0.51 | 19968 | 1078 | 0.65 |
| 158 | 1 | 19.57 | 19.83 | 21700 | 1172 | 1646 | 0.71 | 27776 | 1500 | 0.91 |
| 158 | 1 | 19.83 | 19.84 | 21700 | 1085 | 2595 | 0.42 | 27776 | 1389 | 0.54 |
| 158 | 1 | 19.84 | 20.45 | 22700 | 1135 | 2595 | 0.44 | 29056 | 1453 | 0.56 |
| 158 | 1 | 20.45 | 20.68 | 22700 | 1521 | 1697 | 0.9 | 29056 | 1947 | 1.15 |
| 158 | 1 | 20.68 | 20.8 | 27100 | 1816 | 1697 | 1.07 | 34688 | 2324 | 1.37 |
| 158 | 1 | 20.8 | 20.94 | 24800 | 1495 | 1697 | 0.88 | 31744 | 1914 | 1.13 |
| 158 | 1 | 20.94 | 22.08 | 24800 | 1364 | 2558 | 0.53 | 31744 | 1746 | 0.68 |
| 158 | 1 | 22.08 | 22.77 | 23000 | 1265 | 2558 | 0.49 | 29440 | 1619 | 0.63 |
| 50 | 1 | 22.77 | 23.13 | 23000 | 1035 | 1153 | 0.9 | 26450 | 1190 | 1.03 |
| 50 | 1 | 23.13 | 23.42 | 23000 | 1380 | 1697 | 0.81 | 26450 | 1587 | 0.94 |

TABLE 2

| Town | Route | Mileage | | 2002 ADT | 2002 Pk Hr | Capacity | 2002 v/c | 2025 ADT | 2025 Pk Hr | 2025 v/c |
|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 1 | 23.42 | 23.91 | 17700 | 1062 | 1697 | 0.63 | 20355 | 1221 | 0.72 |
| 50 | 1 | 23.91 | 24.31 | 17700 | 1062 | 1697 | 0.63 | 20355 | 1221 | 0.72 |
| 50 | 1 | 24.31 | 24.36 | 17700 | 1062 | 1697 | 0.63 | 20355 | 1221 | 0.72 |
| 50 | 1 | 24.36 | 24.39 | 17700 | 1062 | 1697 | 0.63 | 20355 | 1221 | 0.72 |
| 50 | 1 | 24.39 | 24.57 | 17700 | 1062 | 1697 | 0.63 | 20355 | 1221 | 0.72 |
| 50 | 1 | 24.57 | 24.61 | 17700 | 1062 | 1697 | 0.63 | 20355 | 1221 | 0.72 |
| 50 | 1 | 24.61 | 24.73 | 20800 | 1373 | 1697 | 0.81 | 23920 | 1579 | 0.93 |
| 50 | 1 | 24.73 | 25.29 | 20800 | 1373 | 1697 | 0.81 | 23920 | 1579 | 0.93 |
| 50 | 1 | 25.29 | 25.51 | 24800 | 1637 | 1697 | 0.96 | 28520 | 1882 | 1.11 |
| 50 | 1 | 25.51 | 25.63 | 25000 | 1250 | 1355 | 0.92 | 28750 | 1438 | 1.06 |
| 50 | 1 | 25.63 | 25.7 | 25000 | 1650 | 1697 | 0.97 | 28750 | 1898 | 1.12 |
| 50 | 1 | 25.7 | 25.81 | 25000 | 1650 | 1697 | 0.97 | 28750 | 1898 | 1.12 |
| 50 | 1 | 25.81 | 26.25 | 14500 | 1164 | 1697 | 0.69 | 16675 | 1339 | 0.79 |
| 138 | 1 | 33.49 | 34.01 | 14900 | 697 | 849 | 0.82 | 17582 | 823 | 0.97 |
| 138 | 1 | 34.01 | 34.03 | 14900 | 697 | 1697 | 0.41 | 17582 | 823 | 0.48 |
| 138 | 1 | 34.03 | 34.14 | 19600 | 935 | 1697 | 0.55 | 23128 | 1103 | 0.65 |
| 138 | 1 | 34.14 | 34.2 | 19600 | 935 | 1578 | 0.59 | 23128 | 1103 | 0.7 |
| 138 | 1 | 34.2 | 34.63 | 17200 | 820 | 1646 | 0.5 | 20296 | 968 | 0.59 |
| 138 | 1 | 34.63 | 34.69 | 14500 | 870 | 1697 | 0.51 | 17110 | 1027 | 0.61 |
| 138 | 1 | 34.69 | 34.82 | 14500 | 870 | 1697 | 0.51 | 17110 | 1027 | 0.61 |
| 138 | 1 | 34.82 | 34.89 | 31200 | 1404 | 1417 | 0.99 | 36816 | 1657 | 1.17 |
| 138 | 1 | 34.89 | 34.94 | 31200 | 1404 | 1417 | 0.99 | 36816 | 1657 | 1.17 |
| 138 | 1 | 34.94 | 34.95 | 42600 | 1917 | 1417 | 1.35 | 50268 | 2262 | 1.6 |
| 138 | 1 | 34.95 | 35.04 | 42600 | 2769 | 2974 | 0.93 | 50268 | 3267 | 1.1 |
| 138 | 1 | 35.04 | 35.08 | 32500 | 2113 | 2974 | 0.71 | 38350 | 2493 | 0.84 |
| 138 | 1 | 35.08 | 35.12 | 41600 | 1872 | 3783 | 0.49 | 49088 | 2209 | 0.58 |

TABLE 2

| Town | Route | Mileage | | 2002 ADT | 2002 Pk Hr | Capacity | 2002 v/c | 2025 ADT | 2025 Pk Hr | 2025 v/c |
|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 130 | 0 | 0.09 | 15500 | 1209 | 1385 | 0.87 | 17825 | 1390 | 1 |
| 50 | 130 | 0.09 | 0.49 | 15500 | 775 | 1440 | 0.54 | 17825 | 891 | 0.62 |
| 15 | 130 | 0.49 | 0.82 | 15500 | 1209 | 1371 | 0.88 | 18910 | 1475 | 1.08 |
| 15 | 130 | 0.82 | 1.14 | 15300 | 1193 | 1371 | 0.87 | 18666 | 1456 | 1.06 |
| 15 | 130 | 1.14 | 1.4 | 15300 | 765 | 1119 | 0.68 | 18666 | 933 | 0.83 |
| 15 | 130 | 1.4 | 1.54 | 16400 | 820 | 1119 | 0.73 | 20008 | 1000 | 0.89 |
| 15 | 130 | 1.54 | 1.7 | 18200 | 910 | 1119 | 0.81 | 22204 | 1110 | 0.99 |
| 15 | 130 | 1.7 | 1.81 | 21500 | 946 | 1900 | 0.5 | 26230 | 1154 | 0.61 |
| 15 | 130 | 1.81 | 1.89 | 26200 | 1153 | 1900 | 0.61 | 31964 | 1406 | 0.74 |
| 15 | 130 | 1.89 | 1.96 | 22200 | 977 | 1900 | 0.51 | 27084 | 1192 | 0.63 |
| 15 | 130 | 1.96 | 1.99 | 18200 | 801 | 1371 | 0.58 | 22204 | 977 | |
| 15 | 130 | 1.99 | 2.01 | 18200 | 801 | 1371 | 0.58 | 22204 | 977 | 0.71 |
| 15 | 130 | 2.01 | 2.03 | 18200 | 801 | 1371 | 0.58 | 22204 | 977 | 0.71 |
| 15 | 130 | 2.03 | 2.08 | 18200 | 801 | 685 | 1.17 | 22204 | 977 | 1.43 |
| 15* | 130 | 2.08 | 2.58 | 9400 | 0 | 685 | 0 | 11468 | 0 | 0 |
| 15* | 130 | 2.58 | 3.07 | 12600 | 0 | 685 | 0 | 15372 | 0 | 0 |
| 15* | 130 | 3.07 | 3.37 | 9600 | 0 | 685 | 0 | 11712 | 0 | 0 |
| 15* | 130 | 3.37 | 3.59 | 8800 | 0 | 685 | 0 | 10736 | 0 | 0 |
| 15* | 130 | 3.59 | 3.69 | 4700 | 0 | 1371 | 0 | 5734 | 0 | 0 |
| 15* | 130 | 3.69 | 3.76 | 10100 | 0 | 1371 | 0 | 12322 | 0 | 0 |
| 15 | 130 | 3.76 | 3.77 | 12600 | 983 | 2056 | 0.48 | 15372 | 1199 | 0.58 |
| 15 | 130 | 3.77 | 3.79 | 12600 | 983 | 1371 | 0.72 | 15372 | 1199 | 0.87 |
| 15 | 130 | 3.79 | 3.8 | 12600 | 983 | 2056 | 0.48 | 15372 | 1199 | 0.58 |
| 15 | 130 | 3.8 | 3.85 | 12600 | 983 | 2056 | 0.48 | 15372 | 1199 | 0.58 |
| 15 | 130 | 3.85 | 3.88 | 18300 | 1427 | 1371 | 1.04 | 22326 | 1741 | 1.27 |
| 15 | 130 | 3.88 | 4.16 | 18300 | 933 | 1371 | 0.68 | 22326 | 1139 | 0.83 |
| 102 | 809 | 0 | 0.74 | 8100 | 535 | 805 | 0.66 | 10287 | 679 | 0.84 |
| * one way section updated 4/8/2004 | | | | | | | | | | |