Concord to Spaulding Turnpike 10428

MEMORANDUM

TO: Advisory Task Force Members

FROM: Roger Sanborn

DATE: March 17, 1992

SUBJECT: Rationale Report

Enclosed you will find the Rationale Report which will be discussed at the Advisory Task Force meeting to be held at 7:00PM on March 26, 1992 at the Northwood Elementary School Library. This report provides a description of the step-by-step approach carried out in the formulation of the range of alternatives for the Concord to Spaulding Turnpike Study. The report covers the process resulting in the proposals made at the regional meetings in Barrington, Strafford and Epsom, held in the Fall of 1991.

Please review this document for discussion at the ATF meeting. There will be ample opportunity given to comment on this report and we would appreciate your beginning your review prior to the meeting. Copies of the Rationale Report are also going to the Federal Highway Administration and the five state and federal Cooperating Agencies, and we hope to report to you on their initial reactions to the document.

We look forward to seeing you at the March 26th Advisory Task Force Meeting.

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

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ALTERNATIVES SELECTION RATIONALE REPORT

Part I

New Hampshire Department of Transportation
Project No. 10428

March 17, 1992

Prepared by
Sverdrup Corporation

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CONCORD TO SPAULDING TURNPIKE STUDY

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PREFACE

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The New Hampshire Department of Transportation is studying means for providing transportation improvements between Concord and the Tri-Cities of Dover, Somersworth and Rochester, the state capital and the third largest urban area in the state, respectively. The study area includes over 460 square miles of central New Hampshire located in all or a portion of twenty-one cities and towns (**Figure P-1, "Regional Context"**). The study is named the "Concord to Spaulding Turnpike Study."

The study is examining six types of alternatives, ranging in scale from No Action to a four lane divided highway on new location. The purpose of this "rationale", or methods and results, report is to document the process used to develop and select a range of reasonable alternatives to be analyzed in detail and reported in a Draft Environmental Impact Statement (DEIS) and to document the rationale for the rejection of other alternatives. This report focusses on the screening down of the "build" type alternatives - construction of roadways on new location, widening existing roads and combinations thereof. These alternatives will be carried forward in addition to the less construction intensive alternatives, the "no build" or "low build" alternatives: No Action, Transportation Systems Management/ Transportation Demand Management measures and mass transit improvements. This report is in two parts and is designed in particular to document how the requirements of the National Environmental Policy Act (NEPA) and Section 404 of the Clean Water Act were complied with in the alternatives screening and selection process. This volume, Part I, document the process followed to the point of presenting for public review and comment the alternatives proposed for further analysis. Part II will report on the process used in further refining the proposed alternatives in response to public and Cooperating Agency comments.

The lead agency for this study is the Federal Highway Administration of the US Department of Transportation. The Cooperating Agencies are the US Environmental Protection Agency, the US Army Corps of Engineers, the US Fish and Wildlife Service, the New Hampshire Wetlands Board and the NH Division of Historic Resources.

Phase I of the Concord to Spaulding Turnpike Study consisted primarily of inventorying and mapping natural and man-made environmental resources, developing conceptual mile-wide new location corridors and conducting a roadside interview origin and destination traffic survey. Twenty-two Technical Memoranda and the Scoping Report document Phase I activities. **Phase II** consisted of screening the conceptual new location corridors using the mapped resource constraints and evaluating existing east-west routes as potential upgrade corridors, collecting traffic data and making initial future traffic projections. At the end of Phase II many corridors were eliminated, a narrowed down area was proposed, and after public comment and minor adjustments, accepted for further study. **Phase IIIA** consisted of the identification and analysis of potential new location corridors approximating the width of roadways within the narrowed study area and upgrade corridors centered on existing routes. The purpose of Phase IIIA was to reduce the number of alternatives to a reasonable range for detailed analysis in **Phase IIIB**, the completion of the DEIS. During **Phase IV**, the Final Environmental Impact Statement (FEIS) will be prepared.

This report is one of twenty-six reports prepared in support of the Draft Environmental Impact Statement for the Concord to Spaulding Turnpike Study. Copies of all DEIS supporting reports are available for inspection at the New Hampshire Department of Transportation.

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

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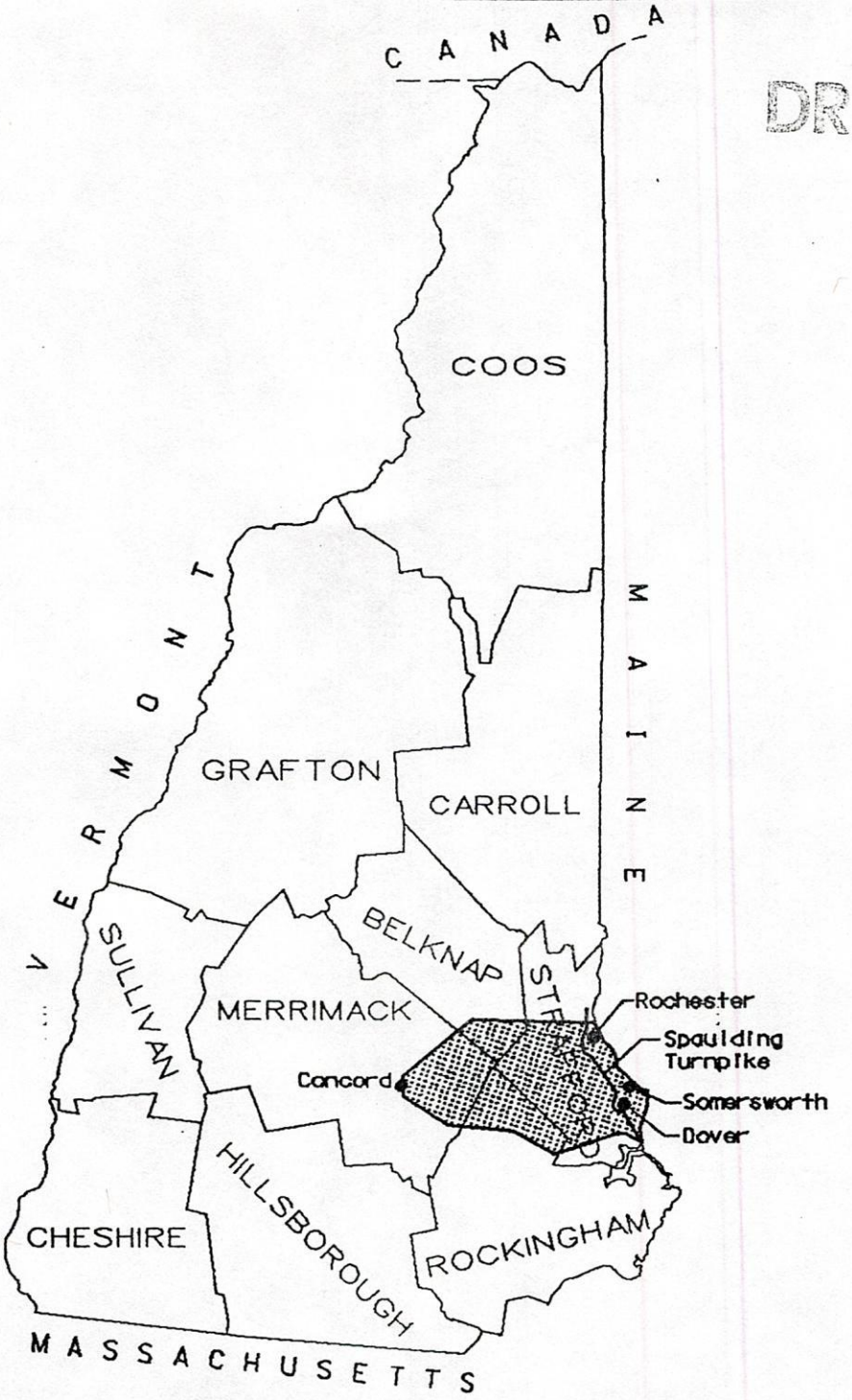

LEGEND

CONCORD TO SPAULDING TURNPIKE STUDY AREA

COUNTIES

FIGURE P-1
REGIONAL CONTEXT

STATE OF NEW HAMPSHIRE

Area Resources - Resources such as surface water bodies, wetlands, parklands and farmlands which occupy relatively larger land areas ranging from a few acres to several hundred acres.

ADT (Average Daily Traffic) - The total volume of traffic during a given period divided by the number of days in the given period. If the given time period is a year, the average daily traffic would equal the AADT, or average annual daily traffic.

CADD (Computer Aided Design and Drafting) - A drafting and design production system which processes information in a computer and directly translates this information into graphics through the use of a plotter.

Cooperating Agencies - Federal and state agencies with regulatory responsibilities or other particular interest in a project and who have agreed to advise the project and review its progress. Specifically, the Cooperating Agencies for the Concord to Spaulding Turnpike Study are: US Army Corps of Engineers (Corps), US Environmental Protection Agency (EPA), US Fish and Wildlife Service (USFWS), NH Wetlands Board and NH Division of Historic Resources (which is also designated as the State Historic Preservation Office).

Corridor - Generally, an existing or prospective transportation path across an area. In Phase IIIA of the Concord to Spaulding Turnpike Study, the term is used more specifically to mean the aggregation of new location or upgrade subcorridors crossing the full width of the study area.

Corridor Study Area - That portion of the issues study area between Concord and the Spaulding Turnpike in which possible alternative highway corridors were to be laid out for analysis.

Diverge - The intersection in East Northwood, near the Northwood/Barrington/Nottingham town lines, where Routes 9/202 diverge from Route 4.

EIS (Environmental Impact Statement) - Documentation of the analysis which compares impacts on the natural, socio-economic and cultural environment to an equal level of detail for each of a reasonable range of alternatives. The purpose of the EIS is to identify which alternative action is projected to create the least environmental damage while meeting project objectives.

The Review Draft Environmental Impact Statement (RDEIS) is an initial draft designed primarily for review by NHDOT and FHWA to assure that all regulations and guidelines are being observed. The Draft Environmental Impact Statement (DEIS) is then prepared and formally approved by the NHDOT and FHWA for public circulation and review and for presentation at a formal public hearing. After the public hearing, a Final Environmental Impact Statement (FEIS) is developed, which responds formally to the comments and issues raised at the public hearing and during the public review period. The FEIS is also formally approved by the NHDOT and FHWA for public review and comment. When the FHWA finds the FEIS acceptable, the process is completed by the FHWA issuing a Record of Decision.

GIS (Geographic Information System) - A computer system that records the locational attributes and other characteristics of mapped information and analyzes those attributes. Its distinction from CADD is its ability to recognize the relationship between mapped objects and hence its analytical capability as opposed to only a graphics preparation capability.

IGRDS (Interactive Graphic Roadway Design System) - A highway design software package which tests engineering feasibility of conceptual lines to meet highway construction standards, such as horizontal (curvature) alignment and vertical (grade) profile.

Issues Study Area - The area between Concord and the New Hampshire-Maine state line within which transportation demand and environmental issues were inventoried, examined and analyzed. Data collected within the portio of the issues study area east of the Spaulding Turnpike was limited for some traffic and environmental resource parameters because no prospective highway improvements east of the Spaulding Turnpike were to be included in the study.

LCIP (Land Conservation Investment Program) - A New Hampshire state program established in 1987 by RSA:221-A providing funding over a six year period for a range of conservation efforts. The flexible program allows for a range of activities to conserve land including the purchase of land, acquisition of easements and acceptance of outright gifts.

Lead Agency - The federal agency with prime responsibility for federal participation in a project and which has agreed to take lead responsibility for the review and guidance of the project. The lead agency for the Concord to Spaulding Turnpike Study is the Federal Highway Administration (FHWA) of the US Department of Transportation.

LEDPA (Least Environmentally Damaging Practicable Alternative) - Under Section 404 (b)(1) of the Clean Water Act, the Corps of Engineers is required to determine the LEDPA, which is the alternative analyzed in the EIS which is determined by the Corps to be least damaging to wetlands, is practicable to develop, and meets the purpose of the project.

Link - (1) A relatively short stretch of a potential, conceptual path for a new roadway connecting two nodes. In Phases I and II of the study, links represent the centerlines of mile-wide corridors. In Phase IIIA, links represent the centerline of conceptual potential highway corridors which are 400 feet in width. (2) The representation of short stretches of highway within a traffic model network.

Link Analysis Zone - In Phase II, the bundling together for the purpose of environmental analysis mile-wide links which serve essentially the serve essentially the same transportation purpose, or in other words, generally connect the same places.

MGE/MGA - The GIS software program developed by the Intergraph Corporation.

NEPA (National Environmental Policy Act) - The federal legislation which requires study of alternatives before major public actions can be granted federal funds or federal approvals, such as developing solutions to the transportation issues in the Concord to Spaulding Turnpike Study area. At a minimum for the project, proposed actions would probably require federal permits from the Corps of Engineers to alter wetlands under Section 404 of the federal Clean Water Act. If federal highway funds are to be used, NEPA requires FHWA to prepare an EIS.

Node - Intersection of links.

Origin/Destination Study - An analysis of the starting and ending points of trips used in studying not only volumes of traffic on roads but the most efficient routes chosen to make trips.

"Other" Resources - Resources not specifically protected by laws or regulations but nevertheless widely accepted as important considerations when planning a highway.

Point resources - Resources such as historic buildings, community facilities and public wells whose location is site specific.

Preferred Alternative - The action proposed to be taken by the proponent, namely the State of New Hampshire in the Concord to Spaulding Turnpike Study, after study in the EIS. The preferred alternative may be identified in the DEIS and reviewed at the public hearing, or may be identified in the FEIS after the public hearing and public comment.

Protected Resources - Resources with some level of protection provided by state or federal laws or regulations. Examples include wetlands, requiring a U.S. Army Corps of Engineers permit to alter wetlands under Section 404 of the Clean Water Act, and public parklands or an historic or archeological site or district on or eligible for placement on the National Register of Historic Places requiring an analysis under Section 4(f) of the federal Transportation Act before federal funds can be used in a manner to impact these resources.

Section 106 - Section 106 of the National Historic Preservation Act requires that possible effects of the project on National Register of Historic Places properties or on National Register eligible properties, must be considered. Compliance also involve providing an opportunity for comment for the federal Advisory Council on Historic Preservation.

Section 4(f) - The section of the US Department of Transportation Act of 1966 which requires a study of alternatives if an action requiring federal funding or approval will impact historic properties, archeological resources on or eligible for listing on the National Register of Historic Places, public parkland, recreation areas, or wildlife refuges. No feasible and prudent alternative to the action must be available, and all steps must be taken to mitigate any potential impact of the action upon identified 4(f) properties.

Section 6(f) - A restriction on federal actions similar to Section 4(f) above, except applying to properties on which federal recreation funding has been invested.

Section 404 - The section of the federal Clean Water Act which requires a permit from the Corps, with the review of EPA, for "discharge of fill or dredged material into the waters of the United States ...", i.e. aquatic resources: water courses and wetlands.

Segment - A portion of an existing road being studied for potential upgrading or other treatment, similar in idea to a new location "link".

Subcorridor - The Phase IIIA aggregation of new location links or existing route segments into longer paths covering larger portions of the study area, typically crossing one or more towns. Subcorridors were then aggregated into corridors which crossed the entire study area.

Study Area - The issues study area.

Traffic Model - A computer-based analysis which simulates existing and projected traffic on existing or proposed road networks. Analysis is based on current traffic volumes and projected, population, and employment totals and distribution. The model used was MINUTP, developed by the COMSIS Corporation.

Trip Table - A chart of the number of trips between origins and destinations in a study area.

EXECUTIVE SUMMARY

[To be added]

Table of Contents

Page

Table of Contents - continued

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List of Tables

List of Tables - continued

List of Appendices

[To be added]

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I. INTRODUCTION

A. PURPOSE AND NEED FOR THE PROJECT

1. Purpose

Senate Bill Number 398, passed by the New Hampshire Legislature and effective June 26, 1990, states that "... it is the clear intent of the legislature that the purpose of this proposed highway is to serve the present and future transportation needs from the Concord area to the tri-city area of Dover, Somersworth and Rochester." In a letter dated September 14, 1990, William F. Lawless, P.E., Chief of the Regulatory Division of the Operations Directorate of the New England Division of the US Army Corps of Engineers stated that, "We have determined that the basic project purpose of the proposed activity is to provide improved highway access for the foreseeable future from the Concord area to the tri-cities of Rochester, Dover and Somersworth ... We will use this 'basic project purpose' in determining compliance with 404(b)1 guidelines."

Other purposes and variations of the purpose have been discussed over the history of looking at solutions to east-west transportation needs in this area of New Hampshire. During the many public involvement meetings of the current study, various state and local officials, citizen committees, and others, have expressed their views as to the proper the purpose of the study. The lead agency, the Federal Highway Administration, has not as yet have formally accepted the above statement of purpose.

However, in compliance with the mandate of the New Hampshire Legislature and the determination of the Army Corps of Engineers under Section 404 of the Clean Water Act, the purpose of the Concord to Spaulding Turnpike Study is as stated in paragraph one of this section.

2. Need

The principal roadways that currently provide east-west access across the area between Concord and the Spaulding Turnpike are US Routes 4 and 202 and State Route 9 (**Figure I-1, "Study Area"** in Chapter VII - Figures). These routes consist mostly of two-lane roads lined with homes and businesses in developed areas, and winding over hills, through woodlands and past lakes in the less developed areas. As detailed further in the Methods and Results Report: Traffic Analysis and Chapter I, "Purpose and Need", of the Review Draft Environmental Impact Statement, existing and projected traffic volumes, the mix of through and local traffic, the deficiencies of the existing road network and accident data support the need for studying improvements to the existing east-west transportation network in the area between Concord and the Tri-Cities of Dover, Somersworth and Rochester.

B. THE STUDY AREA

The Concord to Spaulding Turnpike Study area consists of over 460 square miles of central and eastern New Hampshire. The area is made up of all or parts of twenty-one cities and towns located in four counties (See **Figure I-1, "Study Area"**). Allenstown, Chichester, Concord, Epsom, Loudon, Pembroke and Pittsfield are in Merrimack County. Barrington, Dover, Durham, Farmington, Lee, Madbury, Rochester, Rollinsford, Somersworth and Strafford are in Strafford County. Deerfield, Northwood and Nottingham are in Rockingham County. Barnstead is in Belknap County.

Initially, an "issues study area" and a "corridor study area" were defined. The issues study area represented the area between Concord and the New Hampshire-Maine state line in which transportation demand and environmental issues were inventoried, examined and analyzed. Data collected within the portion of the issues study area east of the Spaulding Turnpike was limited for some traffic and environmental resource parameters because no prospective highway improvements east of the Spaulding Turnpike were to be included in the study. The corridor study area represented that portion of the issues study area between Concord and the Spaulding Turnpike in which possible alternative highway corridors were to be laid out for analysis.

Prior to the passage of Senate 398 in 1990, the southeastern portion of the issues study area, an area including Durham, most of Madbury and Lee, south Dover and part of Nottingham, was excluded from the corridor study area. Upon passage of Senate 398, the corridor study area and the issues study area west of the Spaulding Turnpike became coincident, and the alternatives development process in this coincident area was brought up to an equivalent level. From hereon, the issues study area will generally be referred to in the text as "the study area".

The study area covers an area approximately thirty miles from west to east. Starting from Interstate Route 393 at the Chichester - Pembroke town line, the boundary arcs north and south, forming a study area about fifteen miles in width and proceeds easterly to the Piscataqua and Salmon Falls Rivers, which constitute the eastern boundary of the study area. These rivers also form the boundary between New Hampshire and Maine.

C. RANGE OF ALTERNATIVES CONSIDERED

The alternatives studied in this project range from taking no action at all to the construction of a four lane divided highway on new location entirely across the study area. All of the alternatives considered are described in the Review Draft Environmental Impact Statement (RDEIS). Some of these alternatives, the "no build" and "low build" alternatives, involve only a relatively minor and widely spaced amount of construction and are not analyzed in this Rationale Report; their analysis is documented in the RDEIS. These include:

- No Action
- Transportation Systems Management (TSM) and Transportation Demand Management (TDM) Measures
- Improvements to Mass Transit

The remaining alternatives considered involve a varying amount of construction and impacts on the environment. These "build" alternatives are divided into three categories:

- New Location
- Upgrade of Existing Routes
- Bypass and Combination Alternatives

The procedures used for identifying these alternatives and the rationale for selecting some and rejecting others are described in detail in the following sections of this report.

D. DESCRIPTION OF THE STUDY ANALYSIS PHASES USED

The Concord to Spaulding Turnpike Study has been divided int into five phases. The screening process used on each of the first three of these phases for selecting or rejecting build alternatives are described in the following six chapters of this report. The scope of each of the five phases is summarized below.

It must be noted hat the Army Corps of Engineers Highway Methodology has also defined a four phase process. The Concord to Spaulding Turnpike Study phases do not correspond in numbering with the Highway Methodology phases, but fall within their bounds. Phases I, II and IIIA of the Concord to Spaulding Turnpike Study constitute Phase I of the Highway Methodology, and the close of Phase IIIA is the point at which Corps approval of the reasonable range of alternatives is sought (Phase I is the close of the Corps Highway Methodology).

1. Phase I

Phase I consisted primarily of conducting traffic counts and an origin and destination traffic survey, creating a database inventory of natural and man-made environmental resources and developing conceptual mile-wide new location corridors. Twenty-two technical memoranda and the Scoping Report and Update 1: Scoping Report document Phase I activities.

Approximately 800 miles of conceptual mile-wide corridors were laid across the study area in an east-west fashion, and screened, one resource at a time. This screening process, as described in Chapter II, resulted in a network of approximately 300 miles of conceptual new location corridors to be carried forward into Phase II.

2. Phase II

As described in Chapter III, each of the 300 miles of mile-wide new location corridor was analyzed in Phase II in relation to all mapped resources together, as opposed to the individual resource evaluation performed in Phase I; a manifest or link evaluation form was developed for each link. Combinations of least impacting east-west corridors emerged in a pattern across the study area. This pattern was considered in relation to traffic projections developed for new location link combinations across the study area. In addition, upgrade alternatives were defined and incorporated into the analysis. A reduced analysis area integrating new location and upgrade analysis was defined for developing finer scaled alternatives.

3. Phase IIIA

In Phase IIIA, in compliance with NEPA and Section 4(f) of the federal Transportation Act of 1966, potential 400 foot wide new location corridors were developed across the reduced analysis area to avoid all environmental resources or, if avoidance was not possible, to minimize impact on resources. Short competing links which served the same transportation purposes were compared, the least impacting retained, and longer paths composed for further comparative analysis. These longer paths, called "subcorridors" were also evaluated for their positive contribution to three planning objectives: community cohesion, economic development and overall network efficiency.

In consideration of requirements of Section 404(b)(1) of the Clean Water Act, the new location alternatives which crossed the study area and were least impacting to total wetland acreage and/or wetlands judged to be valuable in performing many wetlands functions were selected and proposed to be carried into Phase IIIB as a network for further analysis in the DEIS. Upgrade corridors and possible bypasses were also subjected to a selection process, and were also proposed as possible build alternatives for more detailed analysis in Phase IIIB

4. Phase IIIB

Once the range of alternatives proposed for further study at the end of Phase IIIA is accepted as reasonable by the U.S. Army Corps of Engineers, conceptual plans will be developed for all of the alternatives and environmental impact analysis further detailed. In Phase IIIB, the Section 404 permit application(s) will be filed and the DEIS will be completed, published and circulated. It is proposed that a joint public hearing on both the DEIS and the Section 404 permit application(s) will be held.

5. Phase IV

In Phase IV, comments on the DEIS will be responded to, a Section 4(f) statement prepared if necessary and a Final EIS prepared. The preferred alternative, the action proposed to be undertaken by NHDOT will be identified, and the Corps of Engineers will determine the Least Environmentally Damaging Practicable Alternative. Any inconsistencies between the preferred alternative and the LEDPA would need to be resolved during this phase.

Impacted wetlands will be field delineated for the LEDPA alternative and avoidance, minimization and compensation measures defined in compliance with Section 404(b)(1) of the Clean Water Act will be identified. Enhancement measures in compliance with the Intermodal Surface Transportation Efficiency Acto of 1991 will be identified. After agreement is reached with the involved Cooperating Agencies with regulation responsibilities, FHWA will issue a Record of Decision approving the FEIS and the Corps will issue the Section 404 permit(s).

II. PHASE I: DESCRIPTION OF SCREENING PROCESS

The objectives of Phase I, the initial phase of the Concord to Spaulding Turnpike Study, were to establish a comprehensive environmental database and develop knowledge of existing traffic conditions in the study area. The results of the environmental and traffic conditions inventory work were reported in twenty-two Technical Memoranda and the Scoping Report and Update 1: Scoping Report. Alternatives analysis during Phase I focused on the identification of new location corridors.

A. IDENTIFICATION OF CONCEPTUAL NEW LOCATION ALTERNATIVES

During Phase I of the study, as reported in the Scoping Report and Update 1: Scoping Report, data regarding natural and man-made environmental features of the study area were inventoried from federal, state, regional and local agencies plus other informed sources. Satellite imagery was interpreted to provide land use information and mapping, particularly for residential, commercial and industrial land use and for active farmland. Additionally, a digital terrain model was developed to incorporate topographic characteristics into the database. The inventory was conducted for twenty environmental resources and the data are documented in a series of Technical Memoranda listed in **Table II-1**.

Sixteen of the resources discussed in the twenty-two technical memoranda are geographically oriented. The resource data were assembled, mapped at the 1"=2000' scale to be consistent with USGS mapping, and digitized on the Sverdrup CADD (Computer Aided Drafting and Design) system. An example of a resource map is shown as Figure II-1 "Wetlands in the Study Area". A planimetric base map showing roads, political boundaries and bodies of water was also developed at the 1"=2000' scale.

Each category of natural and man-made resources was plotted on a separate overlay map printed on transparent acetate. This information at the scale of 1"=2000' was reviewed at a series of meetings with interested federal and state agencies and with involved communities and regional organizations. Additionally, the information was printed at a scale of 1"=5000' and distributed to study area cities and towns for local review via the Advisory Task Force members. Additional information and modifications were noted and added into the environmental inventory.

These maps were called "constraint maps" because each resource is viewed as an asset whose value should be respected and which could constrain roadway construction. It was evident from an analysis of these constraint maps that not one prospective existing route upgrade or new location corridor could be identified which would not impact some resources of concern.

Using only the criteria of avoiding major surface water bodies and major areas of steep slopes, conceptual new location corridor "links" connecting the eastern and western portions of the study area were generated covering the full corridor study area. These corridors were one mile wide bands crossing the study area and within which possible new highway alignments could be considered. The assumption was that it did not make environmental, engineering or financial sense to plan for potential new construction to cross lakes or ponds or to build in difficult terrain.

TABLE II-1

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LIST OF SUPPORTING TECHNICAL DOCUMENTATION

Scoping Report, October 19, 1989
Update 1: Scoping Report, October 25, 1989

Technical Memoranda:

1. Land Use and Community Facilities
2. Population
3. Employment, Housing, Commercial and Industrial Activity
4. Topography
5. Wetlands
6. Floodplains
7. Surface Water
8. Groundwater Resources
9. Wild and Scenic Rivers
10. Coastal Zone
11. Park and Conservation Land
12. Farmland
13. Forestland
14. Terrestrial Resources
15. Aquatic Resources
16. Threatened and Endangered Species
17. Historic and Archaeological Resources
18. Hazardous Materials
19. Air Quality
20. Geological Resources
21. Community Concerns
22. Design Criteria

Note: All these documents are available for inspection at the New Hampshire Department of Transportation.

Each corridor was not viewed as one separate path but, using the corridor centerlines, as a series of possible links connecting to other links at common points, or "nodes". The result, recorded in the Sverdrup CADD System, was a grid or web of approximately 800 miles of lines crossing the study area, oriented in a general east-west direction and representing conceptual mile-wide corridors. (See **Figure II-2 "Phase I New Location Network for Analysis and Screening".**) Note that the lines on **Figure II-2** represent centerlines of mile-wide corridors. If the mile-wide corridors were graphically indicated, the entire study area would be covered many times with overlapping coverage.

B. IDENTIFICATION OF CONCEPTUAL UPGRADE ALTERNATIVES

Study of the existing road network and analysis of traffic data began to identify the in-place road network which was serving east-west traffic between Concord and the Tri-Cities. (See **Figure I-1**). Appropriate portions of the following roads, discussed below proceeding from west to east, were initially studied regarding east-west traffic:

Joint Routes 4/9/202: East of Interstate Route 393, US Route 4, US Route 202 and State Route 9 jointly use a roadway through Chichester, Epsom and Northwood, until Routes 9 and 202 diverge in a northeast direction in East Northwood, near the Northwood/Barrington/Nottingham town lines. This latter intersection will be referred to as the "diverge." This roadway represents the only feasible upgrade path across the western portion of the study area. Since the federal and state Cooperating Agencies have made clear that an upgrade alternative across the study area must be considered in the Environmental Impact Statement, this portion of roadway must remain in study throughout the EIS process.

Routes 9 and 202: East of the diverge, Routes 9 and 202 follow a shared right of way until they diverge in Barrington near Nippo Pond. Route 202 heads northeast toward Rochester and the Spaulding Turnpike. Route 9 continues east toward Dover, intersecting Route 155, just west of the Spaulding Turnpike.

Routes 4, 155, 108 and Madbury Road: East of the diverge, Route 4 continues southeast of the Tri-Cities through Durham to connect with the Spaulding Turnpike at Dover Point. Route 155 travels northeast from Route 4 in Lee to intersect Route 9 just west of the Spaulding Turnpike and then connect into Dover. Route 108 travels northeast also to connect Route 4 with Dover. A short stretch of Madbury Road between Durham and Madbury connecting Route 4 and Route 155 was also initially identified as potentially carrying some east-west traffic.

Route 125: Route 125, although geographically a north-south road, carries some cross-regional trips to the Spaulding Turnpike and into Rochester. The section of Route 125 between Route 4 and the Spaulding Turnpike was included.

One issue that became apparent from observation of the road network was the "fan" situation in the east. The one road serving east-west traffic on the west fanned out into a series of roads serving a range of destinations between Rochester and Dover Point on the east. The implication of this situation upon upgrade planning is that although one upgraded road may serve the western portion of the study area, more than one road in the east may need to be upgraded to improve access into the Tri-Cities from the west.

C. NEW LOCATION ALTERNATIVES SCREENING PROCESS

Systematically, each of the sixteen separate resource maps was overlaid one at a time onto the preliminary network of potential mile-wide links. Links which severely or repeatedly impacted a resource were methodically identified and eliminated from further consideration. In many instances, links had severe or repeated impacts on more than one resource, reinforcing their elimination. An important consideration in the analysis was that, although a portion of the mile-wide corridor might impact a resource, an actual alignment might later be located within the broad band without actually impacting that constraint, or with minimal impact. As the map for each constraint was made available from the digitized inventory data base, the overlay process was completed for the constraints listed in **Table II-2** below.

TABLE II-2

PHASE I
ENVIRONMENTAL CONSTRAINTS ANALYZED

Community Facilities (1)
Existing Land Use (1)
Topography (4)
Wetlands (5)
Floodplains (6)
Surface Water Bodies (7)
Groundwater Resources (8)
Wild, Scenic and Recreational Rivers (9)
Coastal Zone (10)
Public/Private Parkland (11)
Soils Suitable for Farmland (12)
Soils Suitable for Forestland (13)
Protected Species (16)
Potential Historic Resources (17)
Potential Archeological Resources (17)
Hazardous Waste Sites (18)

Note: The numbers in parentheses refer to the identification number of the Technical Memorandum in which the inventory of that resource is documented.

Some constraints, such as surface water bodies, wetlands, and farmland, typically involve substantial areas of land and the potential impact of a corridor was clearly indicated at 1"=2000' scale. As described in more detail in Chapter III "Description of Phase II Screening Process", these resources are referred to as "area resources". Other constraints, such as community facilities, historic resources and groundwater wells tend to be site specific and their relationship to a possible mile-wide corridor are less well defined. For these "point resource" constraints, consideration was given in the analysis to supporting areas, such as farmland supporting the

environment of historic farm buildings or residential land use areas relating to community facilities. The set of links surviving each step or individual resource screening was recorded on the Sverdrup CADD system.

After this process of elimination, the remaining links were analyzed as a combined network. Missing links in an otherwise rational prospective path were reconsidered in relation to the constraint or constraints which initially eliminated them. In the interest of considering a balanced, rational network which minimizes overall impact on the study area, missing links which could conceivably function were restored. Missing links which clearly could not function were not restored. The network was again analyzed as a system, and links which no longer were part of reasonable continuous paths, regardless of their environmental ranking, were eliminated.

D. NEW LOCATION ALTERNATIVE NETWORK PROPOSED FOR PHASE II ANALYSIS

The result of this process was the network of potential highway corridors displayed in the Scoping Report and Update 1: Scoping Report. Upon passage of state legislation in 1990 in response to comments by federal agencies that the scope of the study needed to be expanded, links in the Dover, Durham and Madbury area which had been in the issues study are but not the corridor study area, were laid out in a similar fashion, screened according to the Phase I analysis methodology and integrated into the previously screened network of links.

The screening for environmental constraints done in Phase I resulted in approximately 300 miles of potential highway corridor links. The result of the process is shown in Figure II-3 "Phase II New Location Network for Analysis and Screening". This series of approximately 190 prospective links was then subjected to further analysis in Phase II.

III. PHASE II: DESCRIPTION OF SCREENING PROCESS

During Phase II, the mile-wide conceptual analysis corridors were evaluated for their relation to all mapped resources together and for their potential for addressing traffic in the future. Following this, a reduced study area was defined in which more specific alternatives would be further defined. The analysis of upgrade alternatives was also introduced during Phase II to consider whether screening out of segments was feasible and to identify environmentally challenging segments where new location bypass alternatives should also be developed.

A. COMPARATIVE ENVIRONMENTAL EVALUATION OF NEW LOCATION ALTERNATIVES

The 300 miles of links, representing mile-wide corridors which survived Phase I screening, were bundled into environmental analysis zones termed "link analysis zones". These zones group links which serve essentially the same transportation purpose, or in other words, generally connect the same places. There are eleven link analysis zones labelled "A" through "K" and shown in **Figure III-1 "Phase II New Location Link Analysis Zones".**

Each link within each zone was labelled alphabetically "a" through "z"; links in zones with greater than 26 links were further labelled "aa", "bb", etc. Links were identified by zone and link, for example Zone K, Link m, as "K-m". A link, that is a mile-wide corridor between "nodes", or intersections with other links, varied in length from less than a mile to several miles, depending on location.

The links within each link analysis zone were printed on sheets of acetate at a scale of 1"=2000' showing both centerlines and the mile-wide corridor boundaries. These sheets were called "Phase II Link Analysis Zone" sheets. Environmental resource information was then transferred from the sixteen individual 1"=2000' environmental resource maps to a single zone overlay analysis sheet, aggregating the different types of environmental data on a single sheet for each link analysis zone. This process was also documented on the Sverdrup CADD system.

"Area resources" are resources such as wetlands, parklands and farmlands which occupy relatively larger land areas ranging from a few acres to several hundred acres. "Point resources" are resources such as historic buildings, community facilities and public wells whose location is site specific. Throughout all phases of the study, the attempt is to avoid all resources. Where avoidance is not possible, impact upon an affected resources is minimized. In Phases I and II of the study, utilizing mile-wide corridors, area resources, due to their scale relative to the scale of the corridor are somewhat more difficult to avoid than point resources. For example, a farm could easily occupy the width of a new location link and be impossible to avoid in that particular link; an historic building could occupy a site in the link which would allow for ample passage of actual new location roadway without interference with the site. As such, area resources play a particular role in the screening of mile-wide corridors. Concentrations of point resources play a similar role.

"Protected resources" are those with some level of protection provided by state or federal laws or regulations. Examples include wetlands, requiring a U.S. Army Corps of Engineers permit to alter wetlands under Section 404 of the Clean Water Act, and public parklands or an historic or archeological site or district on or eligible for placement on the National Register of Historic Places requiring an analysis under Section 4(f) of the federal Transportation Act before federal funds can be used in a manner to impact these resources. Resources not specifically covered by such laws or regulations but nevertheless widely accepted as important considerations when planning a highway are listed as "other".

Each individual link was then systematically analyzed in relation to each of the resources listed in **Table III-1, "Phase II Resources Considered in Environmental Analysis"**. In Phase II, the resources were viewed in combination to analyze the relationship of the underlying geography to the links; in Phase I, analysis had been conducted one resource at a time.

During Phase II analysis, which utilized broad one-mile wide corridors, the focus of the analysis centered on minimizing the likelihood that major resource areas or combinations of resources would be impacted. Due to the conceptual nature of this analysis, the evaluation process was adjusted for some constraints. Some resources such as possible historic properties and groundwater resources were divided into area and point components (i.e., historic districts and sites; and, aquifers and public wells). Aquifers and forestland are so pervasive that no analysis was conducted at this stage. Floodplains also have high potential for prehistoric archeological sites yet were rated only in the floodplain category in order to avoid double-counting a screening criterion. Terrestrial and aquatic resources analysis focused on the protected species habitats. Geological resources were considered only in relation to gravel pits and mines. In addition to the environmental constraints, major and minor stream crossings and road crossings were counted to give an initial sense of engineering parameters. Topographic analysis consisted of screening for slopes greater than 15%.

The net result of these modifications is that, in Phase II, each link was analyzed for its relation to twenty environmental criteria, including the natural, social and cultural environment.

Starting from a quantitative viewpoint, the number of times a resource occurred in a link was noted where feasible; if a resource had many identifiable segments, these sections were counted as separate occurrences.

Orientation and direction, as well as number of resources, were considered. A resource whose main axis was oriented perpendicular to the main axis of the corridor link may be more likely to be interfered with than a resource of the same multitude or area but whose main axis runs parallel to the corridor. In addition, interference with some resources had to be judged relative to the level of interference by other links which that same resource impacted. For example, all paths must cross the north-south oriented Suncook River and its floodplain. The many east-west corridors intersecting the Suncook River were viewed to determine relatively lower interference crossings.

TABLE III-1

PHASE II
RESOURCES CONSIDERED IN ENVIRONMENTAL ANALYSIS

Protected Areas Resources

5 Wetlands
6 Floodplains (also high potential for prehistoric archeological sites)
7a Surface Water Bodies
7b Stream Crossings
9 Wild, Scenic and Recreational Rivers
8a Aquifers *
10 Coastal Zone
11 Park, Recreation and Conservation Lands
16 Threatened, Endangered and Rare Species
17a Possible Historic Districts
17b Other Potential Archeological Resource Areas
12 Farmlands

Protected Point Resources

17c Possible Historic Sites
17d Archeological Sites (known)
8b Public Wells
18 Hazardous Waste Sites

Other Area Resources

1a Land Use
4 Topography (slopes greater than 15%)
20 Geological Resources (mineral)
13 Forestlands *
14 Other Terrestrial/Aquatic Resources
22 Road Crossings

Other Point Resources

1b Community Facilities

* Coverage for these resources was too broad to include in the Phase II conceptual analysis; resources were mapped and identified, but not considered in Phase II screening.

Note: The numbers before the resources refer to the identification number of the Technical Memorandum in which the inventory and analysis of that resource is documented.

The interference of the link with each of the range of resources was rated as "high", "moderate", "low", or "not present," was recorded on an individual sheet for each link, called the **"Link Evaluation Form," (Figure III-2)**. The Link Evaluation Form also has space for remarks about the characteristics or significance of each resource impacted and records the length of the link in miles. In addition, appropriate comments note the name or location of the resource (for example, "steep topography located along south slopes of Catamount Mountain") and describe the alignment, combination and interaction of resources for each link.

A low interference rating would be given if a link contains the resource, but the pattern within the corridor would nevertheless allow possible passage of a highway alignment without impact to that resource. A moderate interference rating would be given if the resource was of moderate density, or relatively low density yet was situated perpendicularly across the corridor. The rating of high interference was applied when the resource was heavily concentrated within the corridor, virtually precluding a highway corridor from being developed without impact. A final possibility was that the resource was not present within the corridor.

When this initial screening of resources was completed, a **"Zone Summary Form" (Figure III-3)** was used to record the interference ratings and a summary of remarks for all the links in a zone. The interaction and pattern of resources were also reviewed and noted. Resources could work in combination to make it difficult to avoid some impacts within that link. An example of this would be the areas of the range roads where strings of possibly historic farm residences run continuously along routes which are also surrounded by active farmland. Another example is where the link is attempting to traverse terrain made up of steep slopes interspersed with wetlands.

At this level of detail, the range of circumstances varied from a link which is largely clear of interference, through a link which offers the possibility of bypassing many resources but has one or more major areas of resources which are difficult to avoid within the corridor as defined, to a link which contains concentrations of defined resources. The low, moderate, and high ratings used initially to score the interference level of each link with each resource was now applied for all resources in combination and recorded on the Zone Summary Form.

An example of the first kind of link (low interference) is one which may contain a series of resources such as wetlands, farmlands and residential development, but whose patterns within the corridor would nevertheless allow possible passage of a highway alignment. An example of the second kind of link (moderate interference) is one which is largely free of environmental resources but intersects a band of resources, such as historic properties, residences or community facilities, extending perpendicularly across the corridor. An example of the third kind of link (high interference) is one which is virtually completely occupied by identified resources, particularly those which cover wide areas, such as wetlands, floodplains or farmland.

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION - CONCORD TO SPAULDING TURNPIKE STUDY
PHASE II CORRIDOR ANALYSIS - LINK EVALUATION FORM

NHDOT 10428
Sverdrup 20219

Zone _____ Link _____ Link Length _____ miles

* ENVIRONMENTAL CONSTRAINT	UNITS	RATING	COMMENTS
PROTECTED AREA RESOURCES			
5 Wetlands		○	
6 Floodplains**		○	
7a Surface Water Bodies		○	
7b Stream Crossings		○	
Major		○	
Minor		○	
9 Wild/Scenic/Recreational Rivers		○	
8a Aquifers		○	
10 Coastal Zone		○	
11 Park/Recreation/Conservation Lands		○	
16 Threatened/Endangered/Rare Species		○	
17a Possible Historic Districts		○	
17b Potential Archeological Areas		○	
12 Farmlands		○	
PROTECTED POINT RESOURCES			
17c Possible Historic Sites		○	
17d Archeological Sites (known)		○	
8b Public Wells		○	
18 Hazardous Waste Sites		○	
OTHER AREA RESOURCES			
1a Land Use		○	
Residential		○	
Industrial/Commercial		○	
4 Topography (over 15% slopes)		○	
20 Geological Resources (mineral)		○	
13 Forestlands		○	
14 Other Terrestrial/Aquatic Resources		○	
22 Road Crossings		○	
Major		○	
Minor		○	
OTHER POINT RESOURCES			
1b Community Facilities		⊙	

GENERAL COMMENTS:

STATUS:

* Reference Number to Technical Memoranda
**Also Memo 17, high potential prehistoric archeological sites

Units-Number of times resource occurs in link

● High Interference with Environmental Resource
◒ Moderate Interference
◎ Low Interference
⊙ Environmental Resource Not Present

ANALYSIS SIGN-OFF	Originated	Reviewed	Date
Project Manager			
Planner			
Engineer			
Environmental Scientist			

FIGURE III - 2
LINK EVALUATION FORM

Utilizing the individual Link Evaluation Forms and Zone Summary Forms, each link was reviewed in relation to the number, orientation and pattern of underlying environmental resources. A four-member, four-discipline team reviewed each link evaluation form for consistency. The team consisted of the Project Manager, the Project Engineer, the Project Planner and the Project Environmental Scientist. The Project Planner raised questions and concerns dealing with planning and systems issues. The contribution of the Environmental Scientist was a scientific perspective with respect to each individual resource. This review process resulted in some minor adjustments in ratings, and produced expansion and clarification of comments included on the link evaluation forms.

The Phase II link analysis process was reviewed with the Advisory Task Force and at a workshop of involved federal, state and regional agencies. Participating federal and state officials conducted field checks of inventory data and analysis at a representative sampling of sites across the study area. The Central New Hampshire Regional Planning Commission completed a thorough review of the link evaluation process for the portion of the study in their planning region. Team planners reviewed this information and made appropriate changes in the Phase II analysis. The New Location Link Evaluation Forms and Zone Summary Forms are attached as **Appendix A**.

The links were mapped according to the high, moderate and low interference ratings with underlying resources and combinations of resources. **Figure III-4 "Phase II Environmental Analysis of New Location Links"**, maps these results. The entire network of links and analysis results were then viewed and analyzed, as described in Section III-D below, to begin to determine the least impacting links to be carried forward.

B. COMPARATIVE ENVIRONMENTAL EVALUATION OF UPGRADE ALTERNATIVES

The analysis of upgrade alternatives was introduced during Phase II to consider whether screening out of segments was feasible and to identify environmentally challenging segments where new location bypass alternatives should also be developed.

1. Definition of Upgrade

The existing route upgrade was defined as using an existing road on its present right-of-way, but expanding it from two to four travel lanes and redesigning it to higher standards. Upgrading was considered for the major existing routes in the study area which serve east-west traffic as identified by the Phase II traffic origin-destination survey and as listed below.

- Routes 4/9/202: from I-393 to the Route 4/9/202 diverge
- Route 4: from Routes 9/202 to the Spaulding Turnpike
- Routes 9/202: from Route 4 to the Route 9/202 diverge
- Route 9: from Route 202 to Route 155/Spaulding Turnpike
- Route 202: from Route 9 to the Spaulding Turnpike
- Route 125: from Route 4 to the Spaulding Turnpike
- Route 155: from Route 4 to the Spaulding Turnpike
- Route 108: from Route 4 to the Spaulding Turnpike
- Madbury Road: from Route 4 to Route 155

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION-CONCORD TO SPAULDING TURNPIKE STUDY
PHASE II CORRIDOR ANALYSIS-ZONE SUMMARY FORM

NHDOT 10428
Sverdrup 20219

Zone _____

DRAFT

Link	Link Length Miles	PROTECTED AREA RESOURCES 5	6	7 a	7 b	9	8 a	10	11	16	17 a	17 b	12	PROTECTED POINT RESOURCES 17 c	17 d	8 b	18	OTHER RESOURCES AREA 1 a	4	20	13	POINT 14/15	22	1 b	COMMENTS
a		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
b		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
c		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
d		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
e		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
f		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
g		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
h		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
i		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
j		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
k		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
l		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
m		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
n		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
o		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
p		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
q		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
r		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
s		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
t		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
u		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
v		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
w		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
x		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
y		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
z		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
aa		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Numbers refer to Technical Memoranda

High Interference

Moderate Interference

Low Interference

Enviornmental Resource Not Present

ANALYSIS SIGN-OFF

	Originated	Reviewed	Date
Project Manager			
Planner			
Engineer			
Environmental Scientist			

PROSPECTIVE CORRIDORS BY LINK SEQUENCE

Zone Comments

FIGURE III - 3
ZONE SUMMARY FORM

These existing routes were divided into 34 segments of one- to five-mile lengths. The segments were selected as being roughly homogeneous sections based on observation of the road, its surroundings and traffic. Approximately 70 miles of existing routes were analyzed.

For the purpose of the Phase II upgrade analysis only, a conceptual 100 foot right-of-way was assumed for study with a 350-foot impact area. The width and configuration of a potential four-lane right-of-way was refined in later phases of the study (250 feet in Phase IIIA), but for the purposes of this initial environmental screening, a 100 foot right-of-way was considered a conservative representation of a four lane upgrade.

2. Methodology for Evaluating Resource Interference

A methodology similar to that used to screen mile-wide corridors for potential new location highway links was used for the analysis of potential existing route upgrades. The planimetric base map at the 1"=2000' scale and the environmental resource overlays developed in Phase I were again used to assess the resources adjacent to or spanning the existing routes.

Rather than using mile-wide corridors which were viewed to determine the potential for developing new location highway alignments, the upgrade environmental analysis occurred in approximately 350 foot wide bands centered on the established centerline of existing routes. The 350 foot impact width was chosen as a generous distance to encompass the conceptual 100 foot right-of-way and to ascertain broad environmental impacts. Incorporating 125 feet in each direction beyond each edge of the proposed roadway shoulders reflected the realization that the impact of an upgrade would extend beyond the edge of construction.

A systematic approach was used to rate the impact of a four lane upgrade on each of the same resources **(Table III-1)** itemized in the Phase II new location link analysis above. The Link Evaluation Forms **(Figure III-2)** used to evaluate the potential impacts of new location links were used to document the existing route upgrade segment interference levels. The number of times a resource was encountered and its relation to the roadway were documented. Comments were made to record any special characteristics or unique arrangements of resources that might affect the level of impact. The level of interference for each of the environmental resources was rated as high, moderate or low for each segment. The interference levels were then combined to obtain an overall rating of high, moderate, or low interference for each road segment and recorded on a Zone Summary Form **(Figure III-3)**.

The Upgrade Segments Link Evaluation Forms and Zone Summary Forms for the upgrade segments are attached as **Appendix B.**

3. Comparison of the Phase II Upgrade and New Location Analyses

Inherent differences in the characteristics of the upgrade segments, as compared to the new location links, necessitated a slightly different approach in the Phase II evaluation system and analysis of the results. The rating system for both was an effort to determine the segments or links which would minimize the potential impact on a wide range of resources. Not only were the size and number of resources considered, but also the unique relationship between alternative corridors and the patterns of impact created by resources in combination.

The differences in the basis of the interference ratings between the upgrade and new location analyses were due to differences in scale and locus at this stage of the analysis. For the upgrade alternative, a 100-foot right-of-way within a wider 350-foot range of impact was considered. These analysis bands were anchored to the centerline of existing roads. For new location links, a 5280-foot, or one mile, wide corridor was considered, an analysis corridor which is 15 times as wide as the upgrade analysis band. Also, conceptual new location corridors under study could be moved to avoid identified resources.

When used to evaluate upgrades, the 1"=2000' scale overlays were sufficient to provide an understanding of the type and level of resources adjacent to each road segment, but the detail was insufficient to determine precisely whether a resource falls within a specific impact range. A small margin of error would not much affect the rate of impact within a mile-wide corridor. Yet within about 150 feet of an existing route, a small differential could heavily influence whether or not a resource is impacted. For instance, it was possible to identify buildings close to existing routes, but not precisely if a building might actually need to be relocated.

Perhaps even more important is the issue of locus. The existing route analysis deals with anchored transportation corridors which traditionally allowed adjacent development. The new location analysis deals with a flexible range of options to be pursued within a mile-wide corridor with the purpose of avoiding conflict with underlying resources. Special consideration is necessary when evaluating resources adjacent to an existing route as opposed to within new location links; it is the existing route, itself, which has caused many of the adjacent resources to locate nearby.

Socio-economic and cultural resources, such as potential historic properties, community facilities and residential and commercial land use, were the evaluated resources most often found adjacent to existing routes. The impact to these resources, if compared to the results of the new location corridor analysis, would be relatively high. Rating all upgrade segments as having a high interference level with possible historic structures or residential and commercial land use would not provide a sense of where opportunities do and do not exist and provide differentation between options. Therefore, since these resources would be impacted in the majority of upgrade alternatives, the rating system was adjusted to reflect the relative impact. As a result, the socioeconomic and cultural land use screening of existing route upgrades was adjusted as discussed below.

A larger scale of study was used to focus in on the relative impact to land use on each upgrade segment. Rather than use the satellite interpreted images of land use at 1"=2000' scale, as was done in new location analysis, aerial photography at the 1"=400' scale was used to quantify the actual number of buildings along each existing route segment within given distances from the centerline. The number of buildings, or amount of development, along each segment was counted within three ranges of total impact corridor width:

- 100 feet: <u>direct impact range:</u> based on an assumed 100-foot right-of-way; considers any resource within this range to be directly impacted.

- 150 feet: <u>primary impact range:</u> considers any building or resource within 25 feet either side of the 100 foot right-of-way to be indirectly impacted.

- 350 feet: secondary impact range: resources, especially non-buildings, within 125 feet of the right-of-way may potentially experience secondary impacts.

Using the 1"=400' scale aerial photographs, individual buildings could be identified with certainty but their specific uses or historic significance could not be determined.

Although buildings could not be specifically identified as community facilities or possible historic sites, the existence of these resources could be ascertained from the USGS maps, field knowledge or from the historic structures windshield survey inventory done in Phase I. As a result, interference with community facilities and historic resources was initially evaluated as part of the environmental analysis done at the 1"=2000' scale, then these resources were included as buildings within the aerial photography building count.

The primary impact range was used to develop the interference rating of the four lane upgrade on adjacent buildings or land use. For the purpose of Phase II level analysis, it was assumed that any building within the 150 foot band, or within 75 feet of the centerline of the four-lane upgrade, would need to be remodeled, relocated or demolished. The number of structures within the 150 foot range was divided by the segment length to determine the average number of buildings found in each mile. This information was recorded on the Link Evaluation Forms.

The potential impact of a four-lane upgrade on residential, commercial and historic buildings, community facilities, and on public wells along each road segment was rated relative to the impact on other existing route upgrade segments. That is, the median impact level was determined for each of these resources and a low, moderate or high interference level was assigned based on the median, rather than the more subjective ratings assigned for the new location links. The interference ratings were based on the following ranges:

TABLE III-2

PHASE II
INTERFERENCE RATINGS USED IN UPGRADE ANALYSIS

	NUMBER OF UNITS IDENTIFIED		
Point Resource	Low Interference	Moderate Interference	High Interference
Buildings per mile	1-5	6-10	11 or more
Historic Sites per mile	1-4	5-9	10 or more
Community Facilities per mile	1	2-5	6 or more
Public Wells per mile	1-2	3-6	7 or more

Large-area resources were rarely impacted along the upgrade segments. Wetlands were occasionally crossed, but more often ran adjacent to the sides of an existing route segment. The location of road crossings were carefully considered in the upgrade analysis, as the possible reconstruction of intersections to accommodate four lanes could create a major impact.

The potential upgrade of existing routes was initially analyzed to get a sense of impacts on the natural, cultural and socio-economic environments. **Figure III-5, "Phase II Environmental Analysis of Upgrade Segments"** represents the individual upgrade segments and their interference ratings. It can be seen that there are only a few segments along which a four lane existing route upgrade would have only minimal environmental impact.

Due to the relatively large scale at which the analysis was conducted and the analysis purpose of indicating opportunities or lack of opportunity, upgrade segments were not proposed for elimination from further consideration as a result of the Phase II environmental analysis. In Section III-D following, the results of the Phase II upgrade analysis are reviewed and considered in relation to the new location environmental analysis results and traffic considerations to form a reduced study area for Phase IIIA.

Regarding the phases, in Phase IIIA, a right of way 250 feet in width, a desirable right of way width for upgrade to meet federal and state design standards, was used to calculate in more detail potential environmental impacts. For Phase IIIB, engineering of the upgrade alternative will indicate more precisely what land area within the right of way would actually be involved in construction and which resources would be impacted. The secondary impact range will be more clearly defined to encompass impacts such as those caused by grade changes, noise levels, etc.

C. TRAFFIC ANALYSIS

As detailed in Technical Memorandum No. 23, Traffic Methods and Results, traffic data gathering and analysis continued in Phase II providing input into the environmental analysis. Phase II traffic analysis was undertaken concurrently with the environmental analysis. The objective of Phase II traffic analysis was to develop an understanding of where prospective new location highway corridors would best serve future demand. No Phase II projections were made for the upgrade alternative as the location of the upgrade segments was established by the existing road network.

The traffic analysis strategy adopted was to identify groups of new location links which virtually serve the same traffic purpose. Effectively parallel link combinations were identified as a network of "generic" traffic links representing combined highway corridors which connect similar trip ends. The generic links were combined with other generic links to produce complete paths across the study area from Route I-393 to the Spaulding Turnpike, creating ten such paths. No path represents an actual proposed alignment -- the purpose of the defined paths was to obtain order-of-magnitude estimates of the traffic demand associated with different routes across generalized portions of the study area and projecting the relative effectiveness of different alternatives in addressing traffic.

A "trip table" is a chart of the number of trips between origins and destinations in a study area. An "origin-destination study" is an analysis of the starting and ending points of trips used in studying not only volumes of traffic on roads but the most efficient routes chosen to make trips. The future trip table developed in Phase I from socio-economic projections and the origin-destination survey was assigned to produce traffic projections for the paths using the MINUTP traffic forecasting model. **Figure III-6 "Projected Traffic on Generic New Links: Year 2010"** indicates the relative range of traffic anticipated on generic links which combine to form conceptual new location traffic corridors across the study area. It should be noted that in reviewing projected traffic on generic new links, origins and destinations of projected traffic must be considered, in addition to total traffic. In other words, two links may indicate drawing similar numbers of cars, but they are different cars.

Observations regarding design year (2010) projected traffic using the generic traffic links in different locations were discussed with the Advisory Task Force and the information provided at the August, 1990 meeting. These observations, which remain valid, were:

- The volumes projected for year 2010 on most new links making up different new location paths across the study area range from about 18,000 to 25,000 vehicles per day.

- Links which closely parallel Route 4 or Route 9 or Route 202 for part of their route tend to attract traffic away from these existing roads for that part of the route.

- Links located farther away from Route 4 or Route 9 or Route 202 have less ability to divert traffic from these routes, although they may divert traffic from other roads such as Routes 126 and 202A.

- On the western end of the study area, traffic links extending northeast from Interstate Route 393 attract substantially greater numbers of vehicles than those extending southeast from I-393. The northeast communities of Loudon/Pittsfield/ Barnstead have a large, direct traffic attraction to Concord, whereas the traffic attraction from the southeast communities of Allenstown/Pembroke/Deerfield is split between Concord and Manchester.

- At the eastern end of the study area, Rochester and Dover generate the largest volume of traffic on new links. To the south, Durham and points south of the study area reached via the Spaulding Turnpike bridge across Little Bay also generate traffic on new links, but Rochester and Dover were found to be the major destinations in the eastern portion of the study area. Links south of Exit 7 on the Spaulding Turnpike serve little or no Rochester-bound traffic, and Dover-bound traffic on these potential new links tends to exit the new location links before reaching the Spaulding Turnpike.

- For Rochester-bound traffic, a minor differential in the location of links is significant; the more southerly the link connecting Route 125 with the Spaulding Turnpike, the less it attracts Rochester-bound traffic, and the more Rochester-oriented east-west traffic diverts to Route 125.

- In analyzing traffic results on Route 4 east of Route 125, it was found that new links closely paralleling Route 4 east of Route 125 are not particularly effective at diverting Route 4 traffic in this area because:

  - most of the traffic at the extreme eastern end of Route 4 is destined for points south on the Spaulding Turnpike; and,

  - Route 4 is still a more direct route for the largest part of this traffic than a new route involving new links north of Route 4. This occurs because the majority of this traffic originates south of Route 4. As examples, traffic travelling east from Lee to the Newington Malls or between Durham and the Newington Malls would not likely travel north to a new location roadway to travel east to the Spaulding Turnpike and then travel south. For this traffic, which is a large portion of the traffic on this section of Route 4, Route 4 would remain the most direct route.

These observations began to suggest the potential traffic benefits of different alternative corridors or in which areas would new links best serve projected traffic demand. The purpose of Phase II level of analysis was not to determine which corridor would generate the most traffic, but which issues and to what extent traffic problems were addressed by different options.

Use of this traffic knowledge in conjunction with environmental analysis information is designed to assist in determining which links may provide the optimum combination for improvement to east-west highway access in the area between Concord and the Tri-Cities while minimizing environmental impact.

D. RESULTS OF THE PHASE II ANALYSIS

A narrowed study area for more detailed analysis and alternative development in Phase IIIA emerged as a result of integrating the new location and upgrade resource evaluations and the analysis of current traffic conditions and projected traffic demands.

1. Integration of New Location and Upgrade Phase II Analysis Results

As a first step, the new location environmental interference ratings were viewed in groups to determine how alternative corridors could be congregated to cross each zone with minimal detrimental environmental impacts. The objective of these link groupings was to maximize use of links with low interference, to avoid (except in rare cases and for short distances) use of links with high interference and to minimize use of links with moderate interference.

Alternate links in each zone were considered side by side along with the groupings which would make up the series of connections with the next zone. In this way, combinations of links and their relationship to resources were considered and compared for environmental impact. Paths that formed more highly interfering patterns were discontinued; paths that formed relatively non-interfering patterns were continued. Some had more circuitous routes or other peculiarities that would require further evaluation. In some cases, a link was reintroduced into

the network because it contributed to a more rational total corridor definition despite the existence of some environmental impact concerns.

Although the links were not yet organized into a reduced network or system, a rough picture emerged. It became clear that no new location path could be selected across the study area which did not have some impact on underlying environmental resources of concern. (Figure III-4) Similarly, the analysis of the upgrade segments revealed that no continuous upgrade route could be found that did not encounter some segments of high impact. **(Figure III-5)**

It became apparent that an integrated network of the least impacting new location links and upgrade segments offered the opportunity of creating some alternatives deserving further analysis. In this way, bypasses on new location could be considered as alternatives to the upgrading of segments of existing road which would generate high environmental impact, and upgrade segments with low environmental impact might be integrated with new location options which would otherwise highly impact environmental resources. The new location corridors were therefore slightly adjusted as required to permit logical connections to existing routes at many points. In particular narrow areas between new location links and upgrade segments where connections might be useful were included within the analysis area. Within the outer bounds of the area carried forward for Phase IIIA analysis formed areas (referred to as "doughnut holes") which, due to their concentration and pattern of resources, were generally not considered further for developing east-west corridors. An example is the large wetlands area along the Bellamy River to the west of the Bellamy Reservoir in Barrington and Madbury.

Traffic information was used to provide understanding of the functioning of potential corridors. The only area where traffic projections were used to screen out alternatives from further study was the area south of Routes 4/9/202, particularly in the western part of the study area. In this area, where much of the traffic is oriented toward Manchester, the traffic model indicated that new location paths would draw a quantum level less traffic than paths to the north of Routes 4/9/202. In other areas, such as between Route 4 and Route 9 in Madbury and South Dover, traffic information reinforced decisions made based upon environmental analysis.

The narrowed down study area resulting from Phase II analysis did not include any portion of the Coastal Zone. As a result, involvement with that program was not an issue after Phase II.

2. Definition of Phase IIIA Analysis Corridors

Adding the results of the Phase II traffic analysis to the evaluation of the new location links and the upgrade segments generated the integrated, reduced area network shown in **Figure III-7 "Integrated Network of Phase II Corridors"**. Routes 4/9/202 through Chichester, Epsom and Northwood must be continued, despite high environmental interference ratings in some stretches, as the only feasible upgrade alternative in the western portion of the study area. The Phase II analysis findings which led to this reduced analysis area are described below, by the following sub-areas:

- Concord to Route 28 and the Suncook River: In addition to upgrading Route 4/9/202, rated as of moderate impact in Phase II upgrade analysis, opportunities exist for connecting I-393 with alternative crossings of the Suncook River to minimize environmental impacts while serve traffic effectively.

- Gossville (Epsom): Upgrading Routes 4/9/202 through Gossville rates as of high environmental impact. In addition to this upgrade, low impacting new location paths offering both the possibility of a Gossville bypass and the opportunity to serve as a link to a longer new location corridor across the study area.

- Northwood/Strafford: In addition to the upgrade of Routes 4/9/202, which rates high environmental impact in Northwood, new location links offering both bypass and full new location options while passing by Bow Lake were identified.

- Barrington to Rochester: Several options were identified for connecting Barrington and Rochester, one of the major origin/destination pairs in the study area.

- Access to Somersworth: Alternative ways of providing east-west access to Somersworth appeared possible.

- Barrington to Dover: Alternative ways were found possible for connecting Barrington and Dover, another one of the major origin/destination pairs in the study area.

- Access to points outside the study area reached via the Spaulding Turnpike and the bridge across Little Bay: this subarea addresses the connection to an origin/destination to the south of the Tri-Cities area, such as Newington and Portsmouth.

a. Concord to Route 28 and the Suncook River

Upgrade of existing Routes 4/9/202 in this area was initially rated as having a moderate impact. New location links to the north of Route 4/9/202 offer potential low interference options, and traffic analysis indicated that strong traffic demand exists in a northeast direction between Concord and Pittsfield.

Although a pattern of low, moderate and some high interference links could potentially have been developed south of Route 4, traffic projections indicated that new location corridors would draw significantly less traffic in this area than in the areas north of Route 4 (16,000/17,000 ADT to the south versus over 20,000 ADT for alternatives north of Route 4). This situation is due generally to the orientation of the area south of Route 4 toward Manchester for business and commuting. Therefore, developing new location paths south of Route 4/9/202 in this area would serve the project purpose of improving transportation between Concord and the Spaulding Turnpike far less effectively than developing alternatives north of Routes 4/9/202.

Thus, it became clear that an area including Routes 4/9/202 and an area arcing northeast from I-393 should be analyzed in greater detail in Phase III to define transportation improvements. To permit continuity with the corridors selected for further study to the east in Epsom, the area around Chichester Center and North Chichester **(Figure III-7)**, was also retained as part of the Phase IIIA Analysis Area.

b. Gossville (Epsom)

The upgrade of Routes 4/9/202 from I-393 through Gossville must be carried forward as the only upgrade option existing in the western portion of the study area. In the Gossville area of Epsom, the abundance of man-made and natural resources along Route 4/9/202 would make an upgrade of this road high in potential environmental interference. The high environmental impact of upgrading between Route 28 and Center Hill Road in Epsom indicates the need to consider a bypass, and traffic indicates that new location links close to Routes 4/9/202 would draw the most traffic from this road and environmental analysis indicates new location options would be best considered north of Routes 4/9/202. New location opportunities north of Routes 4/9/202 offer possibilities of lower environmental interference.

The new location corridor directly to the north of Routes 4/9/202 offers the potential as a short bypass of the developed areas, or as part of a longer new location route between Concord and Northwood. In order to maximize potential options for new location, upgrade and bypass options, particularly where the Gossville section of Routes 4/9/202 has been identified as an upgrade area of high impact, the area located north of Route 4/9/202 and between the new location link of low environmental interference is included in the study area. **(Figure III-7)**

Corridors east of the Suncook River through Pittsfield, Barnstead and Strafford, encountered only high and moderate impact links, while the lower impact links were further south, closer to Routes 4/9/202 **(Figure III-7)**. Thus, conflicting needs of this area were demonstrated by the demand for traffic to arc north toward Pittsfield west of the Suncook River and Route 28, while a bypass close to Routes 4/9/202 east of the Suncook River shows both environmental and traffic potential.

c. Northwood/Strafford

Phase II analysis of existing Routes 4/9/202 through Northwood indicates that widening the road would interfere substantially with existing buildings, potential historic properties and community facilities. Traffic evaluation indicates that new location links close to Routes 4/9/202 would tend to draw the most traffic from this road. New construction to the south of Routes 4/9/202 would entail high environmental interference due to a concentration of natural resources, particularly surface water bodies, wetlands and conservation land. New location links to the north of Routes 4/9/202 offer potential for relatively lower environmental interference than those to the south. Thus further analysis was needed of a bypass, or a link making up a segment of an entirely new east-west alignment to the north of Routes 4/9/202, particularly between Route 107 and Route 152, in addition to study of the reconstruction of Route 4/9/202.

New location links north of Routes 4/9/202 which are close enough to draw traffic from this road, which connect to the analysis area being defined to the west and which rated as relatively low in environmental interference were identified and included in the analysis area. Initially a more northerly new location corridor, north of Bow Lake in Strafford, was eliminated from further consideration due to traffic, network and secondary environmental impact considerations. Traffic projections indicated that the corridors closer to Routes 4/9/202 would attract the most traffic currently using that route. Although a more northern route north of Bow Lake could potentially attract a comparable amount of traffic from a range of existing secondary roads, traffic projections indicate that the northern route would do less to address the existing

and projected traffic conditions on the major east-west route currently serving the area, namely the Routes 4/9/202 joint corridor. With Bow Lake between Route 4/9/202 and these new location links, no opportunity would exist for integrating a combination of upgrade and new location alignments as a possible solution. Pursuing a new location route away from existing through routes and across an undeveloped area containing many environmental resources would directly raise the issue with the Cooperating Agencies of generating avoidable "secondary impacts."

Objections were made by Northwood officials and residents to the proposed new location corridor through Northwood and these were discussed with the Cooperating Agencies, noting that local concerns were essentially of two kinds. First, area residents expressed concern that they do not want another major east-west road in Northwood, particularly one that passes through the potential recharge area for the Northwood Ridge aquifer; and second, they were not convinced by the reasons for eliminating a corridor north of Bow Lake. Other ATF members had expressed similar concerns about eliminating all corridors north of Bow Lake.

To respond to the issue of the aquifer recharge area, the Lamprey River watershed, which Northwood officials understand to be the recharge area, was avoided by expanding the proposed new location corridor through Northwood slightly to the north of Oak Hill.

With respect to the issue of a corridor north of Bow Lake, the cooperating agencies were presented with the environmental and traffic data developed in Phases I and II and the reasoning used to eliminate initially such a corridor from further study. The agencies voiced their concerns regarding potential secondary impacts of a route north of Bow Lake on environmental resources not currently in proximity or accessible to major traffic routes and expressed satisfaction with the way in which the study was paying attention to these concerns.

The cooperating agencies, however, also noted the National Environmental Policy Act (NEPA) encourages public comment and requires thorough response to public concerns. Since many public participants in the study have recommended further study of this route, which appears to be consistent with the purpose of the project, the agencies felt a corridor north of Bow Lake should be studied further to develop more detailed information on the potential impacts. After considering the public comment and opinion of the cooperating agencies, this additional corridor was retained within the study area.

The area of the Routes 4/9/202 diverge and Route 43 intersection in Northwood is a connection point of the existing and proposed network that needed more detailed analysis. This critical area is where existing routes historically and naturally diverge to serve each of the Tri-Cities and the points further south towards the Seacoast, outside the study area. It was apparent that several options in this area needed further analysis, for either upgrade or new location alternatives, or combinations of the two, depending on the alternatives chosen east and west of this point. As a result, an area between Route 4 and the new location link rated as low in environmental interference crossing South Barrington was added to allow for study of interconnections between the new location links, Route 4 and Routes 9 and 202 in this area of historic diverging of paths. **(Figure III-7)**

d. Barrington to Rochester

Access across Barrington to Rochester is presently provided by Routes 202 and 125. Traffic projections have indicated there is substantial demand for movement in this southwest to northeast direction primarily by local commuter traffic and secondarily by regional through traffic. Several options for routing traffic through Barrington and improving access to Rochester needed further analysis.

The Routes 9/202 area around West Barrington and the Route 202 area near Nippo Lake have high concentrations of sensitive natural environmental resources. New location corridors slightly removed from this resource rich area, but providing alternatives to the existing route offered potential routes of lower environmental interference. The upgrade of existing Route 125, a north-south route which also serves some east-west traffic demand, would result in lower impact on the environment than the upgrade of the northern section of Route 202. **(Figure III-5)**

New location corridors rated as low in environmental impact and effectively paralleling existing routes also required further analysis. Phase III detail was necessary in this area to determine which options would be least environmentally impacting and still serve traffic demands effectively.

e. Access to Somersworth

No existing route provides a direct link between Somersworth and the Route 108 (formerly Route 16) area to the east and Routes 125 to the west. During the course of the study, the lack of direct access to Somersworth had been articulated as a public issue. New location options needed to be further investigated in this area to produce a possible Exit 10 on the Spaulding Turnpike and possible additional means of reaching Route 108 from the west. Since none of the link between Route 125 and the Spaulding Turnpike were rated as low interference, and most links were rated as of moderate interference, the range of link connections were continued to allow for further, more detailed analysis. **(Figure III-7)**

f. Barrington to Dover

Present access into Dover from the west is provided across Barrington and Madbury via Route 9 and across Lee, Durham, Nottingham and Madbury via portions of Route 4 and Route 155. Neither of these existing paths could be widened along its full extent without substantial environmental interference. **(Figure III-5)** Route 108 and Madbury Road provide access into Dover, but primarily from Durham and areas to the south.

The upgrade of Route 4 east of Northwood has some segments with potential for lower resource interference, such as in Nottingham or east of Route 125 along the Durham bypass. However, the potential upgrades of the Lee Circle area and the eastern segments of Routes 9 and 155 were rated as having high interference. **(Figure III-5)** The Lee Circle area has large wetlands areas and much surrounding land use. Route 9 crosses the Bellamy Reservoir and passes close to adjacent homes. Widening Route 155 would substantially alter the character of the road, particularly through Madbury, which has clearly articulated its planning goals in its Master Plan.

Potential lower impact new location corridors have been identified through Barrington and Dover which would enable Dover-oriented traffic demand to be met, and these were included in the analysis area. Due to the traffic "fanning" characteristics discussed in Chapter I, access to Dover also needed to be developed from the options coming from the west on a more northerly alignment. This required the inclusion of a link of high environmental interference between Route 9 and the Isinglass River in Barrington. **(Figure III-7)**

Therefore new location options were retained for further analysis in addition to the possible upgrade of Routes 4, 9, 125 and 155.

g. Access via the Spaulding Turnpike to Points South of Little Bay

East of Northwood, Route 4 provides access to Durham and to points outside the study area accessed by the Spaulding Turnpike across the Little Bay Bridge. Environmental analysis has shown that all prospective new location corridors providing access to Dover Point contain links which have potential for high environmental interference. In addition, traffic analysis has shown that new location links just to the north of Route 4 in the Lee, Madbury and Durham area would not draw substantial traffic away from Route 4. Traffic from generators along and south of Route 4, such as the University of New Hampshire in Durham, would not travel north to a new location link in order to then go south on the Spaulding Turnpike, which is the destination of much of this traffic. As a result of these environmental factors, reinforced by traffic data, no new location corridors were proposed for study in this area.

After review and discussion with the Advisory Task Force, Route 4 east of Route 155, and Route 108 and Madbury Road were eliminated from further analysis at this point as traffic data noted above indicate that these highway sections do not meet the purpose of the project of improving transportation between Concord and the Tri-Cities. Route 4 east of Route 155 and the Scammell Bridge carry high traffic volumes and may require improvements, but these evaluations are beyond the purpose of the Concord to Spaulding Turnpike Study.

h. Elimination of Other Prospective Corridors

In addition to the analysis area which has evolved from the subarea by subarea analysis, consideration was given to other possible new location paths which could possibly have evolved out of the systems approach to the new location analysis.

As noted in the subarea discussion above, new location routes south of Route 4 have been removed from consideration because, in addition to environmental factors, the traffic projections indicate that such routes, particularly in the western portion of the study area would attract lower traffic volumes. **(Figure III-6)** These lower east-west volumes would be generated due to the orientation of the area toward the Manchester area.

The number, pattern and location of resources in the links in the far northern portion of the study area precluded the development of paths across this area. The pattern of land having steep slopes interspersed with wetland systems and supporting protected species habitat and placed into conservation trusts created corridors of high environmental interference when resource impacts were viewed at the Phase II level of detail **(Figure II-4)**. For example, the steep slopes of Parker Mountain, protected species habitat and Blue Hills conservation trust land

form a barrier across the center of the northernmost link (link H-a) in Strafford (**See Figure II-1**). Farmland at the western end and wetland throughout also constrain the link. The link (C-m) which runs from Barnstead southwest toward Bow Lake contains a network of wetlands associated with ponds between steep slopes, and conservation land and a Boy Scout Camp are located in the center of link. The link (C-j) which runs from Pittsfield across the northern tip of Northwood and east toward Bow Lake intersects Catamount Mountain on the west and a wetland network on east. Steep topography constrains the north portion of the link and wetlands, farmland and conservation land combine with terrain to constrain the southern portion. The net result was that a far northern path was not feasible due to environmental constraints.

The resulting Phase IIIA analysis area is shown as **Figure III-8 "Phase IIIA Analysis Area"**. As described earlier, the varied width as well as the location of the corridors were proposed in order to open options for creating combinations of upgrade and new location alternatives, consistent with the results of the analysis of underlying environmental resources and traffic conditions. As can be seen in **Figure III-7**, several gaps between analysis corridors, mainly in the west, were closed to permit corridor continuity or to permit consideration of bypasses and their required connections. Several other areas, from Bow Lake east, remained excluded, however, as will be noted in Phase IIIA, two of these were later reconsidered to permit analysis of logical corridor development.

The Phase IIIA analysis area allows for study of a range of new location options crossing the study area, as well as upgrade alternatives, and combination bypass/upgrade alternatives. For new location alternatives, upgrades and bypass/upgrade combinations, potential exists for multiple-termini alternatives. Bypasses of segments of existing roadways with concentrations of environmental resources, such as Gossville, Northwood, around North River Pond and across Barrington, are possible.

IV. PHASE IIIA: DEVELOPMENT AND SCREENING OF SUBCORRIDORS

A. INTRODUCTION

The purpose of the Phase IIIA analysis was to define the range of alternatives to be carried forward into Phase IIIB, the completion of the Draft Environmental Impact Statement. In the progression of the phases, environmental analysis became more refined and changed focus from analyzing broad, mile-wide new location corridors and considering upgrades, to defining and comparing specific alternatives to develop the reasonable range of options to be studied in detail in the DEIS.

In Phase IIIA, the corridors surviving the Phase II screening process and shown on **Figure III-8, "Phase IIIA Analysis Area"** were subjected to a finer scale of analysis in order to define the range of build alternatives. The key elements of the Phase IIIA analysis included:

- Within the Phase IIIA analysis area created by assembling Phase II mile-wide corridors, 400-foot wide new location paths were defined and tested for environmental and engineering feasibility along with 250-foot wide upgrade subcorridors.

- These 400-foot wide paths were assembled into a Phase IIIA network of links and within zones for analysis purposes.

- The resource database was overlaid with this network and queried to tabulate the specific impact to each new location link or upgrade segment.

- Pairs of redundant new location links were compared for resource impacts and higher impacting links were removed. The remaining links were assembled into longer subcorridors.

- A qualitative analysis of the consistency of new location and upgrade subcorridors with planning objectives was introduced.

- A qualitative analysis of the subcorridors relative to wetlands functions and values was introduced.

- Preliminary cost estimates were developed for new location and upgrade subcorridors to provide insight into the scope of the engineering challenge of developing the subcorridors.

- These qualitative factors were evaluated, along with the quantitative environmental impact data for each subcorridor, as part of a comprehensive comparison; the less impacting and more effective subcorridors were retained for further study.

- These surviving subcorridors were assembled into more than fifty possible alternative full upgrade, bypass and new location corridors across the entire study area.

- One upgrade, four bypass/upgrade and the ten new location corridors least impacting on wetlands were identified and presented at public meetings for review and comment as proposed for further analysis in Phase IIIB.

The development of links and subcorridors and the methodology and results of the analysis which led to their screening are described in the following sections.

B. DEVELOPMENT OF SUBCORRIDORS

In preparation for undertaking a rigorous comparative analysis of prospective new location and upgrade subcorridors, several preliminary steps were taken. The Phase IIIA new location links and upgrade segments that were to be incorporated into a subcorridor analysis were developed within the Phase IIIA analysis area that was assembled from Phase II mile-wide corridors; their width was chosen to approximate the desirable width of new location or upgrade roadways meeting federal and state design standards. The voluminous data accumulated during Phases I and II were organized, and the Phase IIIA analysis area was divided into analysis zones to facilitate labelling and record keeping in the comparative link and subcorridor analysis. The Phase IIIA link network was reviewed to eliminate any expendable, redundant links. Finally, links surviving the redundancy test were assembled into longer subcorridors.

1. Identification of New Location Links

Using a display of all the sixteen natural and man-made environmental resources mapped in Phases I and II of the study (see **Table III-1**), a planner and an engineer jointly mapped 400-foot wide graphic paths oriented in a generally east-west direction within the surviving Phase II conceptual corridors. The 400-foot width was chosen to approximate the desirable (as opposed to minimum) right-of-way width for a four-lane roadway and adjacent slopes meeting federal and state engineering design and safety standards. Due to the expanding scale of analysis (from 5280 feet to approximately 400 feet), more than one Phase IIIA new location link could be laid out within the Phase II corridors, providing many link connections and the opportunity to find the least environmentally impacting paths across the study area.

The objective in drawing these paths was to avoid impact on all resources while developing a rational continuous path, and where avoidance was not possible, to minimize impact on resources. Examples of impact minimization are crossing a farm along its edge or a floodplain at its narrowest point. This method was designed to comply with the National Environmental Policy Act by minimizing impact on all resources and to comply with Section 404 of the Clean Water Act by minimizing impact on aquatic resources. Furthermore, this method was designed to reduce the need to introduce mitigation measures in later phases of the study.

Using a highway design software package, IGRDS, these mapped paths were then tested for engineering feasibility along horizontal (curvature) alignment and vertical (grade) profile, to determine whether the paths could function as roadways meeting federal and state highway standards. When a path did not meet engineering standards, the team adjusted the path slightly. If, based on visual review, the path as adjusted could continue to avoid or minimize impacts on environmental resources, the adjusted path was retained for further study. If the path as adjusted

still could not meet the design standards or if the adjustment resulted in unacceptable resource impacts, the path was dropped from further study.

The resulting network of potential new location links was viewed at a series of technical and Advisory Task Force meetings and suggestions for further modifications to the system were received. The modifications were made if appropriate and feasible. The Phase IIIA new location corridor link network is shown in **Figure IV-1 "Phase IIIA Analysis Corridors".**

Inspection of **Figure IV-1** indicates the relationship between Phase II and Phase IIIA "links". One or more 400-foot wide Phase IIIA new location link could be developed within each mile wide Phase II link. In assemblies of mile-wide corridors, such as along the Suncook River in Chichester and Epsom, a series of links could be developed. The mile-wide Phase II links, as adjusted and shown in **Figure III-7**, provided the necessary guidance for developing the Phase IIIA links, with three exceptions. During the engineering analysis of the routes around Epsom Mountain, it was found that the least impacting most northerly link required a small loop outside the Phase II corridor. In the Barringtron/Dover area it was found that the east-west orientation of the Phase II corridors limited the possibilities of making north-south connections between adjacent corridors. Thus, two north-south links were added through areas previously excluded from consideration: one near Mallego Brook and one at the Cocheco River.

To facilitate record keeping in the detailed Phase IIIA analysis, these Phase IIIA links were labelled as indicated in **Figure IV-2 "Corridor Link Key and Upgrade Segments".** The network was divided into four parts numbered "1" through "4". All links were labelled with this area number followed by an individual link number within that area. These initial area numbers represent the four general areas in which the links were developed and organized for labeling purposes. For example, the link on the map labelled "1-12" is link number twelve in area one. The four link development areas essentially cross the study area from west to east.

2. Identification of Upgrade Subcorridors

In contrast to the new location link network which had to be created, the upgrade network exists. In Phase II, the existing routes had been divided into 34 segments to evaluate the level of environmental interference which might occur should that segment be upgraded. At the end of Phase II, a network of roads serving east west traffic was identified for further study in Phase IIIA. These roads consisted of Routes 4/9/202 through Chichester, Epsom and Northwood; Routes 9/202 through Barrington and Route 202 continuing into Rochester and Route 9 continuing into Dover; Route 4 through Nottingham, Barrington and Lee and Route 155 continuing into Dover; and, Route 125 between Rochester and Route 4.

These segments were joined to become subcorridors. Also, through joint analysis of the new location and upgrade corridors, the prospects of considering a bypass as an additional option were identified along some upgrade corridors, while in other subcorridors, the prospects for a bypass were not present because of the geographical isolation of the upgrade corridor from other new locations corridors under consideration. To facilitate this interactive analysis and the development of a complete upgrade alternative, the existing routes were combined into the following ten subcorridors: **(Figure IV-3, "Upgrade Subcorridors")**

- Subcorridor 1: Routes 4/9/202 - Between I-393 and Route 107 Northbound
- Subcorridor 2: Routes 4/9/202 - Between Route 107 Northbound and Routes 9/202
- Subcorridor 3: Route 4 - Between Routes 9/202 and Route 125
- Subcorridor 4: Routes 4/155 - Between Route 125 and the Spaulding Turnpike
- Subcorridor 5: Routes 9/202 - Between Route 4 and Route 9
- Subcorridor 6: Route 202 - Between Route 9 and the Spaulding Turnpike
- Subcorridor 7: Route 9 - Between Route 202 and Route 125
- Subcorridor 8: Route 9 - Between Route 125 and the Spaulding Turnpike
- Subcorridor 9: Route 125 - Between Route 4 and Route 9
- Subcorridor 10: Route 125 - Between Route 9 and the Spaulding Turnpike

3. Definition of Phase IIIA Analysis Zones

To continue the environmental analysis process, the Phase IIIA analysis area was divided into five analysis zones (**Figure IV-4, "Phase IIIA Analysis Zones"**.) These zones are: Suncook River (west portion of the study area), Epsom Mountain (west-central), Bow Lake (central), Isinglass River (eastern portion of the study area, with links in the vicinity of the Isinglass River) and Bellamy River (eastern portion of the study area, with links extending across the southern part of Barrington). These analysis zones are generally similar to the link development areas set up for numbering the Phase IIIA links although, created for environmental analysis purposes, the analysis zones do not have a direct relationship to the link numbering system.

The five Phase IIIA analysis zones were used to analyze the role each link might play within the network made up of new location, upgrade and bypass/upgrade options. Listed below are descriptions of these five zones:

- Suncook River: Portions of Chichester, Epsom and a small area in Pittsfield between Interstate I-393 in Concord and the Epsom Mountain area. In essence, these links were grouped to find the best crossing of Route 28 and the Suncook River.

- Epsom Mountain: The band of the study area in eastern Epsom and western Northwood north of Routes 4/9/202 in the Epsom Mountain area. These links provide alternative options for crossing the difficult terrain neighboring Epsom Mountain.

- Bow Lake: The center of the study area mainly located in Northwood and Strafford, with a portion of western Barrington and a small portion of Nottingham included. Options going either north or south of Bow Lake were compared in this zone.

- Isinglass River: Includes the eastern two-thirds of Barrington and the small northern corner of Madbury. Also included is the southern portion of Rochester and the northern portion of Dover with the Spaulding Turnpike as the eastern boundary. This analysis zone includes links which connect to alternatives in the Isinglass River area, near Route 126 in Barrington.

- Bellamy River: Includes most of the southern portion of Barrington and overlaps geographically with the Isinglass River area on the eastern end. The focus is on links which connect alternatives from the vicinity of North River Pond to the Spaulding Turnpike.

4. Quantification of Impacts: New Location Links

With no one corridor being completely free of environmental interference, it was necessary to measure and quantify the potential impact of each link upon natural, cultural and socio-economic environmental resources.

Using a geographic information system (Intergraph MGE/MGA) based on the sixteen resources mapped and updated in the Sverdrup computer system during Phases I and II, the acreage of impact within each 400-foot wide corridor was calculated for each resource. Area resources, such as wetlands, farmland, parkland and residential and commercial land uses, which occupy relatively large land areas, were measured to determine the acreage of individual resources which would be impacted by each link. Point resources, such as community facilities and possible historic buildings whose location is site specific, were quantified in terms of units falling in each corridor link.

In some cases a resource could be counted in two categories. For example, an affected school and surrounding playground would be counted as one community facility, a point resource, and as so many acres of impacted parkland, an area resource.

An extensive database of environmental data was developed as a result of this quantification of the acreage or number of resources which would be directly impacted by each new location link. These data are contained in **Appendix C**, and are arrayed in new location and upgrade subcorridor analysis below.

In addition, preliminary construction cost estimates were developed based on average costs of construction in different types of terrain. This information provides a first estimate of the costs involved in creating a roadway under the conditions encountered. The cost information was not used as a screening factor per se, but provided insight into the relative engineering challenge involved in selecting alternative paths. The methods used to develop these estimates, the typical cross sections used in developing the cost and data sheets are detailed in **Appendix H, Conceptual Construction Cost Estimates"**, and in Technical Memorandum No. 22, "Mapping Techniques, Location and Design, and Database Management."

In Phases I and II the screening process consistently eliminated situations where high potential for serious impacts on the environment might occur. This effective elimination of conflicts continued in Phase IIIA as the corridors were reduced from one-mile wide to 400 feet. Due to the process used to develop the links initially, most links avoid many of the resources analyzed. The resources most commonly impacted were wetlands, farmland, residential and commercial land use and potential historic sites.

Considerations concerning the resources analyzed include these:

- Wetlands are pervasive throughout this portion of New Hampshire. Virtually all new location links and upgrade segments impact wetlands. In analysis and in compliance with the intent of Section 404 of the Clean Water Act, the option less impacting on wetlands was retained, unless there was an overriding reason to discontinue the link, such as presence of a community center or land subject to Section 4(f) of the federal Transportation Act of 1966. With the number of links and comparisons at this stage, a wide range of options still existed. As more analysis was done in Phase IIIA, qualitative information regarding wetlands became available to develop the wetland analysis further.

- In the eastern portion of the study area only, the Soil Conservation Service (SCS) has provided information on active farmland, and this information (referred to in the figures as "Farm - SCS") was used in addition to the farmland identified via satellite imagery (and referred to in the figures as "Farm - Landcover"). When the SCS and satellite information was compared, the SCS information appears inclusive, but provided a useful additional source of information in examining the potential impacts of a link. In addition, inspection of aerial photographs and comments at public meetings indicated that much of the land reported by SCS but not identified by satellite imagery is managed tree farms, a resource not identifiable from satellite imagery.

- Residential and commercial land use, although smaller in absolute acreage impacted than wetlands or farmland, were resources frequently impacted and presenting a range of impact from high to low. Impact on residential and commercial land use can elicit the greatest public response, as it most immediately affects the day to day lives of area residents.

- Historic sites were also resources frequently indicated as impacted and thus may prove to be important Section 4(f) issues. These impacts are of major concern and particular attention has been and will continue to be paid to these resources throughout the study in consultation with the NH Division of Historic Resources.

- Park or conservation land was impacted very rarely. The few cases that were identified as possibly subject to Section 4(f) were noted in the evaluation.

  Due to the intent of the Concord to Spaulding Turnpike Study to become aware of all resources of concern and attempt to avoid them, the park and conservation land inventory includes some privately owned sites not protected under the provisions of Section 4(f). Examples of two such areas are an informal boat launching area in Chichester and the bend of the Isinglass River in Barrington known as Hale Woods. Hale Woods has been noted as an area of concern by the Barrington Conservation Commission, but no public ownership or other interest has yet been obtained. Discussions of these resources are included in the text.

5. Quantification of Impacts: Upgrade Subcorridors

Using the method described above, the potential impacts of upgrade subcorridors on each mapped resource were calculated using the GIS system. A 250 foot right-of-way width representing the desirable upgrade width to meet design and safety standards was used as the corridor in which impacts were calculated. The impact tables for the upgrade subcorridors are attached as **Appendix D.**

6. Elimination of Redundant New Location Links

The acreage or number of resources impacted were compared for relatively short new location links which serve the same network purpose, with a few exceptions for longer parallel links which crossed similar territory between the same two nodes. In other words, link pairs which connected the same nodes in the Phase IIIA link network were compared and the link with the lesser environmental impacts was retained and used to develop longer subcorridors for further comparative analysis. If no substantive difference between links was evident, both links were retained for further analysis. Only redundant short links, or link combinations clearly serving similar transportation purposes, were compared in this step. The existing route network does not have any segments which are clearly redundant, therefore resource impacts caused by potential existing route upgrades were not compared in this step.

A detailed description of how this comparative analysis was carried out is contained in **Appendix E, "Elimination of Redundant New Location Links."**

Of the total of 111 new location links in the Phase IIIA network, 67 were redundant and subjected to this first iteration of comparative analysis. Only 23 links were eliminated. The remaining 88 links were carried into the next step of analysis. This resulting network is shown on **Figure IV-5, "Phase IIIA Corridor Link Key after Redundant Link Elimination".**

7. Assembly into Subcorridors

The 88 new location links remaining after the redundancy analysis were formed into longer paths across the five zones of the Phase IIIA analysis area. These longer paths, called "subcorridors", generally cross the full width of an analysis zone, and typically cross more than one community in the process. The ten upgrade subcorridors were not included in the first step of elimination due to the absence of redundant upgrade subcorridors; upgrade subcorridors were to undergo the same qualitative comparative analysis methodology as the new location subcorridors.

The remaining new location links were formed into subcorridors within the five zones as follows. The subcorridors are numbered and the zone name is abbreviated using the first letters of the name of the zone (e.g., subcorridor Suncook River 4 is referred to as "SR-4").

a. Suncook River Zone: Subcorridors SR-1 to SR-6 **(Figure IV-6)**

The Suncook River area primarily covers Chichester and Epsom north of Routes 4/9/202, although a small portion of Chichester south of this route is included. The western boundary

of this zone is essentially the terminus of Route I-393, with coverage extending east to the Barton Hill and Gulf Brook area of Epsom.

Of the six Suncook River subcorridors, four (SR-1, SR-2, SR-3 and SR-4) begin with a common path extending northeast from I-393 in Chichester for about two miles then continue on individual paths to the north of Epsom Mountain in northeast Epsom. These four paths represent combinations of two paths across Chichester and the Suncook River and two paths across the northern portion of Epsom. SR-2 and SR-4 cross the Suncook River just south of Main Street in Chichester, converging in Epsom with SR-1 and SR-3 which cross the Suncook River near the Chichester/Pittsfield/Epsom border. SR-1 and SR-2 continue across Epsom north of the range of hills including Locke's Hill and Barton Hill, while SR-3 and SR-4 pass south of these hills closer to Routes 4/9/202.

SR-5 is similar to SR-4, except shorter for the purpose of comparison to SR-6, ending just east of the Suncook River. SR-6 is the one path which runs south of Routes 4/9/202 in Chichester, creating an additional new crossing of that road. Due to its connection and proximity to Routes 4/9/202, the eastern part of SR-6 could also function as a bypass to upgrading portions of Routes 4/9/202.

b. Epsom Mountain Zone: Subcorridors EM-1 to EM-4 **(Figure IV-7)**

Four relatively short paths cross between Epsom Mountain and Northwood Narrows area in the west-central portion of the study area. The Epsom Mountain subcorridors play a connecting role between the subcorridors crossing the Suncook River to the west and the range of paths passing north and south of Bow Lake to the east.

c. Bow Lake Zone: Subcorridors BL-1 to BL-11 **(Figure IV-8)**

The eleven Bow Lake zone subcorridors form long paths across Northwood and/or Strafford. The subcorridors connect two possible western nodes north of Routes 4/9/202 in the Northwood Narrows area with two possible eastern nodes, one at the bend of the Isinglass River near Route 126 in Barrington and one north of North River Pond at the Barrington/ Northwood/ Nottingham line.

Six of the combinations (BL-1, BL-2, BL-3, BL-9, BL-10 and BL-11) run to the northern new location network diverge near the bend of the Isinglass River in Barrington. Three (BL-1, BL-2, and BL-3) of these six combinations run from the more northerly path across Epsom and Northwood Narrows and three (BL-9, BL-10 and BL-11) from the more southerly route across Epsom. Only one subcorridor (BL-1) passes through Strafford north of Bow Lake and crosses into Barrington north of the Isinglass River.

Five paths (subcorridors BL-4, BL-5, BL-6, BL-7 and BL-8) run from one of the two nodes near Northwood Narrows to the southern diverge near North River Pond in Barrington; two subcorridors originate at the northern point (BL-4 and BL-5) and three (BL-6, BL-7 and BL-8) from the slightly more southerly point.

Subcorridors which include links 2-4, 2-62 or 2-20 and connect to Route 202 (i.e. BL-6, BL-7 and BL-8) could function as bypasses of the densely developed Routes 4/9/202 corridor through Northwood. A subcorridors which includes link 2-14 could bypass just the North River Pond area along Route 9/202.

d. Isinglass River Zone: Subcorridors IR-1 to IR-7 **(Figure IV-9)**

These seven Isinglass River subcorridors run from the northern new location network diverge in Barrington at the bend in the Isinglass River near Route 126 to six locations along the Spaulding Turnpike between Exit 8 in Dover and Exit 13 in Rochester. These subcorridors all run north of Route 9. The subcorridors are ordered sequentially from north to south, with IR-1 and IR-7 intersecting the Spaulding Turnpike at the most northerly and southerly link, respectively.

e. Bellamy River Zone: Subcorridors BR-1 to BR-7 **(Figure IV-10)**

Paths in the Bellamy River zone all begin north of North River Pond and cross Barrington on link 3-8, which runs in a northeast direction to East Barrington, passing north of Swain's Lake. This link, 3-8, which is common to all Bellamy River subcorridors, could function as a bypass of Route 9 from the Route 4 diverge to Route 125. The paths then follow various combinations of links around East Barrington and the intersection of Routes 9 and 125 to connect to the Spaulding Turnpike at four locations between Exit 8 in Dover and Exit 11 in Rochester. The subcorridors are essentially ordered sequentially north to south, although BR-2 and BR-4, and BR-3 and BR-5 share the same termini, but have different paths across the zone.

C. QUALITATIVE COMPARATIVE ANALYSIS: PLANNING OBJECTIVES

1. Methodology

The use of environmental protection criteria as the basic analysis tool in the development and screening of Phase IIIA corridors was necessary to ensure the resulting range of alternatives would withstand the detailed scrutiny and impact evaluation required in the Environmental Impact Statement in compliance with the Section 4(f) of the US Department of Transportation Act, the National Environmental Policy Act (NEPA) and the Clean Water Act.

Unlike the Clean Water Act, which is concerned with the protection of aquatic resources, broader NEPA concerns encompass the socio-economic and cultural environments as well as the natural environment. Additional NEPA concerns are: (1) avoiding possible conflicts between a proposed project and the objectives of land use plans, policies and controls for the area concerned, and (2) assuring that the project purpose is not diverted by other concerns.

During a series of initial Phase IIIA presentation and review meetings with the public and with the Cooperating Agencies, general approval was expressed regarding the Phase IIIA methodology used to develop, refine and reduce the range of new location links to be studied in the Draft Environmental Impact Statement. However, concern was expressed that the objective of protection of the natural environment, while valued as a primary consideration, was

being given too much emphasis and not sufficient attention was being given to socio-economic issues and land use planning objectives. Further, there was concern that too much dependence was being put on counting up quantities (e.g. acres of wetlands, number of historic sites) without giving consideration to the quality of the resources possibly being impacted.

As a result, additional parameters were introduced for analysis:

- Community Cohesion: Specific consideration of (1) the impacts that the proposed action would have on the human environment or local communities involved, and (2) the consistency of the proposed corridor location with local residential and community land use planning objectives.

- Economic Development: Specific consideration of (1) the impacts that the proposed action would have on the patterns and conditions of existing employment and businesses, and (2) the consistency of the proposed action with local economic development objectives.

- Network Efficiency: Specific consideration of how well the emerging alternatives would provide an effective advancement of the objective of the project of improving east-west traffic movement in the area between Concord and the Tri-Cities.

In compliance with NEPA, the Phase I data collection effort had included information on socio-economic conditions and concerns, including local land use plans and objectives. The planning objectives related to community cohesion, economic development and network efficiency were now evaluated in Phase IIIA based on a review of technical memoranda and study maps, community master plans and public comments, traffic studies and analysis, interviews with local officials, as well as other knowledge gained from community, Advisory Task Force and public information meetings.

A series of planning objective worksheets were completed for each upgrade segment and new location subcorridor under study in Phase IIIA. **Table IV-1** lists the set of questions established to guide the evaluation on positive community cohesion objectives, economic development objectives and network efficiency. A summary of results for the effectiveness of each alternative subcorridor in meeting individual planning criteria was provided to give three overall qualitative ratings.

2. Consideration of Planning Objectives in New Location Subcorridors

The interpretation of the evaluation questions and explanatory text of the qualitative ratings assigned each of the new location subcorridors is summarized below by analysis zone. The role of each subcorridor in meeting the planning objectives was judged as "effective," "moderately effective" or "ineffective" as summarized in **Table IV-2, "Planning Objectives: Summary Rating for New Location Subcorridors"**. The worksheets used in the qualitative analysis to determine the individual ratings for effectiveness in meeting the objectives of community cohesion, economic development and network efficiency are in **Appendix F**.

a. Suncook River Zone

1). Community Cohesion

The neighborhoods and community centers located in this area are Chichester Center, North Chichester, a grouping of homes on New Orchard Road in Epsom, and the commercial and residential development along Routes 4 and 28, particularly at Epsom Circle and Gossville. Subcorridors which include link 1-6 (i.e. SR-2, SR-4, SR-5 and SR-6) have a particular impact on Chichester Center and North Chichester.

Due to the orientation of the town of Chichester, none of the subcorridors cross Chichester along its geographic border. However, paths arcing north away from the center of the town at Chichester Center and North Chichester were considered somewhat more respecting of the orientation of the town. All of the subcorridors pass through the northern portion of the town of Epsom. The paths closer to the northern border of Epsom (SR-1 and SR-2) are considered to be more respectful of the borders than those closer to Route 4.

2). Economic Development

Concord is the center of existing economic development in the western portion of the study area, and all six subcorridors provide improved access to this market. Traffic projections have indicated that new location links arcing north (SR-1 and SR-3) would carry the largest volume of traffic, thus providing the greatest level of access improvement to existing employment centers.

Major new employment centers are not planned in the Suncook River zone. The economy has placed a hold on major commercial developments that might be expected in East Concord. Only small scale local commercial development is planned in Chichester and Epsom along Routes 4 and 28. As a result, improving access to planned employment centers within those towns is not an issue and is rated as not applicable.

A review of the master plan indicates the goal of Chichester is to remain rural. Subcorridors arcing north (SR-1 and SR-3) would take traffic off existing roads, and with an interchange unlikely between Route 28 and Routes 4/9/202, would not provide undesired accessibility. As a result, these subcorridors are rated effective in meeting local development goals for Chichester. Suncook River subcorridors SR-2, SR-4 and SR-5, which include link 1-6, are located close to Chichester Center and North Chichester and would likely create an interchange at Route 28 adjacent to these centers. As a result, these corridors are rated ineffective in meeting the local development objectives of Chichester. The subcorridor south of Route 4 (SR-6) would likely create a new interchange with Route 4 in Chichester and is also rated as effective in meeting the local goals of Chichester.

TABLE IV-1

PLANNING OBJECTIVES QUESTIONS ASKED

Community Cohesion

- **Avoids direct impact to a neighborhood?** Does the new location or upgrade subcorridor bisect or directly impact a residential neighborhood, i.e. a relatively concentrated group of homes with a common identity?

- **Avoids direct impact to an activity center or a community center?** Does the new location or upgrade subcorridor bisect or directly impact areas of concentrated commercial land use or community centers, i.e. one or more town or institutional buildings with a community focus?

- **Respects the geographic boundaries of a municipality?** Does the new location or upgrade subcorridor generally pass between two municipalities rather than bisect a municipality?

Economic Development

- **Improves access to existing employment centers?** Does the new location or upgrade subcorridor provide improved access to areas of concentrated industrial and commercial land use?

- **Improves access to planned employment centers?** Does the new location or upgrade subcorridor provide access to areas designated by a community for future industrial or commercial development, particularly areas with current development plans?

- **Do improvements meet local objectives?** Does the location of the new location or upgrade subcorridor coincide with community goals, i.e. respect designated preservation areas, specific zoning, and overall community development or non-development objectives? Would a new location subcorridor interchange put development pressure where it is, or is not, wanted?

Network Efficiency

- **Provides a direct alignment?** Does the new location or upgrade subcorridor help to provide direct (shortest distance) access between Concord and the Tri-Cities ?

- **Improves access between activity centers?** Does the new location or upgrade subcorridor help to interconnect community centers, commercial areas, activity centers and residential areas within the study area?

- **Allows for network integration?** Does a new location subcorridor provide the opportunity to connect with and integrate with an existing route upgrade, and vice versa?

- **Provides relief to existing roads?** Does a new location subcorridor provide effective relief to the existing east-west road network? This evaluation is based on traffic projections and analysis done as part of the study process.

- **Provides for connection east of the Spaulding Turnpike?** Do subcorridors meeting the Spaulding Turnpike terminate where there is ample room to allow for an interchange and a clear path for possible future connections to state routes connecting into Tri-Cities communities? This question is applicable only to subcorridors at the eastern end of the study area, terminating at the Spaulding Turnpike.

Table IV-2

PLANNING OBJECTIVES SUMMARY RATINGS FOR NEW LOCATION SUBCORRIDORS

Subcorridors	Community Cohesion	Economic Development	Network Efficiency
Suncook River 1	E	E	M
Suncook River 2	I	M	M
Suncook River 3	M	E	M
Suncook River 4	I	M	M
Suncook River 5	I	M	M
Suncook River 6	M	E	M
Epsom Mountain 1	I	M	E
Epsom Mountain 2	I	M	E
Epsom Mountain 3	E	M	E
Epsom Mountain 4	M	M	E
Bow Lake 1	I	I	M
Bow Lake 2	E	I	M
Bow Lake 3	M	I	M
Bow Lake 4	E	I	E
Bow Lake 5	M	I	E
Bow Lake 6	E	I	E
Bow Lake 7	M	I	E
Bow Lake 8	I	I	E
Bow Lake 9	M	I	E
Bow Lake 10	M	I	E
Bow Lake 11	I	I	M
Isinglass River 1	E	E	M
Isinglass River 2	M	E	M
Isinglass River 3	M	E	M
Isinglass River 4	E	M	E
Isinglass River 5	M	M	E
Isinglass River 6	M	E	E
Isinglass River 7	M	E	E
Bellamy River 1	M	M	E
Bellamy River 2	M	M	E
Bellamy River 3	M	E	E
Bellamy River 4	M	M	E
Bellamy River 5	M	E	E
Bellamy River 6	M	E	E
Bellamy River 7	M	E	E

E = **Effective** in contributing to objective
M = **Moderately Effective** in contributing to objective
I = **Ineffective** in contributing to objective
- = **Not applicable**
(Multiple rating indicates separate ratings for different communities, west to east)

At a community meeting in the fall of 1991, Epsom citizens generally expressed the idea that the subcorridors close to Route 4 would aid the community most by removing traffic from Gossville center, yet provide access for the community to a new transportation facility. This view caused the subcorridors closest to Route 4 and providing direct connections, or reasonably straight paths, toward Concord (SR-4, SR-5 and SR-6) to be rated effective in meeting the development goals of Epsom. Suncook River subcorridors SR-1 and SR-3 were rated the least effective because of the high arc away from areas of Epsom desiring improved access. Additionally, the Epsom Planning Board has informally expressed interest in paths which include the link 1-6 crossing of Route 28 (SR-2, SR-4 and SR-5) as potentially supporting commercial development near an interchange with Route 28.

3). Network Efficiency

Due to the arcing of paths in this area, most Suncook River subcorridors were rated as ineffective or moderately effective in providing a direct alignment, except for SR-6, which heads almost directly east out of Concord.

However, Phase II traffic analysis has shown that connections arcing northeast from Concord will relieve traffic on both Routes 4/9/202 and 28, particularly serving traffic between Pittsfield, Barnstead and Concord. As a result, all of the subcorridors except Suncook River 6 were rated as effective in improving access between activity centers. From the perspective of Epsom, the closer the subcorridor to Route 4 (e.g. SR-6), the greater improvement of access between community centers.

Regarding network integration, the closer the new location corridor to Route 4 in this area, the greater potential for a bypass option.

b. Epsom Mountain Zone

1). Community Cohesion

The community in this eastern portion of Epsom and western portion of Northwood is Northwood Narrows, which borders the Epsom Mountain and Bow Lake analysis zones. The town of Northwood has identified this community, which extends north from Route 4 along Route 107, as one of the focal points of the town. Subcorridors EM-1 and EM-2 (which include link 2-2) run just north of Northwood Narrows and are rated as ineffective in avoiding impacts on neighborhoods and community centers. Subcorridors EM-3 and EM-4 (which include link 2-5) would have lesser impacts on residences along Route 107.

Three subcorridors were rated as moderate in respect to the geographic borders of Epsom and Northwood; EM-3, which runs along the Epsom border and generally into the northern portion of Northwood was rated as effective.

2). Economic Development

Regarding access to existing employment centers, all four subcorridors connect into Suncook River subcorridors which would provide improved access to the Concord labor market.

No employment centers are planned in the immediate area, or in the neighboring areas to the east and west. Therefore, access to planned employment centers for all four links is not an issue and is rated as not applicable.

As noted in meeting local development objectives for the Suncook River area, from a development standpoint, some sentiment was expressed in Epsom for subcorridors closer to Route 4. As a result EM-1 and EM-2 subcorridors are rated effective in meeting local development objectives of Epsom, and subcorridors EM-1 and EM-3 are rated moderate. Northwood officials have publicly expressed opposition to all paths through the town, and in response, all four paths are rated ineffective in meeting Northwood local development objectives.

3). Network Efficiency

Except for EM-4, which must curve to avoid the steep slopes of Epsom Mountain, these relatively short subcorridors function as direct routes.

All four paths provide potential access via an interchange at Route 107 to Northwood Narrows, and connect to paths potentially leading to Chichester Center, and as such are rated moderate in improving access between activity centers.

Epsom Mountain subcorridors EM-2 and EM-4 are close to Route 4 at their western end and offer a potential connection to Route 4 east of Gossville; as a result they are rated effective in potentially allowing for network integration.

All four subcorridors are close enough to Route 4 to offer relief to existing east-west traffic using that route.

c. Bow Lake Zone

1). Community Cohesion

The community centers located in this portion of the study area are Northwood Narrows, the length of Route 4 in Northwood (particularly at Northwood Center, Northwood Ridge and East Northwood) and Bow Lake Village in Strafford. Other neighborhood concentrations in the area include the row of homes along the north shore of Bow Lake and the Whig Hill subdivision in Strafford.

Subcorridor BL-1 is rated ineffective in avoiding neighborhood impact because it impacts the neighborhood along the north shore of Bow Lake, and as of moderate impact on a community center as the row of homes becomes more concentrated as the corridor passes near Bow Lake Village. Subcorridors BL-8 and BL-10 both include link 2-20 directly north of Route 4 in Northwood and thus are rated ineffective in avoiding direct impact both to neighborhoods and community centers. All other subcorridors are rated as of moderate impact to neighborhoods because they run near Whig Hill and/or Northwood Narrows. All other subcorridors are rated effective in avoiding impacts on community centers, except BL-9 and BL-10, which are rated moderate, and because they run near Northwood Narrows.

BL-1 was rated ineffective in respecting the geographic borders of a municipality because it runs across the geographic middle of Strafford. BL-8 and BL-11 run just north of Routes 4/9/202, and closely parallel the village areas of Northwood, and as such the subcorridors are rated ineffective. Subcorridors BL-2, BL-4 and BL-6, which run along the Northwood/Strafford town line (BL-2 also passes along the Strafford/Barrington town line) are rated as effective in respecting the geographic borders of the municipality. Subcorridors BL-3, BL-5, BL-7, and BL-10 are rated as moderate because they incorporate link 2-62 which swings further south into Northwood, and also BL-9, which uses link 2-4 along the Northwood/Strafford town line, but swings further south into Northwood toward Northwood Narrows.

2). Economic Development

All subcorridors cross the central portion of the study area, and were rated as moderate in improving access to existing centers because they would connect to subcorridors on the east or west which eventually connect to and provide improved access to existing employment centers. No employment centers are planned in this portion of the study area, and as a result, improving access to planned employment centers is rated as not applicable.

The Strafford master plan, written comments from Strafford officials and public comment are unified in stating the desire of the town to remain rural. As a result the Bow Lake 1 subcorridor is rated as ineffective in meeting local development objectives. Although the master plan dated September, 1987, indicates otherwise, Northwood officials have since expressed opposition to all subcorridors in their community. Therefore, all subcorridors are rated ineffective in meeting Northwood development objectives.

3). Network Efficiency

Subcorridors BL-4, BL-5, BL-6, BL-7 and BL-8 all provide relatively direct connections between their end points and thus are rated effective in providing a direct alignment, as is BL-1. Subcorridors BL-2, BL-3, BL-9 and BL-10 use link 3-16, which dips south and then travels north, and as a result are rated moderate. Subcorridor BL-11 takes the sharpest dip, and on the continuum, is rated as ineffective.

Subcorridors BL-6, BL-7 and BL-8 connect areas between Northwood Narrows along Route 107 and Route 202 and are rated effective in improving access between activity centers. Subcorridors BL-4 and BL-5 begin north of Northwood Narrows and run southeast to connect to Route 202 and would be moderately effective in connecting activity centers, as would subcorridors BL-9, BL-10 and BL-11 which run from Northwood Narrows to the bend in the Isinglass River. Subcorridors BL-1, BL-2 and BL-3 connect an area north of Northwood Narrows with the bend in the Isinglass River and are rated ineffective in improving access between activity centers.

Bow Lake subcorridors BL-6, BL-7 and BL-8 run close to Routes 4/9/202 and potentially connect to Routes 107 and 202 allowing for network integration and obtaining a rating of efficient in this category. Subcorridors BL-9, BL-10 and BL-11 also run along Routes 4/9/202, and additionally Routes 9 and 202, allowing for integration and thus rating efficient. Subcorridors BL-2, BL-3, BL-4 and BL-5 begin farther north on the west and offer somewhat

less opportunity for network integration along their length. Subcorridor BL-1 runs at a distance and is separated from existing east-west routes by Bow Lake, and as such is rated inefficient in network integration.

With the notable exception of subcorridor BL-1, which is distant and separated from existing east-west roads, initial traffic analysis indicates that the subcorridors would be effective in providing relief to existing east-west roads.

d. Isinglass River Zone

1). Community Cohesion

Activity centers in the Isinglass River environmental analysis area are the Gonic area of Rochester and East Barrington, both of which function as neighborhoods. Other neighborhoods in the area include the Sixth Street and Tolend Road sections of Dover.

Isinglass River subcorridors IR-1 and IR-4 do not directly impact neighborhoods and as a result are rated effective in that category. The other subcorridors pass near neighborhoods and are rated as of moderate impact: IR-2 and IR-3 on Gonic; IR-5 and IR-6 on Sixth Street; and IR-7 on Tolend Road.

All subcorridors except IR-2 and IR-3 are effective in avoiding direct impact on an activity center or a community center. IR-2 and IR-3 run near Gonic, and as a result are rated of moderate impact.

All Isinglass River subcorridors cross through Barrington. All subcorridors were rated as ineffective in relation to respecting the geographic borders of the town, except IR-1, which runs across the northern corner of the town. Subcorridors IR-4 and IR-5 run along the borders of Rochester and Dover, respectively, and were rated as effective regarding respecting the geographic borders of those municipalities. Other subcorridors were rated as moderate in relation to Dover and Rochester, except IR-1, which cuts through the middle of Dover west of the Spaulding Turnpike.

2). Economic Development

Rochester, Dover and Somersworth are major employment centers on the eastern side of the study area. Industrial parks are being developed or planned around the existing urban core in Rochester, and along Sixth Street and Route 9 in Dover west of the Spaulding Turnpike. Additionally, the area around the Dover/Somersworth/Rochester city lines intersection is viewed by those communities as having potential for industrial expansion.

All subcorridors except IR-4 and IR-5 provide reasonably direct access to existing employment in either Dover or Rochester. IR-4 and IR-5 bring traffic to the Spaulding Turnpike between the cities where, although commercial and industrial development is planned, little exists; the traffic model has also shown this terminus to be somewhat less effective in providing direct access to the cities than other subcorridors. With so much commercial and industrial development planned in the three cities, particularly along the Spaulding Turnpike, all subcorridors proved effective in improving access to planned employment centers.

Except for a large area rezoned for industrial development northwest of Lee Circle, Barrington has indicated its desire to remain rural in character. Therefore, all new location subcorridors were rated as ineffective in meeting local development objectives for Barrington. By vote of the City Council which considered development issues, Dover has indicated its opposition to links 4-24 and 4-5; therefore, subcorridors IR-5 and IR-6 were rated as ineffective in meeting the development objectives of Dover. Rochester has indicated its lack of support for link 4-14, and as a result this link was rated as moderate in this category. Other subcorridors were rated as effective in meeting the development goals of Rochester and Dover.

3). Network Efficiency

Subcorridors IR-1, IR-2 and IR-3 rated as effective in providing a direct alignment because they create a direct connection across the Isinglass River analysis zone to the Spaulding Turnpike. Other subcorridors were rated as moderate as their inclusion of link 3-27 created a looping effect; this loop is needed to avoid the engineering challenges of Sunnyside Hill and an additional crossing of the Isinglass River.

Subcorridors IR-4, IR-5, IR-6 and IR-7 would better connect the East Barrington area with the Spaulding Turnpike and Tri-Cities area and therefore, are rated as effective in improving access between activity centers. Although subcorridors IR-1, IR-2, and IR-3 also connect to the Spaulding Turnpike on the east, the only major activity centers are near the eastern termini at the Spaulding Turnpike. Therefore, these subcorridors were rated as moderately effective.

Isinglass River subcorridors IR-4, IR-5, IR-6 and IR-7 allow for integration with both Routes 9 and 125 and are rated as effective in this category. Subcorridors IR-2 and IR-3 would allow for integration with Route 125 and are rated as moderately effective. IR-1 runs to the north and allows only for limited integration; that is, it may integrate with Route 202 serving Rochester, but does not expand much on the opportunity for the development of a regional purpose network opportunities.

Traffic projections indicated that all Isinglass River subcorridors in this area of heavy traffic demand would be effective in providing relief to existing east-west roads, and all are rated as effective in this category.

All subcorridors provide connection to the Spaulding Turnpike and therefore are rated in relation to providing a connection east of the Turnpike. Subcorridors IR-1 and IR-7 were rated as ineffective because eastern extension of the subcorridors would run directly into the urbanized centers of Rochester and Dover, respectively, causing disruption of existing land use. Comments received from City of Somersworth officials state that IR-4 and IR-5 could connect into the secondary road system east of the Spaulding Turnpike; these two subcorridors were rated as effective in providing connections east of the Spaulding Turnpike. IR-2, IR-3 and IR-6 provide somewhat less opportunity to connect to roads east of the Spaulding Turnpike, and as a result were rated as moderate in this category.

e. Bellamy River Zone

1). Community Cohesion

In this subcorridor analysis zone, which overlaps somewhat with the Isinglass River area, residential neighborhoods are located around East Barrington, and along Sixth Street and Tolend Road in Dover. East Barrington is also an activity center and community center.

All subcorridors swing to the north or south around East Barrington. Bellamy River subcorridors BR-2, BR-3, BR-4 and BR-5 moderately impact the Sixth Street area, and BR-6 and BR-7 moderately impact the Tolend Road area. BR-1 was also rated as moderate in avoiding direct impact to a neighborhood and to an activity center or a community center.

Since all links cross near or through the geographic middle of Barrington, they are all considered as not respecting the community borders. In addition, the links crossing south into Madbury across the Bellamy Reservoir are considered as moderately respecting the geographic borders of this town. As discussed relative to the Isinglass River subcorridors above, subcorridors including links 4-62 and 4-24 (namely BR-1, BR-2 and BR-4) were rated as effective in respecting the borders of Rochester and Dover. Subcorridors including link 4-4 (BR-3 and BR-5) were rated as moderately effective, and subcorridors including link 4-4 (BR-6 and BR-7) were ranked as ineffective in respecting the borders of Dover.

2). Economic Development

The more southerly subcorridors directly serving Dover are considered as serving existing employment areas, while the more northerly links serve undeveloped land. Therefore, subcorridors BR-3, BR-5, BR-6 and BR-7 were rated as effective in improving access to existing employment centers, and BR-1, BR-2 and BR-4 were rated as moderately effective in this category.

As noted in the discussion of economic development for Isinglass River subcorridors above, Dover, Rochester and Somersworth plan substantial industrial and commercial development on open land to the west and east of the Spaulding Turnpike. Therefore, all links in this analysis area are considered as serving planned employment centers. The Madbury master plan indicates Route 108 in the southeastern part of town as the area of desired development, so subcorridor BR-7, which passes through northern Madbury, is viewed as ineffective in promoting local economic development goals.

The Dover City Council has voted to support the eastern portion of link 4-4 as an alternate to Route 9 and Rochester has voiced support of link 4-62, both in relation to local development goals. Therefore, BR-1, BR-6 and BR-7 are rated as effective in meeting the goals of the eastern communities, and the remaining corridors are rated as moderate in this category.

3). Network Efficiency

Subcorridors BR-1, BR-2 and BR-4 provide relatively direct connections between their endpoints and are rated as effective in providing direct alignment. Other subcorridors in this analysis area are somewhat more circuitous and are rated as moderately effective in providing a direct alignment.

All corridors connect Northwood with East Barrington and the Spaulding Turnpike, while more directly connecting Routes 4/9/202 with Routes 125 and 9. As such, all corridors are considered as improving access between activity centers and allowing for network integration as possible bypass options. Traffic projections have indicated that these subcorridors are particularly effective in serving future traffic demand and providing relief for existing roads.

All Bellamy River zone subcorridors connect to the Spaulding Turnpike. As noted in the discussion of network efficiency for Isinglass River subcorridors above, subcorridors including links 4-62 and 4-24 are effective in providing connections to the network of roads to the east of the Spaulding Turnpike. As a result, subcorridors BR-1, BR-2 and BR-4 were rated as effective. Subcorridors BR-6 and BR-7, which include link 4-4, would directly enter the City of Dover to the east and were rated ineffective because they would create substantial disruption of existing land use in the urbanized portion of Dover east of the Spaulding Turnpike. Remaining subcorridors BR-4 and BR-5 were rated moderately effective.

3. Consideration of Planning Objectives in Upgrade Subcorridors

The rationale used and issues raised in the evaluation of the positive contributions of each upgrade subcorridor to planning objectives are explained below and summarized in **Table IV-3**. The individual evaluation sheets used in this analysis are included in **Appendix F**. It should be noted that subcorridors are not rated in terms of providing relief to existing roads, since they are existing roads. The four upgrade subcorridors which do connect to the Turnpike, namely subcorridors 4, 6, 8 and 10 using Route 155, Route 202, Route 9 and Route 125 respectively, were rated as ineffective in providing future connections to the east, since extensions of these upgrades would disrupt the land use patterns of the urbanized areas of Dover and Rochester east of the Spaulding Turnpike.

a. Routes 4/9/202 between I-393 and Route 107 Northbound (Subcorridor 1)

1). Community Cohesion

This corridor passes through central areas of Chichester and Epsom. The Chichester portion functions mainly as a commercial activity center, with scattered homes. Gossville, which is a neighborhood, activity center and community center for Epsom, stretches along Routes 4/9/202 east of Epsom Circle, which is also an activity center. As a result, upgrading this portion of Routes 4/9/202 was rated ineffective in avoiding direct impact to a neighborhood, activity center or community center and to respecting the geographic borders of a municipality.

TABLE IV-3

PLANNING OBJECTIVES SUMMARY RATINGS
FOR UPGRADE SUBCORRIDORS

Upgrade Subcorridors	Community Cohesion	Economic Development	Network Efficiency
1	I	M	E
2	I	I	E
3	E	E	I
4	I	I	M
5	I	M	E
6	E	E	M
7	I	M	E
8	M	M	E
9	M	E	I
10	I	E	E

E = **Effective** in contributing to objective
M = **Moderately Effective** in contributing to objective
I = **Ineffective** in contributing to objective
N/A = **Not Applicable**

(Multiple rating indicates separate ratings for different communities, west to east)

2). Economic Development

Upgrading this subcorridor would improve access into existing employment in Concord. As noted in the new location discussion above, no new employment centers are planned in this area, so the subcorridor was not rated for improving access to planned employment centers. This upgrade would meet the local development objectives of Chichester to focus development along Routes 4/9/202, but would be ineffective in meeting the development goals of Epsom to maintain the integrity of Gossville, the center of the community.

3). Network Efficiency

Upgrading Routes 4/9/202 along this section would be effective in providing a direct alignment, improving access between activity centers, such as Gossville and Concord, and allowing for integration with new location and possible bypass options.

b. Routes 4/9/202 between Route 107 Northbound and the Routes 9/202 Diverge (Subcorridor 2)

1). Community Cohesion

Residences, community facilities and commercial establishments are situated continuously along this portion of Routes 4/9/202 through Northwood. Homes and facilities are most heavily concentrated at Northwood Narrows, which stretches north of Routes 4/9/202, Northwood Center, Northwood Ridge and East Northwood. Although this subcorridor is zoned for commercial activity, Northwood residents have stated an upgrade would be disruptive to community cohesion, and would directly impact neighborhoods, community centers and activity centers while not respecting the geographic borders of the town.

2). Economic Development

Since this subcorridor is centrally located in the study area, upgrading it would moderately improve access to existing employment centers; however, no employment centers are currently planned for future development in this area. In accordance with comments from Northwood residents, upgrading the subcorridor was rated as ineffective in meeting local development objectives.

3). Network Efficiency

Upgrading the Routes 4/9/202 subcorridor was rated as effective for: 1) providing a direct alignment, 2) improving access between activity centers, both the clusters of development in Northwood and at either end of the subcorridor, and 3) for network integration with new location or bypass alternatives.

c. Route 4 between the Routes 9/202 Diverge and Route 125 (Subcorridor 3)

1). Community Cohesion

Beginning in highly developed East Northwood, this subcorridor continues through a relatively undeveloped area along the northern boundary of Nottingham and the southern boundary of Barrington. Except for the subcorridor termini at East Northwood and the Lee Traffic Circle, this subcorridor is effective in avoiding impact on neighborhoods, activity centers and community centers. Since the subcorridor runs along the borders of Barrington and Nottingham, the subcorridor was rated as effective in respecting the geographic borders of a municipality.

2). Economic Development

Upgrading this Route 4 subcorridor would moderately improve access to existing employment centers to the east, such as in Durham. The town of Barrington has recently rezoned approximately 1200 acres of land northwest of Lee Circle for large scale industrial development. Therefore, this upgrade would improve access to the employment center planned

for Barrington. Upgrading of this subcorridor was rated ineffective in meeting the local development goals of Northwood, moderately effective in meeting the development goals of Nottingham, effective in meeting the development goals in Barrington and moderately effective in meeting the goals of Lee. The moderate ratings for Nottingham and Lee were based on comments made by the ATF representatives of these towns expressing reservations about the upgrading of Route 4 on their communities.

3). Network Efficiency

Since the subcorridor is parallel to the main axis of the Tri-Cities and, in fact, would be perpendicular to a direct path to the Tri-Cities, and since it does not allow for integration with any prospective new location links, the subcorridor was rated as ineffective in providing a direct alignment and allowing for network integration. However, because of access improvements between Lee Circle and the Northwood area, the subcorridor was rated as effective in improving access between activity centers.

d. Route 4/Route 155 between Route 125 and the Spaulding Turnpike (Subcorridor 4)

1). Community Cohesion

The neighborhood in this portion of the study area is clustered around the intersection of Routes 9 and 155 in Dover; other homes are found scattered along the length of this subcorridor. Activity centers are located at Lee Circle and the intersection of Town Hall Road and Route 155 near Hicks Hill in Madbury, which also is the community center. Upgrading Route 155 would moderately impact the neighborhood in Dover. Although neighborhood impacts in Madbury would be moderate, the corridor passes through both the geographic and community center of town, earning an ineffective rating for impacts on activity center and respecting the geographic borders of a municipality.

2). Economic Development

Upgrading this Routes 4 and 155 subcorridor would improve access to existing employment centers in Dover, and improve access to planned employment in the expanding industrial area along Route 9 in Dover. Local economic development objectives would be moderately met for Lee. Dover officials have expressed lack of support for this upgrade, and this alternative is rated ineffective in meeting the economic development objectives of Dover. Impact would be negative for Madbury which has indicated Route 108 as the preferred corridor for commercial growth in that community.

3). Network Efficiency

The subcorridor would provide direct access into Dover and improve access between the activity centers of Lee Circle and Dover. Upgrading the subcorridor would not allow for integration with any prospective new location links, and would be disruptive to land use patterns in the developed area of the city of Dover east if continued east of the Spaulding Turnpike.

e. Routes 9/202 between the Route 4 Diverge and Route 9 (Subcorridor 5)

1). Community Cohesion

This stretch of roadway impacts the densely developed area of homes near North River Pond. Except for some small stores along North River Pond, the area is not particularly a community center for the town. However, the residential development is dense, so upgrading the segment is rated as ineffective in contributing to community cohesion. The subcorridor runs along the borders of three communities and then angles in to Barrington, and as a result was rated moderately respectful of the geographic borders of municipalities.

2). Economic Development

The subcorridor would provide some improved access from the area to the growing communities of both Rochester and Dover, and is rated as moderately effective in improving access to existing employment centers. The subcorridor, however, must pass through an area of Barrington in which increased development is not a community objective, and the subcorridor is rated as ineffective in meeting local development objectives.

3). Network Efficiency

Upgrading this portion of Routes 9 and 202 would improve upon one of the direct alignments between Concord and the Tri-Cities. It would be well situated to integrate with new location corridors or bypasses as part of a combination alternative. The subcorridor is rated as moderate in improving access between activity centers.

f. Route 202 between Route 9 and the Spaulding Turnpike (Subcorridor 6)

1). Community Cohesion

There are no clearly defined neighborhoods or community centers along this subcorridor. Therefore, an upgrade along this relatively undeveloped portion of Route 202 would be effective in avoiding impacts on neighborhoods, activity centers and community centers. Running parallel and reasonably close to the town line, an upgrade of this subcorridor would moderately respect the geographic borders of Barrington.

2). Economic Development

Access to existing and proposed employment in Rochester would be improved and this improved access would meet the economic development objectives of Rochester. The economic development objectives of Barrington would not be served, because access would not occur in the best location relative to future, local land use objectives.

3). Network Efficiency

Upgrading this stretch of Route 202 would provide a direct alignment to Rochester and allow for integration with some prospective new location links. This subcorridor was rated moderately effective in improving access between activity centers because, although Rochester is a major activity center, there are no other major activity centers along the subcorridor. A future extension of this upgrade would disrupt the developed land use patterns east of the Spaulding Turnpike in Rochester, and an ineffective rating was given for future connections.

g. Route 9 between Route 202 and Route 125 (Subcorridor 7)

1). Community Cohesion

East Barrington, which encompasses the eastern end of this subcorridor is a neighborhood, activity center and community center. Also, the area along Province Lane, which arcs slightly north of Route 9, contains the town offices and a school. The subcorridor crosses through the geographic center of town. As a result, upgrading the subcorridor was rated as ineffective in meeting the three community cohesion objectives.

2). Economic Development

Upgrading this subcorridor would provide improved access to the existing and proposed employment centers in each of the Tri-Cities. In Barrington, improved access would be provided to the junction of Routes 9 and 125, a growing commercial area. However, since the town would prefer to focus commercial activity along Route 125 and industrial growth near the Routes 4 and 125 intersection, upgrading the subcorridor was rated as ineffective in meeting local development objectives.

3). Network Efficiency

Upgrading this subcorridor would be effective in providing a direct alignment and particularly effective in allowing for network integration with potential new location links. It should be noted upgrading this subcorridor would allow the existing diverge point of roads in the eastern portion of the study area to be moved from Northwood several miles to the east, an effective and efficient approach to meeting the project objectives of improving access between Concord and the Tri-Cities. The subcorridor was rated moderate in improving access between activity centers because of the East Barrington activity center located at one end of the subcorridor. Traffic projections show high traffic demand between Barrington and the Tri-Cities.

h. Route 9 between Route 125 and Route 155 (Subcorridor 8)

1). Community Cohesion

Residential neighborhoods exist in this subcorridor east of the Bellamy Reservoir and near the intersection with Route 155 in Dover, and would be impacted by upgrading Route 9. East Barrington does not extend far east of Route 125 and would not be particularly impacted by

upgrading this subcorridor. The subcorridor was rated as moderately effective in respecting the geographic borders of a municipality as it passes across the northern edge of Madbury and terminates just over the western border of Dover.

2). Economic Development

Improved access would be provided between Barrington and both Dover center and an area along Route 9 designated by Dover for increased commercial and industrial growth. The area crossed by this upgrade in Madbury has been designated as a non-growth area by the town. Therefore, the subcorridor was rated moderately effective in meeting the economic development goals of Barrington, ineffective in meeting the goals of Madbury and effective in meeting the goals of Dover. The Dover City Council has confirmed this; it has voted in support of upgrading Route 9.

3). Network Efficiency

Upgrading this Route 9 subcorridor would provide a direct alignment to Dover, improve access between activity centers particularly East Barrington and Dover, and allow for network integration with new location or bypass alternatives. An extension of this upgrade east of the Spaulding Turnpike would disrupt the existing land use patterns in the developed portion of Dover.

i. Route 125 between Route 4 and Route 9 (Subcorridor 9)

1). Community Cohesion

Activity centers along this stretch of Route 125 consist of Lee Circle, low density commercial activities, and community activities leading into East Barrington. This upgrade was rated effective in avoiding residential impacts. Its termini are community activity centers, which would be impacted by upgrading. This impact would be moderate, however, due to the scattered nature of the development and the setback of existing uses. The subcorridor was rated as moderately effective in respecting geographic borders.

2). Economic Development

Upgrading this subcorridor would be only moderately effective in improving access to existing employment centers, such as in Rochester. The subcorridor was rated as effective in serving areas designated for future growth in Barrington, namely the planned industrial park, and meeting the local development objectives of the community.

3). Network Efficiency

Due to its north-south orientation, this subcorridor does not provide direct or improved access between Concord and the Tri-Cities, nor does it integrate well with prospective new location links, causing it to be rated ineffective in both these categories. Connecting Lee Circle with East Barrington earned an effective rating for improving access between activity centers.

j. Route 125 between Route 9 and the Spaulding Turnpike (Subcorridor 10)

1). Community Cohesion

Gonic and East Barrington both function as neighborhoods, activity centers and community centers potentially impacted by an upgrade of Route 125. Due particularly to the impact of an upgrade on Gonic, the subcorridor was rated as ineffective in avoiding direct impact to a neighborhood, activity center and community center. Upgrading the subcorridor was rated as moderately respectful of the geographic borders of Barrington and Rochester.

2). Economic Development

Upgrading this subcorridor would be effective in improving access to both existing and planned employment centers in Rochester. Upgrading would meet the development objective of Barrington to focus commercial and industrial growth along Route 125, and of Rochester to improve access to the city.

3). Network Efficiency

Upgrading this subcorridor of Route 125 would provide a direct and efficient access to Rochester, connecting East Barrington with Rochester. The subcorridor allows for network integration, intersecting most of the prospective new location alternative connections to the Spaulding Turnpike.

D. QUALITATIVE COMPARATIVE ANALYSIS: WETLANDS FUNCTIONS AND VALUES

1. Methodology

In Phases I and II, the objective in defining and screening prospective highway corridors was to avoid, to the greatest extent possible, all wetlands regardless of function and value. During Phase IIIA, in order to effectively evaluate the potential impacts associated with the prospective alternative highway improvements, wetland resources were evaluated with respect to their functional value. The results of this evaluation were used in an objective comparative evaluation of the potential alignments.

Eleven drainage basins and sub-basins were identified within the Concord to Spaulding Turnpike study area. The eleven basins and sub-basins are located within the Merrimack River Valley, the Lamprey River Basin, four sub-basins of the Isinglass River, two sub-basins of the Cocheco River, and the Mallego Brook/Bellamy River basin. The basins and sub-basins were used as convenient and appropriate means of dividing the study area in order to describe wetlands systems. In Phase IIIA, wetland systems within these basins were evaluated using an adaptation of the Herin Methodology developed by the Kansas Department of Transportation for use on highway projects. The Herin Methodology was used to classify wetlands based on land use, size, vegetative community, open water, edge/interspersion, isolation/fragmentation, and uniqueness/significance.

Wetland functions were evaluated for major wetland systems within the drainage basins using aerial photography in conjunction with resource composite maps. The resource composite maps show wetland boundaries, floodplains, aquifer recharge areas, surface water supplies, protected species, public and private parkland, and residential and commercial development.

Initially, this approach provided a qualitative rating in one of three categories of the value of the various wetland systems. Concern was voiced by the Corps over the assignment of values to wetlands, stating that they require an assessment of functional values by experts, not a matrix rating system. As a result, the data developed during the application of the Herin analysis was reinterpreted to lead to a judgmental assessment of the wetlands systems by river basin and sub-basin and by prospective highway subcorridors as described by analysis zone below.

During Phase IIIB, a more detailed analysis of wetlands functions and values will be performed for the wetlands along the final set of alternative alignments. This analysis will include field visits to potentially impacted wetlands to better define their significant characteristics.

This section provides a summary of the narrative description of the wetlands systems potentially impacted by each subcorridor based upon the significant functions and values associated with the drainage basins defined within the Phase IIIA analysis area. Technical Memorandum No. 5, "Wetlands" documents the complete analysis methodology and results of the wetlands assessment.

In summary, the wetlands systems in each of the eleven Phase IIIA drainage basins were found to furnish the majority of attributes associated with the following wetland functions:

- groundwater interchange
- sediment/shoreline stabilization
- sediment/toxicant retention
- wildlife habitat
- recreation
- floodflow alteration
- nutrient removal/retention/transformation
- production export
- fish and shellfish habitat
- endangered species (in some instances)

2. Consideration of Wetlands Functions and Values

In this section the wetlands functions and values assessment results are summarized by the five Phase IIIA Analysis Zones described earlier. These analysis zones should not be confused with the basins and sub-basins, some of which have similar names taken from area geography. In Technical Memorandum No. 5, "Wetlands" the functions and values of the major wetlands systems in the vicinity of the study area were discussed and the purpose of this discussion is to describe the functional values of the wetlands systems along prospective highway corridors. This discussion clarifies the potential impacts to wetlands functions of the various alternative new location and upgrade subcorridors.

a. Suncook River Zone **(Figure IV-11)**

The Suncook River Phase IIIA analysis zone covers the western end of the Phase IIIA analysis zone and includes portions of three drainage basins: the Soucook River basin, the Suncook River basin and the Little Suncook River sub-basin. The western boundary is the terminus of I-393 and the eastern boundary is the Epsom Mountain area. In essence, subcorridors in this area were compared to find the best crossing of the Suncook River and Route 28. Key environmental constraints in the vicinity include the steep mountains in southern Chichester and Epsom and the oxbows and wide floodplains associated with sections of the Suncook River.

Chichester and Epsom constitute most of this analysis zone, yet small portions of Concord, Loudon, Pembroke and Pittsfield are included. Routes 4/9/202 run east-west through the southern portion of this area; Route 28 is the major north-south corridor in the center of the area. Moderate density residential/commercial and industrial land uses are found along the entire lengths of both these routes. Concentrated development is also found in Chichester Center, North Chichester, Gossville and at Epsom Circle. Homes are scattered throughout the area.

Parklands in this vicinity include Taylor State Forest in Concord. No protected species have been identified within this analysis zone. No hazardous waste sites have been identified. The Suncook River is a recommended trout fishing area, and is stocked with salmon fry. The

wetland system south of Odiorne Pond between Locke's Hill and Barton Hill is also a recommended game fish area.

During Phase IIIA, six new location corridors and one upgrade option were developed as alternative means of crossing this zone. **Figure IV-11, "Suncook River Analysis Zone: Subcorridors, Basins and Wetlands"** shows the Suncook River analysis zone, the prospective subcorridors, basins and sub-basins and wetlands. The upgrade option involves reconstruction of the joint Routes 4/9/202 roadway through this zone. The discussion of the functional characteristics of wetlands resources along these links can most easily be framed in terms of the river drainage areas.

1). Soucook River Basin (western part of analysis zone)

To traverse this area, two new location subcorridors and one upgrade option evolved. The northern new location corridor extends from the eastern city line in Concord in a generally northeastward path through western Chichester. This corridor serves as a link on five of the six subcorridors (SR-1 to SR-5). Just west of the start of the Suncook River basin the prospective corridors diverge. The crossing of four wetlands resources within the Soucook basin would be required by this link. The first two crossings involve unnamed streams which occur in residential areas near the joint Routes 4/9/202 highway corridor. The other two crossings would affect forested wetlands associated with the Giddis Brook system. The crossings of these resources occur in a rural residential areas near the point at which they are traversed by secondary roads. Potential sources of excess sediments, toxicants and nutrients associated with the nearby roadways and development increase the importance of these four wetlands in maintaining water quality. The nearby highway and associated development has decreased the value of these wetlands as wildlife habitat. However, in the case of the northernmost Giddis Brook wetland, undeveloped wildlife corridors remain.

The southern new location corridor traverses the Soucook River basin by following a route practically due east. This corridor does not branch and serves only subcorridor SR-6. Six wetlands resources within this basin would potentially be affected by this link; four unnamed streams, Giddis Brook and a small farm pond. The crossings of Giddis Brook, one stream and the pond occur in areas where the adjacent land use is residential and agricultural. Wildlife habitat functions in these areas have been reduced by fragmentation. Nearby sources of excess nutrients and sediments would accentuate the value of these resources for nutrient retention and transformation, and sediment and toxicant retention. The other three stream crossings would occur in more pristine areas. These resources include forested and emergent marsh wetlands systems with a greater diversity of plant communities. Wildlife habitat is not fragmented and surrounding upland areas are forested.

The upgrade option through the Soucook basin follows the joint Routes 4/9/202 corridor. (See **Figure IV-7, "Upgrade Corridors"**). This subcorridor would affect eight wetlands areas within the Soucook basin. In addition to the Soucook River itself, this option would potentially impact Giddis Brook, three unnamed streams, and three isolated wetlands. These wetlands are all adjacent to an existing highway and most of the corridor has been developed. Thus, the wildlife habitat values of these areas have been adversely affected. The prevalence of impervious surfaces, coupled with developed land nearby raises the significance of these

wetlands with respect to floodflow alteration. Potential sources of excess sediments, toxicants and nutrients associated with development also increase their importance with respect to water quality maintenance functions.

2). Suncook River Basin (central part of analysis zone)

Three new location subcorridors and one upgrade alternative span this region. Two of the new location subcorridors originate from the northern link described in the previous section while the third is a continuation of the southern link.

The northern branch of the northward new location option (SR-1 and SR-3) would involve six wetlands crossings within this basin. Three wetlands associated with Saunders Brook, an isolated wetland, Perry Brook and the Suncook River would be spanned. The Saunders Brook wetlands comprise an expansive and diverse resource. Surrounding lands are undeveloped forest and wildlife corridors exist between a variety of upland and wetland habitat types. Productivity in these wetlands is likely to be high. The three potential crossings in this vicinity would impair a variety of wetlands functions and values being analyzed. The isolated wetland that would possibly be impacted by this link is approximately 35 acres in size and mostly vegetated with scrub-shrub. This too is judged to be a resource as surrounding lands are not developed and wildlife corridors to adjacent areas are present. The crossings of Perry Brook and the Suncook River occur in a relatively undeveloped area, although some nearby land is in agricultural use. Crossings would potentially impact forested riparian resources and floodplain. The Suncook River is a fisheries resource and fisheries exchange with Perry Brook is likely.

The southern branch of the northern new location option (SR-2 and SR-4) would involve three wetlands crossings within this basin. One crossing affects the intermittent headwaters region of an unnamed tributary to Saunders Brook. This wetland is an undeveloped area and provides wildlife habitat functions. An oxbow within the Suncook River floodplain and the Suncook River must also be crossed. Although the wetlands are not judged to be fragmented, land uses surrounding these resources include a major roadway (Route 28), residences, agricultural fields and bands of forest. These two wetlands provide certain functions related to flood flow alteration, water quality maintenance, and fisheries habitat.

The Suncook River basin section of the southern new location corridor (SR-6) would potentially impact nine wetlands resources. One crossing occurs in the upper elevation part of an unnamed tributary to Mason Brook. Although most of the land to the south surrounding this small stream is undeveloped, building along Routes 4/9/202, which is located about 2000 feet to the north, has encroached to within 200 feet. Two unnamed streams originating from Marsh Pond would possibly be affected. These resources each contain several community types including open water, marsh, and forest. However, residences and industrial buildings are present within about 500 feet of each and they are close to a gravel pit. Although these three wetlands systems are largely undisturbed, their wildlife habitat value has been decreased to a certain extend by the neighboring development. There is a public well in the vicinity, and proximal potential sources of extra sediments and nutrients enlarge their value with respect to groundwater functions and water quality maintenance. Two isolated wetlands northeast of Mason Brook must be crossed. These wetlands occupy a lowland natural area to approximately 1500 feet to the west of Route 28 and 2000 feet to the east of Mason Brook. They are relatively

homogeneous forested wetlands with no open water present. Good wildlife habitat, wildlife corridors and a nearby public well cause these wetlands to be evaluated as valuable in wildlife and groundwater functions. An isolated small pond (less than 1 acre) within a few hundred feet of Route 28 could also be impacted. Land use immediately surrounding it is forested, but the highway and agriculture to the east significantly impact wildlife characteristics. The small size and lack of inlet or outlet reduce its importance in water quality protection. The spanning of the Suncook River would occur in an area where the floodplain is currently cultivated but development is not present. This resource would provide floodflow alteration, sediment and toxicant retention, and fisheries and wildlife habitat functions. Finally, an intermittent tributary to the Suncook with bordering wetlands could be affected in two locations. One is near an existing secondary road and several residences. Some of the land adjacent to the stream is forested, but the remainder is cultivated. The other is about 2000 feet upgradient from the road. Surroundings here are forested and undisturbed, however the potential wildlife corridor is truncated by the existing road. Subcorridor SR-6 terminates at the eastern boundary of this drainage area, merging with Subcorridors SR-3 and SR-4.

The path of the upgrade alternative across the Suncook River basin continues to follow the joint Routes 4/9/202 corridor. This route would affect five resource areas. Three crossings involve unnamed streams that eventually flow into Mason Brook. Mason Brook and the Suncook River are each crossed once. Because these resources are all within the developed Routes 4/9/202 corridor, they would principally be valued for water quality maintenance functions. The Suncook River is also valued for fisheries resources, floodflow alteration, and since there are several public wells nearby, groundwater recharge.

3). Little Suncook River Sub-basin (eastern part of analysis zone)

Two new location corridors and one upgrade option have been developed to traverse the Little Suncook River sub-basin. A bypass connecting one of the new location links to the upgrade is also being investigated.

The northern new location link through this part of the watershed incorporates Subcorridors SR-1 and SR-2. Possible impacts to six wetlands would be involved. The crossing of Lockes Brook and the tip of an unnamed intermittent tributary to the brook occur in a forested undeveloped area. The southerly edge of a scrub-shrub wetland associated with Odiorne Pond could be impacted. These resources exist in an undeveloped area with a high degree of wildlife habitat diversity and opportunities for travel among them. Odiorne Pond represents a significant recreational and warmwater fisheries resource. The corridor crosses Gulf Brook north of Barton Hill in a forested area with a mowed and cultivated fields nearby. An unnamed intermittent tributary to the brook is crossed by this link in the vicinity of two secondary roads. Adjacent wetlands have been fragmented by the roads, but contribute to water quality considerations. Little Bear Brook would also have to be spanned by this link. The crossing occurs in a forested wetlands area about 1200 feet south of Chestnut Pond. Because there has been little development in this vicinity and areas are only sparsely disturbed by farming, substantial wildlife habitat exists around each of the above resources. However, in certain areas these values are diminished by roadway intrusion. Because each of these wetlands is connected to other waters with fisheries (e.g. the Little Suncook River), and artificial barriers do not exist, it can be assumed that fisheries exchange occurs.

The southern new location link through this portion of the Little Suncook sub-basin is used by Subcorridors SR-3 and SR-4. (For analysis purposes Subcorridors SR-5 and SR-6 truncate at the western end of this link, but would also involve use of this corridor.) Use of this corridor would involve potential impacts to four wetlands areas. The Lockes Brook crossing would occur through a section vegetated by forested and scrub-shrub wetland. The wetland in this vicinity is fragmented by a roadway junction and there is an adjacent residential area. While the wildlife habitat functions of this area are judged to be degraded by development, the area is likely to assist in retaining sediments and toxicants entering the system via roadway runoff. Another prospective impact involves the crossing of an unnamed intermittent stream which flow through an unnamed pond and eventually into Lockes Brook. The surroundings are undeveloped and the stream banks are forested. The Gulf Brook crossing of this link would occur south of Barton Hill through a forested wetland bordering the brook. The wetland is not fragmented, nor is the surrounding area developed. Little Bear Brook is crossed by this link at a point about 1000 feet east of a secondary road. These unfragmented wetlands have been evaluated as providing wildlife habitat values. In addition, it is likely that exchange of fisheries resources occurs among these streams and the Little Suncook River.

The upgrade alternative across the Little Suncook watershed continues to follow Routes 4/9/202. In four instances wetlands resources could potentially be intersected by the improved roadway. Through this corridor the highway runs parallel to and within several hundred feet of the Little Suncook River. Residential and commercial development exists along the entire length. The river valley is designated as floodplain and there are several nearby sand and gravel pits. Prospective roadway expansion would encroach upon wetlands bordering the Little Suncook River just east of the intersection of Black Hall Road. This wetland is a combination of scrub-shrub and forested wetland surrounded by residential and agricultural land uses. The highway crosses Lockes Brook about 1000 feet to the east of the previous resource. Scrub-shrub wetlands border the brook with residences and agriculture nearby. There is a 1.4 mile section of highway along which the Little Suncook River runs extremely close to Routes 4/9/202. The section starts near the junction of Center Hill Road and extends eastward to just west of the confluence of Gulf Brook. Bixby Pond is included in this reach of the river and a highway rest stop overlooks the pond. The vegetation is comprised of forested wetlands, scrub-shrub and marshes which are fragmented by the existing road. The highway then spans Gulf Brook in a forested area. The final potential wetlands impact along the Little Suncook River in this analysis zone consists of a forested, scrub-shrub and marsh area through which the river meanders. Although this resource is not considered fragmented, the existing highway skirts along its northern edge. Development and disturbance associated with the highway has decreased the wildlife habitat value of all of the above wetlands. Because impervious surfaces and runoff are increased, the importance of these resources in floodflow alteration has been increased. The wetlands are also judged to contribute to mitigating water quality impacts related to development and roadway runoff.

A possible by-pass segment extending from the eastern end of Subcorridors SR-3 and SR-4 southward to the Routes 4/9/202 corridor is under investigation. This connector would involve crossing Gulf Brook, but it would eliminate two impacts on the eastern section of the subcorridor. Gulf Brook would be crossed about 1000 feet north of Old Turnpike Road in the vicinity of a parking lot access road. In the vicinity of this forested wetland there is undeveloped forest, a roadway, and a commercial and industrial area. Although the wetland is

not fragmented, disturbance is likely to have affected wildlife values. Potential sediment and toxicant sources suggest the area may help to protect water quality.

b. Epsom Mountain Zone **(Figure IV-12)**

The band of the Phase IIIA analysis zone in eastern Epsom and western Northwood is known as the Epsom Mountain area. Routes 4/9/202 and Route 107 form the approximate southern and eastern boundaries, respectively, of this area. Subcorridors in this area provide alternative options for crossing the difficult terrain neighboring Epsom Mountain. The municipalities of Epsom and Northwood are involved. All wetland resources within this area are considered part of the Little Suncook River sub-basin; the functions and values being analyzed associated with this basin are described in Technical Memorandum No. 5, "Wetlands". The following discussion more specifically discusses wetlands functional values at potential impact sites.

Four alternative new location paths across the Epsom Mountain area are under consideration. These paths consists of links originating from the two western Suncook River area nodes and terminating at the two eastern Bow Lake area nodes. In actuality, two paths are involved; one passing to the north of Epsom Mountain, and another passing to the south of it. The western ends of these corridors are connected to both western nodes by short links. The upgrade alternative in this analysis zone entails use of the joint Routes 4/9/202 corridor.

1). Subcorridor EM-1

Epsom Mountain Subcorridor EM-1 starts in the west at the northern node and angles southeastward to cross south of the mountain. Its eastern terminus is at the southern Epsom Mountain node. Six potential wetlands impacts would be involved.

Near its western end in Epsom, Little Bear Brook would have to be spanned by this subcorridor. The crossing would occur in a forested wetlands area about 2000 feet south of Chestnut Pond. Because there has been little development in this vicinity and areas are only sparsely disturbed by farming, substantial wildlife habitat exists. Because the brook is connected to other waters with substantial fisheries (e.g. the Little Suncook River), and artificial barriers do not exist, it can be assumed that fisheries exchange occurs. The headwaters of an unnamed intermittent tributary to Little Bear Brook would be crossed on the south-facing slope of Epsom Mountain. The surrounding area is forested, undeveloped and not otherwise fragmented. The area exhibits wildlife habitat values. Flat Meadow Brook would be intersected in Northwood just east of the Epsom/Northwood town line. This perennial stream flows into Northwood Lake and it is likely that there is an exchange of fisheries between the lake and brook. The watershed in this area is forested and undeveloped. In this vicinity, an unnamed intermittent tributary to the brook would also be crossed. There is a single residence about 1500 feet from the prospective crossing. These resources would contribute to wildlife habitat functions. An unnamed tributary to Narrows Brook would be crossed in the region where the stream flows adjacent to Old Pittsfield Road. Adjacent land use is a mix of forest, single family homes, commercial or industrial development, and agricultural fields. The wetlands system is fragmented by a driveway, the roadway, and clearings for development. Wildlife habitat values have been substantially reduced by this fragmentation, but wetlands bordering the stream help

to maintain water quality. Just east of the terminus of this link, near Route 107 and Old Pittsfield Road, another tributary to Narrows Brook and its associated wetlands would be intersected. This resource is near a utility corridor, agricultural lands, and residential development. Although the system is not fragmented, wildlife habitat is adversely affected by the surrounding land uses. Sediment and toxicant retention, and nutrient retention and transformation are the principal values.

2). Subcorridor EM-2

Subcorridor 2 begins on the west at the southern node. From there, it angles northeastward, joining the EM-1 corridor. The only difference between EM-2 and EM-1 in terms of potential wetlands impacts is that for EM-2 crossing of Little Bear Brook would occur at point farther south. As compared with EM-1, the EM-2 crossing occurs in a more developed area. There are several homes and a road nearby. These factors reduce the contribution of the area to wildlife habitat. This scenario would involve a total of six wetlands crossings.

3). Subcorridor EM-3

The western end of Epsom Mountain Subcorridor 3 is at the northern (EM-1) node. This option follows a corridor that goes north of Epsom Mountain. It would require seven wetlands impacts. The crossing of Little Bear Brook would occur slightly north of the EM-1 crossing, but with respect to the analysis of wetlands characteristics, these two sites are very similar. An isolated wetland just west of Flat Meadow Brook, Flat Meadow Brook itself, and an unnamed tributary to the brook (impacted in two locations) would each be crossed in an undeveloped area on the east facing slope of Epsom Mountain. These resources are part of an expansive forested wetlands system which would be considered as wildlife habitat. In addition, exchange of fisheries resources between the Flat Meadow Brook and Northwood Lake may be significant. South of Jenness Pond and just east of Route 107, wetlands associated with the headwaters of Jenness Brook would be crossed. The area includes two ponds, and the stream appears partly channelized. The surrounding lands are actively farmed and there are a number of homes along the highway. The key functions of wetlands in this area are judged to be sediment and toxicant retention, and nutrient retention and transformation. Wildlife habitat is severely degraded.

4). Subcorridor EM-4

Subcorridor 4 starts at the southern node and heads northward to merge with the EM-3 corridor. The only difference between wetlands impacts of EM-3 and EM-4 is the Little Bear Brook Crossing. The EM-4 crossing is within 1000 feet of the crossing area described for Subcorridor EM-1. The crossing would occur in a forested wetlands area about 3000 feet south of Chestnut Pond. There has been little development in this vicinity and the area is only sparsely disturbed by farming, so substantial wildlife habitat exists. It can be assumed that fisheries exchange occurs between the brook and the Little Suncook River. In all, Subcorridor EM-4 would affect six wetlands areas.

5). Upgrade Subcorridor

The upgrade option through this analysis zone is a continuation of the joint Routes 4/9/202 corridor improvements. (See **Figure IV-7, "Upgrade Corridors"**). The highway corridor forms the southern boundary of the Epsom Mountain analysis zone and crosses the zone with a practically east-west orientation. The roadway skirts the northern shore of Northwood Lake. This option would entail at least eight wetlands impact areas, all within the Northwood Lake area of the Little Suncook River sub-basin.

The joint Routes 4/9/202 corridor crosses Little Bear Brook at the confluence with the Little Suncook River. The brook is forested and the highway corridor is not developed in the immediate area. The valley to the north is largely undisturbed and constitutes good quality wildlife habitat. Bordering wetlands vegetation in the vicinity functions to retain and transform pollutants in roadway runoff. Prospective highway improvements would impact the Little Suncook River at a point just west of the Route 107 junction. There is development clustered around the intersection and the river channel is designated floodplain. Fisheries habitat, floodflow alteration and water quality maintenance are the key functions of the river at this location. About 2000 feet east of Route 107 the northwestern corner of Northwood Lake possibly would be impacted. There is a band of scrub-shrub vegetation between the lake and the existing highway, with several small buildings nearby. The entire lake is identified as floodplain and a public well is located nearby. The fringe of wetlands vegetation is important with respect to shoreline stabilization and mitigation of adverse water quality impacts. The corridor crosses a northward projection of the lake at the Epsom/Northwood line. There is an area of emergent marsh and open water to the north of the highway, while to the south only a very small strip of land lies between the road and the lake. The deep open water and emergent marsh habitats in this area provide conditions favorable to nutrient removal, retention and transformation. At the northeastern corner of the lake Flat Meadow Brook and associated resources would be crossed. The wetlands resources here include the stream bed, a small pond, emergent marsh and scrub-shrub vegetation. Adjacent land uses include farming and residential development. In this area Narrows Brook is also crossed. The brook is scarcely wooded and the surroundings are disturbed by agriculture and homes. Development is particularly dense to the north (upstream) in the Northwood Narrows area. Wetlands resources in this vicinity would be important in reducing the water quality impacts of the surrounding land uses. East of this point the joint Routes 4/9/202 corridor enters the Bow Lake analysis zone.

c. Bow Lake Zone **(Figure IV-13)**

The center of the Phase IIIA area, located mainly in Northwood and Strafford, is termed the Bow Lake analysis zone; a portion of western Barrington and a small portion of Nottingham are also included. This zone is evaluated to compare link options going either north or south of Bow Lake.

Routes 107, Routes 4/9/202 and Routes 9/202 roughly form the western, southern and eastern boundaries of this area, respectively. The area extends about one-mile north of Bow Lake and includes Routes 202A and 126. As with the other analysis zones, the major concentrations of land use are found along these existing routes. Drainage basins included in this area are: Little Suncook sub-basin, Isinglass River sub-basin, Lamprey River basin, and

Berry's/Mohawk River sub-basin. Eleven new location subcorridors are under evaluation as means of traversing this basin. These subcorridors are derived by combining in different combinations links along four corridors. A single upgrade option is feasible. In this part of the report, the potentially impacted resources will be described for each of four typical prospective new location corridors (Subcorridors BL-1, BL-2, BL-3, and BL-8) then the other combinations undergoing evaluation will be presented. Finally, wetlands resources along the upgrade corridor will be discussed. In all cases, discussion will work from west to east along the corridors.

1). Subcorridor BL-1

Bow Lake analysis zone subcorridor BL-1 starts from the northern node on the western side of the analysis zone. This node is the eastern terminus of Epsom Mountain Subcorridors EM-3 and EM-4 (discussed above). This subcorridor crosses the analysis zone following a generally eastward route that would pass north of Bow Lake. The terminus at the eastern end is the node from which Isinglass River Subcorridors IR-3 to IR-7 begin. The alignment would potentially impact eight wetlands areas.

The first potential wetlands impact along this subcorridor would consist of the crossing of a perennial stream in Northwood which feeds into the northeastern end of Long Pond. Surrounding land use is forested and the nearest existing roadway is a little under one mile away. Most of the stream course is forested wetland, however there appears to be at least one section in which there is emergent vegetation. The lack of nearby roadways or other signs of development combined with a variety of upland and wetland habitat types, suggest that this area represents high quality wildlife habitat. There may also be an exchange of fisheries between Long Pond and the stream. An unnamed perennial tributary in Strafford would be crossed along its reach draining from Wild Goose Pond into Bow Lake in the vicinity of Province Road. Although the road is nearby, the wetlands resource is not fragmented and no residences are shown on the inventory mapping. The surrounding lands are undeveloped. There are diverse vegetative communities present, including upland and wetland forest types, scrub-shrub wetlands, emergent marsh and open water. The stream channel and adjacent lands are designated floodplains. This resource provides high quality fisheries and wildlife habitat, productivity export, and flood flow alteration functions. Another unnamed tributary to Bow Lake would be intersected near the intersection of two secondary roads. A variety of vegetative communities and open water are present. Adjacent land is forested and largely undeveloped, but there is a residential area downstream. This resource is assessed as being contributing to wildlife habitat. It may also help attenuate adverse water quality impacts of the secondary roads. A third unnamed tributary to Bow Lake would have to be crossed. This stream flows from a smaller lake north of the lake, passing by several lake front residential properties. Agricultural land was also inventoried nearby. This resource is judged to contribute to wildlife habitat. Because it would bisect the access corridors to Bow Lake, a prospective roadway through this area would also be likely to affect wildlife use of the smaller lakes and other lands to the north. This northern territory includes several large tracts of land on the Blue Hills Range placed in conservation land trusts. An unnamed tributary to the Isinglass River would be crossed about 1000 feet north of the confluence. The crossing is in a relatively undeveloped area, although there are homes and agricultural lands to the north (upslope) along Route 126. Wildlife habitat values remain substantial, and sediment and toxicant retention, and nutrient retention and transformation also are important. The river valley is also identified as floodplain. This

potential corridor crosses the Mohawk River in Barrington, just east of the Strafford/Barrington boundary. Development is found nearby along Route 126 and a secondary road, and a gravel pit is also in the vicinity. However, the river remains forested, and access routes to resources associated with the Isinglass River are not now fragmented. Fisheries and wildlife habitat, as well as maintenance of water quality are the important functions of this resource. The very narrow part of Barrington Long Pond would be spanned near the confluence with the Isinglass River. Forested wetlands are found on either side of the pond in this vicinity. Surrounding land use is primarily forested, but Route 126 is within about 1000 feet. An identified area of protected species habitat is located adjacent to the southern pond shore 2000 feet away and there is parkland shown downstream. This resource is mapped as Prime Wetlands by the Town of Barrington. The pond and surrounding lands provide high quality wildlife habitat. Fisheries habitat is also present. The final potential impact area along this subcorridor is an intermittent unnamed tributary to the Isinglass River located in a forested area north of the river. Wildlife habitat is the principal value.

2). Subcorridor BL-2

The western and eastern ends of Bow Lake Subcorridor 2 are at the same nodes as Subcorridor 1, but this scenario angles southeastward, passing south of Bow Lake. Twelve wetlands impacts would be involved.

The perennial stream in Northwood feeding into the northeastern end of Long Pond crossed by BL-1 would be also affected by BL-2, but in a slightly different location. The area represents high quality wildlife habitat. An intermittent stream at the eastern end of Little Bow Lake would be crossed. Wetlands vegetation at the crossing is forested, but there is also scrub-shrub nearby. Surrounding lands are forested and undeveloped. Wildlife habitat is the principle value. Sherburne Brook, an intermittent tributary to the brook, and an intermittent tributary to Bow Lake would all be intersected by a segment of a prospective roadway in the vicinity of Sherburne Hill. This area is forested and sparsely developed, with residential properties within about one-half mile. Again, wildlife habitat is a contributing value, reduced slightly by encroachment. Because this system receives runoff from Northwood Center, mitigation of adverse water quality impacts also is important. In Strafford, the corridor skirts to the south of an unnamed pond east of Ridge Road. Associated wetlands and surrounding uplands are forested. The pond is hydraulically connected to Bow Lake and provides fisheries and wildlife habitat. An intermittent stream feeding into the Spruce Brook system is intersected west of Route 202A. The immediate vicinity of the crossing is forested and undeveloped, but there are homes within 1500 feet. Spruce Brook itself is crossed slightly east of the power line right-of-way. The area is forested and undeveloped with a dirt road and cemetery nearby. Wildlife habitat and sediment retention are the key functions. Just east of the Strafford/Barrington town line boundary two intermittent streams feeding in to the Stonehouse Brook system and Nippo Brook are crossed. Nippo Brook is mapped as Prime Wetlands by the Town of Barrington. The vicinity is forested with farmland and residential development within several thousand feet, clustered along Province Road and another secondary road. These resources comprise parts of a multi-branched wetlands system within which there is an assortment of vegetative communities. They contribute wildlife habitat, water quality maintenance and productivity export functions. This prospective corridor would cross the Isinglass River at a point northeast of Route 126. There are residences along the highway, and farmland and a gravel pit to the

west, but the river corridor in the area of the crossing is forested. Fisheries and wildlife habitat, sediment, nutrient, and toxicant retention and shoreline stabilization are determined to be the major functions. The final potential wetlands impact along this corridor involves an unnamed intermittent tributary to the Isinglass River. Surrounding land use is undeveloped forest. This resource primarily performs wildlife habitat functions.

3). Subcorridor BL-3

For most of its route, the Bow Lake Subcorridor BL-3 corridor is the same as that of BL-2. The alignments diverge for a three mile segment in Northwood south of Bow lake where BL-3 follows a more southerly route. In Strafford, BL-2 and BL-3 merge to follow the same path. The more southerly route of BL-3 avoids the three wetlands impacts to the tributaries to Bow Lake in the Sherburne Hill vicinity. However, as in BL-2, Sherburne Brook would be crossed. There is development in the vicinity of the crossing, but wildlife habitat is not exceedingly fragmented and water quality maintenance functions are important. A total of nine impacts would be involved, including those on the BL-2 alignment.

4). Subcorridor BL-8

The western end of Subcorridor BL-8 consists of the southern Epsom Mountain node (EM-1 and EM-2) in Northwood. From there, it takes a generally southeastward course, going well south of Bow Lake and roughly parallel to but north of the joint Routes 4/9/202 corridor. The eastern terminus is the node from which Isinglass River subcorridors IR-1 and IR-2 and Bellamy River subcorridors BR-1 to BR-7 begin (described below). This scenario would involve four potential impact areas.

The westernmost potential impact site is a crossing of Narrows Brook north and west of Northwood Narrows and about 2000 feet south of Durgin Pond. The area is forested with development downstream and to the west, but wildlife corridors to Durgin, Little Bow and Long Ponds are unfragmented. Sherburne Brook is intersected by this subcorridor northwest of Northwood Center. Wildlife habitat values are present, but reduced slightly by encroachment. As stated above, the brook is important for mitigation of adverse water quality impacts from Northwood Center runoff. Tucker Brook would be intersected east of Northwood Center and just 1000 feet north of Routes 4/9/202. The area of the crossing is forested and upstream of the nearby development. Wildlife habitat values are judged to be reduced by the disturbance caused by the highway. The last impact on BL-8 involves an unnamed perennial stream flowing from the Acorn Pond system. It would be crossed north of the Route 4 and Route 9/202 diverge. Vegetation consists of forest and development is restricted to the major roadways over one half mile away. The principal value is assumed to be wildlife habitat.

5). Subcorridor BL-4

All but one of the wetlands impacts that would occur along the links comprising Subcorridor BL-4 have been described above. This corridor begins at the same node as BL-1, BL-2 and BL-3. It then follows the BL-2 link south of Bow Lake. Where BL-2 curves northeastward toward the crossing of Spruce Brook and the more northerly node, BL-4 heads southeast toward the more southerly (BL-8) node. In this section, between the split from BL-2

and the end node, one wetlands resource would be affected. Hall Brook would be intersected in Strafford, east of the utility line right of way, and very near the Route 202A crossing. The surrounding land is forested with residential development nearby. Wildlife habitat is somewhat fragmented. Bordering wetlands may assist in reducing adverse impacts from roadway runoff. In total, BL-4 would involve eight wetlands impacts.

6). Subcorridor BL-5

Subcorridor BL-5 is similar to BL-4. The difference is that south of Bow Lake it follows the southern (BL-3.) loop, as opposed to the northern (BL-2 and BL-4) segment. The entire alignment would involve five potential impact locations.

7). Subcorridor BL-6

Bow Lake Subcorridor BL-6 would entail two wetlands impacts not discussed above. This subcorridor is almost the same as BL-4, except instead of beginning at the northern node on the west (BL-1, BL-2, BL-3 and BL-4), it starts from the southern (BL-8) node. From there, it projects eastward to intersect BL-2 near the point at which BL-2/BL-4 and BL-3/BL-5 split. In between, two wetlands resources would potentially be impacted. Narrows Brook would be crossed, just skirting the southern end of Durgin Pond. In addition, a wetland associated with Little Bow Pond would be intersected south of the pond. The area around these ponds and brooks are largely undeveloped and wildlife habitat would be present. This subcorridor would involve eight resource impacted in all.

8). Subcorridor BL-7

This subcorridor is very similar to BL-6, except south of Bow Lake where BL-6 follows the BL-2 path, BL-7 uses the BL-3 corridor. All five of the potential impacts along this route have been characterized in the context of the other subcorridors.

9). Subcorridor BL-9

Subcorridor BL-9 starts from the southern node on the west side, extends eastward like BL-6, then follows BL-2. In sum, twelve previously characterized impact sites would be involved.

10). Subcorridor BL-10

Subcorridor BL-10 follows BL-9, but it uses the BL-3 path south of Bow Lake. This scenario entails nine impact areas, all described above.

11). Subcorridor BL-11

Subcorridor BL-11, starts out like BL-8, paralleling Routes 4/9/220. North of the Route 4 and Route 9/202 split, this subcorridor would angle northeastward to hook up with BL-2, rather than following BL-8 to the southerly node. A total of eleven wetlands resource

intersections would be involved. This northbound link overlays the current location of Route 202A in the vicinity of the Northwood/Strafford boundary. It would entail a crossing of Hall Brook at the existing Route 202A crossing. The surrounding land is forested with residential development nearby. Wildlife habitat is somewhat fragmented. Bordering wetlands may assist in reducing adverse impacts from roadway runoff.

12). Upgrade Subcorridor

The single upgrade option through this analysis zone involves upgrading of the joint Routes 4/9/202 corridor. (See **Figure IV-7, "Upgrade Corridors"**). The existing highway corridor forms the southern boundary of the zone, crossing the region on a generally southeastward (northwestward) tending course. The Lamprey River basin and a small portion of the Isinglass River basin and the Little Suncook River sub-basin are involved. This subcorridor is entirely within Northwood. For discussion purposes, this subcorridor is assumed to end in eastern Northwood at the Route 4 and Routes 9/202 divergence. Upgrades involving Route 4 and Routes 9/202 are discussed below in the context of the Bellamy River analysis zone.

This subcorridor is an extension of the Routes 4/9/202 upgrade corridor discussed above under the Bow Lake zone. Just east of the zone boundary, the highway intercepts wetlands bordering Kelsey Brook, Kelsey Brook itself, two tributaries to the brook, and a isolated wetland at a small pond. Wetlands vegetation includes forested and scrub-shrub areas. Agricultural land, commercial or industrial development, and residential development are in the vicinity. The brook and its valley are floodplain, and there are water supply wells nearby. Functions include flood flow alteration and maintenance of water quality. In Northwood Center the highway skirts the northern shore of Harvey Lake. The upgrade would affect the lake, Kelsey Brook and Sherburne Brook near where each flow from the lake, and Tucker Brook where it flows into the lake. Areas within the wetlands are generally forested, with some emergent vegetation. Most of the roadway corridor is developed, consisting of lawns and impervious surfaces. The lake and Kelsey Brook are designated floodplain. Water supply wells were inventoried within Harvey Lake, Kelsey Brook and Tucker Brook. Given the amount of development surrounding the designated floodplain, the lake, streams and associated wetlands particularly contribute to flood flow alteration. The deep water and emergent marshes would also have great capacity to retain and transform nutrients and toxicants, and to retain sediments. This function would be significant in protecting the nearby wells and water quality in the area, including that of Bow Lake since Sherburne Brook drains into the lake. Near Northwood Ridge there are water supply wells along the roadway. While no wetlands resources would be directly impacted in this area, roadway expansion could affect water quality.

d. Isinglass River Zone **(Figure IV-14)**

The Isinglass River Phase IIIA analysis zone includes the eastern two-thirds of Barrington and the small northern corner of Madbury. Also included is the southern portion of Rochester and the northern portion of Dover, with the Spaulding Turnpike as the eastern boundary. This analysis zone includes subcorridors which connect from nodes in the Isinglass River area, near Route 126 in Barrington to the Spaulding Turnpike in Rochester and Dover. The river drainage basins that are partially included are: Berry's River sub-basin, Isinglass River basin, Oyster/Bellamy Rivers basin and Cocheco River basin.

Since these subcorridors do not involve potentially interchangeable corridors, the clearest way to describe the resources that could be possibly impacted by these is to work from west to east along each subcorridor.

1). Subcorridor IR-1

For comparison, Subcorridor IR-1, the northernmost corridor in this group, begins just east of the node in the far eastern portion of the Bow Lake analysis zone described above where BL-1 to BL-3 end. It follows a northeastward tending route through Barrington, north of Ayers Pond and Route 202, intersecting the Spaulding Turnpike about 3000 feet south of Exit 13 in Rochester. This subcorridor traverses portions of the Isinglass River basin and the Cocheco River basin, and would possibly impact five wetlands resources.

Near the western end of this subcorridor an unnamed intermittent tributary to the Isinglass River would be crossed. Surrounding land use is undeveloped forest. This resource primarily performs wildlife habitat functions. Potential impacts involve isolated wetlands in a forested area north of Ayers Pond and about 1000 feet west of Second Crown Point Road. There is one residence in the vicinity. In this area the corridor would pass within 1500 feet to the south of an isolated wetland mapped as a Prime Wetlands by the Town of Barrington. The crossing of a perennial stream that feeds into Hanson Pond would occur in a forested area just downstream of the crossing of Dry Hill Road. In the vicinity are several homes and agricultural lands. These three wetlands were evaluated as serving wildlife habitat functions to some degree, although farms and sparse development are present. Given the presence of farming activities, they would also be valued for sediment and toxicant retention. Wetlands bordering Axe Handle Brook could possibly be affected by the interchange where this subcorridor would meet the Spaulding Turnpike. The brook about 400 feet from the eastern side of the Spaulding Turnpike and adjacent land is forested. In addition to the highway, a cemetery and a ball field are nearby. A National Guard Armory and a housing subdivision are within 1000 feet. Because the stream channel is designated as floodplain, this area functions in flood flow alteration. Wildlife habitat values are not considered major due to the level of disturbance. Exchange of fisheries resources with the Cocheco River is likely.

2). Subcorridor IR-2

Subcorridor IR-2 begins at the same node as IR-1. It follows a northeastward course south of Ayers Pond and Route 202, intersecting the Spaulding Turnpike near Gonic. Portions of Barrington and Rochester would be traversed. This subcorridor covers portions of the Isinglass River basin and the Cocheco River basin, and would possibly involve wetlands impacts in eleven places.

An unnamed tributary from Ayers Pond to the Isinglass River would have to be spanned. The crossing would take place in the vicinity of the existing Route 202 crossing. Wetlands vegetation is forested and there is a large marsh complex 3000 feet upstream. Adjacent land use is generally forested with a few residences. Protected species habitat has been identified within 1000 feet of this crossing. In addition to functioning as endangered species habitat, the wetland

mitigates water quality impacts from Route 202. A second unnamed tributary to the Isinglass River would be crossed in a undeveloped area downstream of the large wetlands complex between Ayers Pond and the river. Vegetation is a mix of forest and scrub-shrub. This resource is mapped as Prime Wetlands by the Town of Barrington. The area is assessed as having significant wildlife habitat value and productivity export is also likely. An isolated forested wetland about three acres in size located north of the Isinglass River and southwest of Green Hill Road could possibly be affected. There is no open water and vegetative diversity is not high, but given the undeveloped surroundings and corridors to nearby water sources, the wetland may benefit wildlife. The tip of an intermittent stream flowing into the Isinglass River would be crossed by this subcorridor. Some of the area is forested, but there has also been clearing possibly for agriculture or a sand and gravel operation. The intermittent nature of this stream and its location in an altered area reduce its wetlands functions. In the vicinity of Flagg Road, north of the Isinglass River, a small tributary to the river and an associated farm pond would have to be crossed. These resources are in an agricultural area and function to moderate water quality impacts of the farming activities. East of Route 125 a tributary to the Cocheco River would be spanned. This area is developed and farmed, and it is next to a golf course. Maintenance of water quality is assessed to be the primary function of the bordering wetlands. Subcorridor 2 crosses the Cocheco River northwest of the sewage treatment plant and adjacent to the golf course. A band of riparian forest exists along the river banks and the floodplain is approximately 700 feet wide at this point. Flood flow alteration, sediment and shoreline stabilization, and fisheries habitat functions are important. Finally, Subcorridor 2 would impact a tributary to the Cocheco River located on the eastern side of the river. This tributary and associated marshlands would be affected in at least three places. The stream is in an agricultural, and commercial and industrial area. Its associated wetlands resources function to moderate adverse water quality impacts of the surrounding land uses.

3). Subcorridor IR-3

Subcorridor IR-3 follows essentially the same corridor as IR-2. The only difference is that the western end of IR-3 is located slightly farther east, at the origin of IR-4 to IR-7 (the BL-1 to BL-3 end node). This subcorridor was devised to enable the IR-2/IR-3 corridor to be directly compared with the corridors of IR-4 to IR-7. The wetlands resources that would be affected by IR-3 are described above under IR-2. The more eastward origin does not avoid any wetlands impacts.

4). Subcorridor IR-4

Subcorridor IR-4 originates from the IR-2 corridor a little more than one mile from the western end of IR-2. The corridor starts out arcing southeastward for the first 1.5 miles, then trends northeastward, staying south of the Isinglass River and joining the Spaulding Turnpike near the Blackwater Road underpass. It crosses parts of the Isinglass River basin, Oyster/Bellamy Rivers basin, and the Cocheco River basin. It goes through Barrington and Rochester. Impacts to nine wetlands areas would possibly occur.

The Isinglass River would be crossed north of Scruton Pond Road in a forested area with sparse residential development. Fisheries habitat and flood flow alteration are judged to be the principal functions. West of Cate Pond a steam flowing into the pond would be crossed. The wetland and surrounding area is forested, with residences about 1500 feet to the north and east along Smoke Street. This area is particularly sensitive because protected species habitat is found around Cate Pond less than 1200 feet downstream from this crossing. Despite housing to the east, good quality wildlife habitat exists to the west and north. Mallego Brook, which flows southward from Cate Pond would need to be spanned in a forested region that is mapped as Prime Wetlands by the Town of Barrington. A large residential development is found just north (upstream) of the crossing but undeveloped land remains to the south and west. This resource would be considered to have value with respect to wildlife habitat, and it is likely to help mitigate water quality impacts of the residential area. An intermittent, upper elevation section of a tributary to Green Hill Brook would potentially be impacted. The area is generally forested, but residential development exists in this vicinity on three sides. The intermittent nature of this stream and its location in a developed area decrease its wetlands functions. Immediately to the east of Route 125, the tip of a wetland associated with Green Hill Brook could possibly be affected. The resource is a forested wetland and the immediate area is undeveloped. It is mapped as Prime Wetlands by the Town of Barrington. In this vicinity on the western side of the Route 125 and the old railroad grade, an area mapped as Prime Wetlands by the Town of Barrington would also be impacted. This area appears to be a recent impoundment of Green Hill Brook near the point at which the brook crosses under the old railroad grade. This resource was not mapped in the Phase I inventory. The proximity of the existing roadway and a large development to the south would slightly decrease wildlife appeal, but wildlife habitat is found along the brook. This subcorridor crosses the Isinglass River a second time east of Route 125 and north of Tolend Road at the Barrington/Rochester municipal boundary. The area is undeveloped and a forested riparian corridor remains. Wildlife and fisheries habitat and flood flow alteration are functions present. Recreation would also be considered important since this is a parkland area. The Cocheco River crossing would occur near Pickering Road just south of the sewage treatment plant. The area is mostly forested to the west, but only a band of trees remain along the eastern riverbank. Beyond the river to the east are farmland and residences. Significant functions of this resource include flood flow alteration, sediment and shoreline stabilization, and fisheries habitat. The last potential wetlands impacts associated with Subcorridor 4 involve two isolated ponds and surrounding forested wetlands that are located west of Blackwater Road. The area is surrounded by residential and agricultural land uses. Wildlife use of the area is assumed to be minimal because access corridors to undeveloped areas do not exist. The ponds may provide some nutrient and toxicant retention functions.

5). Subcorridor IR-5

Subcorridor IR-5 originates at the same node as IR-4, branching from the IR-4 corridor about 2000 feet east of the Mallego Brook crossing. It follows a course nearly due east, but curves north after crossing the Cocheco River. The intersection with the Spaulding Turnpike would be just south of Blackwater Brook. The route includes portions of the Oyster/Bellamy Rivers basin, Isinglass River basin, and Cocheco River basin in Barrington and Dover. This subcorridor includes three impacts described above under Subcorridor IR-4, and additional eight potential impact areas.

Green Hill Brook would be crossed at a point about 500 feet west of Route 125. The area is forested with no nearby development other than the roadway. Wildlife habitat extends to the north and west. A public water supply well and farmland are in the immediate vicinity. A wetland would be affected at the headwaters of Calef Brook several thousand feet east of Route 125. Also potentially impacted in this area is a tributary to the brook located about 1000 yards to the east. These sites are forested and nearby development is sparse. There is farmland immediately south of the crossing. These two resources are judged to be supportive of wildlife habitat and sediment and toxicant retention. In addition, since Calef Brook feeds the Bellamy Reservoir, the affiliated resources are important in maintaining water quality. Wentworth Brook would be spanned at a point about 1500 feet north of the confluence with Calef Brook. Land in the area is forested, but residential, and commercial and industrial development are nearby. A public water supply well is located to the southeast within about 1000 feet. Wentworth Brook also feeds the Bellamy Reservoir, so water quality maintenance is a principal function. In this same general area an isolated forested wetland in a residential area and another less disturbed isolated wetland would also be affected. Given that groundwater recharge is likely to occur through the sandy soils of the Mallego Plain, combined with the nearness of public wells, these isolated wetlands are assumed to serve groundwater exchange functions. The spanning of the Cocheco River would take place in Dover near the intersection of Rochester Neck Road and County Farm Road. The western bank is forested, while to the east are agricultural lands. There is a band of riparian forest along the river. In this area the floodplain is relatively narrow, but present. Significant functions of the river include flood flow alteration, sediment and shoreline stabilization, and fisheries habitat. Finally, the southern fringe of wetlands bordering Blackwater Brook would possibly be impacted east of Long Hill Road. The immediate vicinity is undeveloped, although some farming is present. Wildlife habitat, sediment and toxicant retention, and floodplain functions are judged to be important.

6). Subcorridor IR-6

The western section of Subcorridor IR-6 follows the same corridor as IR-5 (described above). These two scenarios branch in Barrington, east of the Wentworth Brook crossing. Subcorridor IR-6 then loops slightly southward into Dover, crosses the Cocheco River at Watson Road, and merges with the Spaulding Turnpike about 2000 feet south of the Long Hill Road underpass. All wetlands impacts from the Wentworth Brook crossing west that were described above for IR-5, also apply to IR-6. In addition to these nine areas, seven other resources would possibly be impacted by IR-6.

Two isolated forested wetlands in Dover, near the Dover/Barrington municipal boundary would be affected. One is just west of Tolend Road and the other is just east of that same road. These resources are both forested and contain no open water. Except for the roadway, the area is undeveloped. There is, however, an identified hazardous waste site immediately to the south. There is a public water supply well to the north. Wildlife habitat and groundwater exchange functions are judged to be important. A small (<1 Ac), isolated wetland north of the intersection of French Cross Road and Tolend Road may be impacted. This area has no open water and appears to be a mowed wet meadow or pasture land. This agricultural conversion has substantially reduced the significant wetlands functions. The corridor crosses a small pond and tributary located in the Cocheco River floodplain and a nearby forested wetland in the area west

of Watson Road and southeast of the river. Mowed fields and several residences are in the neighborhood. These wetlands primarily serve water quality maintenance functions. In addition, the floodplain area is presumed to be useful for flood flow alteration, and productivity export small in magnitude. This corridor bridges the Cocheco River at the existing Watson Road crossing. The riverbanks in the immediate area are mowed, but forested to the north and south. There is a park just north of Watson Road on the eastern shore. This resource features flood flow alteration, fisheries habitat, shoreline stabilization, and recreation. Finally, Subcorridor 6 would impact an isolated wetland east of Reyners Brook and north of Sixth Street. The site is forested with no open water. There are homes nearby along the roadway, but undeveloped wildlife corridors remain between the wetland and the Reyners Brook system.

7). Subcorridor IR-7

The western section of Subcorridor IR-7 follows the same corridor as IR-6 (described above). These two alignments branch in Dover near the intersection of French Cross Road and Tolend Road. From there IR-7 arcs southward and joins the Spaulding Turnpike about 1500 feet south of the Tolend Road overpass. All wetlands impacts to the west of the divergence that were described above for IR-5 and IR-6, also apply to IR-7. In addition to these eleven areas, two other resources would possibly be impacted by IR-7.

A node of the wetlands system associated with the Bellamy Reservoir would be crossed by this corridor south of Tolend Road and east of French Cross Road. No water is associated with this forested wetland, but it is contiguous with the Bellamy River wetlands system (although several existing roadways intervene). Nearby lands are forested, with several residences within 2000 feet. This area can be assumed to receive some wildlife use and it also helps to maintain water quality of the Bellamy Reservoir. The headwaters region of Knox Marsh Brook would possibly be impacted. Much of this vicinity has been cleared and is currently in agricultural use. Wetlands bordering the brook function to reduce adverse water quality impacts of adjacent land uses.

8). Upgrade Subcorridors

Upgrade options within the Isinglass River analysis zone involve prospective improvements to Routes 4, 9, 202, and/or 125. (See **Figure IV-7, "Upgrade Corridors"**). The functional values assessments of potentially affected resources along these routes are presented at the end of the next section in conjunction with the overlapping Bellamy River analysis zone.

e. Bellamy River Zone **(Figure IV-15)**

The Bellamy River portion of the Phase IIIA area overlaps with the Isinglass River analysis zone geographically, but its focus is on subcorridors which connect eastern Northwood and south/central Barrington to subcorridors on the Spaulding Turnpike south of the Rochester wastewater treatment plant. The western end of all of these subcorridors consists of the eastern end of the southern links in the Bow Lake area (BL-4 to BL-8). Drainage basins included are: Lamprey River, Oyster/Bellamy Rivers basin, Isinglass River basin and Cocheco River basin.

The potential corridors in this analysis zone are comprised of various links that are combined in different combinations to develop multiple subcorridors. From the western node to a branching point northeast of Swains Lake in Barrington, all Bellamy River options follow the same corridor. In addition, the eastern termini (at the Spaulding Turnpike), and much of eastern portions of these subcorridors overlap those described above for the Isinglass River analysis zone. The following discussion will first describe the four major corridors (BR-1, BR-2, BR-5 and BR-7), then the various possible link combinations will be presented. In order to avoid repetitiveness, where the routes overlap those described above, the conclusions reached with regard to functional values of the impact areas will be summarized. Please refer back to the previous discussion for the rationale behind those assessments.

1). Subcorridor BR-1

From the western node, which is north of Routes 9/202 and south of Hall Brook in West Barrington, the Bellamy River analysis zone Subcorridor BR-1 follows a course nearly due east to the branching point northeast of Swains Lake. It then angles northeastward, staying south of the Isinglass River, and joining the Spaulding Turnpike near the Blackwater Road underpass. The eastern third of this option is the same as IR-4 in the Isinglass River analysis zone. It crosses parts of the Oyster/Bellamy Rivers basin, Isinglass River basin, and the Cocheco River basin, going through Barrington and Rochester. Impacts to thirteen wetlands areas would possibly occur.

About one-half mile east from the western node, the corridor intersects an intermittent tributary to Hall Brook in the same vicinity that the waterway is crossed by Routes 9/202. The wetlands vegetation is a mix of scrub-shrub and forest. In addition to the existing highway, in the neighborhood are several residences and historic farmland on which a conservation easement has been placed. The wetland is upstream of, but not within the conservation area. Wetlands bordering the stream would principally function to mitigate water quality impacts from the highway. Given the intermittent character of this stream, the magnitude of this function would not be as great as if it were perennial, however the downstream conservation area increases the importance. An unnamed tributary carrying flow from Round Ponds to Mendums Pond would be crossed south of the ponds and north of a forested and marsh area that is west of Swains Pond. This resource is mapped as Prime Wetlands by the Town of Barrington. The link crosses these wetlands at their narrowest point. About one mile east of this crossing, two tributaries to Swains Pond would also be crossed. The area around these crossings is mostly forested with few residences but there are two agricultural areas nearby. Conservation land was inventoried to the north. This area is judged to represent significant wildlife habitat. Minimal fragmentation is seen and a variety of different habitat types are found in the vicinity including open water, upland and wetland forest, and marshes. East of Young Road the corridor crosses a perennial tributary to an unnamed lake located on the south side of Route 9 near the Young Road junction. The wetland and surrounding uplands are forested. Although somewhat disrupted by the surrounding roads and residential development about 2000 feet to the south, this area is be expected to receive wildlife use. Unbroken corridors connect the area to the resources associated with the lake. Approximately one-half mile east of this site, the first major divergence in the Bellamy River subcorridors occurs. In other words, the impacts described to this point would occur in conjunction with each of the Bellamy River new location subcorridors. This section of the subcorridors is referred to as the "common corridor."

At the split, BR-1 curves northward. A stream flowing from the unnamed pond just mentioned above into Mallego Brook would be intersected. Adjacent land use is forested but Route 9 is within 100 feet to the north and there is a dirt road with several residences nearby. A sand and gravel operation and power line right-of-way are found downstream to the southeast. Given these factors, the principal value of this resource would relate to sediment and toxicant retention. In addition, this resource is mapped as Prime Wetlands by the Town of Barrington. The crossing of Mallego Brook would take place west of Smoke Street and north of Route 9. The brook, and much of the area to the west is forested, while residences are found along Smoke Street, with the greatest concentration to the north. The protected species habitat at Cate Pond is one mile away, upstream. This resource would be considered to have value with respect to wildlife habitat, and it is likely to help mitigate water quality impacts of the residential development. Immediately north of this point, this subcorridor begins to overlap the eastern three fourths of Isinglass River Subcorridor IR-4. A summary of the potential impacts follows.

The first potential impact that subcorridors BR-1 and IR-4 have in common involves the developed upper elevation section of an intermittent tributary to Green Hill Brook. The area is judged as providing limited wetlands functions. The tip of a wetland associated with Green Hill Brook could possibly be affected. The brook was assessed as providing some wildlife habitat functions. Also involved would be a previously unidentified recent impoundment of the brook that is mapped as Prime Wetlands by the Town of Barrington. The Isinglass River would be crossed at the Barrington/Rochester municipal boundary. Wildlife and fisheries habitat are significant functions, as are flood flow alteration and recreation. The Cocheco River crossing would occur just south of the sewage treatment plant. Significant functions of this resource include flood flow alteration, sediment and shoreline stabilization, and fisheries habitat. Finally, two isolated ponds and surrounding forested wetlands located west of Blackwater Road would probably be affected. The ponds may provide some nutrient and toxicant retention function.

2). Subcorridor BR-2

The path of Subcorridor BR-2 follows the common corridor (described for BR-1) eastward to the first divide. There it takes the north branch (like BR-1), but then becomes the same as the eastern three fourths of subcorridor IR-5. It follows a course nearly due east, curving north after crossing the Cocheco River. The intersection with the Spaulding Turnpike would be just south of Blackwater Brook. The route includes portions of the Oyster/Bellamy Rivers basin, Isinglass River basin, and Cocheco River basin in Barrington and Dover. This subcorridor includes the seven impacts described above for BR-1, up to the point at which BR-1 merges with IR-4. Please refer to the above discussion for an explanation of the nature of these resources. An additional seven areas would be affected. A summary of their principal functional values follows. Subcorridor BR-2 would potentially affect a total of fourteen wetlands resources.

Green Hill Brook would be crossed at a point about 500 feet west of Route 125. Wildlife habitat extends to the north and west and water quality maintenance functions are significant. Two impact areas are in the headwaters region of Calef Brook. These resources are judged to contribute to wildlife habitat, and sediment and toxicant retention, and other water quality protection functions. Wentworth Brook would be spanned at a point about 1500 feet north of the confluence with Calef Brook. Water quality maintenance was determined to be its principal

function. An isolated forested wetland in a residential area and another less disturbed isolated wetland would also be affected. Both are assumed to serve groundwater exchange functions. The spanning of the Cocheco River would take place in Dover near the intersection of Rochester Neck Road and County Farm Road. Significant functions of the river include flood flow alteration, sediment and shoreline stabilization, and fisheries habitat. Finally, the southern fringe of wetlands bordering Blackwater Brook would possibly be impacted. Wildlife habitat, sediment and toxicant retention, and floodplain functions are judged to be important.

3). Subcorridor BR-5

The path of Subcorridor BR-5 follows the common corridor (described for BR-1) eastward to the first divide. There, instead of curving north, it continues eastward for approximately two miles, then angles northward. Northwest of the Bellamy Reservoir, BR-5 merges with Isinglass River Subcorridor IR-6 which loops slightly southward into Dover, crosses the Cocheco River at Watson Road, and merges with the Spaulding Turnpike about 2000 feet south of the Long Hill Road underpass. The five impacts described for BR-1, up to the first divide would be involved with this subcorridor. An additional twelve areas would be affected by this scenario, bringing the total number of potentially affected wetlands to seventeen.

About one mile east of the divide Mallego Brook would be crossed. This is the location of the Province Road crossing of the brook. Mallego Brook would also be affected by this alignment along the entire reach of the stream between Province Road and Route 125 (approximately three-fourths of a mile). The area includes residential development along Province Road and Mallego Road, and two sand pits. Although much of the neighborhood remains forested, wildlife values have been degraded by fragmentation. The principal value of this section of the river is judged to be sediment and toxicant retention. Drew Brook would be crossed about 2500 feet south (downstream) of Route 9. This tributary to Mallego Brook flows through an undeveloped, forested area. Wildlife habitat is present and these wetlands may assist in mitigating water quality impacts resulting from Route 9 and adjacent development upstream. Mallego Brook would be affected a third time by a crossing at the current location of the Littleworth Road (Route 9) crossing. Although the river corridor remains forested, the surrounding uplands have been cleared and are in agricultural use. This subcorridor intersects Mallego Brook a fourth and final time very near the confluence with Wentworth Brook. Wetlands in this area are mapped as Prime Wetlands by the Town of Barrington. To the west in this vicinity is farm land, while parkland is found to the east. Since the Bellamy Reservoir is immediately down stream, removal of sediments, toxicants and excess nutrients are particularly important functions for this region of the Mallego Brook watershed. North of this crossing near Tolend Road, the Bellamy River Subcorridor 5 merges with the eastern one third of Isinglass River Subcorridor 6. The possible effects on wetlands values are summarized below.

Two isolated forested wetlands in Dover, near the Dover/Barrington municipal boundary would be affected. Wildlife habitat and groundwater exchange functions are judged to be important. A small (< 1 Ac), isolated wetland north of the intersection of French Cross Road and Tolend Road may be impacted. This conversion of the area to agriculture has substantially reduced its wetlands functions. The corridor crosses a small pond and tributary located in the Cocheco River floodplain and a nearby forested wetland in the area west of Watson Road and

southeast of the river. These wetlands primarily serve water quality maintenance functions. In addition, the floodplain area is presumed to be useful for flood flow alteration, and productivity export small in magnitude. This corridor bridges the Cocheco River at the Watson Road crossing. This resource features flood flow alteration, fisheries habitat, shoreline stabilization, and recreation. Finally, this subcorridor would impact an isolated wetland east of Reyners Brook and north of Sixth Street. There are homes nearby, but undeveloped wildlife corridors remain between the wetland and the Reyners Brook system.

4). Subcorridor BR-7

Bellamy River Subcorridor BR-7 follows the common corridor (described for BR-1) eastward across Barrington to the first divide. There, as with BR-5, it continues eastward. At the point where BR-5 angles northward, BR-7 continues generally eastward into Dover. Near the intersection of French Cross and Tolend Roads, BR-7 merges with IR-7. From there the prospective corridor arcs southward and joins the Spaulding Turnpike about 1500 feet south of the Tolend Road overpass. The watersheds traversed are the Isinglass River, Oyster/Bellamy Rivers, and Cocheco River basins. The five impacts described for BR-1, up to the first divide would be involved with this subcorridor. Also involved would be three potential impacts described in the previous sub-section. An additional nine areas would be affected. This subcorridor involves a total of fourteen wetlands crossings.

After the branch away from BR-5, BR-7 intersects Mallego Brook at a point about 1500 feet south of Littleworth Road (Route 9). The river corridor is forested, but adjacent lands are in agricultural use. Located in a disturbed area upstream of the Bellamy Reservoir, this wetlands possesses values related to water quality maintenance functions. In Dover, just east of the Barrington/Dover town line, the corridor crosses two isolated wetlands. One is forested, and one contains scrub-shrub and emergent vegetation. These resources are both fragmented by crossings of Route 9, and there are several residences nearby. The isolated character and altered surroundings of theses wetlands severely reduce their functional values. An arm of the Bellamy Reservoir that is within the Mallego Brook watershed would have to be crossed by this subcorridor. In addition to the open water of the reservoir, the area of the crossing contains forested uplands and a wooded riparian corridor. Besides the obvious water quality protection aspects of wetlands resources associated with a water supply reservoir, significant fisheries and wildlife habitat functions re provided. North of the Bellamy Reservoir, BR-7 merges with the eastern one third of IR-7.

In summary, the eastern link of BR-7 involves two wetlands resources. A node of the wetlands system associated with the Bellamy Reservoir would be crossed by this corridor south of Tolend Road and east of French Cross Road. This area can be assumed to receive some wildlife use and also helps to maintain water quality of the Bellamy Reservoir. The headwaters region of Knox Marsh Brook also would possibly impacted. Wetlands bordering the brook serve to reduce adverse water quality impacts of the adjacent agricultural land use.

5). Subcorridor BR-3

Subcorridor BR-3 consists of links that were described previously combined in a different arrangement. Its western half involves the common corridor and the north bound branch of BR-1. South of Cate Pond, it veers eastward along the BR-2 corridor, until just west of the Dover/Barrington boundary where it follows the BR-5 corridor. The terminus at the Spaulding Turnpike is south of Reyners Brook.

6). Subcorridor BR-4

Subcorridor BR-4 also consists of links that have previously been described. Its western half involves the common corridor and the east bound branch of BR-5. Northeast of the Bellamy Reservoir in Barrington, it merges with the BR-2 corridor, following this route to the junction with the Spaulding Turnpike that would be south of Blackwater Brook.

7). Subcorridor BR-6

Subcorridor BR-6 is comprised of another combination of corridors. This route would first follow the common corridor and eastward branch scenario of BR-5. Then, north of the Bellamy Reservoir in Dover, it joins BR-7. This brings it to the Spaulding Turnpike about 1500 feet south of the Tolend Road overpass.

8). Upgrade Subcorridors

The following discussion concerns the functional values of potential wetlands impacts associated with upgrade options that span the Isinglass River and Bellamy River analysis zones. These subcorridors provide possible means of connecting the central portion of the study area to the Spaulding Turnpike, crossing Barrington and different combinations of Dover, Lee, Madbury, Nottingham and Rochester. These, and all other upgrade alternatives, are shown in **Figure IV-7, "Upgrade Corridors"**.

a) Route 4 between Route 9/202 and Route 125

The southernmost upgrade option involves a reconstruction of Route 4. The western end of this option begins in Northwood at the eastern end of the Route 4/9/202 upgrade alternative (discussed above under the Bow Lake analysis zone). At this point Routes 9/202 branches generally northeastward and Route 4 continues southeastward. The Route 4 upgrade alternative starts in the Lamprey River basin and crosses the entire Oyster/Bellamy Rivers basin. A total of twelve wetlands crossings would occur in this section. This explanation will work from west to east describing the potentially affected resources along the corridor.

In Nottingham, just east of the Route 152 junction the highway crosses North River south of North River Pond. The area is forested, but houses are clustered around the intersection. Wildlife habitat is extremely degraded. Helping to maintain water quality is the principal function of this resource. On the south side of the roadway, south of Cooper Hill, the northern edge of a forested wetland may be impacted. This resource is associated with an intermittent stream that eventually feeds into Little River. There is only one residence nearby. Wildlife

habitat appears only slightly affected by the proximity of the road, since the wetland remains unfragmented. This vegetated area also functions to remove sediments and toxicants entering the watershed in roadway runoff. South of Mendums Pond the highway crosses the perennial section of the stream mentioned above and then Little River. This river valley is designated floodplain. Although there are two homes along the road nearby, development is very sparse and the river valley is entirely undeveloped. Wildlife habitat, flood flow alteration, and maintenance of water quality are judged to be the significant functions. An unnamed intermittent tributary to Caldwell Brook and its associated wetland are intersected in Barrington, just east of the Nottingham/Barrington boundary. Within 2000 feet, the same stream is crossed again where an associated pond would probably also be affected. Immediately after that, Caldwell Brook is crossed. There are rural residential properties and a power line right-of-way nearby. Two areas of farmland on which conservation easements have been placed are located along the road. Significant undeveloped land exists to the south and north of the highway. This wetlands system appears fragmented only by the existing highway. The area has been assessed as providing wildlife habitat and water quality maintenance functions. Caldwell Brook is again crossed just upstream from the confluence with Oyster River and within 1000 feet the Oyster River itself is crossed. The roadway then enters Lee, skirting an impounded area within the Oyster River on the south side and bisecting a northward projection of this system. This area contains a cluster of residential and commercial development, including a trailer park. At least six water supply wells are in the immediate vicinity. These resources are particularly important with respect to mitigating adverse water quality impacts of the nearby development and the floodplain serves a flood flow alteration function. The diversity of vegetative classes and impoundments increase the efficiency with which sediments, toxicants and nutrients are removed or transformed. Finally, the accessibility and nearness of a University of New Hampshire facility suggests that educational values may also be present. At this point Route 4 intersects Route 125, a major north/south roadway.

b) Routes 4/155 between Route 125 and the Spaulding Turnpike

Route 4 on the eastern side of Route 125 intersects the Oyster River again. The vicinity of this crossing is sparsely residential but there has been forest clearing along the roadway. Immediately downstream, this section of the Oyster River (mislabeled as "Dube Brook" on the Dover West USGS Quadrant) is somewhat wider, and can be assumed to have a slower moving current. This characteristic increases the magnitude of the nutrient, sediment, and toxicant retention functions. At the junction with Route 155 near Lee Five Corners, an unnamed tributary and associated ponded area would possibly be affected in several sites. The surrounding area is developed and the lowlands are designated floodplain. Forested and emergent wetlands are present. Wildlife habitat is degraded, but flood abatement and water quality values are provided. At this point this upgrade option would follow Route 155 (Manchester Road) as it heads northeastward toward Madbury. A farm pond and bordering wetlands might be impacted. The Oyster River is crossed for the final time just west of the Durham/Lee town line. The river valley is indicated as floodplain and residences, agricultural land, and parkland are in the surroundings. The highway cuts across the northwestern corner of Durham and in this short stretch would possibly affect a pond and related wetlands. In Madbury west of Townhall Road two nodes of a forested wetland associated with the upper reaches of Beards Creek would be crossed. The immediate vicinity is forested and only lightly

developed. While some fragmentation is seen, a good sized area to the south appears undeveloped. The variety of vegetative classes found in this vicinity provide wildlife habitat. A particularly sensitive resource along this section of the roadway is the greenbelt comprised of town owned lands at Hicks Hill and the Kingman Farm. A conservation easement established under the Land Conservation Investment Program is also nearby. An isolated wetland on the Kingman Farm would be impacted by the prospective roadway expansion. Protected species habitat has been identified in the immediate vicinity and water supply wells are located north and south of the highway. The area is judged to have significance with respect to wildlife habitat, water quality maintenance, groundwater protection, endangered species, recreation, and uniqueness/heritage values. Near the intersection of Pudding Hill Road and again along the Knox Marsh Road section of Route 155, the roadway crosses an unnamed tributary to the Bellamy River. At the Dover/Madbury municipal boundary the Bellamy River and three of its tributaries (Kelly Brook, Knox Marsh Brook and an unnamed stream) are crossed. These crossings are in an area of manicured lawns and commercial or industrial buildings. Forested, shrub-scrub and emergent wetlands are included in these systems. Moderation of adverse water quality impacts is their principal functional value. The final resource impact that could occur along this upgrade corridor involves wetlands southeast of the Route 9/Route 155 interchange in Dover. This forested and emergent vegetation is associated with an unnamed tributary to the Bellamy River. The resource is bisected by the existing roadway. The key function is sediment and toxicant retention.

c) Route 125 between Route 4 and Route 9

The Route 125 upgrade option would involve the section of the highway extending north from Route 4 in Lee, through Barrington and into Rochester. The Oyster/Bellamy, Isinglass River and Cocheco River basins would be traversed. This alternative will be described in two segments (south of Route 9 and north of Route 9), starting at the southern end and working northward.

On the northwest side of the junction of Route 4 and Route 125 in Lee a northward projection of wetlands associated with the Oyster River system would be impacted. In this vicinity there is a cluster of residential development, including a trailer park. At least six water supply wells are in the immediate vicinity. The resources in this area are particularly important with respect to mitigating adverse water quality impacts of the nearby development. In addition, the accessibility of the wetland and nearness to a University of New Hampshire facility suggests that educational values may also be present. Pierce Brook would possibly be affected in two locations in Barrington where is skirted by the highway. The brook feeds into the large wetlands system associated with the Bellamy River. The road runs along the western side of this system for about two miles. Through this section, at least seven wetlands impacts would possibly occur. The Bellamy River, Winkley Pond, Bumford Brook and Mallego Brook and their affiliated wetlands would be affected. Resources in this system are mapped as Prime Wetlands by the Town of Barrington. Surrounding land use is residential, but there are several gravel pits in the vicinity. Two water supply wells are nearby and the system drains into the Bellamy Reservoir. Near the road the waterways and bordering vegetation are primarily important for their water quality maintenance functions. However, the less disturbed portions of this large expanse of wetlands constitute a significant wildlife resource. The system is all designated as floodplain, so the flood flow alteration function is also provided. About one half mile north of the Mallego Brook crossing is the intersection with Route 9.

d) Route 125 between Route 9 and the Spaulding Turnpike

Just north of the Route 125/Route 9 intersection Green Hill Brook flows parallel to the western side of Route 125 for about one and one half miles. The brook and its bordering wetlands would probably be impacted in three locations by the prospective roadway improvements. The resource is a forested and shrub-scrub wetland. Farmland and residential development are the adjacent land uses. Wells are shown in the neighborhood. The proximity of the existing roadway and a large development to the east would slightly decrease wildlife appeal, but wildlife habitat is found along the brook. This resource functions to reduce sediment and toxicant loading of the Isinglass River, which is about one mile downstream. Exchange of fisheries between the river and brook may occur. The Isinglass River is spanned by Route 125 in southern Rochester. In the river crossing area, the resource consists of the river channel and bordering riparian forest, plus an isolated wetland north of the river and east of the highway. Surrounding land uses include agriculture, and residential and commercial development. The river channel provides fisheries habitat and some flood flow alteration function, but the floodplain is very narrow in this vicinity. The forested banks serve in sediment and shoreline stabilization. An unnamed tributary to the Cocheco River and a nearby small ponded area south of West Gonic would possibly be affected. This area is very disturbed by development and includes an identified hazardous waste site. These factors severely decrease their wetlands functions. The northern terminus of this upgrade option is at Exit 12 on the Spaulding Turnpike. The Cocheco River is close to the southwest quadrant of the interchange and could potentially be affected by the upgrade. The floodplain area is forested, and surrounded by dense development. There us an identified hazardous waste site in the vicinity. Wildlife habitat is severely degraded, but the river channel provides fisheries habitat.

e) Joint Routes 9/202 Corridor

This upgrade alternative would involve the improvement of the Route 202 corridor. This discussion will be divided into two sections. The presentation will cover the joint Route 9/202 corridor through Northwood and Barrington first, then the Route 202 corridor from Barrington into Rochester. The functional values of prospective impact areas will be discussed working from southwest to northeast.

Along the joint Routes 9/202 corridor just north of the diverge of Route 4 from Routes 9/202, the highway crosses an intermittent stream with two impoundments and a steam and wetlands system associated with flow from the Acorn Ponds. The vegetation is forested and scrub-shrub wetland. Much of the area is forested but residences line the roadway. Near the Northwood/Barrington town line the highway crosses two tributaries to North River Pond and skirts the northern shore of the pond. The area is forested and the pond shore is developed. Because these resources are near the highway and affiliated development, their wildlife habitat values are reduced. Their principal functions relate to maintenance of water quality. South of Hall Brook an intermittent stream flowing into the brook is crossed. In West Barrington, the road also flanks wetlands bordering the brook. These wetlands are mapped as Prime Wetlands by the Town of Barrington. They are located within an area on which a conservation easement

has been placed. Wetlands south of the road and north of Stonehouse Pond would probably be affected. At the Stonehouse Brook crossing adjacent wetlands are mapped by Barrington as Prime Wetlands. Just south of the Route 9/Route 202 fork, the corridor passes wetlands associated with Hale Pond. Through this region, the area northwest of the highway is very scarcely developed, so wildlife habitat values are judged to be present. Attenuation of water quality impacts from roadway runoff is also a significant function of these resources.

f) Route 202 between Route 9 and the Spaulding Turnpike

Continuing north on Route 202, just past the Route 9/Route 202 fork the existing highway crosses and then parallels a stream flowing from Hale Pond toward the Isinglass River. Along this section, two areas are identified as protected species habitat. The prospective corridor improvements could possibly threaten this habitat. From the Route 126 crossing and north for about one mile, the highway runs parallel and very close to the Isinglass River. There is a roadside park in this area with views of the river. The river is crossed by Route 202 just north of Scruton Pond Road. At the crossing, there is identified protected species habitat east of the roadway. The river channel is designated floodplain and it supports important fisheries resources. South of Ayers Pond the highway crosses the unnamed stream draining from the pond into the Isinglass River and passes very close by wetlands south of the roadway that are mapped as Prime Wetlands by the Town of Barrington. Roadway improvements would probably impact these wetlands. Excluding the highway, surrounding wildlife habitat is unfragmented. In addition, these resources help reduce sediment and toxicant loading from roadway runoff of the Isinglass River. In the vicinity of Little Long Pond another area of protected species habitat is skirted. The road then crosses a small stream and Axe Handle Brook. There appears to be more development in this area so wildlife habitat value is decreased. Water quality protection functions are significant and Axe Handle Brook is designated as floodplain. Finally, two isolated wetlands near Exit 13 of the Spaulding Turnpike would possibly be affected by the upgrade at the terminus of this option. These wetlands include forested and scrub-shrub vegetation. They are in a developed area adjacent to the Spaulding Turnpike. Their primary functions relate to maintaining water quality.

g) Route 9 between Route 202 and Route 125

The Route 9 upgrade alternative starts from the Route 202/Route 9 split in Barrington. From that point, the existing highway follows a route generally eastward, across sections of Barrington and Madbury, intersecting the Spaulding Turnpike at Exit 8 in Dover. This discussion works from west to east and is split into sections that are west and east of Route 125.

Near the junction of Route 9 with Route 126 an intermittent stream is crossed in a forested and agricultural area. Southeast of Huckleberry Hill the highway skirts an unnamed pond and then crosses Mallego Brook. The brook, and much of the area to the north and west is forested, while residences are found along Route 9 and Smoke Street. Wetlands would be considered to have value with respect to wildlife habitat, and they are likely to help mitigate water quality impacts of the residences and roads. Just west of the Route 125 junction, a wetland associated with an intermittent stream that eventually flows into Mallego Brook would probably be impacted. The principal value of this resource would relate to retention of sediment and toxicants in roadway runoff.

h) Route 9 between Route 125 and the Spaulding Turnpike

To the east of the Route 125 junction Route 9 crosses Drew Brook and an associated impoundment. The surroundings are generally forested with a few residences to the east. Wildlife habitat is present north and south of the road, and these resources may assist in mitigating water quality impacts resulting from Route 9 and the adjacent development. Mallego Brook is then crossed again. Although the river corridor remains forested, the surrounding uplands have been cleared and are in agricultural use. Since the Bellamy Reservoir is immediately downstream, removal of sediments, toxicants and excess nutrients are particularly important functions for this region of the Mallego Brook watershed. The roadway bisects two isolated wetlands in a residential area. It then crosses through the Bellamy Reservoir. Bordering the reservoir are forested and shrub-scrub resources. Just east of the crossing in Dover, additional wetlands associated with the reservoir would be intersected. Wetlands in this area are supportive of the protection of water quality in the reservoir. In addition, the reservoir and its wetlands serve flood flow alteration functions. Knox Marsh Brook and affiliated scrub-shrub resources are crossed in an agricultural area. Finally, Route 9 passes by an isolated wetland located south west of the Columbus Ave intersection. The surrounding area is farmed. The principal value of these two resources is judged to be sediment and toxicant retention. There are no additional wetlands between this point and the Spaulding Turnpike.

E. EVALUATION OF NEW LOCATION AND UPGRADE SUBCORRIDORS

1. Methodology

In this step of the Phase IIIA analysis process, information developed for each new location and upgrade subcorridor was displayed and reviewed. This display included the acreage or units of impact to natural, cultural and socio-economic resources, and summary results of the planning objectives analysis. Also, preliminary cost estimates for links and segments were developed and assembled into subcorridors. Although not a determining factor in the screening of subcorridors, these preliminary cost estimates provided additional insight into the relative engineering and construction complexities of the respective alternatives. Finally a qualitative evaluation of wetlands functions and values was added.

The new location subcorridors were compared to select the least impacting for further analysis in the study. Comparisons were performed for groups of subcorridors which served similar network purposes. In each comparison of subcorridors, the subcorridor least impacting on wetlands was identified for further study. In addition, one or more other subcorridors which were less impacting on all mapped resources and/or which met planning objectives more completely than the one least impacting on wetlands were also chosen for further study. Emphasis was given to considering area resource impacts because point resources may be more readily avoided or impacts minimized with mitigating measures, such as alignment shifts.

At the end of this step, the selected new location subcorridors were assembled into all rational combinations of full corridors which crossed the entire study area. The process resulted in the identification of forty-eight possible new location corridor alternatives. These alternatives are described in **Appendix I.**

For upgrade subcorridors, the analysis was somewhat different, since the existing roadway network serves specific and individual purposes. Information regarding potential resource impacts, positive contribution to planning objectives, and qualitative wetlands functions analysis was assembled to develop a better understanding of the characteristics of the subcorridors. Preliminary cost estimates were included in the display to indicate engineering complexity. This information was used to determine in which subcorridors upgrading appeared most feasible and which subcorridors may require bypassing to avoid serious impacts. None of the subcorridors were eliminated from further study at the subcorridor level. Based on the information learned through subcorridor analysis, upgrade subcorridors were combined into five full upgrade corridors for analysis similar to that of full new location corridors.

2. Analysis of New Location Subcorridors

[Subcorridors retained are in **bold** type.]

a. Suncook River Zone

Suncook River Subcorridors **1, 2, 3** and **4**: **(Table IV-4)** The two paths crossing near Chichester Center, namely SR-2 and SR-4, impact approximately one-third fewer acres of wetlands, and as noted in the discussion of wetland functions and values above, some of the wetlands impacted by SR-1 and SR-3, such as the Saunders Brook Area, provide wildlife habitat than the SR-2 and SR-4 impacted wetlands, which in Chichester are located closer to farmland and developed areas.

TABLE IV-4

COMPARISON OF NEW LOCATION SUBCORRIDORS
SUNCOOK RIVER SUBCORRIDORS 1, 2, 3 and 4

Suncook River	1	2	3	4
LINKS	1-15+ 1-30+ 1-2+1-4 +1-12	1-15+ 1-5+1-14 1-6+ 1-12+	1-15+ 1-30+1-2+ 1-4+1-9 +1-10	1-15+ 1-5+1-14 1-6+1-10 +1-11
RESOURCES	**+1-13**	**1-13**	**11+1-29**	**+1-29**
Wetlands	29.86A	21.58A	27.59A	19.31A
Floodplain	5.75A	10.79A	5.75A	10.79A
Surface Water Bodies	-	.01A	-	0.01A
Parkland	-	-	-	-
Endangered Species	-	-	-	-
Farm - Landcover	13.19A	19.26A	8.90A	14.97A
Farm - SCS	-	-	-	-
Commercial Landuse	-	-	-	-
Residential Landuse	2.99A	5.35A	2.85A	5.21A
Hazardous Waste	-	-	-	-
Gravel Pits	-	-	-	-
Potential Historic Sites	13	12	18	17
Potential Arch. Sites	-	-	-	-
Wells	2	3	4	5
Rivers	1	1	1	1
Community Facilities	1	1	1	1
Community Cohesion	E	I	M	I
Economic Development	M	M	E	M
Network Efficiency	M	M	M	M
Construction Cost	$56.95m	$55.53m	$60.35m	$63.11m

Resources impacted by subcorridors SR-2 and SR-4 are floodplain, farmland and residential land use. Subcorridors SR-1 and SR-3, which arc north to cross the Suncook River near the Chichester/Pittsfield/Epsom line impact less floodplain, farmland and slightly less residential land use. SR-1 and SR-3 also rated substantially better than SR-2 and SR-4 in meeting planning objectives. Concern for detrimental impacts on community cohesion is particularly strong for SR-4, the more southerly route through both Chichester and Epsom.

Least impacting on total wetlands and wetlands exhibiting many function, subcorridors SR-2 and SR-4 were retained. Due to the pattern of impacts of all four subcorridors on resources, subcorridors SR-1 and SR-3 were also retained for further analysis.

Suncook River Subcorridors 5 and **6**: **(Table IV-5)** SR-5 is similar to SR-4, except shorter for the purpose of comparison to SR-6, ending just east of the Suncook River. SR-5 impacts fewer acres of wetlands than SR-6, and as mentioned above, the SR-5 wetlands in Chichester are along farmland and developed areas. Approximately half the SR-6 wetlands perform several wetland functions. Although it is of shorter length, SR-6 has the highest construction cost of all Suncook River subcorridors, an indication of the topographic conditions existing south of Route 4.

SR-5 duplicates the route of SR-4 and thus was carried forward as part of that full subcorridor. Inspection of mapping of resources indicated that the most challenging topography and pattern of wetland resources is in the western portion of subcorridor SR-6; the portion east of Routes 4/9/202 is less impacting on these resources and performs the valuable function of providing a potential bypass of the developed area of Gossville along Routes 4/9/202 and Epsom Circle. SR-6 was discontinued from further study as a full corridor, but the portion east of the crossing of Routes 4/9/202 was retained for further analysis as part of a possible bypass.

In summary, the subcorridors in the Suncook River zone carried forward for further analysis were SR-1, SR-2, SR-3, SR-4, and the portion of SR-6 east of its Routes 4/9/202 crossing.

b. Epsom Mountain Zone

Epsom Mountain Subcorridors **1, 2, 3, 4**: **(Table IV-6)** Wetland acreages impacted by EM-3 and EM-4 are slightly higher than in the other two corridors and a slightly higher proportion of the wetlands perform a variety of functions. In the comparisons of EM-1 and EM-2, and of EM-3 and EM-4, impacts on other resources are each comparable: residential land use in the former comparison, and surface water bodies, farmland and residential land use in the latter. In each of the two sets of comparisons, planning objective impacts are comparable; the greatest impacts are in EM-1 and EM-2 which run through Northwood Narrows on a more southerly alignment and are judged to have a negative impact on community cohesion.

TABLE IV-5

COMPARISON OF NEW LOCATION SUBCORRIDORS
SUNCOOK RIVER SUBCORRIDORS 5 and 6

Suncook River	5	6
LINKS	1-15+ 1-5+1-14 1-6+1-10 +1-11	1-24+ 1-22+ 1-11
RESOURCES		
Wetlands	16.20A	22.18A
Floodplain	10.79A	5.43A
Surface Water Bodies	.01A	0.23A
Parkland	-	-
Endangered Species	-	-
Farm - Landcover	14.97A	7.86A
Farm - SCS	-	-
Commercial Landuse	-	-
Residential Landuse	5.05A	6.66A
Hazardous Waste	-	-
Gravel Pits	-	1
Potential Historic Sites	13	8
Potential Arch. Sites	-	1
Wells	4	-
Rivers	1	1
Community Facilities	1	-
Community Cohesion	I	M
Economic Development	M	E
Network Efficiency	M	M
Construction Cost	$46.89m	$65.73m

TABLE IV-6

COMPARISON OF NEW LOCATION SUBCORRIDORS
EPSOM MOUNTAIN SUBCORRIDORS 1, 2, 3 and 4

Epsom Mountain	1	2	3	4
LINKS	1-16+ 2-2	1-7+ 2-2	1-13+ 1-28+ 2-5	1-29+ 1-28+ 2-5
RESOURCES				
Wetlands	7.51A	9.42A	9.49A	11.01A
Floodplain	-	-	-	-
Surface Water Bodies	-	-	.22A	.22A
Parkland	-	-	-	-
Endangered Species	-	-	-	-
Farm - Landcover	-	-	5.52A	5.52A
Farm - SCS	-	-	-	-
Commercial Landuse	-	-	-	-
Residential Landuse	.30A	.73A	1.01A	.99A
Hazardous Waste	-	-	-	-
Gravel Pits	-	-	-	-
Potential Historic Sites	-	1	2	3
Potential Arch. Sites	-	-	-	-
Wells	-	-	-	-
Rivers	-	-	-	-
Community Facilities	-	-	-	-
Community Cohesion	I	I	E	M
Economic Development	M	M	M	M
Network Efficiency	E	E	E	E
Construction Cost	$18.75m	$31.64m	$15.17m	$27.79m

Because all four Epsom Mountain subcorridors connect one or more paths both to the west and east and due to their comparable levels of impact, none were dropped from further consideration; all four Epsom Mountain subcorridors were carried forward for further analysis.

c. Bow Lake Zone

Bow Lake Subcorridors 1, 2 and 3 and Bow Lake Subcorridors 9, 10 and 11: **(Table IV-7)** Subcorridor BL-1, which runs north of Bow Lake, is the least impacting of this group of subcorridors upon wetlands acreage. The subcorridor can avoid involvement which some of the more southerly subcorridors in the group have at each end with the Durgin-Long-Little Bow Ponds on the west and the Isinglass River area on the east. For these reasons, subcorridor BL-1 was continued for further study as a way to cross the center of the study area from Northwood Narrows to the northern diverge point at the eastern end of this analysis zone. However, in between the subcorridor involves areas of substantial unfragmented wildlife habitat. BL-1 also impacts floodplains, and rates ineffective in two of the planning objective evaluations (community cohesion and local development objectives). Therefore, alternatives to this subcorridor must also continue to be considered.

All subcorridors in this group rate high impact on farmland as reported by the SCS, although impact on farmland based on satellite imagery varies markedly. The high figures by the SCS is probably due to the inclusion of managed tree farms, particularly in the area of link 3-16. Subcorridor BL-2 is the only path in this group with no impact on farmland based on satellite imagery, therefore, BL-2, the most northerly of the paths ranging south of Bow Lake, was included for further study. Subcorridors BL-1 and BL-2 are also the lowest in terms of residential land use impacts.

Bow Lake Subcorridors 4, 5, 6, 7 and 8: **(Table IV-8)** In all these subcorridors, virtually all the wetlands were judged to be valuable for carrying out a variety of functions.BL-8, which runs close to and parallel to Routes 4/9/202, was continued into further analysis due to impacting the fewest wetlands of this group. However, subcorridor BL-8 exhibits impact on farmland as identified by satellite, has the highest impact on residential land use, and has an ineffective rating in the community cohesion and local development planning objective categories. In addition BL-8 runs between Routes 4/9/202 and the Northwood Ridge community well system. Northwood officials have identified the area north of the wells as the aquifer recharge area, but the proximity of the BL-8 subcorridor to the wells would raise the issue of impact on water quality. Subcorridor BL-4 which connects the northerly subcorridor through Epsom to the most southerly corridor through Barrington, is the only path in this group which has no impact on farmland as identified by satellite, has the lowest residential land use impacts and hence, was also carried forward for further analysis.

TABLE IV-7

COMPARISON OF NEW LOCATION SUBCORRIDORS
BOW LAKE SUBCORRIDORS 1, 2, 3 and 9, 10, 11

Bow Lake	1	2	3	9	10	11
LINKS	2-6+ 2-7+ 2-8+ 3-11+	2-60+ 2-64+ 2-4+2-11 +3-16+	2-60+ 2-65+ 2-64+2-11 3-16+	2-1+ 2-61+ 2-4+ 2-11+	2-1+ 2-63+ 2-62+ 2-11+	2-18+ 2-20+ 2-12+ 3-16
RESOURCES	3-13	3-32+3-9	3-32+3-9	3-16	3-16	
Wetlands	15.77A	26.40A	23.45A	22.83A	19.88A	22.13A
Floodplain	8.34A	-	-	-	-	-
Surface Water Bodies	-	.47A	-	.73A	.27A	-
Parkland	-	-	-	1.60A	1.60A	1.60A
Endangered Species	-	-	-	-	-	-
Farm - Landcover	1.80A	-	18.75A	10.27A	29.02A	10.71A
Farm - SCS	68.44A	79.91A	65.82A	79.91A	65.82A	66.00A
Commercial Landuse	-	-	-	-	-	-
Residential Landuse	2.01A	2.68A	3.04A	2.87A	3.23A	5.04A
Hazardous Waste	-	-	-	-	-	-
Gravel Pits	1	-	-	-	-	1
Potential Historic Sites	4	7	6	3	2	4
Potential Arch. Sites	2	5	7	1	3	4
Wells	-	-	-	-	-	-
Rivers	1	1	1	-	-	-
Community Facilities	-	2	2	1	1	2
Community Cohesion	I	E	M	M	M	I
Economic Development	I	I	I	I	I	I
Network Efficiency	M	M	M	E	E	M
Construction Cost	$45.49	$39.33	$49.71	$34.29m	$39.62m	$45.49m

TABLE IV-8

COMPARISON OF NEW LOCATION SUBCORRIDORS
BOW LAKE SUBCORRIDORS 4, 5, 6, 7 and 8

Bow Lake	4	5	6	7	8
LINKS	2-60+ 2-64+ 2-4+	2-60+ 2-65+ 2-62+	2-1+ 2-61+ 2-4+	2-1+ 2-63+ 2-62+	2-18+ 2-20+
RESOURCES	2-13	2-13	2-13	2-13	2-14
Wetlands	16.96A	14.01A	17.48A	14.53A	12.93A
Floodplain	-	-	-	-	-
Surface Water Bodies	.47	-	.73A	.27A	-
Parkland	-	-	-	-	-
Endangered Species	-	-	-	-	-
Farm - Landcover	-	18.75A	10.27A	29.02A	10.71A
Farm - SCS	17.34A	3.25A	17.34A	3.25A	3.14A
Commercial Landuse	-	-	-	-	-
Residential Landuse	3.80A	4.16A	4.05A	4.41A	7.71A
Hazardous Waste	-	-	-	-	-
Gravel Pits	-	-	-	-	-
Potential Historic Sites	2	1	4	3	2
Potential Arch. Sites	2	4	-	2	3
Wells	-	-	-	-	-
Rivers	-	-	-	-	-
Community Facilities	-	-	-	-	-
Community Cohesion	E	M	E	M	I
Economic Development	I	I	I	I	I
Network Efficiency	E	E	E	E	E
Construction Cost	$28.61m	$33.79m	$29.86m	$35.19m	$38.06m

The results of these two comparisons, from the Northwood Narrows area to either the Isinglass River or North River Pond area, show that using the shortest path is less impacting. Both distance and resource interference are minimized by crossing north of Bow Lake to reach the Isinglass River area, or crossing south of Bow Lake to reach the North River Pond area. This situation should not be viewed in isolation or be interpreted to determine that a path north or south of Bow Lake is less impacting overall until the full alternative corridors they help to form are also evaluated.

In summary, four subcorridors were continued into further analysis, BL-1, BL-2, BL-4, and BL-8; the remaining seven Bow Lake subcorridors were discontinued.

d. Isinglass River Zone

Two comparisons were made. One was between two paths (IR-1 and IR-2) which run north of the Isinglass River and the other between four paths (IR-4, IR-5, IR-6 and IR-7) all of which must cross the Isinglass River via link 3-27 in Barrington. Subcorridor IR-3, which is essentially the same as IR-2, was included in the second comparison because it started at the same point as IR-4 through IR-7, although IR-3 stays north of the Isinglass River.

Isinglass River Subcorridors 1 and 2: **(Table IV-9)** Subcorridor IR-1 is less impacting on wetland acreage and traverses and area whose topography is such that wetlands do not perform as wide a range of wetland functions as in other areas, and development and farms have somewhat degraded function. Subcorridor IR-1 also rated effective in not being detrimental to community cohesion and on being not inconsistent with local development objectives. As a result, IR-1 was carried forward for further study. It should be noted that IR-1 does impact farmland identified by satellite and privately held land of local concern identified as Hale Woods in Barrington.

Isinglass River Subcorridors 3, 4, 5, 6, and 7: **(Table IV-10)** In this comparison, Subcorridor IR-3 is least impacting on wetland acreage and upon areas of wetlands performing several functions: by using 3-5 it avoids traversing 3-27, which crosses an area of Barrington with many resources. This subcorridor runs along the north side of the Isinglass River. It is the only path which does not impact farmlands, although it does impact 1.28 acres of surface water, as well as commercial land use. All other paths traverse link 3-27 with its range of resources. Subcorridor IR-4, although crossing the Isinglass River on link 3-27, is the only path in this group which does not impact commercial land use. It also rated well for planning objectives and was also included for further analysis.

A situation similar to the Bow Lake zone is observed within the Isinglass River zone. There is almost a direct correlation between distance and level of impact. The distance between the Isinglass River starting point and the six Spaulding Turnpike termini increases from IR-1, the shortest and least impacting subcorridor, to IR-4 through IR-7, the longer and thus more impacting subcorridors. However, the varying levels of impacts must be considered in relation to the varying benefits of the total corridors of which these subcorridors may form a part and which may serve different termini and somewhat different functions.

TABLE IV-9

COMPARISON OF NEW LOCATION SUBCORRIDORS
ISINGLASS RIVER SUBCORRIDORS 1 and 2

Isinglass River	1	2
LINKS	3-31+ 3-30+ 4-15	3-9+ 3-5+ 3-6+ 4-14
RESOURCES		
Wetlands	9.97A	13.65A
Floodplain	.09A	6.72A
Surface Water Bodies	-	1.28A
Parkland	-	-
Endangered Species	-	-
Farm - Landcover	13.86A	-
Farm - SCS	-	-
Commercial Landuse	-	1.57A
Residential Landuse	0.33A	3.05A
Hazardous Waste	-	-
Gravel Pits	1	-
Potential Historic Sites	4	2
Potential Arch. Sites	2	7
Wells	-	1
Rivers	-	2
Community Facilities	-	-
Community Cohesion	E	M
Economic Development	E	E
Network Efficiency	M	M
Construction Cost	$30.04m	$40.45m

TABLE IV-10
COMPARISON OF NEW LOCATION SUBCORRIDORS
ISINGLASS RIVER SUBCORRIDORS 3, 4, 5, 6 and 7

Isinglass River	3	4	5	6	7
LINKS	3-5+ 3-6+ 4-14	3-27+ 4-18+ 4-61+ 4-62	3-27+ 3-63+ 4-19+ 4-23+ 4-24	3-27+ 3-63+ 4-19+ 4-6+4-9 +4-5	3-27+ 3-63+ 4-19+ 4-6+ 4-10+4-4
RESOURCES					
Wetlands	9.56A	21.95A	19.47A	24.85A	23.55A
Floodplain	6.72A	16.56A	13.16A	11.31A	6.03A
Surface Water Bodies	1.28A	-	-	.35A	-
Parkland	-	-	-	.01A	-
Endangered Species	-	-	-	-	-
Farm - Landcover	-	15.44A	30.05A	5.55A	1.43A
Farm - SCS	-	26.22A	44.31A	5.28A	32.39A
Commercial Landuse	1.57A	-	1.05A	.99A	.99A
Residential Landuse	2.99A	4.15A	6.10A	6.50A	6.31A
Hazardous Waste	-	-	-	-	-
Gravel Pits	-	-	-	-	-
Potential Historic Sites	2	1	5	8	7
Potential Arch. Sites	7	5	3	2	3
Wells	1	1	1	3	2
Rivers	1	3	2	2	1
Community Facilities	-	2	1	-	-
Community Cohesion	M	E	M	M	M
Economic Development	E	M	M	E	E
Network Efficiency	M	E	E	E	E
Construction Cost	$37.32m	$35.50m	$40.41m	$41.82m	$45.52m

In summary, Isinglass River subcorridors IR-1, IR-3, and IR-4 were continued and the remaining four discontinued.

e. Bellamy River Zone

These subcorridors are combinations of two paths around both the East Barrington area and the Bellamy Reservoir, arriving at one of three links which connect to the Spaulding Turnpike: 4-24, 4-5 or 4-4. A seventh subcorridor is analyzed which stays north of both East Barrington and the Bellamy Reservoir to arrive at the Spaulding Turnpike just south of the Rochester sewage treatment plant via link 4-62.

Bellamy River Subcorridors **1, 2, 3**, 4, 5, 6 and 7: **(Table IV-11)** Link 3-8, common to all Bellamy River subcorridors, impacts a prime wetland as designated by the town of Barrington. The wetland connects to Round Ponds and is crossed at its narrowest point. Subcorridor BR-2 impacts the least amount of wetland acreage by a small margin, followed by BR-1. In terms of wetlands serving various functions, the proportions of wetlands performing many functions to total acreage were of similar magnitudes for all these subcorridors. Subcorridors BR-1 and BR-2 were retained for further study.

All of the subcorridors in this comparison rate reasonably well in terms of meeting planning objectives. All involve large amounts of farmland noted by SCS, with BR-3 substantially the lowest; BR-3 was also of low magnitude relative to satellite farmland impacts. Subcorridors BR-4, BR-5 BR-6 and BR-7 cross Route 125 south of Route 9 and traverse an area in which Barrington has expressed interest for potential aquifer development. BR-7 crosses a branch of the Bellamy Reservoir, while BR-4, BR-5 and BR-6 cross through the congested resource area directly north of the reservoir. Therefore, BR-3 was the only additional subcorridor retained for further study.

In summary, Bellamy River subcorridors BR-1, BR-2, and BR-3 were continued into further analysis, while the other four were discontinued.

3. Analysis of Upgrade Subcorridors

Subcorridor 1. Routes 4/9/202 between I-393 and Route 107 Northbound: (Table IV-12) This joint corridor is the only feasible upgrade option for this portion of the study area. This portion of roadway passes through a moderately developed area in Chichester. In 1992, the portion of this road from I-393 to the Epsom Circle is being improved to include a truck climbing lane. In Epsom, the road crosses the Suncook River and continues through Gossville where an upgrade would impact many historic properties, potentially an historic district, and community buildings, as well as the Little Suncook River and its attendant potential archeological sites and natural resources south of the road. A state-owned roadside rest area/ park and approximately 23 acres of wetlands primarily associated with the Little Suncook River and Northwood Lake are impacted in this area. The wildlife habitat values of the wetlands along the roadway through Chichester and Gossville have been degraded by development.

TABLE IV-11

COMPARISON OF NEW LOCATION SUBCORRIDORS
BELLAMY RIVER SUBCORRIDORS 1, 2, 3, 4, 5, 6 and 7

Bellamy River	1	2	3	4	5	6	7
LINKS	3-29+ 3-8+ 3-61+ 4-61	3-29+ 3-8+ 3-62+ 4-19	3-29+ 3-8+3-62 4-19+ 4-6+	3-29+ 3-8+ 4-16+ 4-22+	3-29+ 3-8+ 4-16+ 4-11+	3-29+ 3-8+ 4-16+ 4-11+	3-29+ 3-8+ 4-16+ 4-3+4-7
RESOURCES	4-62	4-23+4-24	4-9+4-5	4-24	4-9+4-5	4-10+4-4	+4-4
Wetlands	23.66A	20.88A	26.26A	24.11A	29.49A	28.21A	26.09A
Floodplain	12.13A	8.73A	6.88A	8.73A	6.80A	1.61A	.03A
Surface Water Bodies	.33A	.33A	.68A	-	.35A	-	5.15A
Parkland	.05A	.05A	.06A	.05A	.06A	-	.05A
Endangered Species	-	-	-	-	-	-	-
Farm - Landcover	15.44A	30.05A	5.55A	29.04A	4.54A	.37A	.37A
Farm - SCS	36.95A	55.04A	16.01A	99.64A	60.61A	87.72A	68.31A
Commercial Landuse	-	1.05A	.99A	.06A	-	-	-
Residential Landuse	5.02A	6.97A	8.83A	4.58A	6.44A	3.16A	5.47A
Hazardous Waste	-	-	-	-	-	-	-
Gravel Pits	-	-	-	-	-	-	-
Potential Historic Sites	2	6	9	2	5	4	7
Potential Arch. Sites	6	4	5	5	4	3	5
Wells	2	2	2	-	2	2	-
Rivers	2	1	1	1	1	-	-
Community Facilities	3	1	1	1	1	1	1
Community Cohesion	M	M	M	M	M	M	M
Economic Development	M	M	E	M	E	E	E
Network Efficiency	E	E	E	E	E	E	E
Construction Cost	$30.22m	$49.14m	$50.55m	$45.26m	$46.22m	$49.92m	$47.79m

TABLE IV-12
UPGRADE SUBCORRIDORS
SUBCORRIDORS 1 and 2

ROUTES 4/9/202 RESOURCES	Subcorridor 1 I-393 TO ROUTE 107NB	Subcorridor 2 ROUTE 107NB TO ROUTES 9/202
Wetlands	22.98A	4.98A
Floodplain	21.32A	4.39A
Surface Water Bodies	4.07A	.30A
Parkland	2.62A	2.28A
Endangered Species	-	-
Farm - Landcover	1.71A	5.69A
Farm - SCS	-	-
Commercial Landuse	16.52A	9.56A
Residential Landuse	31.16A	58.49A
Hazardous Waste	-	-
Gravel Pits	-	-
Potential Historic Sites	75	76++
Potential Arch. Sites	13	4
Wells	5	5
Rivers	1	-
Community Facilities	8	4
Community Cohesion	I	I
Economic Development	M	I
Network Efficiency	E	E
Construction Cost	$94.34m	$34.79m

Wetlands along the eastern portion of the upgrade contribute to shoreline stabilization along Northwood Lake and reduce water quality impacts of homes and farming. An ineffective community cohesion rating was generated by impact of a potential upgrade on the Gossville segment of the subcorridor. The subcorridor offers potential for integration with bypass options.

Subcorridor 2. Routes 4/9/202 between Route 107 Northbound and the Routes 9/202 Diverge: **(Table IV-12)** This joint corridor is the only feasible upgrade option for this portion of the study area. This subcorridor spans Northwood, a town which has developed along Routes 4/9/202. An upgrade would produce substantial impacts on both commercial and residential land uses and on potential historic properties and historic districts as reflected in the acreages and number of sites impacted in these categories. Given the amount of development surrounding the lakes along the subcorridor, associated wetlands are significant with respect to flood flow alteration. Although the community master plan indicates the Routes 4/9/202 corridor for commercial activity, Northwood officials have expressed opposition to an upgrade of the road and as a result the subcorridor was rated as inefficient in terms of community cohesion and economic development objectives. This subcorridor shows possibilities for integrating with bypass options in one or more segments.

Subcorridor 3. Route 4 between the Routes 9/202 Diverge and Route 125: **(Table IV-13)** This roadway is one of two options for upgrading east of the Northwood diverge. Residential land use is the largest impact, with concentrations found at the western node near the intersections with Routes 9/202 and Route 43 in East Northwood and approaching the eastern node at Lee Circle. Wetlands near Lee Circle mitigate adverse water quality impacts of development upon a large number of water wells. Residential impacts on the remainder of this subcorridor would be moderate. Due to the lesser level of development in the middle of the subcorridor, wetlands and wildlife habitat are relatively unfragmented. This subcorridor runs parallel to the Spaulding Turnpike and main axis of the Tri-Cities and perpendicular to any direct route to best serve the Tri-Cities, and thus does not contribute to a direct and efficient means of serving the project objective. This subcorridor is rated was inefficient in relation to network efficiency, also due to the fact that its geographic isolation makes it unable to become an element in possible combination alternatives except possibly at its westerly end.

Subcorridor 4. Route 4/Route 155 between Route 125 and the Spaulding Turnpike: **(Table IV-13)** This upgrade subcorridor follows Route 4 between Routes 125 and 155, and then Route 155 to the Spaulding Turnpike in Dover; most impacts fall on the Route 155 segment of the subcorridor. The impacts associated with the subcorridor affect a variety of resources including the Bellamy River floodplain and hazardous waste sites in both Madbury and Dover. A particularly sensitive resource along this section of roadway is the greenbelt comprised of town-owned land at Hicks Hill, the Kingman Farm and an LCIP easement. Protected species habitat has been identified in the immediate vicinity and water supply wells are located north and south of the highway. Upgrading Route 155 would negatively impact community cohesion objectives of Madbury, and would encourage development in an area removed from Route 108, the area designated by the town for future development. Although serving Dover oriented traffic, upgrading this subcorridor would do little to serve Rochester oriented traffic; the subcorridor offers no opportunity for integration with prospective new location links or with bypass options to serve other destinations.

TABLE IV-13

UPGRADE SUBCORRIDORS
SUBCORRIDORS 3 and 4

ROUTES 4 and 155 RESOURCES	Subcorridor 3 ROUTES 9/202 TO ROUTE 125	Subcorridor 4 ROUTE 125 TO SPAULDING TURNPIKE
Wetlands	.11A	4.85A
Floodplain	3.52A	27.54A
Surface Water Bodies	.01A	.63A
Parkland	-	6.70A
Endangered Species	-	2.24A
Farm - Landcover	.06A	3.75A
Farm - SCS	.06A	29.02A
Commercial Landuse	.70A	3.60A
Residential Landuse	42.22A	16.02A
Hazardous Waste	-	4.65A
Gravel Pits	-	-
Potential Historic Sites	47	16
Potential Arch. Sites	2	5
Wells	3	2
Rivers	-	2
Community Facilities	-	1
Community Cohesion	E	I
Economic Development	E	I
Network Efficiency	I	M
Construction Cost	$48.89m	$36.80m

Subcorridor 5. Routes 9/202 between the Route 4 Diverge and the Route 9 Diverge: **(Table IV-14)** This roadway is the remaining option for upgrading immediately east of the Northwood diverge. This upgrade would impact the edge of North River Pond, concentrated residential land use alongside the pond and conservation land in the LCIP program (Warren Farm). Upgrading would be efficient in terms of traffic as it would carry Dover, Somersworth and Rochester oriented traffic closer to the Tri-Cities on one direct facility. This upgrade would also allow for integration with new location options as combination or bypass alternatives.

Subcorridor 6. Route 202 between Route 9 and the Spaulding Turnpike: **(Table IV-14)** Impacts on 13 acres of wetlands would occur in this subcorridor which crosses the Isinglass River. Qualitative evaluation of wetlands indicates that these wetlands are in relatively pristine areas supporting wildlife habitat. A 10 acre area of endangered species habitat adjacent to the Isinglass River would also be impacted. Impact would occur upon about 20 acres of the Hale Woods area along the bend of the Isinglass River in Barrington. Hale Woods is considered an area of interest by the town, but public acquisition for park or conservation purposes has not occurred. Residential land use impacts increase as the corridor enters Rochester and approaches the Spaulding Turnpike. Upgrading this subcorridor aids Rochester oriented traffic but does little to assist Dover bound traffic.

TABLE IV-14

UPGRADE SUBCORRIDORS
SUBCORRIDORS 5 and 6

ROUTES 9/202 and 202 RESOURCES	Subcorridor 5 ROUTE 4 TO ROUTE 9	Subcorridor 6 ROUTE 9 TO SPAULDING TURNPIKE
Wetlands	10.69A	13.24A
Floodplain	-	4.85A
Surface Water Bodies	.60A	-
Parkland	2.48A	20.21A
Endangered Species	-	10.51A
Farm - Landcover	-	1.87A
Farm - SCS	10.41A	1.06A
Commercial Landuse	-	-
Residential Landuse	26.86A	27.66A
Hazardous Waste	-	-
Gravel Pits	-	-
Potential Historic Sites	16	12
Potential Arch. Sites	4	2
Wells	-	1
Rivers	-	1
Community Facilities	3	1
Community Cohesion	I	E
Economic Development	M	E
Network Efficiency	E	M
Construction Cost	$31.62m	$36.49m

Subcorridor 7. Route 9 between Route 202 and Route 125: **(Table 1V-15)** A moderate impact to wetlands, mainly those degraded by the adjacent roadway, was found on this subcorridor through rolling terrain. The major impact is upon residential land use scattered along the route, and on moderate amounts of farmland and small amounts of surface water and parkland. Upgrading the subcorridor would be ineffective in terms of meeting community cohesion objectives of Barrington due to potential impact on the East Barrington area. Upgrading this subcorridor was rated effective in meeting network efficiency objectives; it is the upgrade subcorridor which can bring both Rochester and Dover oriented traffic as far east as possible on one facility. Also, the subcorridor integrates well with possible bypass and new location alternatives and would provide additional and effective capacity for the large proportion of Tri-Cities traffic which originates in Barrington.

Subcorridor 8. Route 9 between Route 125 and Route 155: **(Table IV-15)** Upgrading this subcorridor would impact about four acres of wetlands, and almost five acres of surface water bodies. The water body is the Bellamy Reservoir, a drinking water source of the city of Portsmouth, and improvements to the existing crossing would be required by an upgrade. Wetlands in the Mallego Brook watershed by removing sediments, toxicants and excess nutrients, provide protection for water quality in the reservoir. This crossing would likely involve improvements to the existing embankment or a new bridge. The 250 foot wide corridor used to determine a 5 acre impact to surface water, is more width than actual improvements would require. There would be impact on farmland and residential land use as this subcorridor

enters Dover, and an area of endangered species habitat has been identified near the industrialized area of Dover. This subcorridor was considered to contribute to network efficiency for its direct route to Dover, for its ability to integrate with prospective new location or bypass links and for its relative location to the Tri-Cities area. However, required improvements at the intersection with Route 155 and any upgrade east of the Spaulding Turnpike would be disruptive to existing land uses.

TABLE IV-15

UPGRADE SUBCORRIDORS
SUBCORRIDORS 7 and 8

ROUTE 9 RESOURCES	Subcorridor 7 ROUTE 202 TO ROUTE 125	Subcorridor 8 ROUTE 125 TO ROUTE 155
Wetlands	1.82A	3.88A
Floodplain	-	.99A
Surface Water Bodies	.15A	4.80A
Parkland	.21A	-
Endangered Species	-	1.70A
Farm - Landcover	8.21A	6.85A
Farm - SCS	5.03A	29.63A
Commercial Landuse	-	2.09A
Residential Landuse	18.43A	40.62A
Hazardous Waste	-	-
Gravel Pits	-	-
Potential Historic Sites	12	33
Potential Arch. Sites	4	-
Wells	2	-
Rivers	-	-
Community Facilities	4	1
Community Cohesion	I	M
Economic Development	M	M
Network Efficiency	E	E
Construction Cost	$20.25m	$44.96m

Subcorridor 9. Route 125 between Route 4 and Route 9: (Table IV-16) Upgrade of this portion of the Route 125 corridor would impact about three acres of wetlands, some farmland and over five acres of mixed residential and commercial landuse. Wetlands along the road contribute to maintaining water quality of the large number of wells serving development along the road and of the Bellamy River, Winkley Pond, Bumford Brook, Mallego Brook and associated wetlands that flow into the Bellamy Reservoir and some of which are designated Prime Wetlands by the Town of Barrington. This subcorridor was rated inefficient in terms of network efficiency due to its north-south orientation and its geographic isolation from areas with potential for developing east-west highway connections between the Tri-Cities and the residential neighborhoods to the west of the Tri-Cities in Barrington, Strafford and Northwood, as well as the Concord area.

Subcorridor 10. Route 125 between Route 9 and the Spaulding Turnpike: **(Table IV-16)** The potential upgrade of this subcorridor would impact historic structures and community facilities, particularly at its northern end in the Gonic section of Rochester. A known area of hazardous waste is impacted south of Gonic, which, in addition to development, decreases wetland functions in the area. The subcorridor rated ineffective in community cohesion due to its potential impact on Gonic, but rated effective in economic development, as supporting the economic development goals of both Barrington and Rochester. It contributes to network efficiency because a single east-west road would allow both Dover and Rochester commuter and through traffic as far east as East Barrington, allowing this section of Route 125 could to serve as the Rochester connection.

In summary, all ten upgrade subcorridors were continued into further analysis

TABLE IV-16

UPGRADE SUBCORRIDORS
SUBCORRIDORS 9 and 10

ROUTE 125 RESOURCES	Subcorridor 9 ROUTE 4 TO ROUTE 9	Subcorridor 10 ROUTE 9 TO SPAULDING TURNPIKE
Wetlands	2.99A	2.21A
Floodplain	-	3.13A
Surface Water Bodies	-	-
Parkland	-	-
Endangered Species	-	-
Farm - Landcover	-	-
Farm - SCS	8.71A	30.22A
Commercial Landuse	1.52A	1.69A
Residential Landuse	3.90A	18.74A
Hazardous Waste	-	-
Gravel Pits	-	-
Potential Historic Sites	14	++
Potential Arch. Sites	2	6
Wells	5	-
Rivers	-	1
Community Facilities	-	1
Community Cohesion	M	I
Economic Development	E	E
Network Efficiency	I	E
Construction Cost	$15.80m	$20.88m

4. Resulting Network

As a result of the above analysis, the following new location and upgrade subcorridors were retained for further analysis:

- Suncook River: 1, 2, 3, 4
- Epsom Mountain: 1, 2, 3, 4
- Bow Lake: 1, 2, 4, 8
- Isinglass River: 1, 3, 4
- Bellamy River: 1, 2, 3
- Upgrade: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

The network resulting from the analysis of new location subcorridors and upgrade subcorridors is shown in **Figure IV-16.** In the next step the new location and upgrade subcorridors were assembled into corridors across the study area and analyzed. This corridor analysis is discussed in the following chapter.

V. DEVELOPMENT OF PROPOSED PHASE IIIB ALTERNATIVES

A. INTRODUCTION

The previous chapters documented the process whereby the large number of prospective build options were screened down to a more manageable number of alternatives, with the analysis occurring primarily at the analysis zone or subcorridor level. For upgrade subcorridors, information was used to determine in which subcorridors upgrading appeared most feasible and which subcorridors may require bypassing to avoid serious impact. The next step was to assemble the surviving subcorridors into a series of specific full new location, upgrade and bypass/upgrade corridor alternatives extending from the Concord area in the west to the Spaulding Turnpike in the east. Once this array of alternative corridors was assembled, this range of alternatives was submitted to a comparative analysis and a smaller number of alternatives proposed for further analysis in Phase IIIB. This process is described below.

It must be emphasized that the build options analyzed represent only one kind of possible alternative. Build options involve wide areas of coverage and relatively substantial construction and capital investment either in areas not currently used as transportation corridors or in existing corridors serving adjacent land uses; therefore substantial analysis is required. Other options are generally less broad in coverage, make use of existing facilities and require less capital investment; these "no build" and "low build" options require definition more than screening. The latter alternatives include No Action, Transportation Systems Management and Transportation Demand Management (TSM/TDM) measures, and mass transit. These "low-build" or "no-build" options, in addition to the Build alternatives described in this Rationale Report and surviving screening into Phase IIIB, will together constitute the range of reasonable alternatives to be studied in the DEIS. It must also be emphasized that during the Phase IIIB intensive analysis, combination alternatives may emerge with "build" features in some areas and "low build" or "no build" features in other areas. The definition and analysis of the low-build and no-build alternatives are discussed in the Review Draft Environmental Impact Statement.

B. IDENTIFICATION OF POTENTIAL UPGRADE ALTERNATIVES

The analysis described in the previous chapter concerned ten upgrade subcorridors. The purpose of the analysis was to develop an understanding of potential impacts on resources and positive contributions to planning objectives as well as to further identify segments having concentrations of resources which would necessitate study of new location bypass alternatives.

At this point in the analysis process, the ten upgrade subcorridors were assembled into five full upgrade corridors connecting Concord and the Tri-Cities. As noted earlier in the report, the traffic "fanning" concept in the eastern portion of the study area supports the need for two termini for the upgrade alternative, one at each of the two principal origin and destinations in the east, namely Rochester and Dover.

The five upgrade corridors analyzed in Phase IIIA are shown on **Figure V-1, "Alternative 1: Upgrade"**, and are described below.

- Alternative 1A: Routes 4/9/202 from I-393 to the Routes 9/202 diverge in Northwood,
  Routes 9/202 from Route 4 to the Route 9 diverge in Barrington,
  Route 9 from Route 202 to the Spaulding Turnpike in Dover,
  Route 202 from Route 9 to the Spaulding Turnpike in Rochester.

- Alternative 1B: Routes 4/9/202 from I-393 to the Routes 9/202 diverge in Northwood,
  Routes 9/202 from Route 4 to the Route 9 diverge in Barrington,
  Route 9 from Route 202 to the Spaulding Turnpike in Dover,
  Route 125 from Route 9 to the Spaulding Turnpike in Rochester.

- Alternative 1C: Routes 4/9/202 from I-393 to the Routes 9/202 diverge in Northwood,
  Route 4 from I-393 to Route 125 in Lee,
  Route 125 from Route 4 to Rochester,
  Route 9 from Route 125 to the Spaulding Turnpike in Dover.

- Alternative 1D: Routes 4/9/202 from I-393 to the Routes 9/202 diverge in Northwood,
  Route 4 to Route 155 in Lee,
  Route 155 to the Spaulding Turnpike in Dover,
  Route 125 to the Spaulding Turnpike in Rochester.

- Alternative 1E: Routes 4/9/202 from I-393 to the Routes 9/202 diverge in Northwood,
  Route 202 to the Spaulding Turnpike in Rochester,
  Route 4 to Route 155,
  Route 155 to the Spaulding Turnpike in Dover.

C. IDENTIFICATION OF POTENTIAL BYPASS ALTERNATIVES

The various types of improvements to the existing east-west roads between Concord and the Tri-Cities range from taking No Action to constructing a completely new four-lane divided highway on new location. When combination alternatives are considered, literally hundreds of combinations of No Action in some areas, TSM/TDM measures in other areas, full (four lane) or partial (two lane) upgrade in other areas, and bypasses in other areas could be organized.

The approach taken in developing these alternatives was to build upon the analysis which had occurred of full upgrade corridors. The bypass alternative is a refinement or adjustment of the full upgrade alternative, adding the potential for bypassing areas which have been identified as particularly impacted by potential upgrading. Bypassing is accomplished by using nearby new location links and portions of subcorridor which had survived environmental screening and could serve as bypasses. The bypass alternative was designated Alternative 2 and initially included four subalternatives.

Three segments were identified in which the upgrade solution would have the greatest impact; these were identified as the Gossville section of Routes 4/9/202 in Epsom, in Northwood from Northwood Narrows to the Routes 4/9/202 diverge, and along Routes 9/202 in the North River Pond area. One bypass corridor was identified in Epsom and two alternative bypass corridors were identified in Northwood, consisting of subcorridors also under consideration as new location alignments. These two alignments included the one close to Routes 4/9/202 (referred to as the Acorn Ponds bypass) and the one along the Northwood/Strafford town line (referred to as the Oak Hill bypass).

East of the Routes 4/9/202 diverge, bypass alternatives become less clear. No new location bypass opportunities exist for Routes 4 and 155 to Dover. The functioning of other links as bypasses to existing Routes 202, 9 and 125 is less defined, with the exception of link 3-8 in South Barrington, as an extension of the possible Northwood bypasses described above. Link 3-8 clearly could function as a potential bypass to the upgrade of Routes 9/202 in the Nippo Pond area, and was added to the options.

Introducing bypass options in Epsom, Northwood and South Barrington would thus produce the four alternatives shown on **Figure V-2, "Bypasses"** and described below:

- Alternative 2A: Gossville and Oak Hill bypasses
- Alternative 2B: Gossville, Oak Hill and South Barrington bypasses
- Alternative 2C: Gossville and Acorn Ponds bypasses
- Alternative 2D: Gossville, Acorn Ponds and South Barrington bypasses

The definition of these bypasses indicated that the following connector links were no longer needed to be carried as part of the network under study to function as portions of bypasses, and these links were removed form further study:

1-32 1-36 2-3 2-15 2-21 3-26 3-28

As indicated above, literally hundreds of combination alternatives could be defined. Need for bypasses could be identified in a number of other potential locations such as the Route 9/Route 155 intersection in Dover, the Gonic section on Route 125 in Rochester, the Route 9/Route 125 intersection in East Barrington. Bypasses could additionally be included in combination alternatives with No Action, TSM/TDM, mass transit or partial (two lane) upgrade options. It was anticipated that during public and agency review of the alternatives proposed for Phase IIIB, changes in the overall composition of the Phase IIIB network and the need or opportunity for additional bypass and other combination alternatives might be introduced.

D. IDENTIFICATION OF POTENTIAL NEW LOCATION ALTERNATIVES

In the previous chapter, a total of eighteen new location subcorridors were retained for further analysis. Forty-eight new location alternatives were identified by assembling those paths into full new location corridor options across the study area. To bring some order out of the resulting variety, each alternative was first grouped into one of nine families according to its

route past Bow Lake and its terminal point at the Spaulding Turnpike. These families of new location alternatives were designated Alternatives 3 through 11 and the resulting nine families of alternatives are shown in **Figures V-3** through **V-11**:

- Alternatives 3: Strafford - Chesley Hill: Options that go north of Bow Lake and terminate at the Spaulding Turnpike in the vicinity of Chesley Hill, Rochester.

- Alternatives 4 - Strafford - Gonic: Options that go north of Bow Lake and terminate at the Spaulding Turnpike in the vicinity of Tibbetts Road, Rochester.

- Alternatives 5: Strafford - Blackwater Road: Options that go north of Bow Lake and terminate at the Spaulding Turnpike in the vicinity of the Blackwater Road underpass of the Spaulding Turnpike, Rochester.

- Alternatives 6: Oak Hill - Chesley Hill: Options that go north of Oak Hill on the Northwood-Strafford line and terminate at the Spaulding Turnpike in the vicinity of Chesley Hill, Rochester.

- Alternatives 7 - Oak Hill - Gonic: Options that go north of Oak Hill on the Northwood-Strafford line and terminate at the Spaulding Turnpike in the vicinity of Tibbetts Road, Rochester.

- Alternatives 8: Oak Hill - Blackwater Road: Options that go north of Oak Hill on the Northwood-Strafford line and terminate at the Spaulding Turnpike in the vicinity of the Blackwater Road underpass of the Spaulding Turnpike, Rochester.

- Alternatives 9: Barrington South - Blackwater Hill: Options that go north of North River Pond in Barrington and terminate at the Spaulding Turnpike in the vicinity of Blackwater Hill, Dover.

- Alternatives 10 - Barrington South - Blackwater Road: Options that go north of North River Pond in Barrington and terminate at the Spaulding Turnpike in the vicinity of the Blackwater Road underpass of the Spaulding Turnpike, Rochester.

- Alternatives 11: Barrington South - Reyners Brook: Options that go north of North River Pond in Barrington and terminate at the Spaulding Turnpike in the vicinity of Reyners Brook, Dover.

Additionally, each of these alternative families had four choices, or "subalternatives", for getting across Chichester and Epsom.

- A: Via the northerly Chichester route and the northerly Epsom route;
- B: Via the central Chichester route and the northerly Epsom route;
- C: Via the northerly Chichester route and the southerly Epsom route; and,
- D: Via the central Chichester route and the southerly Epsom route;

For the alternative families whose route included going via southern Barrington, namely Alternatives 9, 10 and 11, there were two path choices across Northwood added to the range of subalternatives:

- A: Via the northerly Chichester route, the northerly Epsom route and the Northwood/Strafford (Oak Hill) route;
- B: Via the central Chichester route, the northerly Epsom route and the Oak Hill route;
- C: Via the northerly Chichester route, the southerly Epsom route and the Oak Hill route;
- D: Via the central Chichester route, the southerly Epsom route and the Oak Hill route;
- E: Via the northerly Chichester route, the northerly Epsom route and the southerly Northwood (Acorn Ponds) route;
- F: Via the central Chichester route, the northerly Epsom route and the southerly Acorn Ponds route;
- G: Via the northerly Chichester route, the southerly Epsom route and the southerly Acorn Ponds route;
- H: Via the central Chichester route, the southerly Epsom route and the southerly Acorn Ponds route;

E. PHASE IIIA TRAFFIC ANALYSIS

1. New Location Assignments

In Phase II, traffic runs were conducted for generic links in order to understand where new location highway corridors might best serve future demand. No path represented an actual proposed alignment -- the purpose of the defined paths was to obtain order-of-magnitude estimates of the traffic demand associated with different routes across generalized portions of the study area and projecting the relative effectiveness of different alternatives in addressing traffic.

In Phase IIIA, four new location traffic assignments were run. These runs were completed to provide additional information on link combinations to represent general north-south, north-north, south-north and south-south paths across the Phase IIIA analysis area. The results are shown on **Figures V-12A** to **V-12D, "Phase IIIA New Location Assignment, Year 2010"** and are summarized below:

- The assignments indicated traffic volumes of the same order as the volumes projected for the assignments completed in Phase II, generally over 20,000 ADT for four-lane new location alternatives across the study area.

- The projected traffic volume, over 20,000 ADT projected in year 2010, cross the threshold level supporting the need to consider a four-lane new location highway.

- The projected growth of the Tri-Cities area is reflected in the fact that large exchanges of commuter traffic continue between the Tri-Cities and the adjacent residential towns. Moreover, the emergence of the Tri-Cities as the predominant traffic generator in the study area is shown by the direction of traffic from rural towns in the center of the study area, such as Strafford, Northwood, Nottingham and Deerfield, towards the Tri-Cities. In 2010, the largest assigned volumes are found crossing the central and eastern parts of the study area, demonstrating increased traffic growth in these rural residential communities and their orientation towards the Tri-Cities.

- In 1989, assigned travel demand was heaviest in the towns immediately adjacent to the urbanized areas of Concord and the Tri-Cities; this continues to be shown in the Phase IIIA assignments. However, in 2010, new location paths attract greater volumes passing through the central and eastern parts of the study area than through the western end of the study area. This is because: 1) no direct east-west route to the Tri-Cities currently exists in the central part of the study area; 2) a new location facility provides a more direct and efficient route on the east than the existing routes which display the "fan" effect; and 3) existing routes on the west, such as Routes 4/9/202 or Main Street in Chichester continue to provide direct access for east-west traffic demand and compete with any new location path into Concord.

- Phase II analysis of corridors heading northeast out of Concord towards Pittsfield and Barnstead showed the further north a corridor intersected Route 28, the more traffic was attracted. This remained true in the Phase IIIA assignments, however it should be noted that the most northerly, or highest traffic generating, link from Phase II was not retained for Phase IIIA analysis because connections to the east were not environmentally acceptable.

- High volumes on the assigned new location paths are in part due to an attraction of traffic away from parallel state routes and more local secondary roads. However, depending on the location of potential interchanges, the volumes on these existing routes may increase as traffic is attracted to an interchange to access the higher-grade facility. This phenomenon is particularly true for roads in the central part of the study area, such as Route 107 and Route 126, where little east-west capacity currently exists.

- On the east, links vary in their effectiveness depending on their ability to serve either Rochester or Dover traffic; the assignments show that it is difficult to serve both divergent demands with one Spaulding Turnpike terminus. Paths across the study area generally increase in volume as they head towards the Tri-Cities, with the following observations made regarding path location in the east:

  - Links accessing the Tri-Cities in a southwest to northeast direction are observed to draw larger amounts of traffic than links with northwest to southeast orientation. Links oriented southwest to northeast best serve both Barrington to Dover and Barrington to Rochester traffic, which represent two of the highest trip interchanges within the study area;

- On all alignments, some traffic diverts at the Route 125 interchange and uses this route as the preferred urban distributor; this diversion is particularly pronounced on the alignment terminating near Gonic, just south of Exit 11 of the Spaulding Turnpike in Rochester. A similar situation is observed when an alignment intersects Route 202 north of Route 9 and traffic bound for Rochester diverts to Route 202. These effects are an outcome explained by the fact that Rochester is actually situated further west than the other Tri-Cities.

- For much Dover-bound traffic, Route 9 currently provides a direct east-west route to the city center. New location options terminating north of Dover on the Spaulding Turnpike compete with Route 9 as the most effective route, and attract various levels of traffic depending on where they intersect state routes and the general orientation of their path.

2. Upgrade Assignments

For upgrade alternatives, in contrast with new location alternatives, the location for roadway improvements is already established; the rationale for selecting one upgrade alternative over another depends even more strongly on how well each alternative would serve the project objectives. Full assignments for two sample alternatives were run to project 2010 traffic volumes on four-lane upgrades (See **Figures V-13A** and **V-13B**). Full assignments were run for Upgrade Alternatives 1B and 1D as defined above to compare the effectiveness of alternatives using Routes 9/202/125 (e.g., Alternative 1B) and those using Routes 4/125/155 (e.g., Alternative 1D).

Additionally, to determine the relative effectiveness of the two alternatives in serving traffic and meeting the project purpose, a "select link analysis" was also performed to follow specific paths of Tri-Cities traffic in these two alternatives (See **Figure V-13C**). Observations based on the analyses of the upgrade assignments are noted below:

- Both of the upgrade assignments result in similar distributions of Rochester-bound traffic north of Route 9. South of Route 9, the choice to upgrade Routes 4 and 125 (Upgrade 1D) instead of Routes 9/202 and 9 (Upgrade 1B) would mean that the small amount of Rochester-bound traffic currently on Route 4 east of the diverge remains there as far as Route 125 instead of diverting to Routes 9/202. However, most Rochester traffic currently uses, and would continue to use, Routes 9/202.

- The primary difference between the two upgrades is in the distribution of Dover-bound traffic between Route 9, Route 155, or Route 4 through Durham. Upgrade 1B attracts and concentrates traffic onto Route 9 from Route 126, Route 202A, and other local roads in the central part of the study area, and this traffic remains on Route 9 into Dover. Under No Action and Upgrade 1D, this east-west traffic remains more dispersed, much still using Route 9 and also various other combinations of Route 4, Route 125 and Route 155 to access Dover.

- An upgraded Route 155 shown in Alternative 1D attracts a relative large volume of traffic destined for Dover, but as shown by the complete lack of Rochester-oriented traffic on this upgraded route. While this may be a somewhat simplistic representation of traffic patterns, the essential point is Route 155 is not attractive for Rochester traffic.

- A further conclusion regarding Rochester-oriented traffic, is that improvements to Route 125 south of Route 9 mainly benefit north-south traffic, not the project objective. This is conclusion is based on geographic fact: Rochester is oriented to the west of the other two Tri-Cities. While Route 125 has been shown to carry some east-west traffic, this is because no better east-west distributor exists for some trip exchanges. In other words, the shortest path between two points is a straight line, but if a straight-line path is not available, some trips must follow paths that turn at right-angles, such as Route 4 to Route 125 to access Rochester.

- In Alternative 1D, which assumes the upgrade of Routes 4, 155 and 125, additional traffic growth, rather than a reduction is observed on Route 9 in Barrington. This is assumed to be Rochester-bound traffic from the central part of the study area which is attracted to an unimproved Route 9 in order to access an improved Route 125, or Dover-bound traffic for which Route 9 still presents the best route. Much of this traffic originates in Barrington which, with Dover and Rochester, represents two of the largest trip exchanges within the study area.

- Upgrade combinations which did not carry traffic reasonably directly toward either Dover or Rochester lost some of the traffic oriented toward that city, and this traffic remained on other roads. Selecting one four-lane upgrade which effectively served the project purpose of improving transportation between Concord and the Tri-Cities thus became difficult. However, based on these observations, Upgrade 1B seemed to offer more potential benefits to both Rochester- and Dover-bound traffic, much of which is generated in Barrington, as well as offering relief to more constrained routes.

- Traffic in the eastern part of the study area is more typical of suburban commuter demand where, while a large majority of traffic is Tri-Cities oriented (about 40%), the remaining traffic has a wide range of origin-destination pairs.

- In the eastern half of the study area, regardless of which roads are upgraded, future traffic will continue to use the entire existing road network because traffic demand is so diverse. Under an upgrade scenario, consideration would need to be given to providing some level of improvement to, or continually upgrading, all routes in this area.

- Except for Route 125, it may not be necessary to provide four lanes in the upgrading of any road segment in the eastern half of the study area to sufficiently accommodate 2010 traffic demand. This does not negate the fact that a new location facility would attract sufficient demand to require four lanes; the placement of a new, more direct, east-west facility would better serve and attract traffic now using a range of existing routes which are incapable of efficiently serving the majority of east-west demand.

- Sufficient traffic is attracted to an upgraded Routes 4/9/202 to require a four-lane roadway to accommodate it satisfactorily.

F. EVALUATION OF ALTERNATIVES

1. Methodology

The first consideration in undertaking an evaluation of the alternatives was to determine whether a possible alternative would serve the project purpose "to provide improved highway access for the foreseeable future from the Concord area to the Tri-Cities area of Rochester, Dover and Somersworth." For the new location alternatives, this evaluation was relatively straightforward since no alternative was proposed for consideration which clearly did not meet the project purpose. For these alternatives, the evaluation process could proceed to comparing the relative impacts considering other parameters. For the upgrade alternative, on the other hand, consideration of project purpose remained an issue, and this must be factored in as discussed below.

The quantitative impacts of the five upgrade, four bypass and forty-eight new location alternatives were tabulated using the database and environmental parameters which had been collected and analyzed earlier in the subcorridor screening process. The subcorridor level analysis had included an assessment of the contribution of each path to each of three planning objectives. The longer corridors formed using these subcorridors cross the entire study area, involving many communities, many sets of local objectives, many activity centers and land uses. Assigning one overall rating could not properly recognize this diversity of environments over a thirty-mile stretch. Therefore, comparison of the full alternatives on the basis of the three planning objectives was not pursued.

Throughout the entire analysis process, the focus has been to avoid if possible, or if avoidance was not possible, to minimize impact upon all resources. As a result, the total impacts are relatively small, particularly for new location alternatives, considering the length of the study area which must be crossed. In fact, for new location alternatives, impacts to known areas of endangered species habitat, known hazardous waste sites and to coastal zone areas have been eliminated completely. Parkland and surface water are rarely observed to be impacted, with many surface water impacts being to small ponds and these may possibly be avoidable or minimized through minor alignment shifts. Within the new location comparisons, the resources which generally have the broadest range of impact between alternatives are wetlands, farmland and land use. For upgrade alternatives, the existing roadway is fixed and avoiding a resource is more difficult to achieve. For upgrade alternatives impact on known endangered species habitat, known hazardous waste sites, parkland and surface water bodies could not be avoided.

Within the range of alternatives resulting from this rigorous and effective effort to avoid and minimize impact on all resources, an analysis of the resulting information highlighted the potentially conflicting demands of Section 404 of the Clean Water Act and of the National Environmental Policy Act. Section 404 requires identification of alternatives least damaging to wetlands, and NEPA requires identification of alternatives least impacting on all environmental resources, natural, social and cultural. The full alternatives least impacting on wetlands were not those least impacting on all resources. In addition, the requirements of Section 4(f), that no feasible alternatives exist to those impacting properties subject to Section 4(f), particularly historic properties, must also be met.

In recognition of the requirements of Section 404 of the Clean Water Act and the U.S. Army Corps of Engineers Highway Methodology, impacts on wetlands and wetlands quality were emphasized. Selecting and creating a set of alternatives least impacting on wetlands was done to meet the Section 404 requirements. The whole multi-phased screening of many environmental parameters described above was designed to meet NEPA and Section 4(f) requirements. An alternative which did not meet Section 404 requirements would not be a feasible alternative, and thus would not meet the acceptable alternative standards of Section 4(f). The result is a series of alternatives designed to meet the requirements of all three sets of regulations.

Quantitative wetlands impacts were measured by total acreage of impact, while qualitative wetlands impacts were measured by impacts on wetlands judged to be performing many functions as analyzed in detail in Section IV-D "Qualitative Comparative Analysis: Wetlands Functions and Values", above.

The proposed range of alternatives was then presented to the Advisory Task Force (ATF) members, other study participants, and the general public to permit them to review, respond and comment. At this point, the responsibility of the U.S. Army Corps of Engineers goes further. Under Section 404, the Corps must determine that a reasonable range of practicable alternatives is being proposed for further analysis.

2. New Location Alternatives

Resource impact tabulations for the forty-eight new location corridors (described in **Appendix I**) are shown in **Tables V-1 to V-6, "Comparative Environmental Analysis of New Location Corridors"**. (All forty-eight alternatives should be viewed together; the alternatives are grouped on the following six tables for convenience and do not imply comparison of only those alternatives on a single table.)

As described in Section 1 above, wetland impacts were used as the primary basis for new location alternative selection. The ten alternatives least impacting to total wetlands acreage were identified as follows (in descending rank):

1. Alternative 4D: Lockes Hill South - Strafford - Gonic
2. Alternative 4B: Lockes Hill North - Strafford - Gonic
3. Alternative 3D: Lockes Hill South - Strafford - Chesley Hill
4. Alternative 3B: Lockes Hill North - Strafford - Chesley Hill
5. Alternative 6D: Oak Hill - Chesley Hill
6. Alternative 4C: Lockes Hill South - Strafford - Gonic
7. Alternative 9H: Barrington South - Blackwater Hill
8. Alternative 9F: Barrington South - Blackwater Hill
9. Alternative 5C: Strafford - Blackwater Road
10. Alternative 7D: Oak Hill - Gonic

Continuing with this approach, but now considering the relative value of the wetlands for performing wetlands functions, the ten alternatives least damaging to wetlands were identified as follows (in descending rank):

1. Alternative 4D: Lockes Hill South - Strafford-Gonic
2. Alternative 3D: Lockes Hill South - Strafford-Chesley Hill
3. Alternative 10H: Barrington South-Blackwater Road
4. Alternative 5D: Strafford-Blackwater Road
5. Alternative 11H: Barrington South-Reyners Brook
6. Alternative 9H: Barrington South-Blackwater Hill
7. Alternative 4B: Lockes Hill North - Strafford-Gonic
8. Alternative 3B: Lockes Hill North - Strafford-Chesley Hill
9. Alternative 10F: Barrington South-Blackwater Road
10. Alternative 6D: Oak Hill - Chesley Hill

TABLE V-1

COMPARATIVE EVALUATION OF NEW LOCATION CORRIDORS
ALTERNATIVES 3 and 4

Alternatives / RESOURCES	3A	3B	3C	3D	4A	4B	4C	4D
Wetlands	67.18A	58.90A	64.25A	55.97A	63.09A	54.81A	60.16A	51.88A
Floodplain	14.18A	19.22A	14.18A	19.22A	20.81A	25.85A	20.81A	25.85A
Surface Water Bodies	0.22A	0.23A	0.22A	0.23A	1.50A	1.51A	1.50A	1.51A
Parkland	-	-	-	-	-	5.59A	-	5.59A
Endangered Species	-	-	-	-	-	-	-	-
Farm - Landcover	34.37A	40.44A	30.08A	36.15A	20.51A	26.58A	16.22A	22.29A
Farm - SCS	68.44A	68.44A	68.44A	68.44A	68.44A	68.44A	68.44A	68.44A
Commercial Landuse	-	-	-	-	1.57A	1.57A	1.57A	1.57A
Residential Landuse	6.34A	8.70A	6.02A	8.38A	8.82A	11.18A	8.50A	10.86A
Hazardous Waste	-	-	-	-	-	-	-	-
Gravel Pits	2	2	2	2	1	1	1	1
Potential Historic Sites	23	22	28	27	21	20	26	25
Potential Arch. Sites	4	4	4	4	9	9	9	9
Wells	2	3	4	5	3	4	5	6
Rivers	2	2	2	2	3	3	3	3
Community Facilities	1	1	1	1	1	1	1	1
Construction Cost	$147.65m	$146.23m	$163.67m	$166.43m	$154.93m	$153.51m	$170.95m	$173.71m

TABLE V-2

COMPARATIVE EVALUATION OF NEW LOCATION CORRIDORS
ALTERNATIVES 5 and 6

Alternatives RESOURCES	5A	5B	5C	5D	6A	6B	6C	6D
Wetlands	75.48A	67.20A	61.61A	64.27A	71.04A	62.76A	68.11A	59.83A
Floodplain	30.65A	35.69A	14.09A	35.69A	5.84A	10.88A	5.84A	10.88A
Surface Water Bodies	0.22A	0.23A	0.44A	0.23A	0.69A	0.70A	0.69A	0.70A
Parkland	-	-	-	-	-	11.96A	6.37A	11.96A
Endangered Species	-	-	-	-	-	-	-	-
Farm - Landcover	35.95A	42.02A	21.74A	37.73A	32.57A	38.64A	28.28A	34.35A
Farm - SCS	94.66A	94.66A	68.44A	94.66A	79.91A	79.91A	79.91A	79.91A
Commercial Landuse	-	-	-	-	-	-	-	-
Residential Landuse	9.98A	12.34A	6.50A	12.02A	7.01A	9.37A	6.69A	9.05A
Hazardous Waste	-	-	-	-	-	-	-	-
Gravel Pits	1	1	1	1	1	1	1	1
Potential Historic Sites	20	19	27	24	25	24	30	29
Potential Arch. Sites	7	7	2	7	7	7	7	7
Wells	3	4	4	6	2	3	4	5
Rivers	5	5	2	5	1	1	1	1
Community Facilities	3	3	1	3	3	3	3	3
Construction Cost	$153.11m	$151.69m	$161.42m	$171.89m	$141.49m	$140.07m	$157.51m	$160.27m

TABLE V-3

COMPARATIVE EVALUATION OF NEW LOCATION CORRIDORS
ALTERNATIVES 7 and 8

Alternatives RESOURCES	7A	7B	7C	7D	8A	8B	8C	8D
Wetlands	73.72A	65.44A	70.79A	62.51A	86.11A	77.83A	83.18A	74.90
Floodplain	12.47A	17.51AA	12.47A	17.51A	22.31A	27.35A	22.31A	27.35
Surface Water Bodies	1.97A	1.98A	1.97A	1.98A	0.69A	0.70A	0.69A	0.70
Parkland	-	-	-	-	6.37A	11.96A	6.37A	11.96
Endangered Species	-	-	-	-	-	-	-	-
Farm - Landcover	18.71A	24.78A	14.42A	20.49A	34.15A	40.22A	29.86A	35.93
Farm - SCS	79.91A	79.91A	79.91A	79.91A	106.13A	106.13A	106.13A	106.13
Commercial Landuse	1.57A	1.57A	1.57A	1.57A	-	-	-	-
Residential Landuse	9.49A	11.85A	9.17A	11.53A	10.65A	13.01A	10.33A	12.69
Hazardous Waste	-	-	-	-	-	-	-	-
Gravel Pits	-	-	-	-	-	-	-	-
Potential Historic Sites	24	23	29	28	23	22	28	27
Potential Arch. Sites	12	12	12	12	10	10	10	10
Wells	3	4	5	6	3	4	5	6
Rivers	3	3	3	3	5	5	5	5
Community Facilities	3	3	3	3	5	5	5	5
Construction Cost	$148.77m	$147.35m	$164.79m	$167.55m	$146.95m	$145.53m	$162.97m	$165.73m

TABLE V-4

COMPARATIVE EVALUATION OF NEW LOCATION CORRIDORS
ALTERNATIVE 9

Alternatives / RESOURCES	9A	9B	9C	9D	9E	9F	9G	9H
Wetlands	75.60A	67.32A	72.67A	64.39A	69.59A	61.31A	69.23A	60.95A
Floodplain	14.48A	19.52A	14.48A	19.52A	14.48A	19.52A	14.48A	19.52A
Surface Water Bodies	1.02A	1.03A	1.02A	1.03A	0.33A	0.34A	0.33A	0.34A
Parkland	0.05A	0.05A	0.05A	0.05A	0.05A	5.64A	0.05A	5.64A
Endangered Species	-	-	-	-	-	-	-	-
Farm - Landcover	48.76A	54.83A	44.47A	50.54A	53.95A	60.02A	49.66A	55.73A
Farm - SCS	72.38A	72.38A	72.38A	72.38A	58.18A	58.18A	58.18A	58.18A
Commercial Landuse	1.05A	1.05A	1.05A	1.05A	1.05A	1.05A	1.05A	1.05A
Residential Landuse	14.59A	16.95A	14.27A	16.63A	17.79A	20.15A	18.08A	20.44A
Hazardous Waste	-	-	-	-	-	-	-	-
Gravel Pits	-	-	-	-	-	-	-	-
Potential Historic Sites	23	22	28	27	21	20	27	26
Potential Arch. Sites	6	6	6	6	7	7	7	7
Wells	4	5	6	7	4	5	6	7
Rivers	2	2	2	2	2	2	2	2
Community Facilities	2	2	2	2	2	2	2	2
Construction Cost	$149.87m	$148.45m	$165.89m	$168.65m	$162.90m	$161.48m	$179.19m	$181.95m

TABLE V-5

COMPARATIVE EVALUATION OF NEW LOCATION CORRIDORS
ALTERNATIVE 10

Alternatives / RESOURCES	10A	10B	10C	10D	10E	10F	10G	10H
Wetlands	78.08A	69.80A	75.15A	66.87A	72.07A	63.79A	71.71A	63.43A
Floodplain	17.88A	22.92A	17.88A	22.92A	17.88A	22.92A	17.88A	22.92A
Surface Water Bodies	1.02A	1.03A	1.02A	1.03A	0.33A	0.34A	0.33A	0.34A
Parkland	0.05A	0.05A	0.05A	0.05A	0.05A	5.64A	0.05A	5.64A
Endangered Species	-	-	-	-	-	-	-	-
Farm - Landcover	34.15A	40.22A	29.86A	35.93A	39.34A	45.41A	35.05A	41.12A
Farm - SCS	54.29A	54.29A	54.29A	54.29A	40.09A	40.09A	40.90A	40.09A
Commercial Landuse	-	-	-	-	-	-	-	-
Residential Landuse	12.64A	15.00A	12.32A	14.68A	15.84A	18.20A	16.13A	18.49A
Hazardous Waste	-	-	-	-	-	-	-	-
Gravel Pits	-	-	-	-	-	-	-	-
Potential Historic Sites	19	18	24	23	17	16	23	22
Potential Arch. Sites	8	8	8	8	9	9	9	9
Wells	4	5	6	7	4	5	6	7
Rivers	3	3	3	3	3	3	3	3
Community Facilities	4	4	4	4	4	4	4	4
Construction Cost	$130.95m	$129.53m	$146.97m	$149.73m	$143.98m	$142.56m	$160.27m	$163.03m

TABLE V-6

COMPARATIVE EVALUATION OF NEW LOCATION CORRIDORS
ALTERNATIVE 11

Alternatives RESOURCES	11A	11B	11C	11D	11E	11F	11G	11H
Wetlands	80.98A	72.70A	78.05A	69.77A	74.97A	66.69A	74.61A	66.33A
Floodplain	12.63A	17.67A	12.63A	17.67A	12.63A	17.67A	12.63A	17.67A
Surface Water Bodies	1.37A	1.38A	1.37A	1.38A	0.68A	0.69A	0.68A	0.69A
Parkland	0.06A	0.06A	0.06A	0.06A	0.06A	5.65A	0.06A	5.65A
Endangered Species	-	-	-	-	-	-	-	-
Farm - Landcover	24.26A	30.33A	19.97A	26.04A	29.45A	35.52A	25.16A	31.23A
Farm - SCS	33.35A	33.35A	33.35A	33.35A	19.15A	19.15A	19.15A	19.15A
Commercial Landuse	0.99A	0.99A	0.99A	0.99A	0.99A	0.99A	0.99A	0.99A
Residential Landuse	16.45A	18.81A	16.13A	18.49A	19.65A	22.01A	19.94A	22.30A
Hazardous Waste	-	-	-	-	-	-	-	-
Gravel Pits	-	-	-	-	-	-	-	-
Potential Historic Sites	26	25	31	30	24	23	30	29
Potential Arch. Sites	7	7	7	7	8	8	8	8
Wells	4	5	6	7	4	5	6	7
Rivers	2	2	2	2	2	2	2	2
Community Facilities	2	2	2	2	2	2	2	2
Construction Cost	$151.28m	$149.86m	$167.30m	$170.06m	$164.31m	$162.89m	$180.60m	$183.36m

Combining the alternatives which were found to be either least damaging to wetlands by both measures (3B, 3D, 4B, 4C, 4D, 6D, 9H) or least damaging by virtue of holding a top ranking by either one of the measures, produced a composite ranking of ten alternatives least damaging on wetlands as follows (in numerical order):

1. Alternative 3B: Lockes Hill North - Strafford - Chesley Hill (**Figure V-19**)
2. Alternative 3D: Lockes Hill South - Strafford -Chesley Hill (**Figure V-20**)
3. Alternative 4B: Lockes Hill North - Strafford - Gonic (**Figure V-21**)
4. Alternative 4C: Lockes Hill South - Strafford - Gonic (**Figure V-22**)
5. Alternative 4D: Lockes Hill South - Strafford - Gonic (**Figure V-23**)
6. Alternative 5D: Strafford - Blackwater Road (**Figure V-24**)
7. Alternative 6D: Oak Hill - Chesley Hill (**Figure V-25**)
8. Alternative 9H: Barrington South - Blackwater Hill (**Figure V-26**)
9. Alternative 10H: Barrington South - Blackwater Road (**Figure V-27**)
10. Alternative 11H: Barrington South - Reyners Brook (**Figure V-28**)

These ten new location alternatives least damaging to both overall wetland acreage and overall wetland quality (as based on professional judgement) were proposed to the ATF and the general public to be considered for further analysis in Phase IIIB. It is emphasized that this was an interim proposal, presented to gain public comment to be submitted to the U.S. Army Corps of Engineers for their review and for their consideration in their determination of a "reasonable range of practicable alternatives" to be subjected to detailed Phase IIIB analysis.

3. Upgrade Alternatives

Table V-7, "Comparative Evaluation of Upgrade Corridors" presents environmental impact estimates for the five upgrade corridors. Applying the total wetlands criteria would draw the conclusion that Alternative 1B, 1C and 1D deserve further study. Applying criteria regarding minimizing impact to wetlands contributing to many wetland functions would also eliminated alternatives 1A and 1E, which includes the portion of Route 202 north of Route 9, which passes through the concentrated resource area of the Isinglass River, where much of the greater impact occurs.

For the upgrade alternative, consideration of project purpose remained an issue. Historically, the existing road network has not served the project purpose well; hence the need for this study. Limited by definition to using various combinations of existing roads, the upgrade alternative began with a built in deficiency in achieving the project purpose. As noted in the traffic discussion above, this diffusion of traffic suggested retaining all options in the fan. Under the four-lane upgrade, this would prove most disruptive to the surrounding land uses and resources. Another alternative, not pursued during the analysis of the full upgrade, would be redefinition of upgrade to consider less than four-lane improvement, coupled with the use of more upgrade segments to accommodate the traffic. Decisions to expand the number of upgraded segments at two-lane widths would need to directly consider project purpose and traffic demands as well as environmental parameters.

Upgrading segments of Route 4 east of the diverge does not primarily serve the project purpose. Route 4 primarily serves Durham and the Seacoast south of Little Bay, just touching the southerly end of Dover Point. With respect to the urbanized Tri-Cities area, Route 4 primarily serves as a bypass, but traffic can and does access Dover from Route 4 via Route 155. When considering the needs of the daily commuter traffic in and out of all of the Tri-Cities, bypassing is, by definition, ineffective in serving the project purpose. The purpose of the project is to define a routes directed toward the city centers rather than a circumferential route.

Another alternative would be to bring the diverge as close as possible to the Tri-Cities in an effort to encourage traffic to use one single upgraded facility for as long as possible. Keeping the main access routes to the two cities together for the longest distance possible, thus minimizing the need to upgrade two routes, can be achieved by upgrading Route 9 as far east as East Barrington and then upgrading Route 9 into Dover and Route 125 into Rochester; this is Alternative 1B. Therefore Alternative 1B was proposed for consideration in Phase IIIB.

4. Bypass Alternatives

Resource impact tabulations for the four bypass/upgrade combinations was calculated as shown in **Table V-8, "Comparative Environmental Analysis of Bypass Corridors"**. Comparing Alternatives 2A and 2C (**Figures V-15** and **V-17**), and comparing Alternatives 2B and 2D (**Figures V-16** and **V-18**), both sets impact the same order of wetlands and of wetlands areas judged valuable in performing many functions.

TABLE V-7

COMPARATIVE EVALUATION OF UPGRADE CORRIDORS

UPGRADE ALTERNATIVES / RESOURCES	1A	1B	1C	1D	1E
Wetlands	57.59A	46.56A	37.15A	38.12A	56.85A
Floodplain	31.55A	29.83A	33.35A	59.90A	61.62A
Surface Water Bodies	9.92A	9.92A	9.18A	5.01A	5.61A
Parkland	7.59A	7.59A	4.90A	11.60A	14.08A
Endangered Species	12.21A	1.70A	1.70A	2.24A	12.75A
Farm - Landcover	24.33A	22.46A	14.31A	11.21A	13.08A
Farm - SCS	46.13A	75.29A	68.62A	68.01A	40.55A
Commercial Landuse	28.17A	29.86A	32.08A	33.59A	30.38A
Residential Landuse	203.22A	194.30	195.13A	170.53A	202.41A
Hazardous Waste	-	31.02A	31.02A	35.67A	4.65A
Gravel Pits	-	-	-	-	-
Potential Historic Sites	224	212+	245+	228+	242
Potential Arch. Sites	27	31	27	32	30
Wells	13	12	18	20	16
Rivers	2	2	3	5	4
Community Facilities	21	21	14	14	17
Construction Cost	$262.45m	$246.84m	$235.95m	$252.50m	$283.93

TABLE V-8

COMPARATIVE EVALUATION OF BYPASS CORRIDORS

BYPASS ALTERNATIVES / RESOURCES	2A	2B	2C	2D
Wetlands	60.89A	68.04A	60.47A	67.62A
Floodplain	23.13A	23.13A	23.13A	23.13A
Surface Water Bodies	9.61A	9.46A	9.14A	9.04A
Parkland	2.76A	0.33A	2.76A	0.33A
Endangered Species	1.70A	1.70A	1.70A	1.70A
Farm - Landcover	26.02A	17.81A	26.02A	17.81A
Farm - SCS	92.68A	87.92A	78.48A	73.72A
Commercial Landuse	19.07A	19.07A	19.07A	19.07A
Residential Landuse	120.16A	98.84A	122.96A	100.83A
Hazardous Waste	31.02A	31.02A	31.02A	31.02A
Gravel Pits	1	1	1	1
Potential Historic Sites	114++	82++	110++	78++
Potential Arch. Sites	19	17	22	14
Wells	9	4	9	3
Rivers	3	3	3	3
Community Facilities	13	8	13	7
Construction Cost				

Combinations 2A and 2C, the bypass routes closest to Routes 4/9/202 which are less impacting on wetland areas and on wetlands judged valuable in performance many functions, impact substantially more residential land. Impacts on residential land for all the bypass alternatives are substantially less than for the upgrade of the bypassed road. This enigma is inherent to the nature of the bypass solution, which is designed to bypass developed areas along existing roads, yet must do so using undeveloped land. Selecting only one or more bypasses based on lowest wetland impact is not necessarily meeting the purpose of developing the bypass. As a result of these circumstances, all four bypass alternatives were continued for further study.

5. Proposed Phase IIIB Alternatives

The network of proposed Phase IIIB upgrade, bypass and new location alternatives is shown in **Figure V-29, "Proposed Phase IIIB Network - Upgrade, Bypass and New Location"**. These proposed Phase IIIB alternatives are defined in more detail in Appendix I.

These alternatives, discussed above were presented to the Advisory Task Force and to the general public in a series of three multi-community meetings held in the study area in late 1991 and proposed to be carried forward into the DEIS in addition to No Action, TSM/TDM and mass transit alternatives. Substantial response in line with the concerns of the National Environmental Policy Act was received, including the following: additional information, votes of city councils, general public comments and views, reports of planning boards, special citizen advisory committees and conservation commissions. This information was reviewed and is evaluated in Part II.

VI. SELECTION OF ALTERNATIVES FOR DETAILED ANALYSIS IN THE DEIS

A. PROCEDURES

Following the presentation of the Proposed Phase IIIB Alternatives to the Advisory Task Force on October 3, 1991, a number of steps were taken to advance the project:

- Three regional meetings were held in Barrington, Strafford and Epsom to present the proposals to the affected communities and to the general public and to benefit from their response.

- Following review of the community and public comment, some revisions in the proposed Phase IIIB alternatives may be made.

- The whole analysis process is being thoroughly documented to permit interested and responsible groups and agencies to review the process. Although more than two dozen reports are involved, this documentation focusses on four reports:

  -Rationale Report (this document)
  -Technical Memorandum No.5 - Wetlands
  -Technical Memorandum No.23 - Methods and Results Report: Traffic Analysis
  -Review Draft Environmental Impact Statement
  Chapter I-"Purpose and Need"
  Chapter II-"Alternatives Considered"

- The above documents will be reviewed with the five Cooperating Agencies.

- The wetlands evaluation process and alternatives selection process will be reviewed with the US Army Corps of Engineers.

- Agreement will be reached on a reasonable range of practicable alternative to be analyzed in detail in the DEIS.

- *It must be realized that the reasonable range of alternatives must satisfy, at a minimum, the requirements of Section 404 of the Clean Water Act, NEPA and Section 4(f) of the Transportation Act of 1966.*

- This agreed upon range of alternatives will be presented to the Advisory Task Force.

B. COMMUNITY AND PUBLIC REVIEW AND COMMENT

The three regional meeting held were:

- Barrington - October 28, 1991
- Strafford - November 21, 1991
- Epsom - December 17, 1991

The community comments suggesting changes to the proposed Phase IIIB network made at the Barrington, Strafford or Epsom regional meetings or submitted to NHDOT by letter will be summarized in Table VI-1. Response to these comments will be given below. The number refers to the comment number in Table VI-1.

C. RESULTS OF REVIEW WITH COOPERATING AGENCIES

[To be added]

D. RESULTS OF SECTION 404 REVIEW WITH CORPS OF ENGINEERS

[To be added]

E. REVISED PROPOSED PHASE IIIB ALTERNATIVES

[To be added]

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

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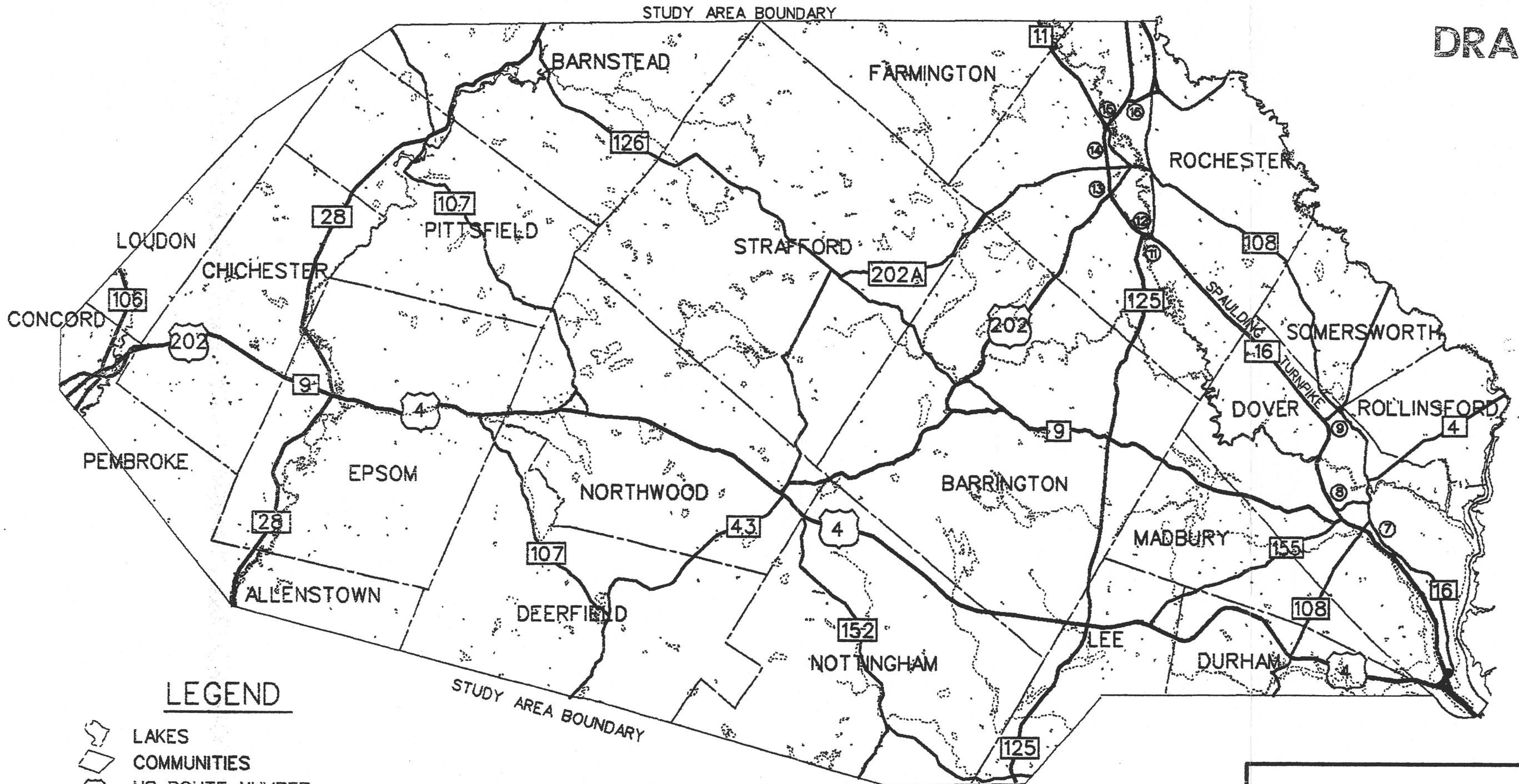

LEGEND

- LAKES
- COMMUNITIES
- US ROUTE NUMBER
- STATE ROUTE NUMBER
- SPAULDING TURNPIKE EXIT NUMBER

FIGURE I - 1
STUDY AREA

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

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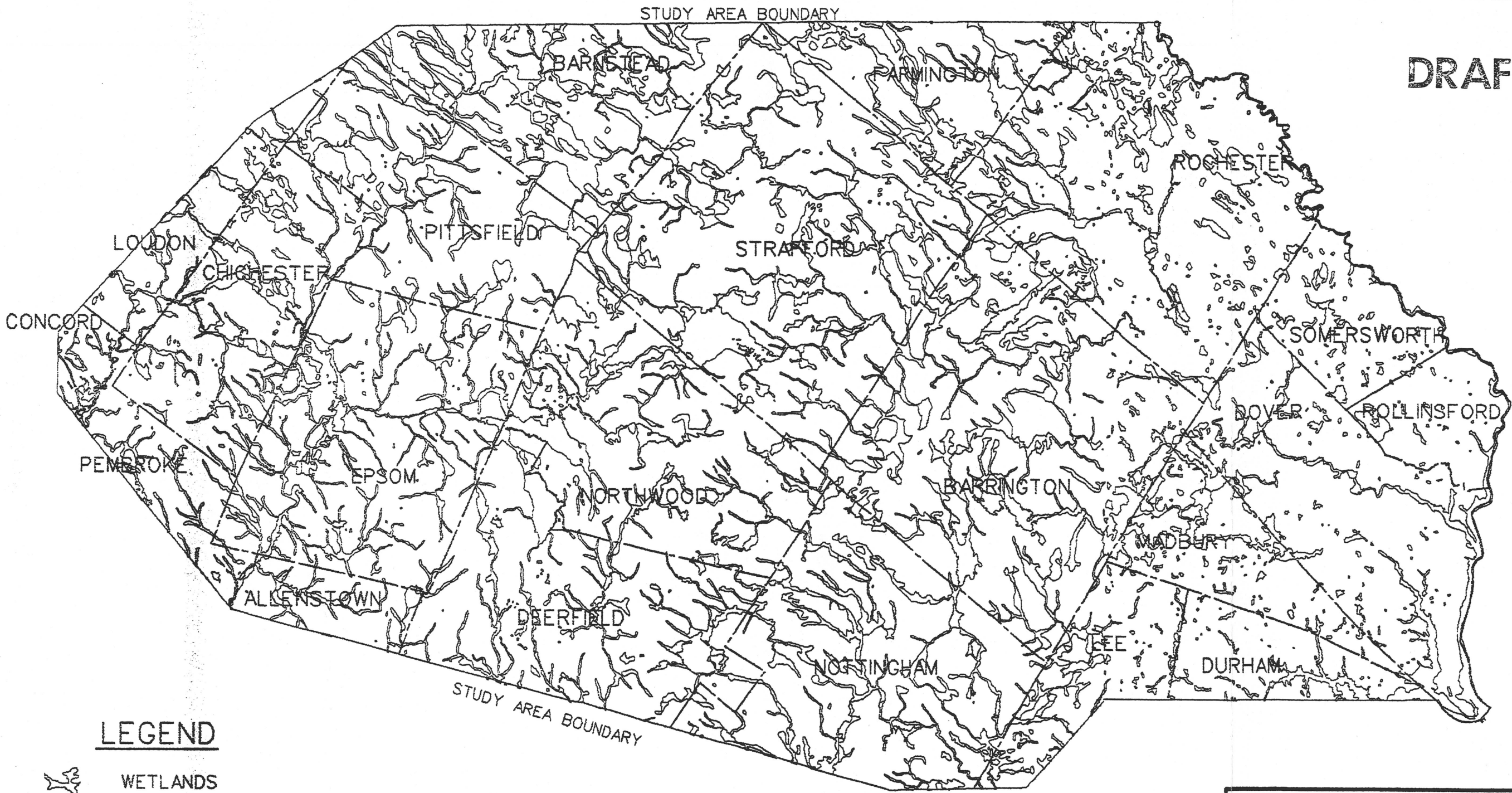

LEGEND

WETLANDS

FIGURE II - 1
WETLANDS IN THE STUDY AREA

0 5000 10000 15000 20000

SCALE IN FEET

3/17/92

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PRF Name: nhrr241.prf
Date of Plot: 02/07/92 (using STANDARD.TBL)

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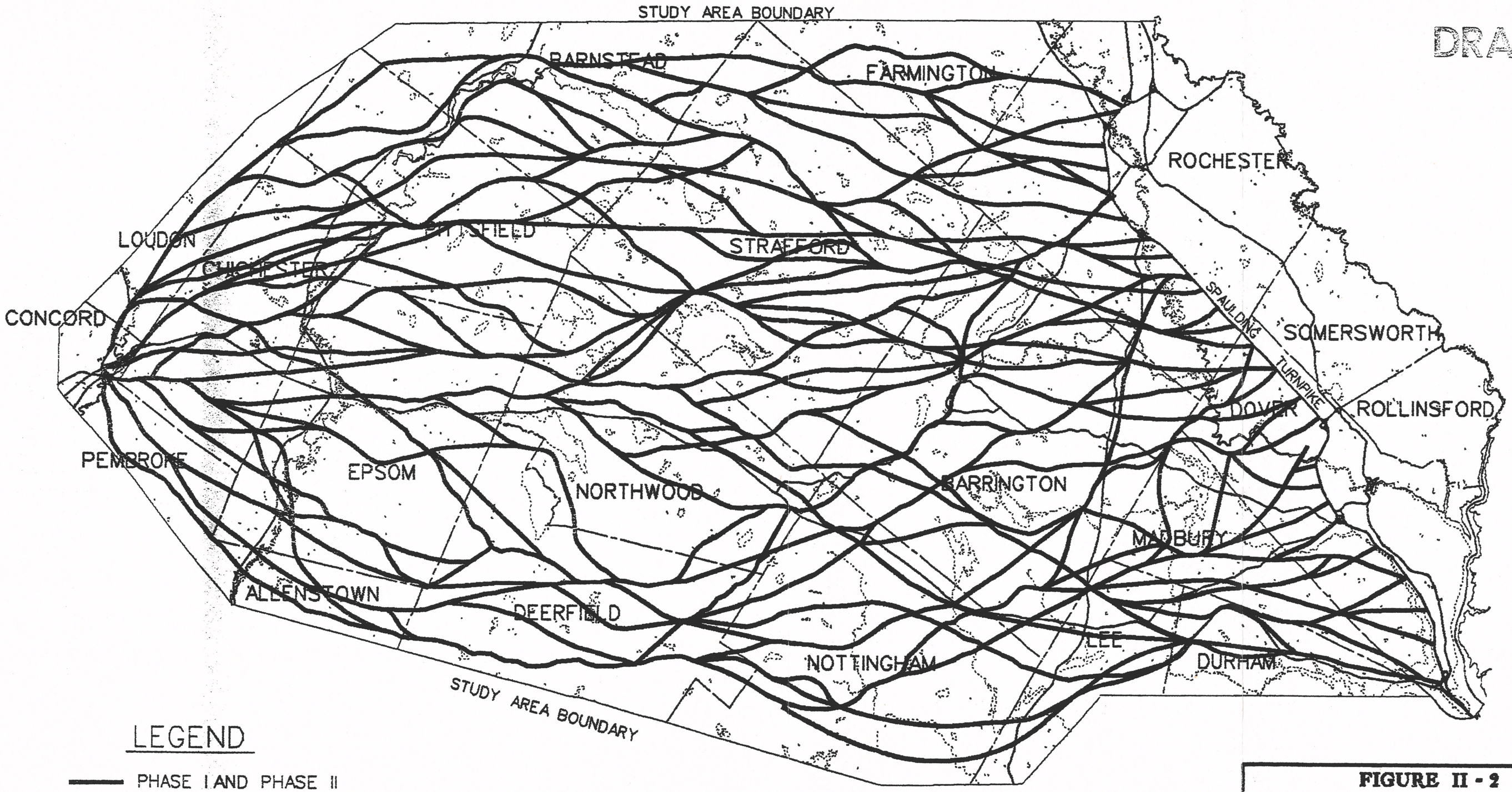

LEGEND

PHASE I AND PHASE II CORRIDOR CENTERLINE

1 Mile ACTUAL CORRIDOR WIDTH

FIGURE II - 2
PHASE I NEW LOCATION NETWORK FOR ANALYSIS AND SCREENING

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N /proj/92021g/rt2f2.plt
PRF Name rt2f2.prf
Date of Plot 02/07/92 (using STANDARD.TBL)

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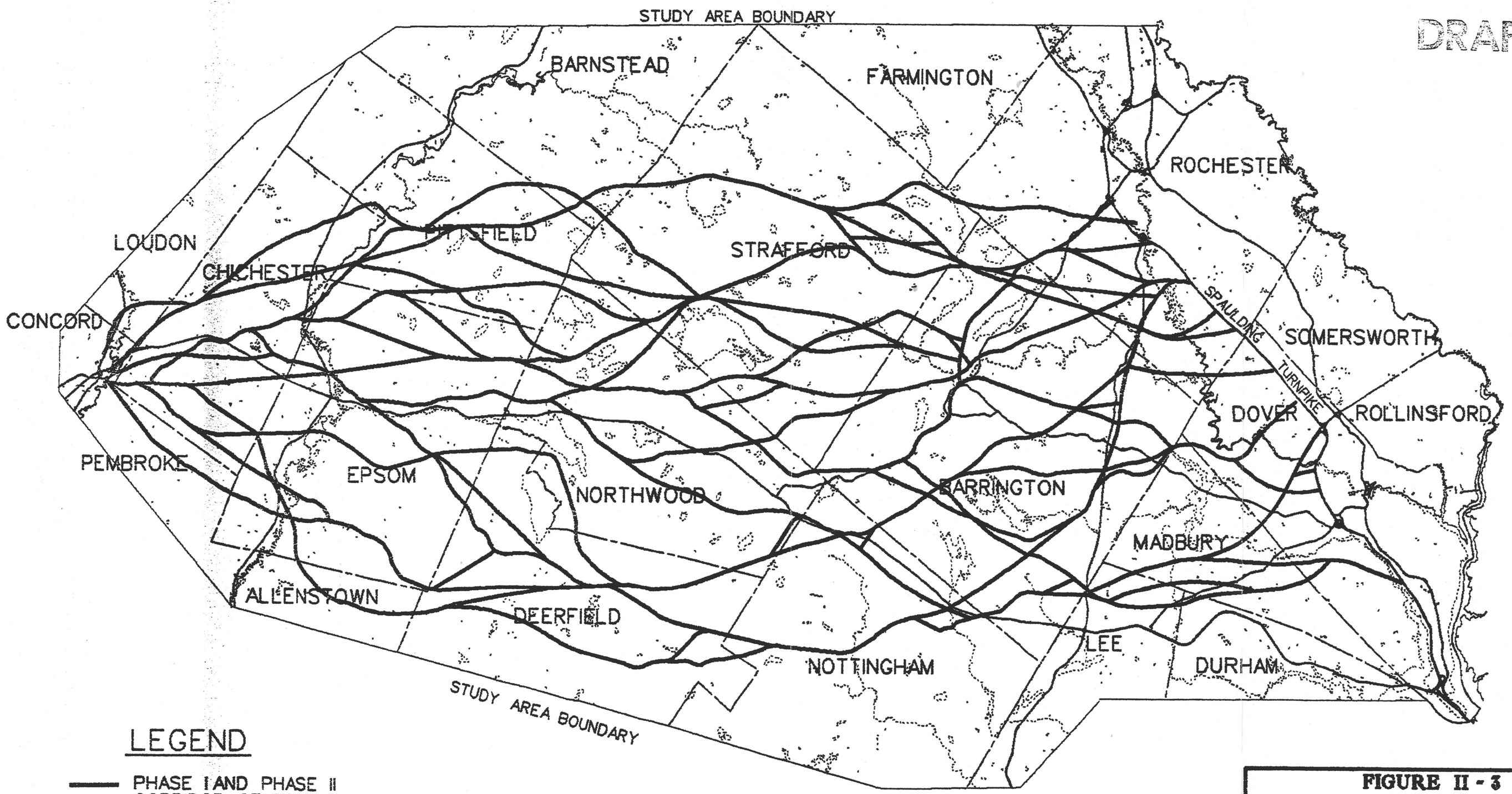

LEGEND

PHASE I AND PHASE II CORRIDOR CENTERLINE

1 Mile ACTUAL CORRIDOR WIDTH

FIGURE II - 3
PHASE II NEW LOCATION NETWORK FOR ANALYSIS AND SCREENING

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N /usr2/proj/030219/rr243.plt
PRF Name: rhr269.prf
Date of Plot: 02/07/92 (using STANDARD.TBL)

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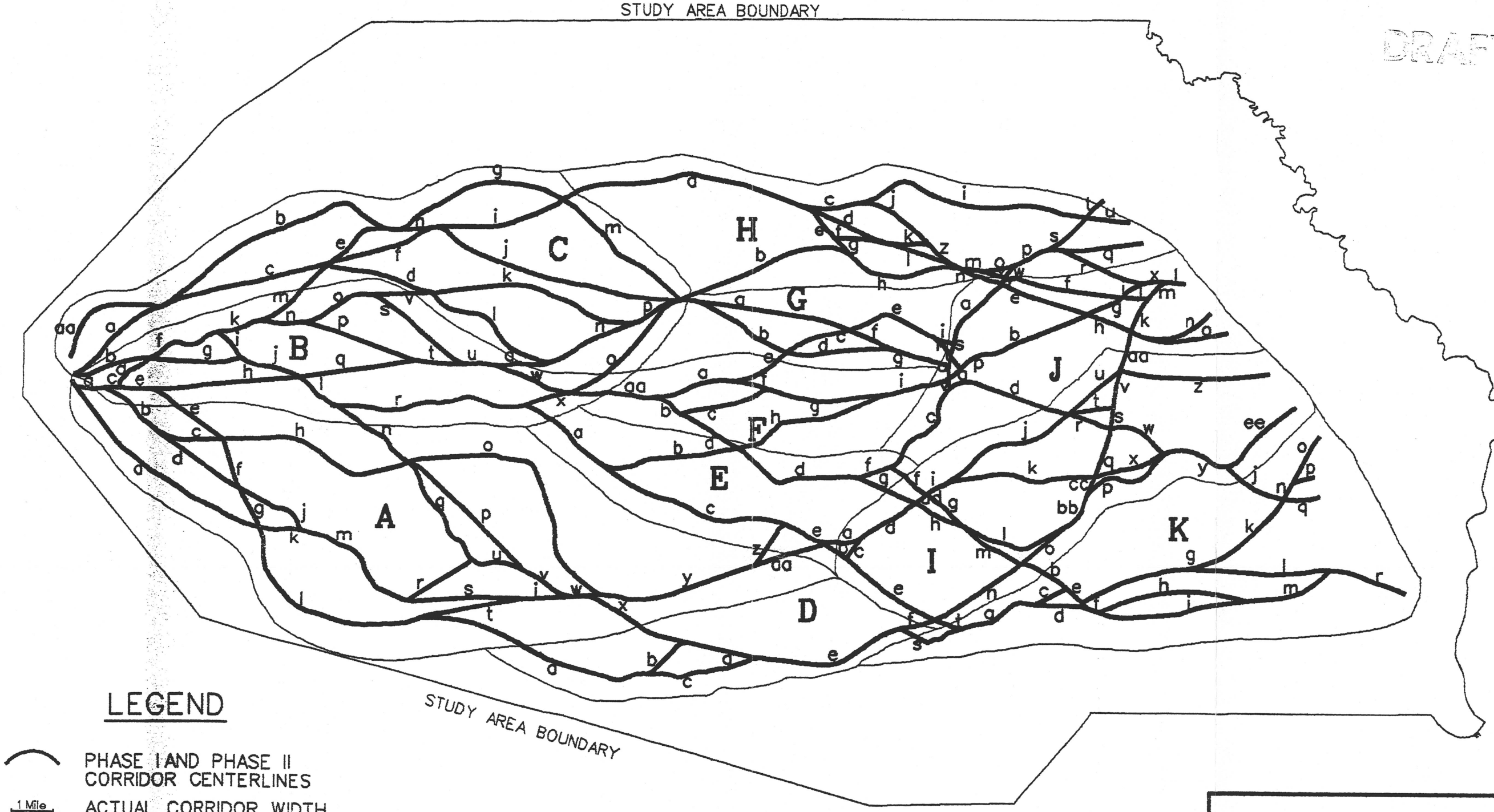
STUDY AREA BOUNDARY



STUDY AREA BOUNDARY

LEGEND

PHASE I AND PHASE II CORRIDOR CENTERLINES

1 Mile ACTUAL CORRIDOR WIDTH

A PHASE II ZONE DESIGNATION

m PHASE II LINK DESIGNATION

FIGURE III - 1
PHASE II NEW LOCATION
LINK ANALYSIS ZONES

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File: /usr2/proj/020219/nr341.plt
PRF Name: nhrr341.prf
Date of Plot: 02/10/92 (using STANDARD.TBL)

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STUDY AREA BOUNDARY

BARNSTEAD

FARMINGTON

ROCHESTER

LOUDON

PITTSFIELD

CHICHESTER

STRAFFORD

CONCORD

SPAULDING TURNPIKE

SOMERSWORTH

DOVER

ROLLINSFORD

PEMBROKE

EPSOM

NORTHWOOD

BARRINGTON

MADBURY

ALLENSTOWN

DEERFIELD

LEE

NOTTINGHAM

DURHAM

STUDY AREA BOUNDARY

ENVIRONMENTAL INTERFERENCE
RATING OF MILE WIDE CORRIDORS

- LOW
- MODERATE
- HIGH

FIGURE III - 4
PHASE II
ENVIRONMENTAL ANALYSIS OF NEW LOCATION LINKS

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File: /usr2/proj/020219/nr344.plt
PRF Name: NRT344.prf
Date of Plot: 02/21/92 (using STANDARD.TBL)

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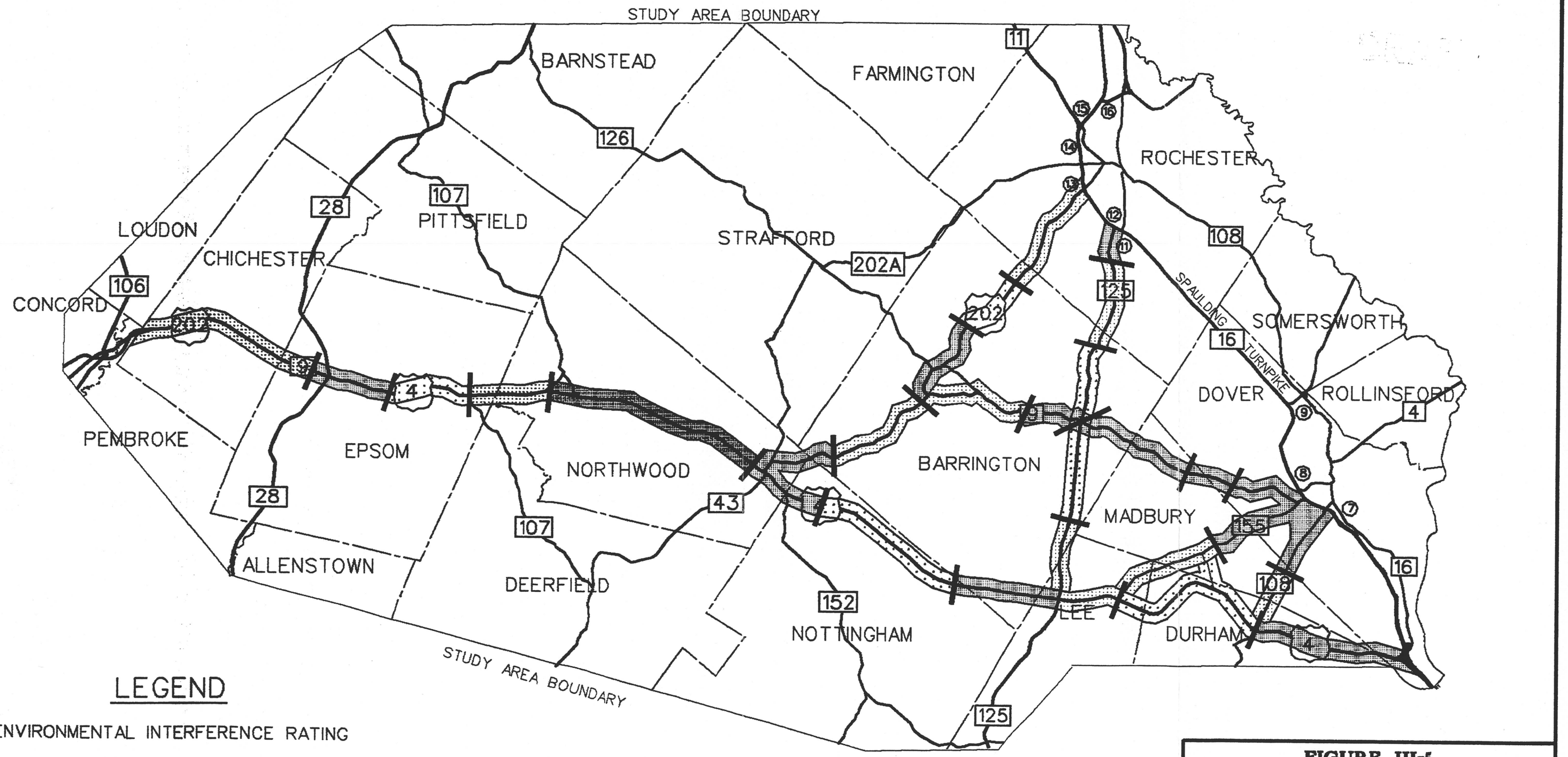

LEGEND

ENVIRONMENTAL INTERFERENCE RATING

- HIGH
- MODERATE
- LOW

FIGURE III-5
PHASE II
ENVIRONMENTAL ANALYSIS
OF UPGRADE SEGMENTS

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N. /usr2/proj/020219/rr395.plt
PRF Name: rr395.prf
Date of Plot: 02/27/92 (using STANDARD.TBL)

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393 CONCORD TO SPAULDING TURNPIKE STUDY

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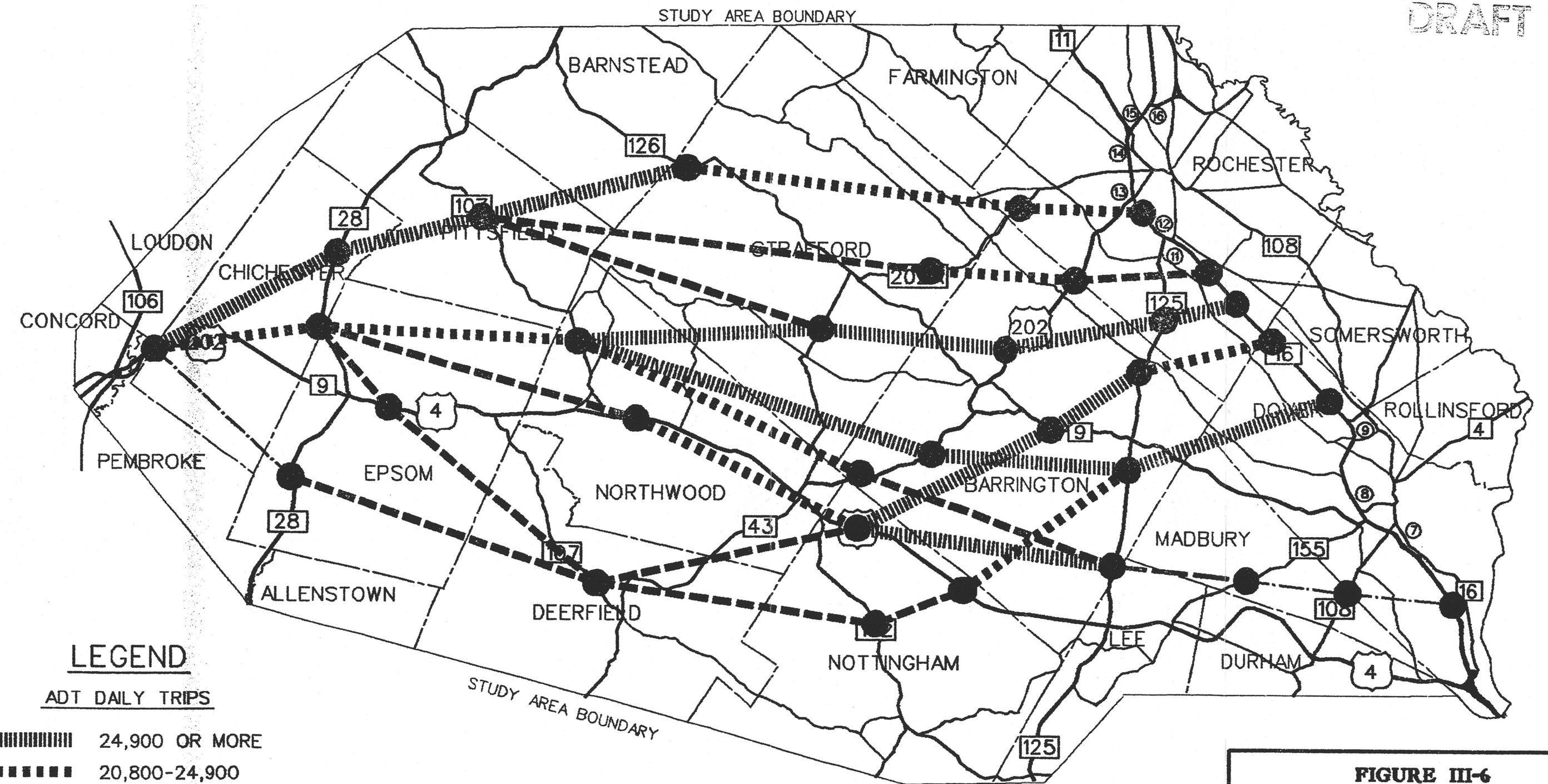

FIGURE III-6
PROJECTED TRAFFIC ON GENERIC NEW LINKS: YEAR 2010

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N... r3rf6.plt
PRF No... NHr3rf6.prf
Date of Plot: 02/10/92 (using STANDARD.TBL)

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CONCORD TO SPAULDING TURNPIKE STUDY

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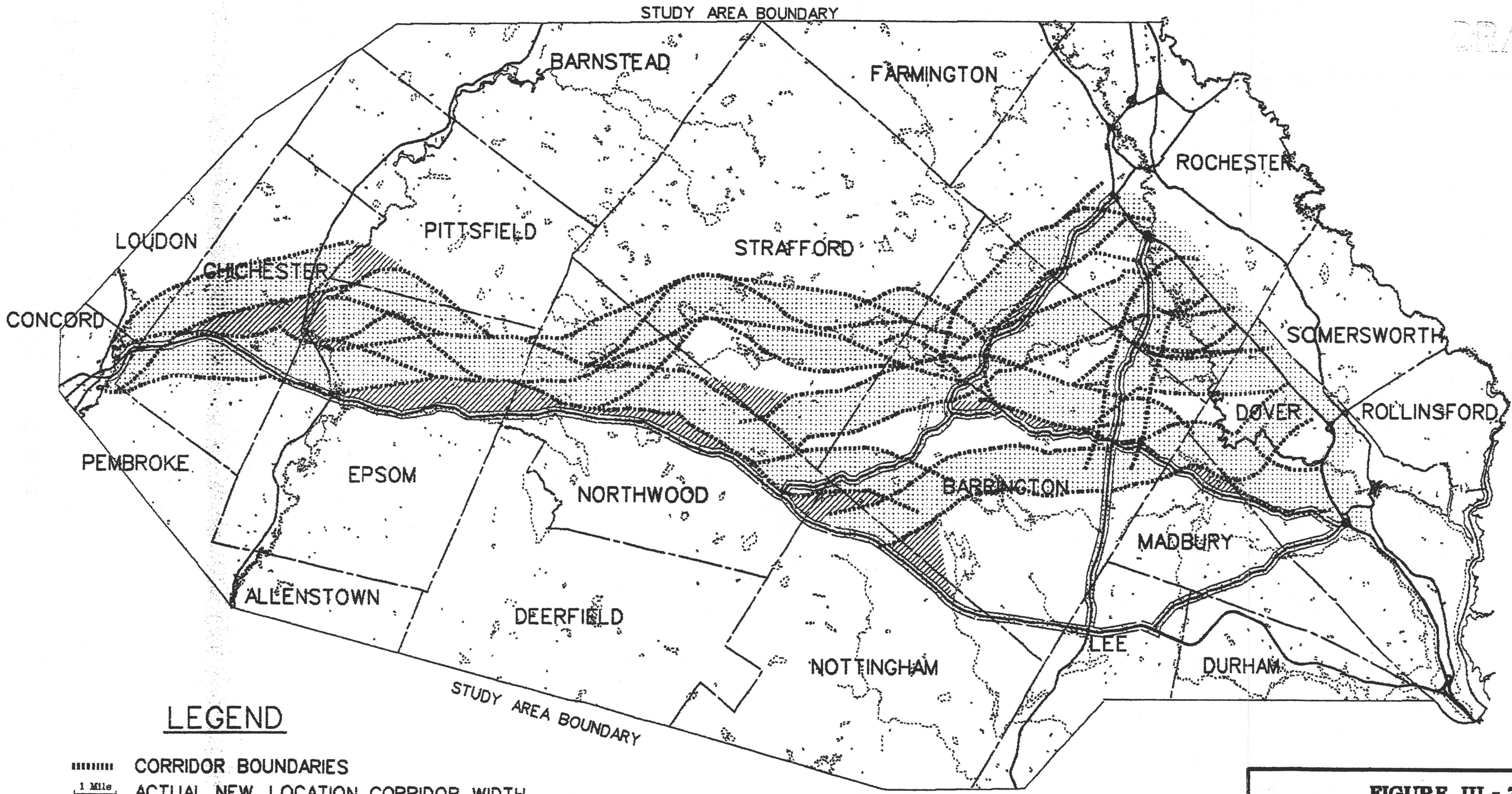

LEGEND

- CORRIDOR BOUNDARIES
- 1 Mile — ACTUAL NEW LOCATION CORRIDOR WIDTH
- 1000' — UPGRADE CORRIDOR WIDTH
- PHASE II CORRIDORS RETAINED
- AREA INCLUDED TO PERMIT CORRIDOR CONTINUITY

FIGURE III - 7
INTEGRATED NETWORK OF PHASE II CORRIDORS

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N /proj/0202219/rr347.plt
PRF Name= rr347.prf
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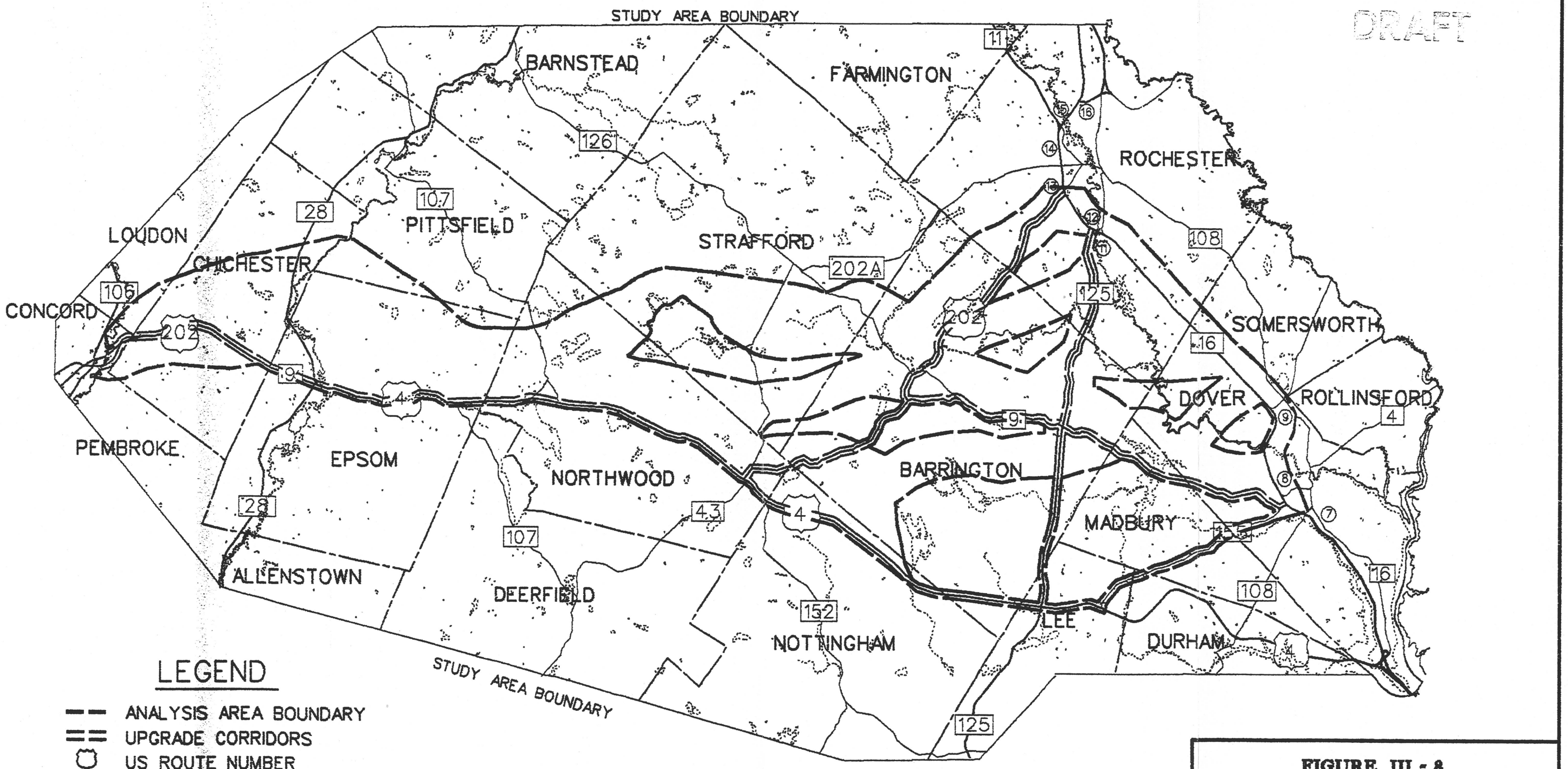

LEGEND

- ANALYSIS AREA BOUNDARY
- UPGRADE CORRIDORS
- US ROUTE NUMBER
- STATE ROUTE NUMBER
- SPAULDING TURNPIKE EXIT NUMBER

FIGURE III - 8
PHASE IIIA
ANALYSIS AREA

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

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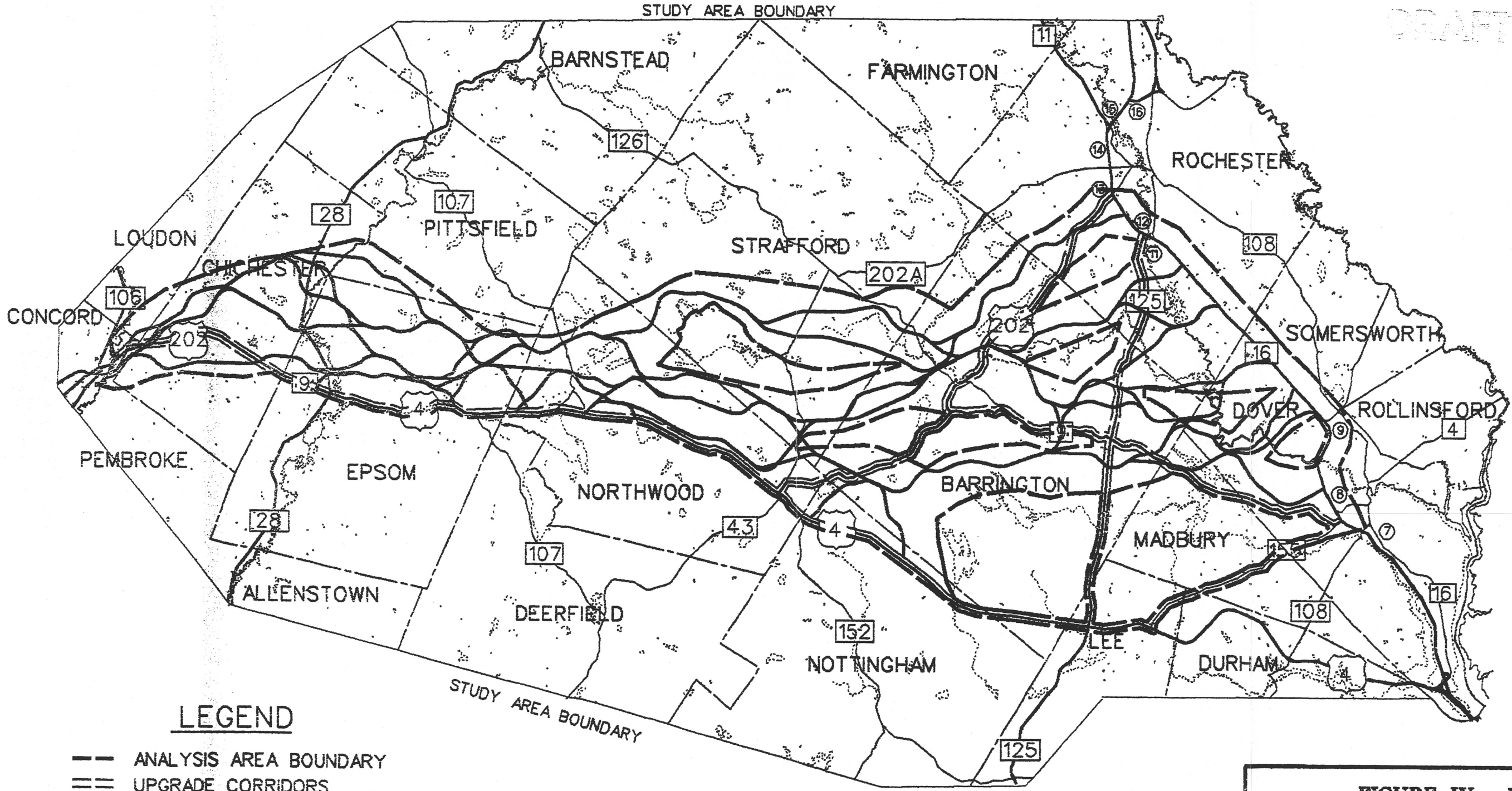

FIGURE IV - 1
PHASE IIIA
ANALYSIS CORRIDORS

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

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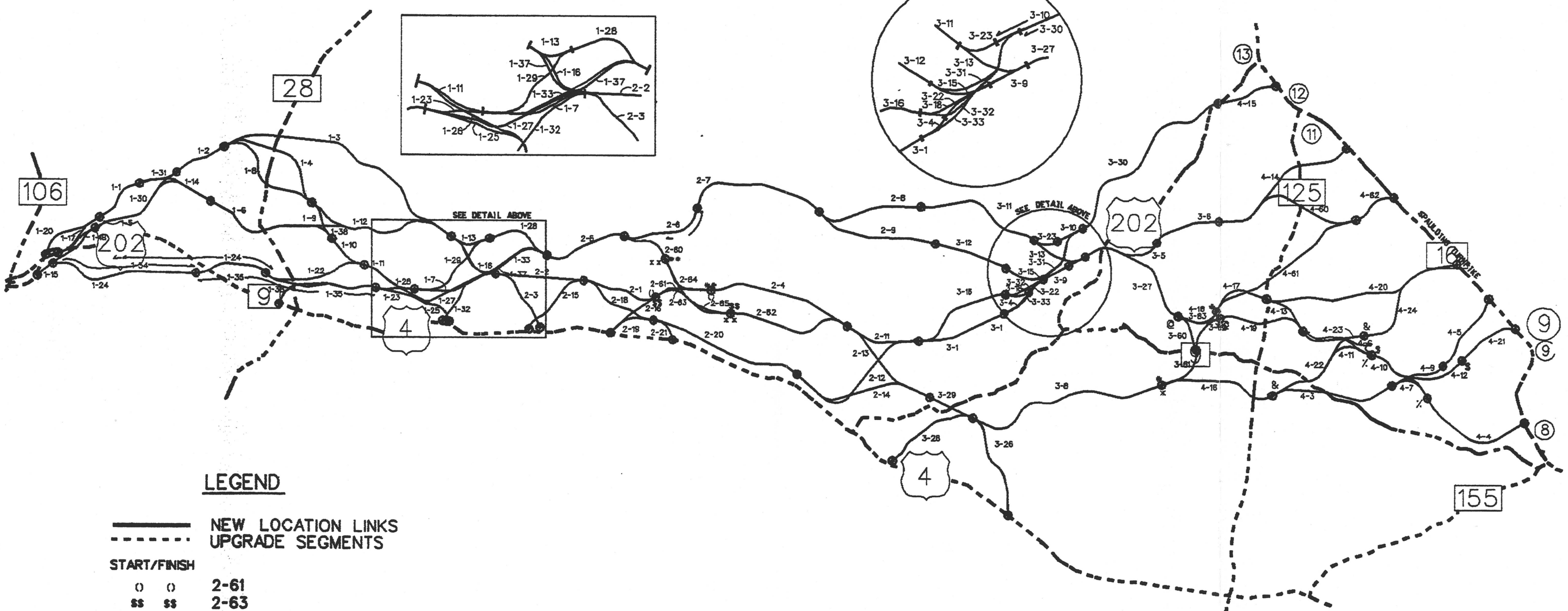

LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH		
()	()	2-61
$$	$$	2-63
**	**	2-64
xx	xx	2-65
&	&	4-22
%	%	4-10
@	@	3-63
×	×	3-62
#	#	3-61
$	$	4-12

FIGURE IV - 2
PHASE IIIA
CORRIDOR LINK KEY
AND UPGRADE SEGMENTS

DIAGRAM NOT TO SCALE

3/17/92

Design File Name: /proj/020219/rr402.plt
PRF Name: rr402.prf
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393 CONCORD TO SPAULDING TURNPIKE STUDY

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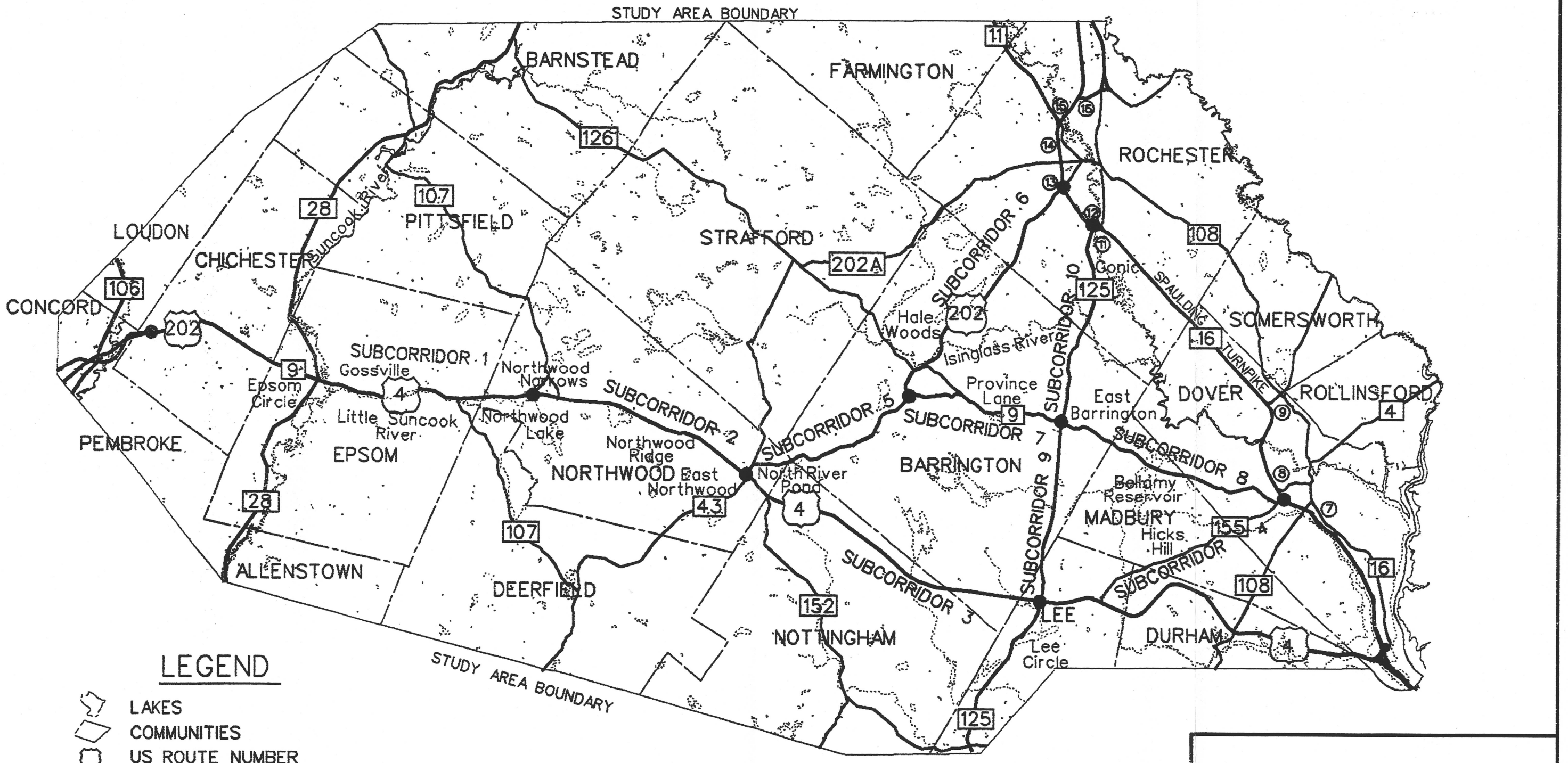

FIGURE IV - 3
UPGRADE SUBCORRIDORS

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N /proj/020219/cr493.plt
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Date of Plot: 02/10/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

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STUDY AREA BOUNDARY

BARNSTEAD

FARMINGTON

ROCHESTER

SUNCOOK RIVER ANALYSIS ZONE

BOW LAKE ANALYSIS ZONE

ISINGLASS RIVER ANALYSIS ZONE

LOUDON

CHICHESTER

PITTSFIELD

STRAFFORD

CONCORD

PEMBROKE

EPSOM

NORTHWOOD

EPSOM MOUNTAIN ANALYSIS ZONE

BARRINGTON

SOMERSWORTH

DOVER

ROLLINSFORD

MADBURY

ALLENSTOWN

DEERFIELD

LEE

NOTTINGHAM

DURHAM

BELLAMY RIVER ANALYSIS ZONE

STUDY AREA BOUNDARY

LEGEND

- ANALYSIS ZONES
- UPGRADE CORRIDORS
- US ROUTE NUMBER
- STATE ROUTE NUMBER
- SPAULDING TURNPIKE EXIT NUMBER

FIGURE IV - 4
PHASE IIIA ANALYSIS ZONES

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

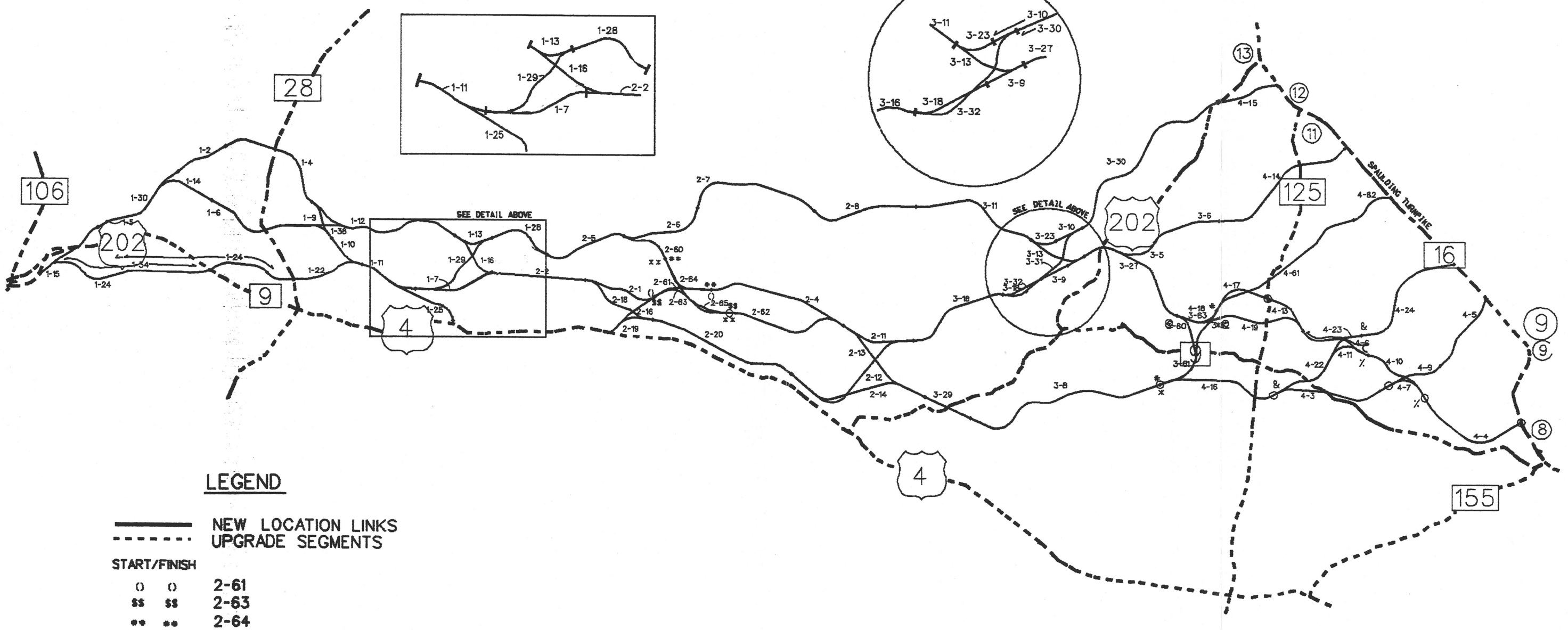

FIGURE IV - 5
PHASE IIIA CORRIDOR LINK KEY AFTER REDUNDANT LINK ELIMINATION

DIAGRAM NOT TO SCALE

3/17\92

Design File: /usr2/proj/020218/rr445.pl+
PRF Name: rhrr445.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

CHICHESTER

LOUDON

PITTSFIELD

CONCORD

PEMBROKE

EPSOM

East Concord

North Chichester

Chichester Center

Suncook River

Gulf Brook

Little Suncook River

Gossville

Catamount Mountain

Locke's Hill

Barton Hill

Epsom Mountain

28

107

106

202

393

9

4

Main St.

SR1,SR3

SR1,SR2
SR3,SR4,SR5

SR1,SR2

SR2,SR4
SR5

SR3,SR4

SR6

End Node
SR1
SR2
SR3
SR4

Start Node
SR1
SR2
SR3
SR4
SR5
SR6

End Node
SR5
SR6

1-2, 1-4, 1-14, 1-30, 1-6, 1-5, 1-9, 1-12, 1-38, 1-10, 1-13, 1-24, 1-34, 1-15, 1-22, 1-11, 1-29, 1-16, 1-7, 1-25

LEGEND

1-7 LINK NUMBER

△ TOP OF HILL

FIGURE IV - 6
SUNCOOK RIVER
SUBCORRIDORS

0 5000 10000

SCALE IN FEET

3/17/92

Design File N: /usr2/proj/020219/rr4f6.plt
PRF Name: rhrr4f6.prf
Date of Plot: 02/13/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

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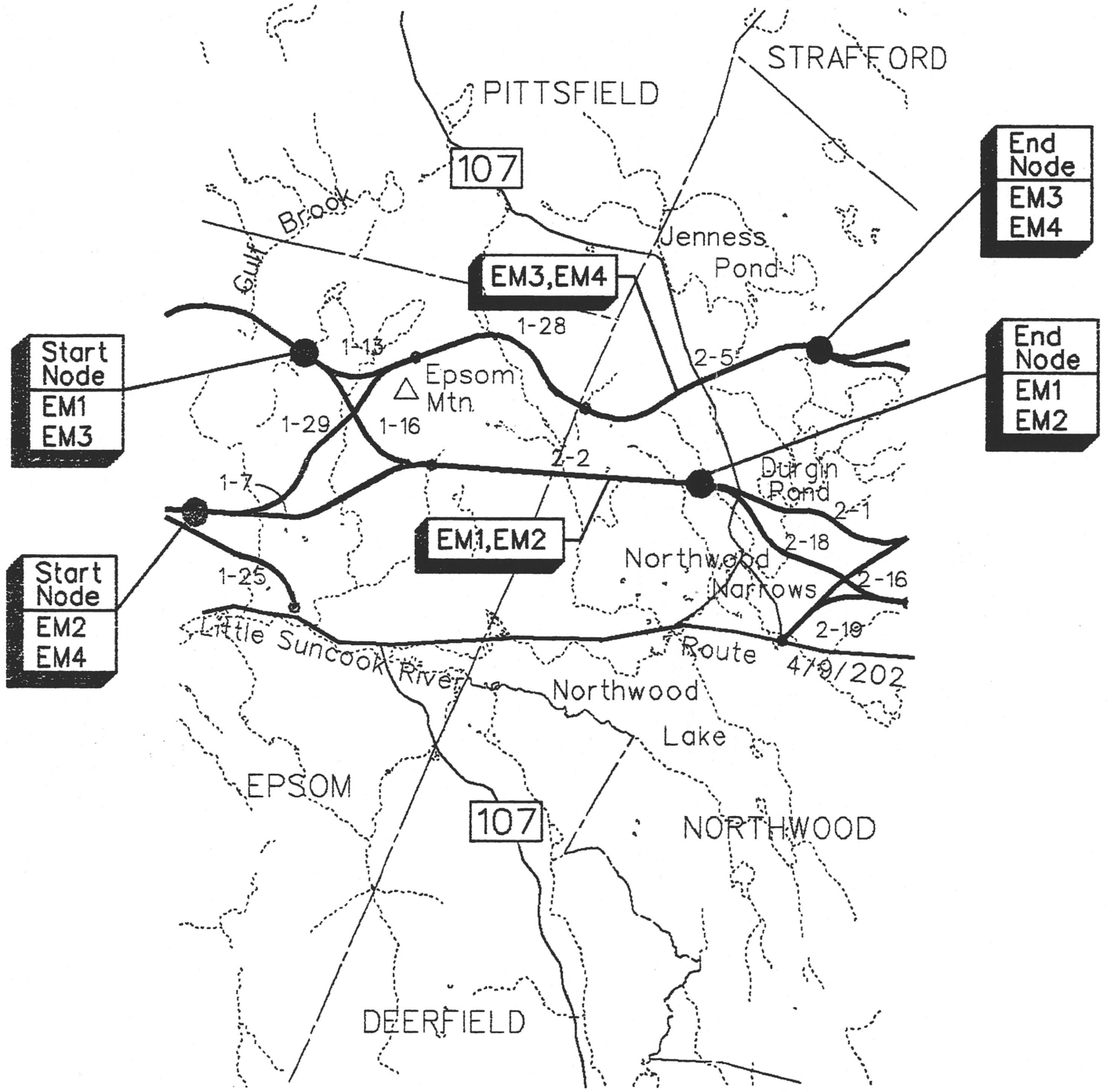
Environmental Impact Statement



LEGEND

1-7 LINK NUMBER

△ TOP OF HILL

FIGURE IV - 7
EPSOM MOUNTAIN SUBCORRIDORS

0 5000 10000

SCALE IN FEET

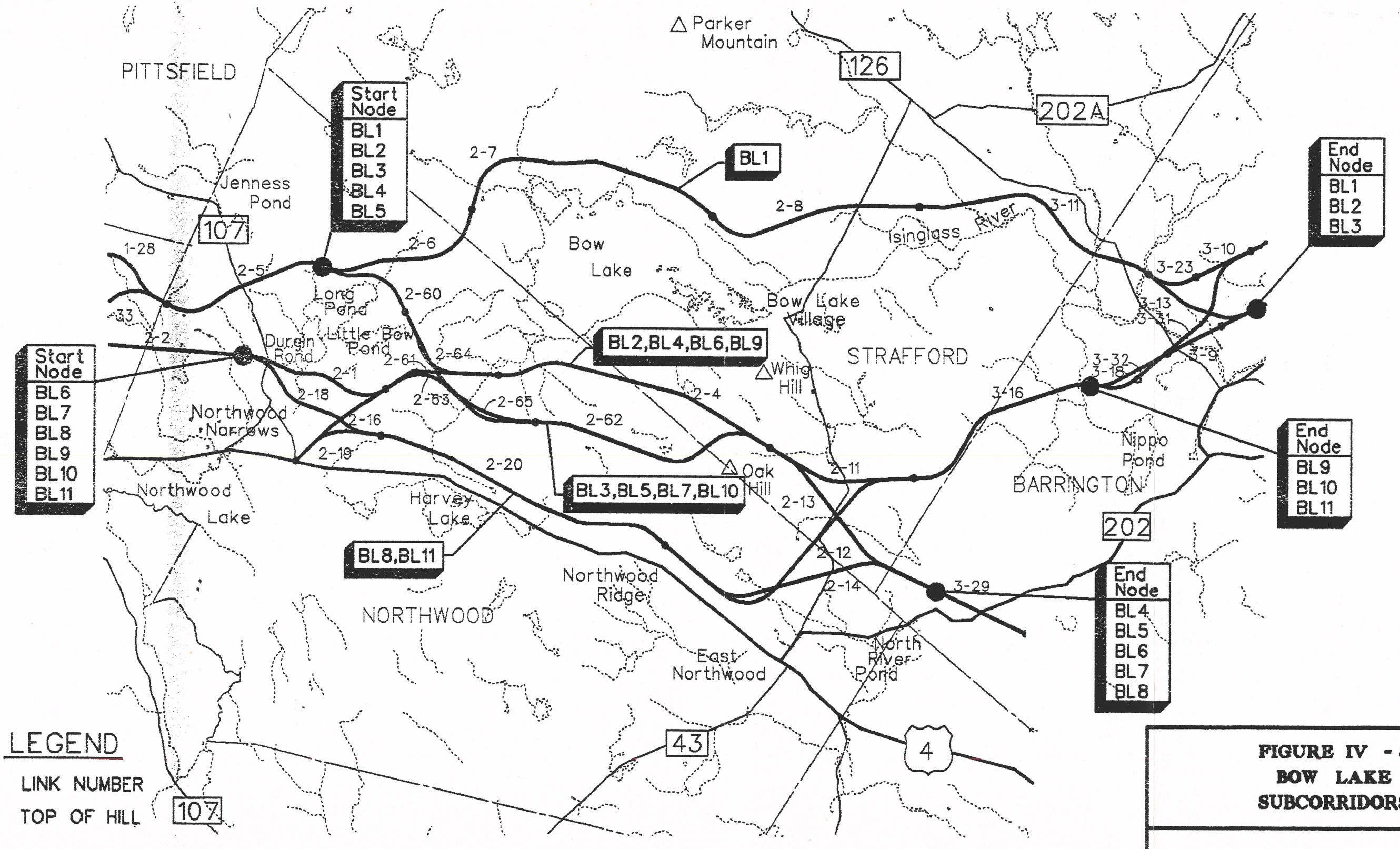
3/17/92

Design File Name: /proj/020219/rr45f7.plt
PRF Name: nhrr45f7.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

1-7 LINK NUMBER

△ TOP OF HILL

FIGURE IV - 8
BOW LAKE
SUBCORRIDORS

0 5000 10000

SCALE IN FEET

3/17/92

Design File N... /prof/020219/rr-468.plt
PRF N... rrr468.prf
Date of Plot: 02/10/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

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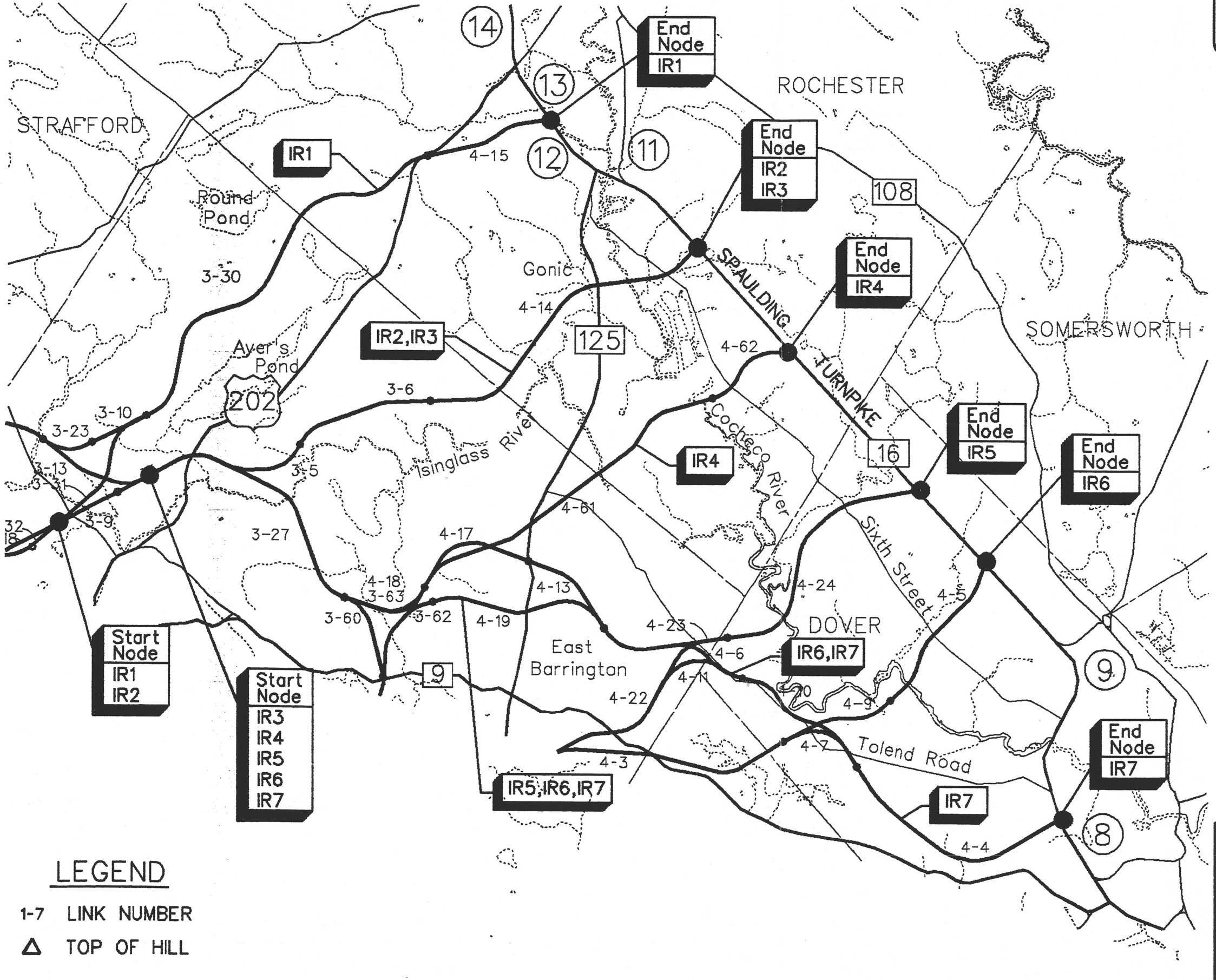


LEGEND

1-7 LINK NUMBER

△ TOP OF HILL

FIGURE IV - 9
ISINGLASS RIVER SUBCORRIDORS

0 5000 10000

SCALE IN FEET

3/17/92

Design File N... /usr2/proj/020218/rr449.plt
PRF N... hhrr449.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT

Start Node
BR1
BR2
BR3
BR4
BR5
BR6
BR7

End Node
BR1

End Node
BR2
BR4

End Node
BR3
BR5

End Node
BR6
BR7

BR2,BR3

BR3
BR5,BR6

BR4
BR5,BR6

BR4,BR5,BR6,BR7

BR7

SPAULDING TURNPIKE

Sixth Street

Tolend Road

Isinglass River

Cocheco River

Nippo Lake

Swain's Lake

Mendum's Pond

Bellamy Reservoir

Bellamy River

ROCHESTER

SOMERSWORTH

East Barrington

BARRINGTON

DOVER

MADBURY

LEE

DURHAM

4-62 4-61 4-17 3-27 4-18 3-63 3-60 3-62 4-19 4-13 4-23 4-24 4-5 4-6 4-11 4-20 4-9 4-22 3-61 3-8 4-16 4-3 4-7 3-29 4-4

125 16 9 8 7 155 4

LEGEND

1-7 LINK NUMBER

△ TOP OF HILL

FIGURE IV - 10
BELLAMY RIVER
SUBCORRIDORS

0 5000 10000
SCALE IN FEET

3/17/92

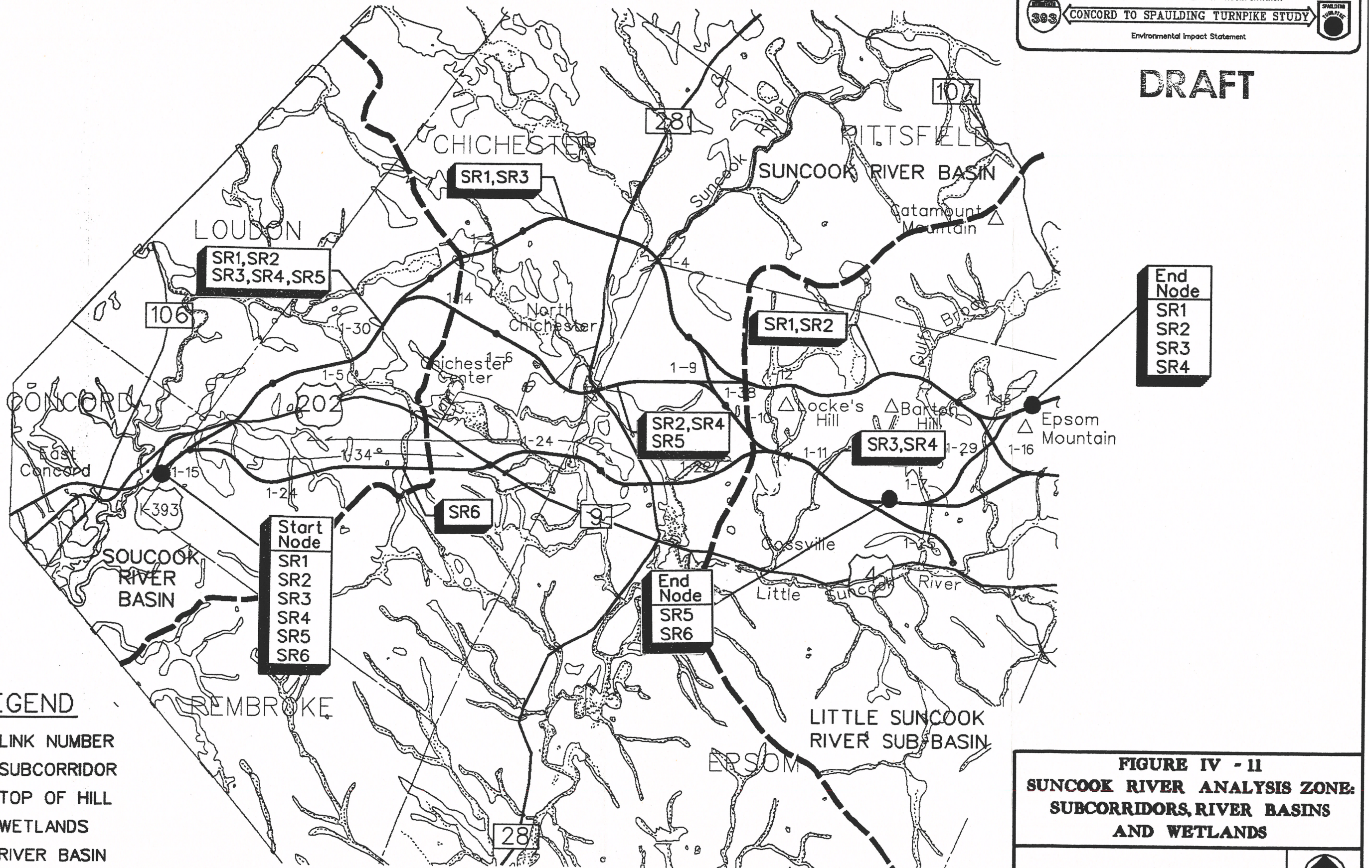
Design File N... /usr2/proj/020218/rr4610.plt
PRF N... rhrr4610.prf
Date of Plot: 02/10/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

1-7	LINK NUMBER
	SUBCORRIDOR
△	TOP OF HILL
	WETLANDS
	RIVER BASIN

FIGURE IV - 11
SUNCOOK RIVER ANALYSIS ZONE: SUBCORRIDORS, RIVER BASINS AND WETLANDS

0 5000 10000
SCALE IN FEET

3/17/92

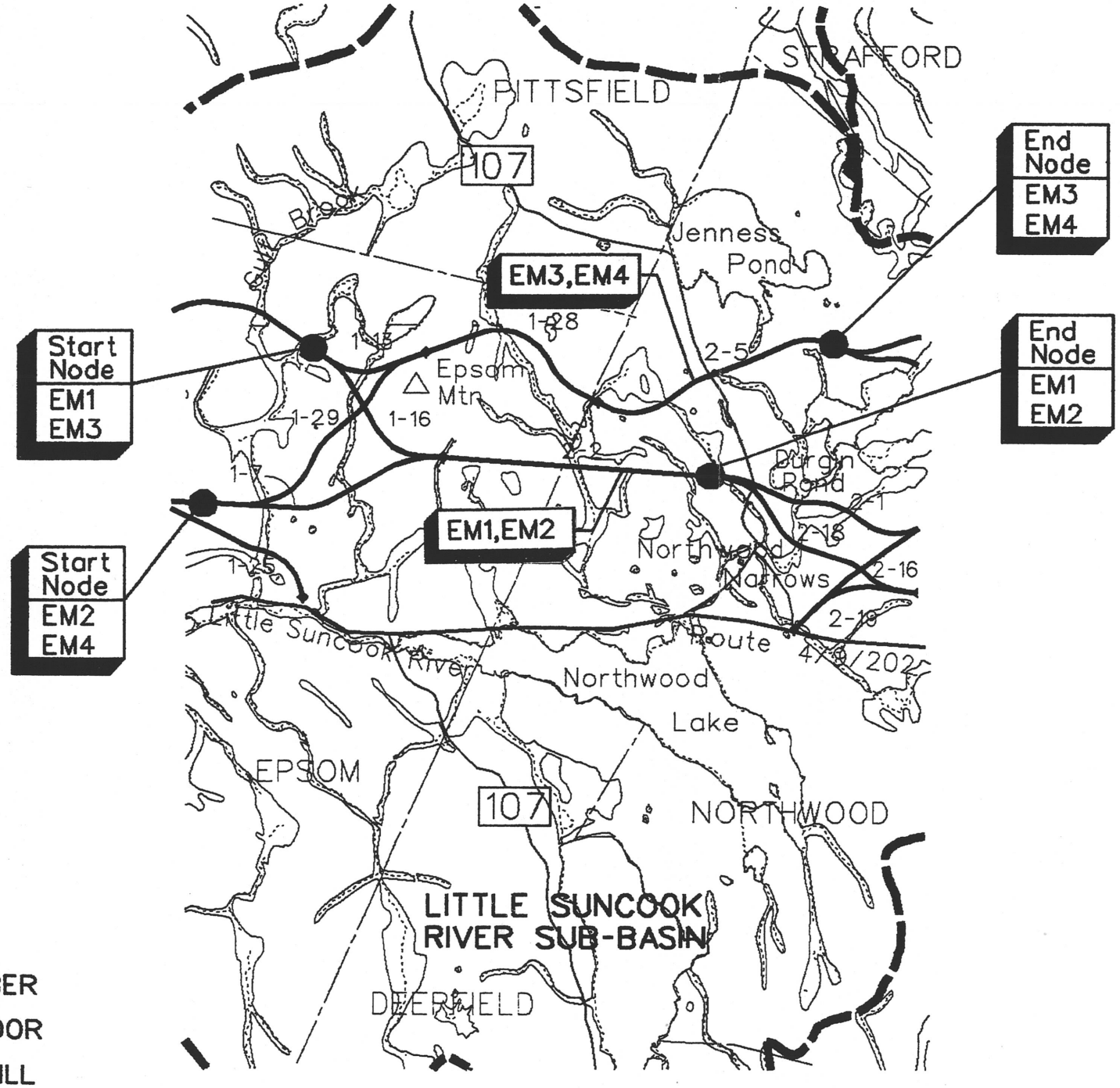
Design File: /proj/020219/rr4f11.plt
PRF Name: RR4F11.PRF
Date of Plot: 02/13/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

- 1-7 LINK NUMBER
- SUBCORRIDOR
- △ TOP OF HILL
- WETLANDS
- RIVER BASIN

FIGURE IV - 12
EPSOM MOUNTAIN ANALYSIS ZONE: SUBCORRIDORS, RIVER BASINS AND WETLANDS

0 5000 10000
SCALE IN FEET

3/17/92

Design File N... /user2/proj/020219/rr4f12.dlt
RRF N... rrr4f12.prt
Date of Plot: 03/02/92 (using STANDARD.TBL)

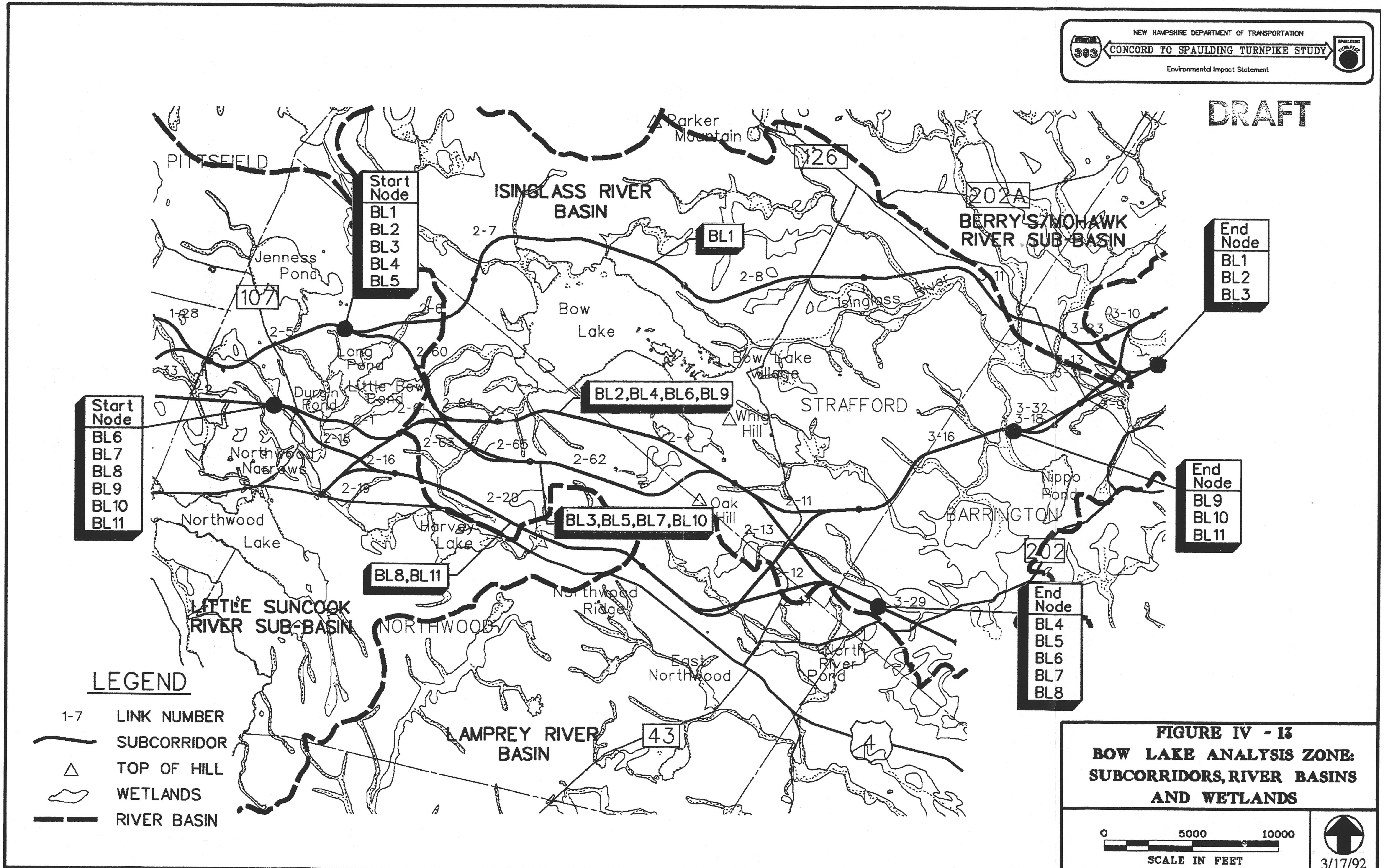


FIGURE IV - 13
BOW LAKE ANALYSIS ZONE: SUBCORRIDORS, RIVER BASINS AND WETLANDS

Design File Name: /usr2/proj/020218/rr4f13.plt
PRF Name: nhrr4f13.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT

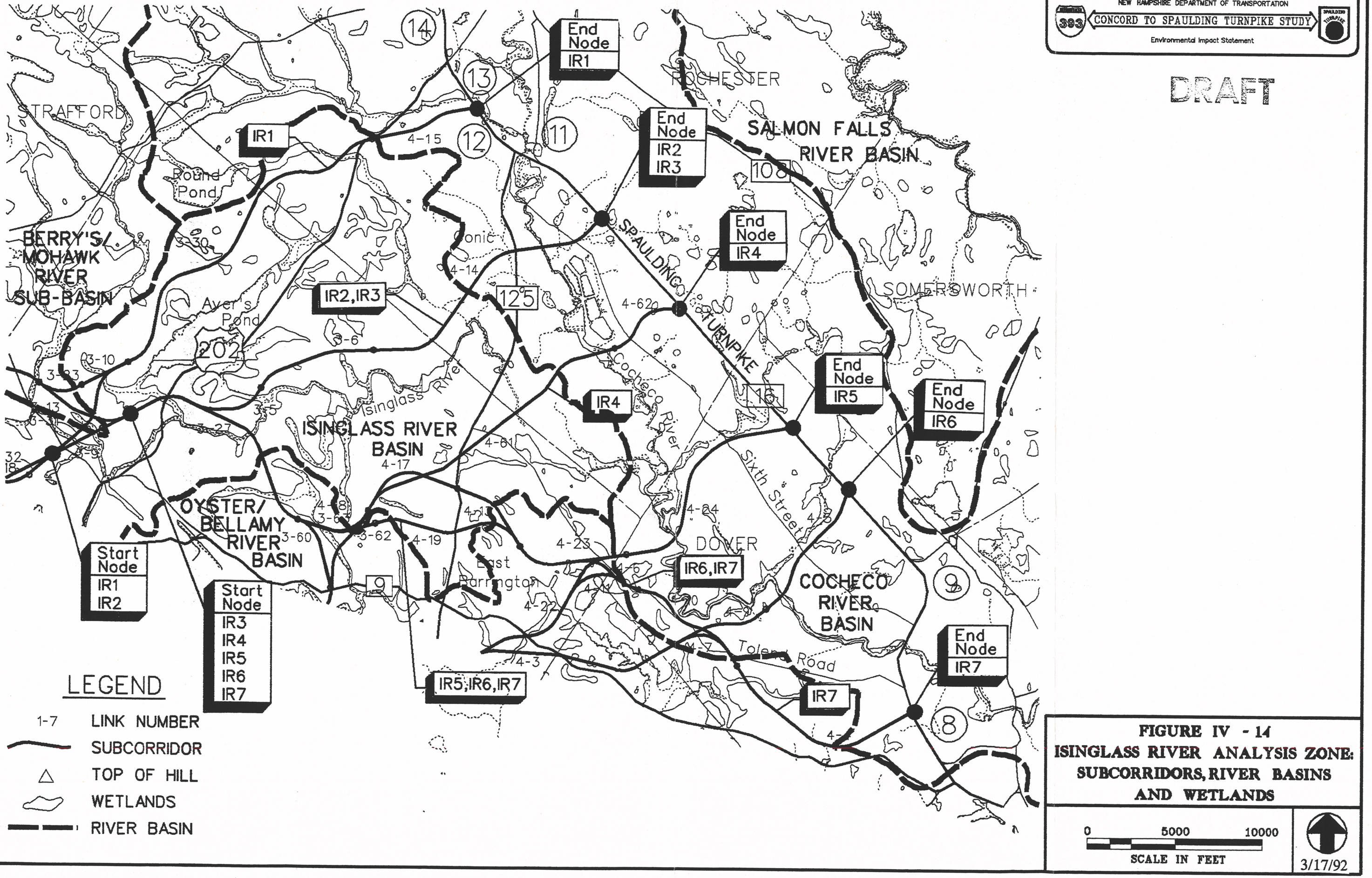


FIGURE IV - 14
ISINGLASS RIVER ANALYSIS ZONE: SUBCORRIDORS, RIVER BASINS AND WETLANDS

0 5000 10000
SCALE IN FEET

3/17/92

Design File N... /user2/proj/020219/rr4f14.plt
PRF N... rrr4f14.prf
Date of Plot: 02/25/92 (using STANDARD.TBL)

Design File /usr2/proj/020219/rr4f15.plt
PRF rr4f15.prf
Date of Plot: 02/25/92 (using STANDARD.TBL)

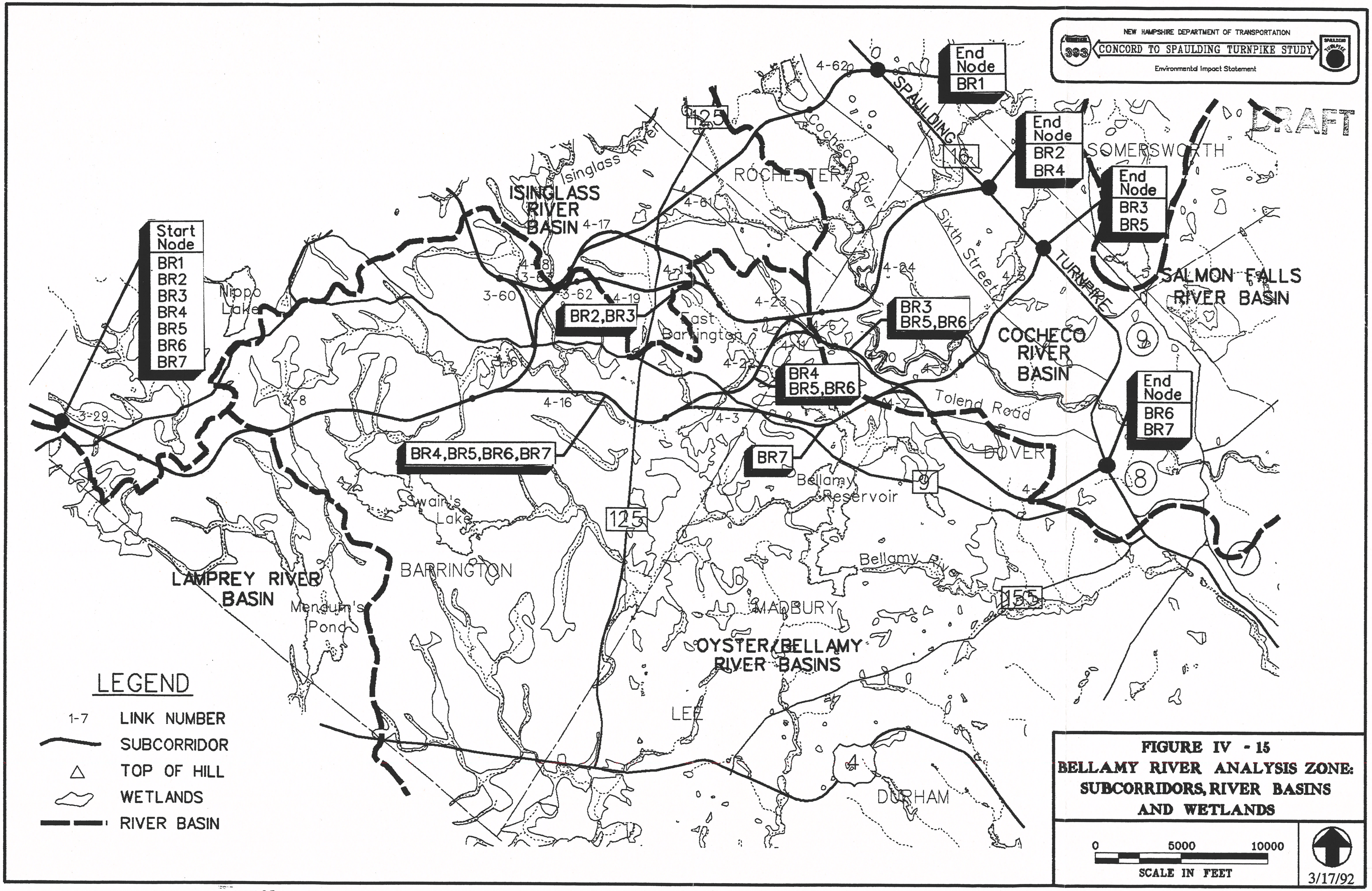


FIGURE IV - 15
BELLAMY RIVER ANALYSIS ZONE: SUBCORRIDORS, RIVER BASINS AND WETLANDS

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT

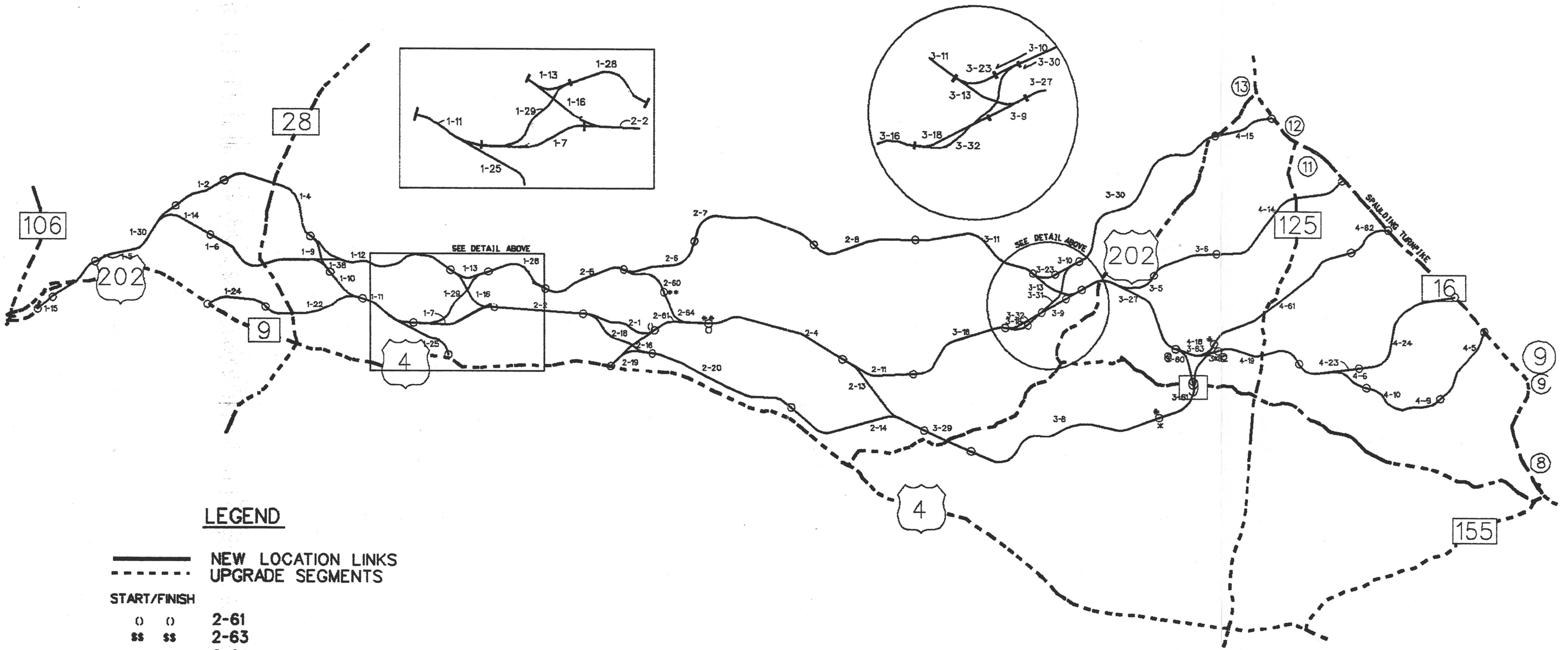


FIGURE IV - 16
CORRIDOR LINK KEY AFTER EVALUATION OF NEW LOCATION AND UPGRADE SUBCORRIDORS

DIAGRAM NOT TO SCALE

3/17/92

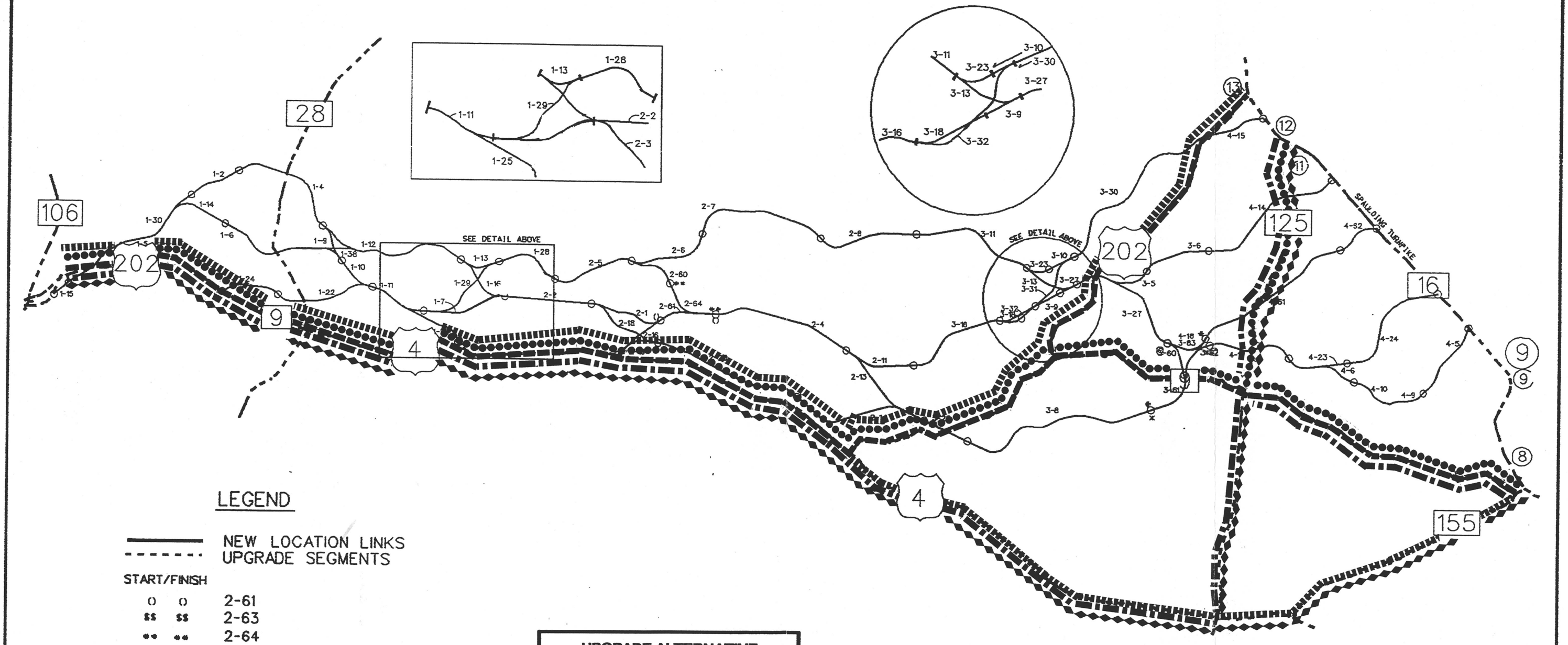
Design File Name: /proj/020218/rr4416.plt
PRF Name: rr4416.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH	
0	0 2-61
$$	$$ 2-63
**	** 2-64
xx	xx 2-65
&	& 4-22
%	% 4-10
@	@ 3-63
x	x 3-62
*	* 3-61

UPGRADE ALTERNATIVE
ALTERNATIVE 1

- Alternative 1A
- Alternative 1B
- Alternative 1C
- Alternative 1D
- Alternative 1E

FIGURE V-1
ALTERNATIVE 1
UPGRADE

DIAGRAM NOT TO SCALE

3/17/92

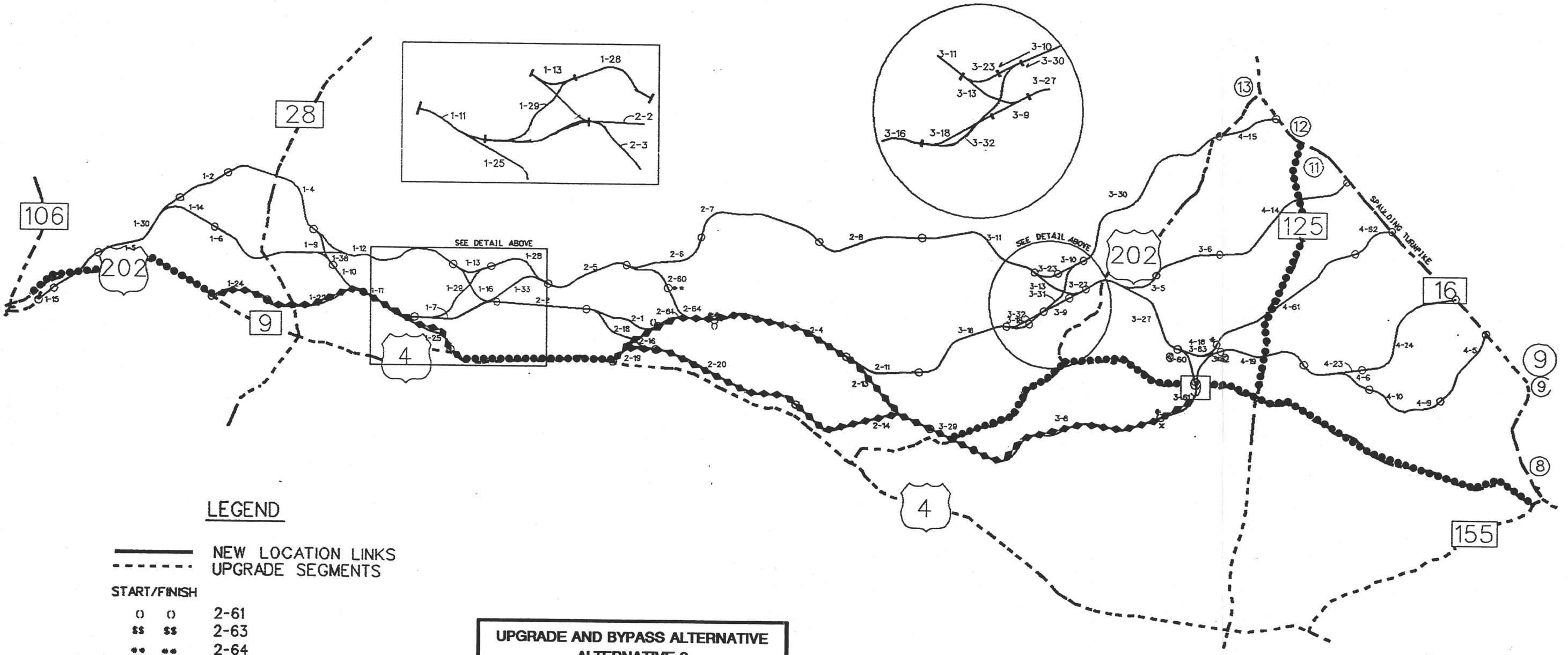
Design File: /proj/020219/rr4616.plt
PRF: normal rrr4616.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH		
0	0	2-61
$$	$$	2-63
**	**	2-64
xx	xx	2-65
&	&	4-22
%	%	4-10
@	@	3-63
x	x	3-62
#	#	3-61

UPGRADE AND BYPASS ALTERNATIVE
ALTERNATIVE 2

●●●●●●●● Upgrade of Existing Routes

◆◆◆◆◆ New Location

Alternative 2A - 1-22 + 2-4
Alternative 2B - 1-22 + 2-4 + 3-8
Alternative 2C - 1-22 + 2-20
Alternative 2D - 1-22 + 2-20 + 3-8

FIGURE V-2
ALTERNATIVE 2
BYPASSES

DIAGRAM NOT TO SCALE

3/17/92

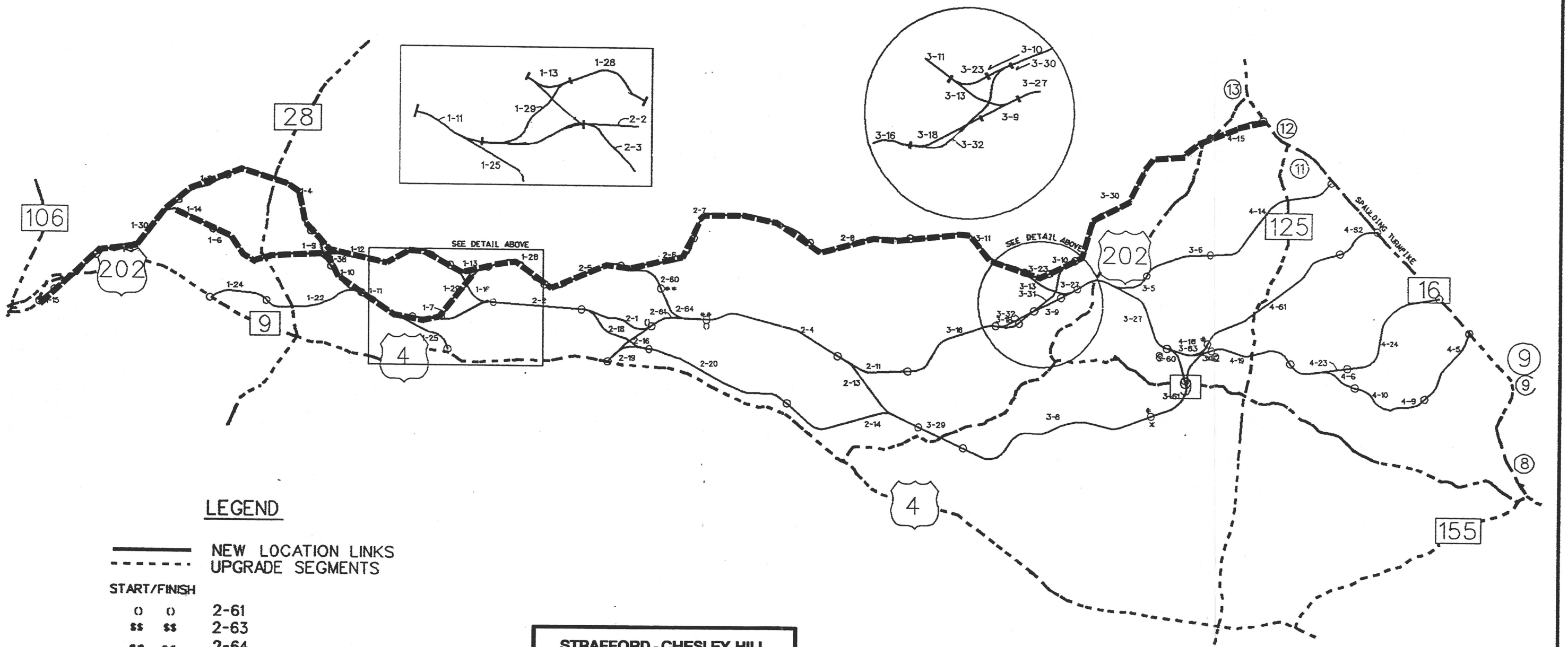
Design File: /proj/020219/rr4618.plt
PRF Name: rr4618.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT

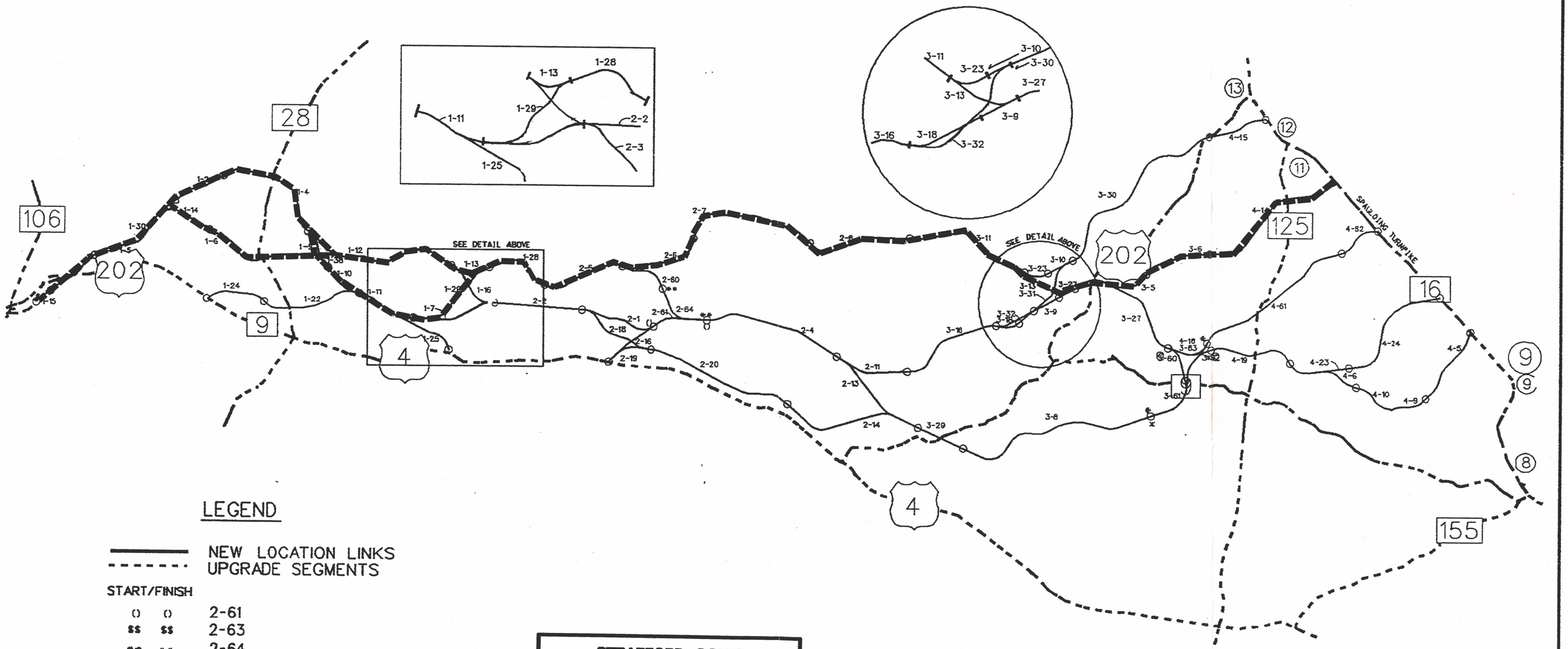


FIGURE V-4
ALTERNATIVE 4
STRAFFORD - GONIC

DIAGRAM NOT TO SCALE

3/17/92

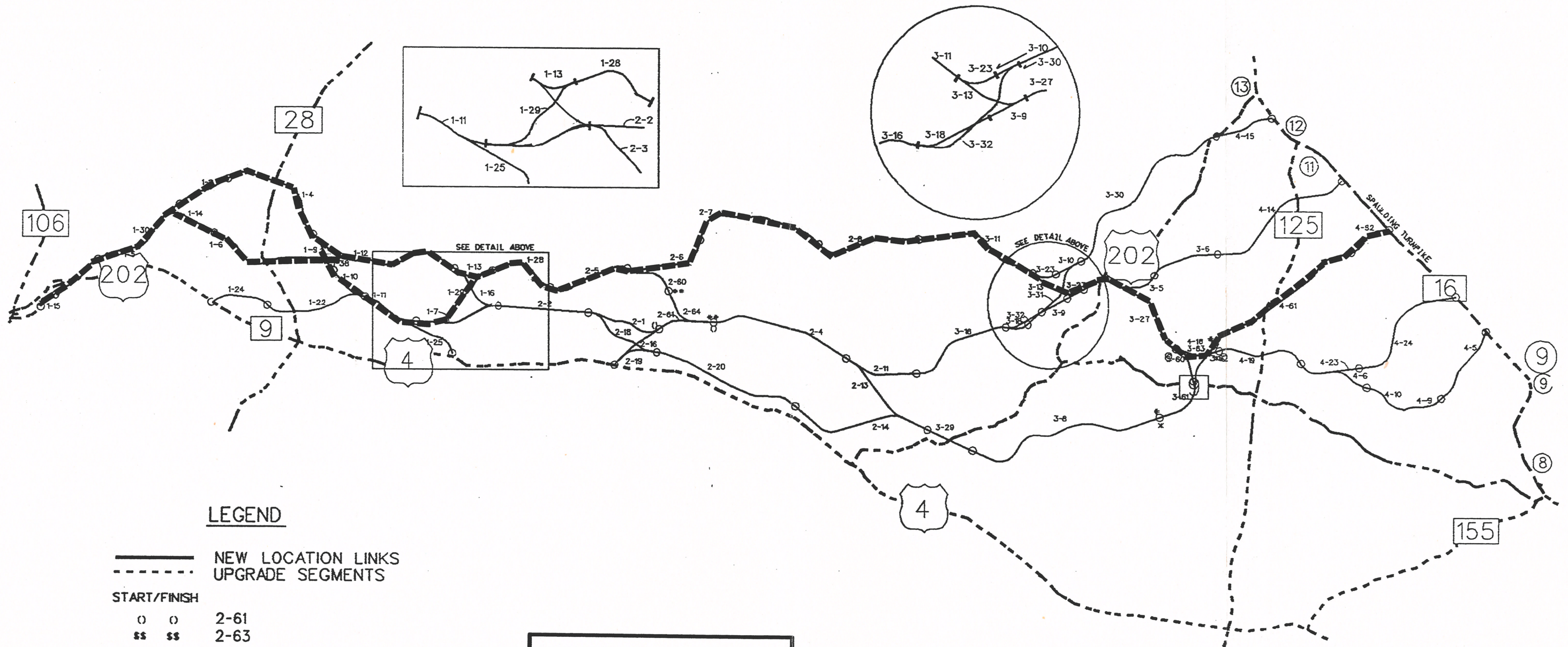
Design Fi... /proj/020219/rr4f16.plt
PRF /tmas/rr4f16.prf
Date of Plot 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH	
0	0 2-61
$$	$$ 2-63
**	** 2-64
xx	xx 2-65
&	& 4-22
%	% 4-10
@	@ 3-63
x	x 3-62
#	# 3-61

STRAFFORD - BLACKWATER ROAD
ALTERNATIVE 5

5A Via 1 - 2 + 1 - 12
5B Via 1 - 6 + 1 - 12
5C Via 1 - 2 + 1 - 10
5D Via 1 - 6 + 1 - 10

FIGURE V-5
ALTERNATIVE 5
STRAFFORD - BLACKWATER ROAD

DIAGRAM NOT TO SCALE

3/17/92

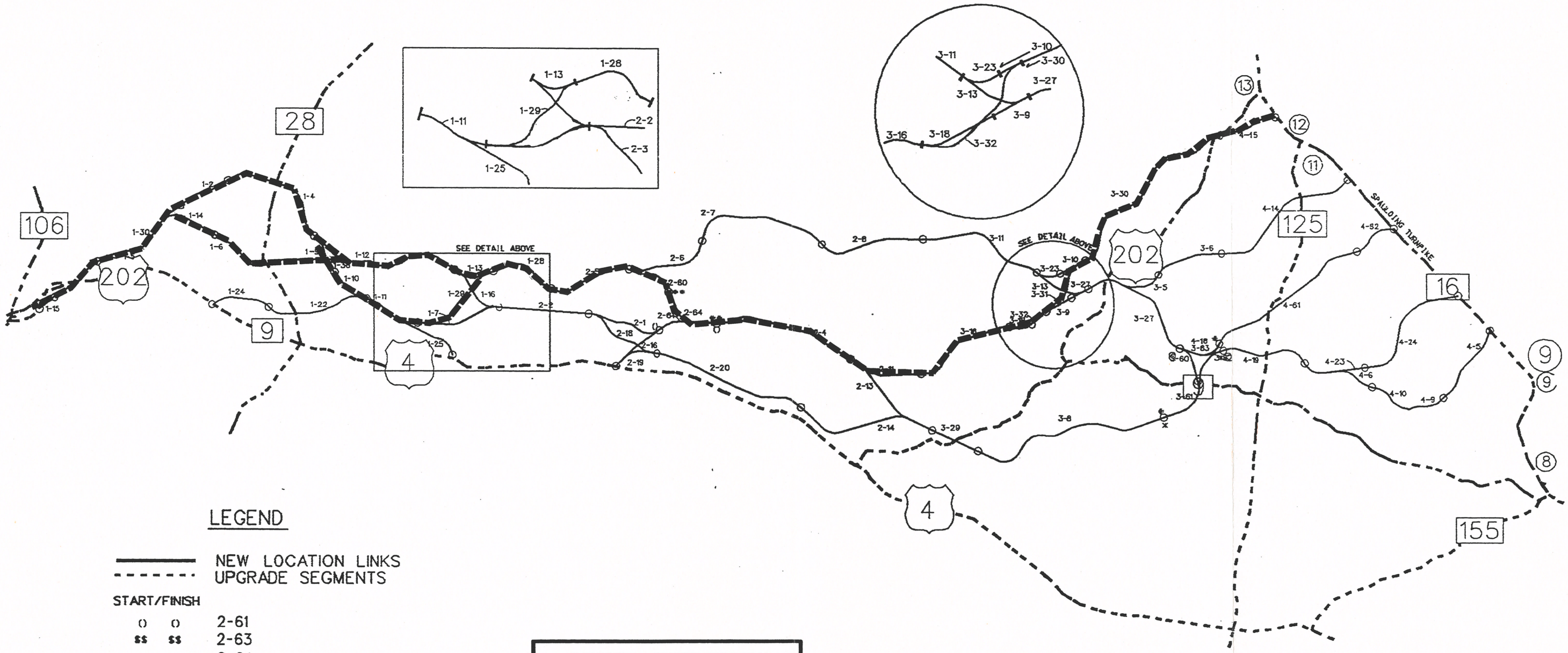
Design File: /proj/032219/rr4f16.plt
PRF Normal rr4f16.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH		
0	0	2-61
$$	$$	2-63
**	**	2-64
xx	xx	2-65
&	&	4-22
%	%	4-10
@	@	3-63
x	x	3-62
#	#	3-61

OAK HILL - CHESLEY HILL ALTERNATIVE 6

6A Via 1 - 2 + 1 - 12
6B Via 1 - 6 + 1 - 12
6C Via 1 - 2 + 1 - 10
6D Via 1 - 6 + 1 - 10

FIGURE V-6
ALTERNATIVE 6
OAK HILL - CHESLEY HILL

DIAGRAM NOT TO SCALE

3/17/92

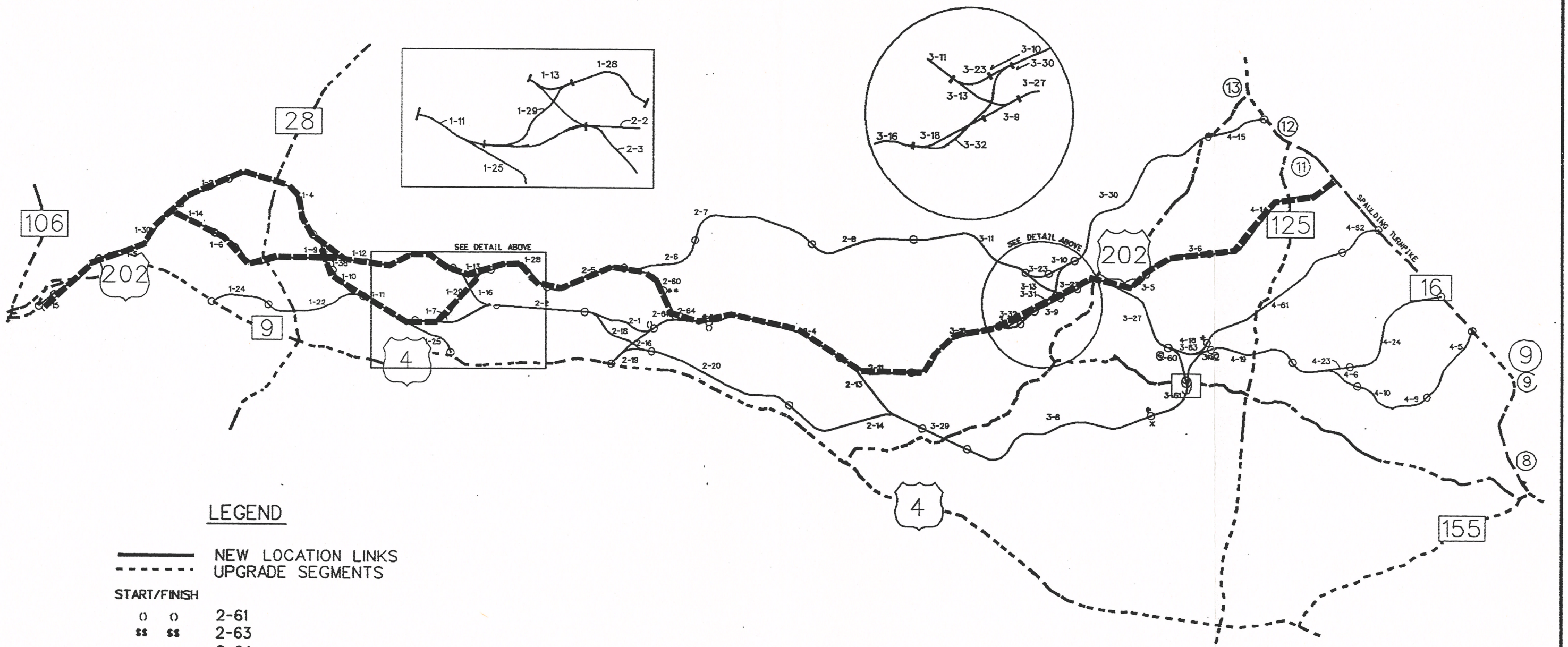
Design File: /proj/020219/rr4f16.plt
PRF Name: rrr4f16.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH		
0	0	2-61
$$	$$	2-63
**	**	2-64
xx	xx	2-65
&	&	4-22
%	%	4-10
@	@	3-63
x	x	3-62
#	#	3-61

OAK HILL - GONIC
ALTERNATIVE 7

7A Via 1 - 2 + 1 - 12
7B Via 1 - 6 + 1 - 12
7C Via 1 - 2 + 1 - 10
7D Via 1 - 6 + 1 - 10

FIGURE V-7
ALTERNATIVE 7
OAK HILL - GONIC

DIAGRAM NOT TO SCALE

3/17/92

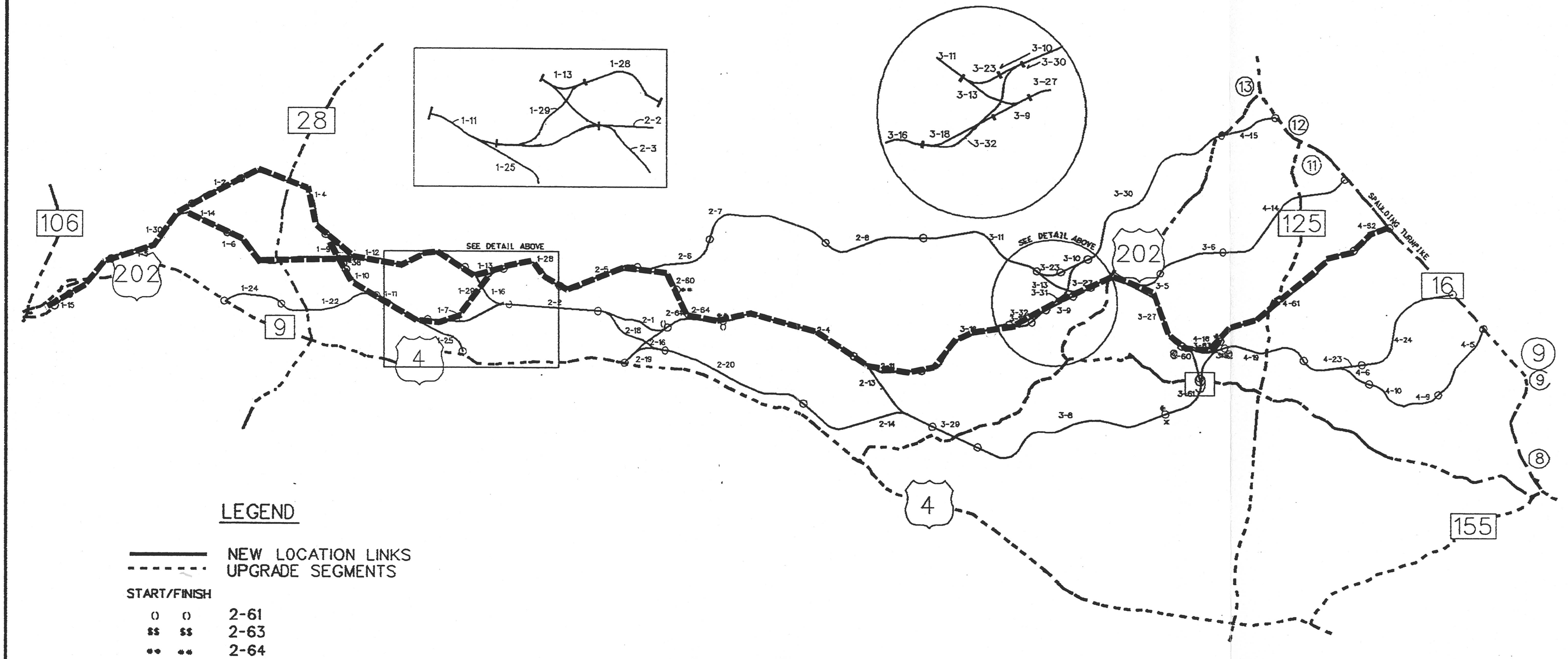
Design File: /proj/032219/rr4416.plt
PRF Name: rr4416.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH		
()	()	2-61
$$	$$	2-63
**	**	2-64
xx	xx	2-65
&	&	4-22
%	%	4-10
@	@	3-63
x	x	3-62
*	*	3-61

OAK HILL - BLACKWATER ROAD ALTERNATIVE 8

8A Via 1-2 + 1-12
8B Via 1-6 + 1-12
8C Via 1-2 + 1-10
8D Via 1-6 + 1-10

FIGURE V-8
ALTERNATIVE 8
OAK HILL - BLACKWATER ROAD

DIAGRAM NOT TO SCALE

3/17/92

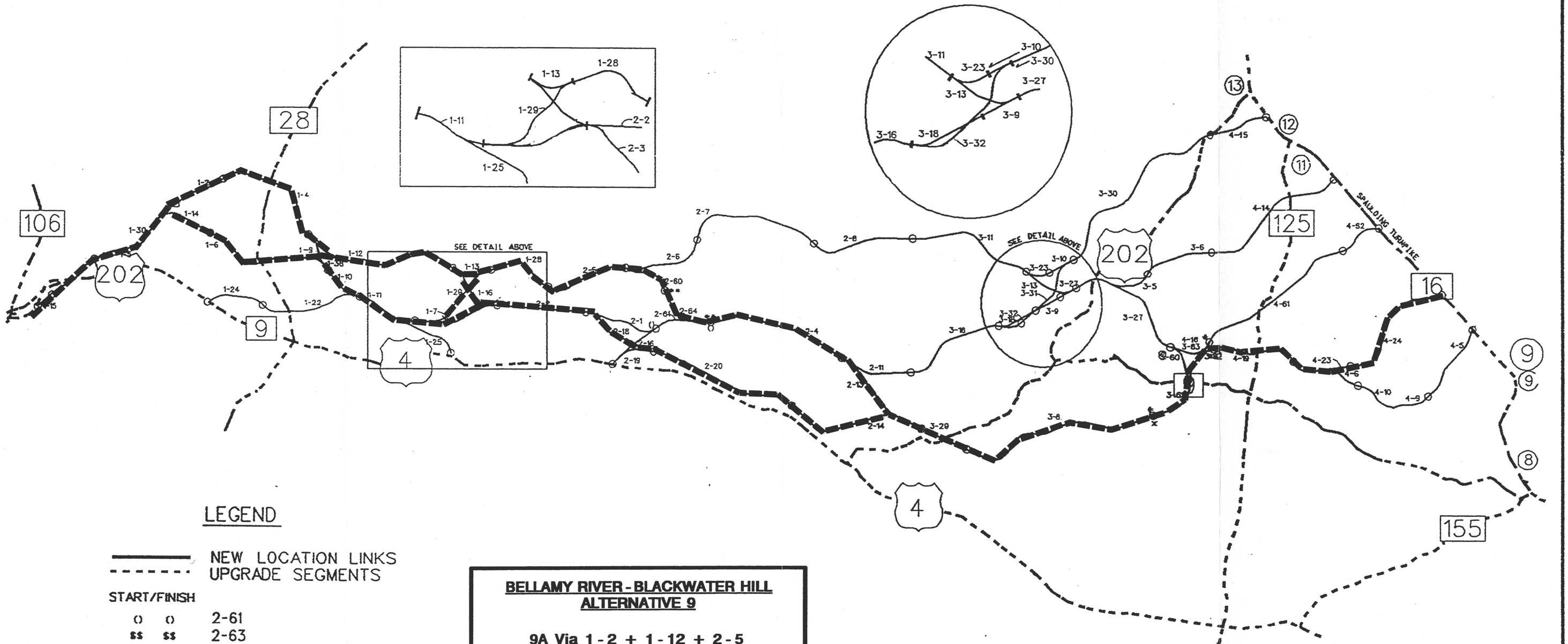
Design File: /proj/020219/rr4f16.plt
PRF name: nhrr4f16.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH		
0	0	2-61
$$	$$	2-63
**	**	2-64
xx	xx	2-65
&	&	4-22
%	%	4-10
@	@	3-63
x	x	3-62
#	#	3-61

BELLAMY RIVER - BLACKWATER HILL ALTERNATIVE 9

9A Via 1 - 2 + 1 - 12 + 2 - 5
9B Via 1 - 6 + 1 - 12 + 2 - 5
9C Via 1 - 2 + 1 - 10 + 2 - 5
9D Via 1 - 6 + 1 - 10 + 2 - 5
9E Via 1 - 2 + 1 - 12 + 2 - 2
9F Via 1 - 6 + 1 - 12 + 2 - 2
9G Via 1 - 2 + 1 - 10 + 2 - 2
9H Via 1 - 6 + 1 - 10 + 2 - 2

FIGURE V-9
ALTERNATIVE 9
BARRINGTON SOUTH-BLACKWATER HILL

DIAGRAM NOT TO SCALE

3/17/92

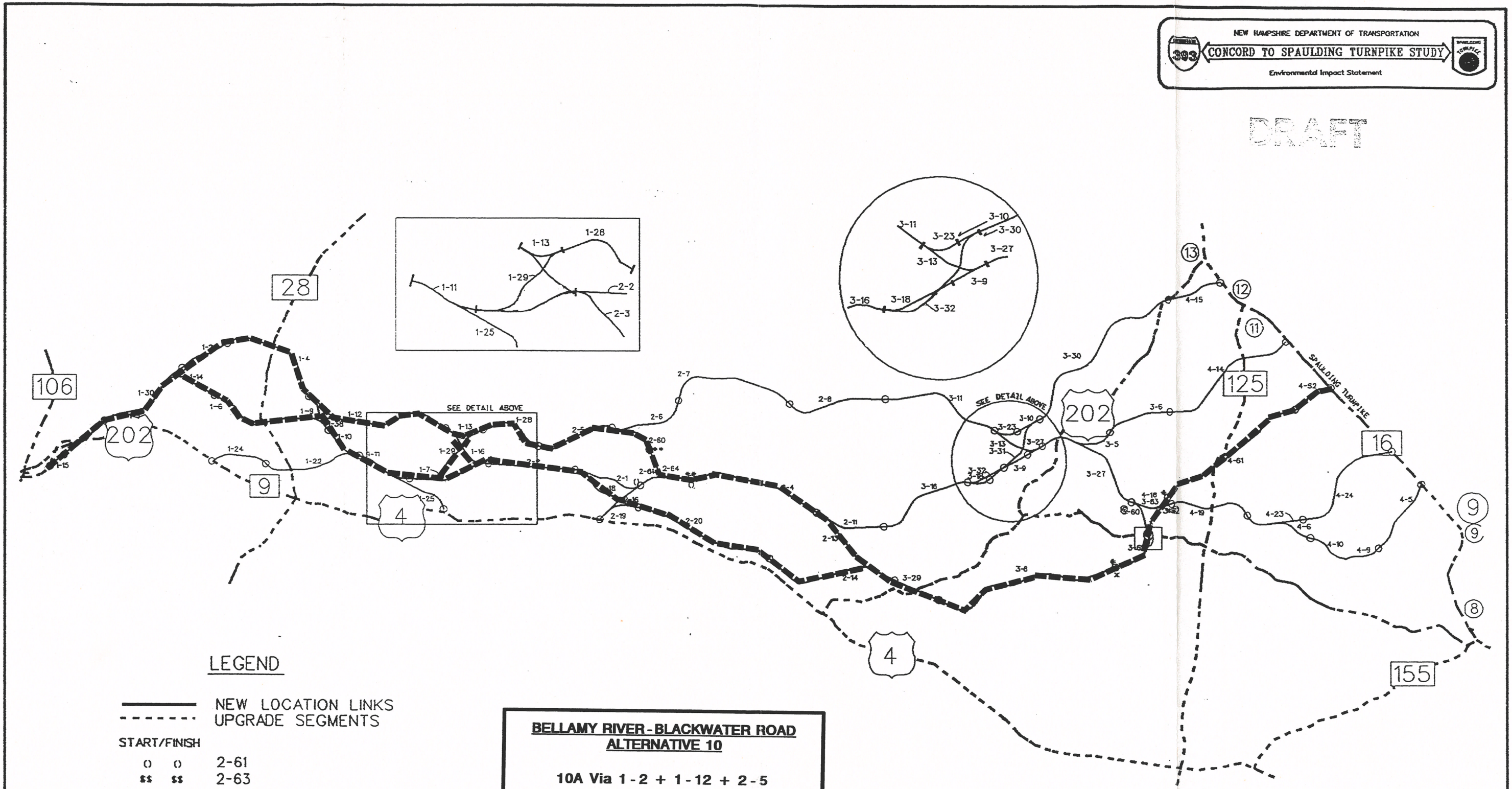
Design File: Name: /proj/0202218/rr4416.plt
PRF Name: rr4416.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

NEW LOCATION LINKS

UPGRADE SEGMENTS

START/FINISH	
0	0
$$	$$
**	**
xx	xx
&	&
%	%
@	@
x	x
*	*

2-61
2-63
2-64
2-65
4-22
4-10
3-63
3-62
3-61

BELLAMY RIVER - BLACKWATER ROAD
ALTERNATIVE 10

10A Via 1-2 + 1-12 + 2-5
10B Via 1-6 + 1-12 + 2-5
10C Via 1-2 + 1-10 + 2-5
10D Via 1-6 + 1-10 + 2-5
10E Via 1-2 + 1-12 + 2-2
10F Via 1-6 + 1-12 + 2-2
10G Via 1-2 + 1-10 + 2-2
10H Via 1-6 + 1-10 + 2-2

FIGURE V-10
ALTERNATIVE 10
BARRINGTON SOUTH-BLACKWATER ROAD

DIAGRAM NOT TO SCALE

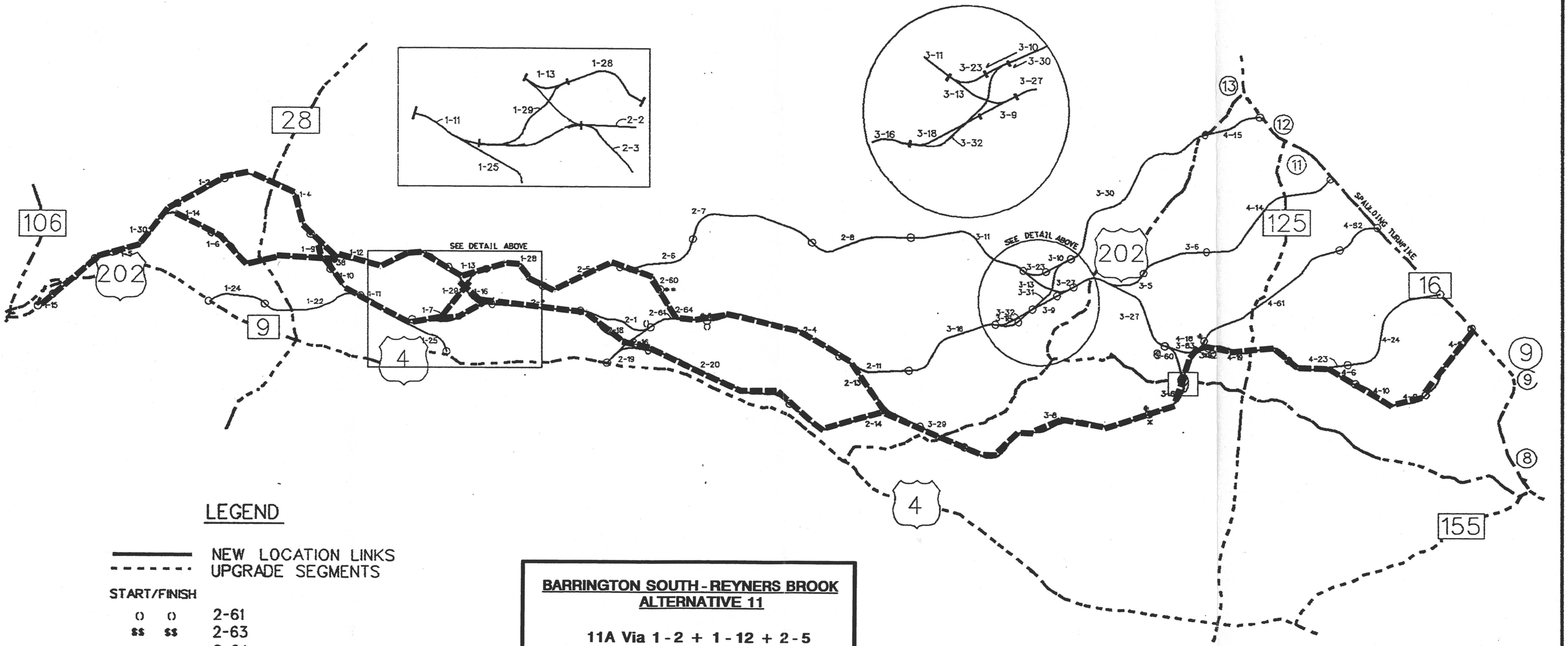
3/17/92

Design File Name: /proj/020219/rt4f16.plt
PRF Name: rt4f16.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

NEW LOCATION LINKS
UPGRADE SEGMENTS

START/FINISH		
0	0	2-61
$$	$$	2-63
**	**	2-64
××	××	2-65
&	&	4-22
%	%	4-10
@	@	3-63
×	×	3-62
#	#	3-61

BARRINGTON SOUTH - REYNERS BROOK
ALTERNATIVE 11

11A Via 1 - 2 + 1 - 12 + 2 - 5
11B Via 1 - 6 + 1 - 12 + 2 - 5
11C Via 1 - 2 + 1 - 10 + 2 - 5
11D Via 1 - 6 + 1 - 10 + 2 - 5
11E Via 1 - 2 + 1 - 12 + 2 - 2
11F Via 1 - 6 + 1 - 12 + 2 - 2
11G Via 1 - 2 + 1 - 10 + 2 - 2
11H Via 1 - 6 + 1 - 10 + 2 - 2

FIGURE V-11
ALTERNATIVE 11
BARRINGTON SOUTH-REYNERS BROOK

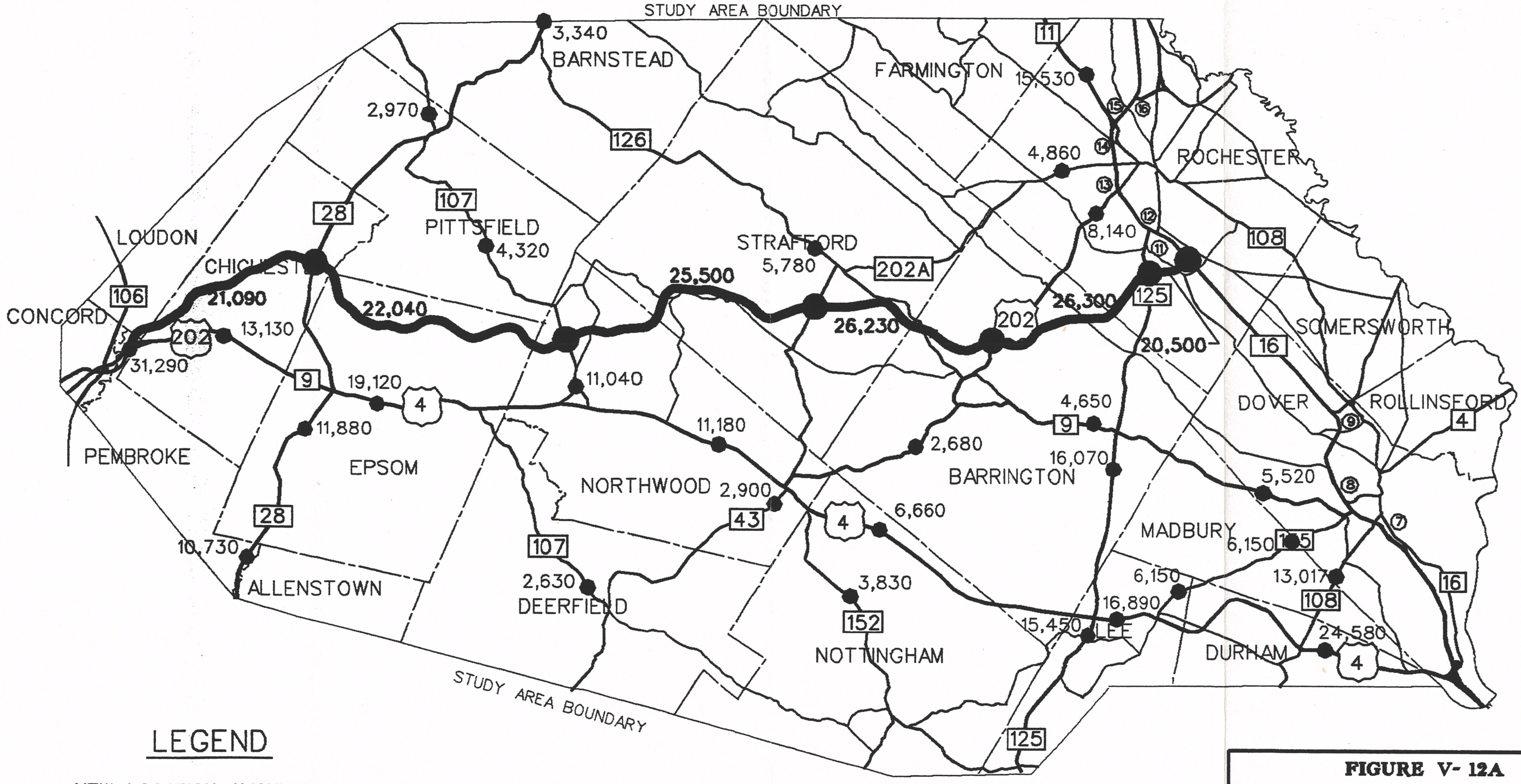
DIAGRAM NOT TO SCALE

3/17/92

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

NEW LOCATION ALIGNMENT ASSIGNED

INTERCHANGE LOCATION

19,270 2010 ADT

FIGURE V- 12A
PHASE IIIA
NEW LOCATION ASSIGNMENT
YEAR 2010

0 5000 10000 15000 20000

SCALE IN FEET

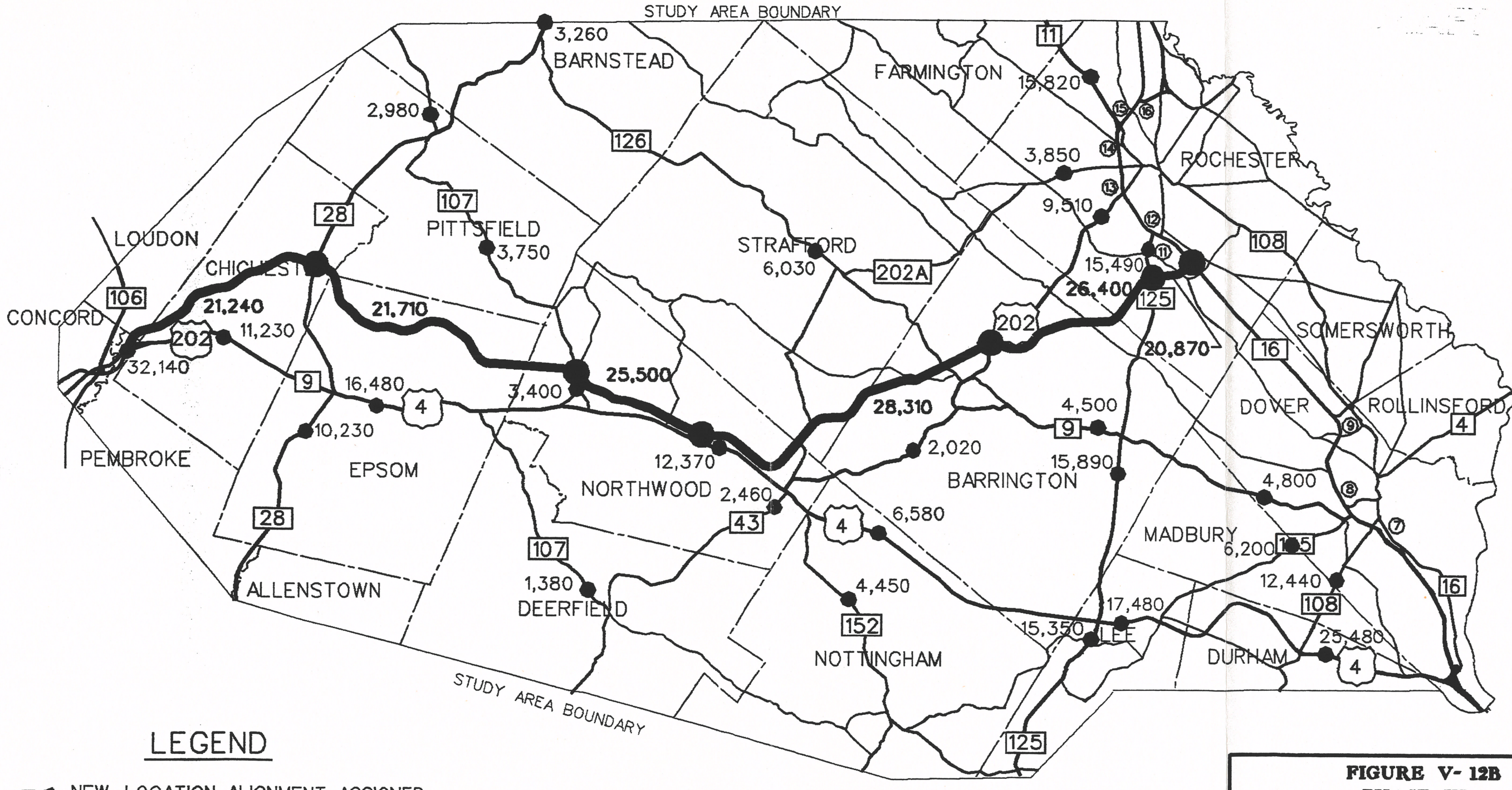
3/17/92

Design File /usr2/prol/020219/rr1430.plt
PRF Name rrr1430.prf
Date of Plot 03/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

NEW LOCATION ALIGNMENT ASSIGNED

INTERCHANGE LOCATION

19,270 2010 ADT

FIGURE V- 12B
PHASE IIIA
NEW LOCATION ASSIGNMENT
YEAR 2010

0 5000 10000 15000 20000
SCALE IN FEET

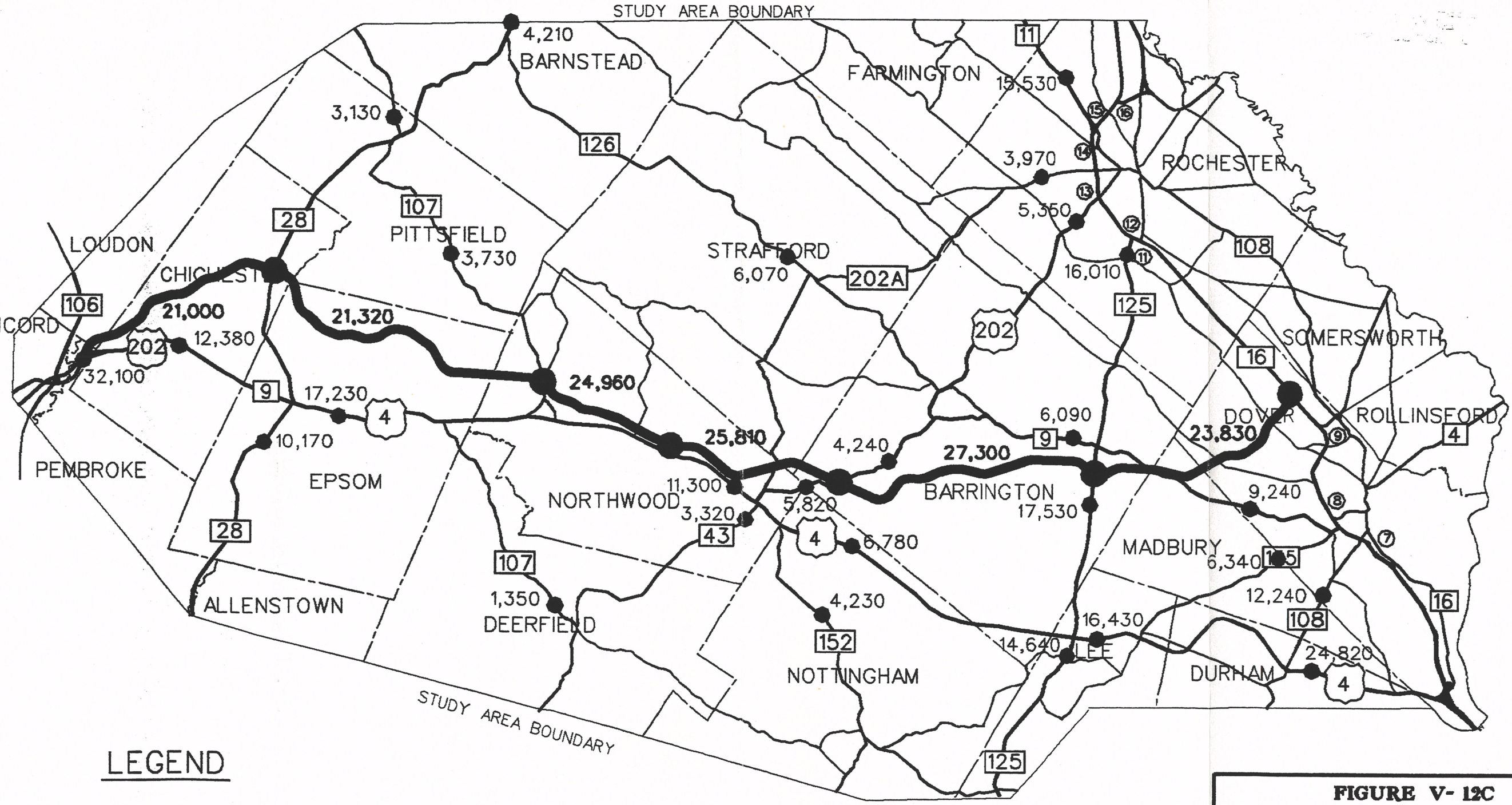
3/17/92

Design File: /usr2/proj/020219/rr5431.plt
PRF: rr5431.prf
Date of Plot: 03/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

NEW LOCATION ALIGNMENT ASSIGNED

INTERCHANGE LOCATION

19,270 2010 ADT

FIGURE V- 12C
PHASE IIIA
NEW LOCATION ASSIGNMENT
YEAR 2010

0 5000 10000 15000 20000
SCALE IN FEET

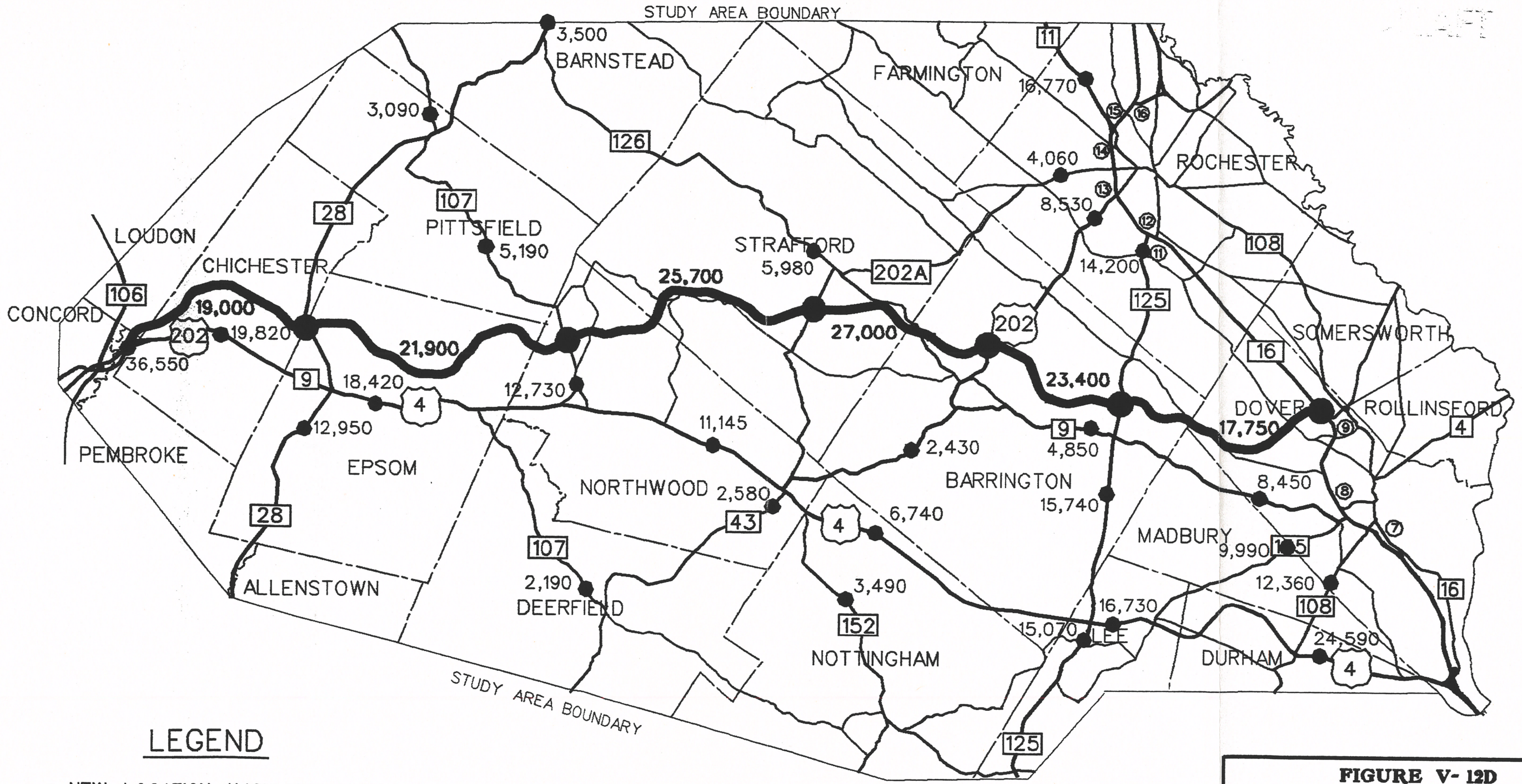
3/17/92

Design File /usr2/proj/020219/rr5132.plt
PRF Name (RR5132.prf)
Date of Plot: 03/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

NEW LOCATION ALIGNMENT ASSIGNED

INTERCHANGE LOCATION

19,270 2010 ADT

FIGURE V-12D
PHASE IIIA
NEW LOCATION ASSIGNMENT
YEAR 2010

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

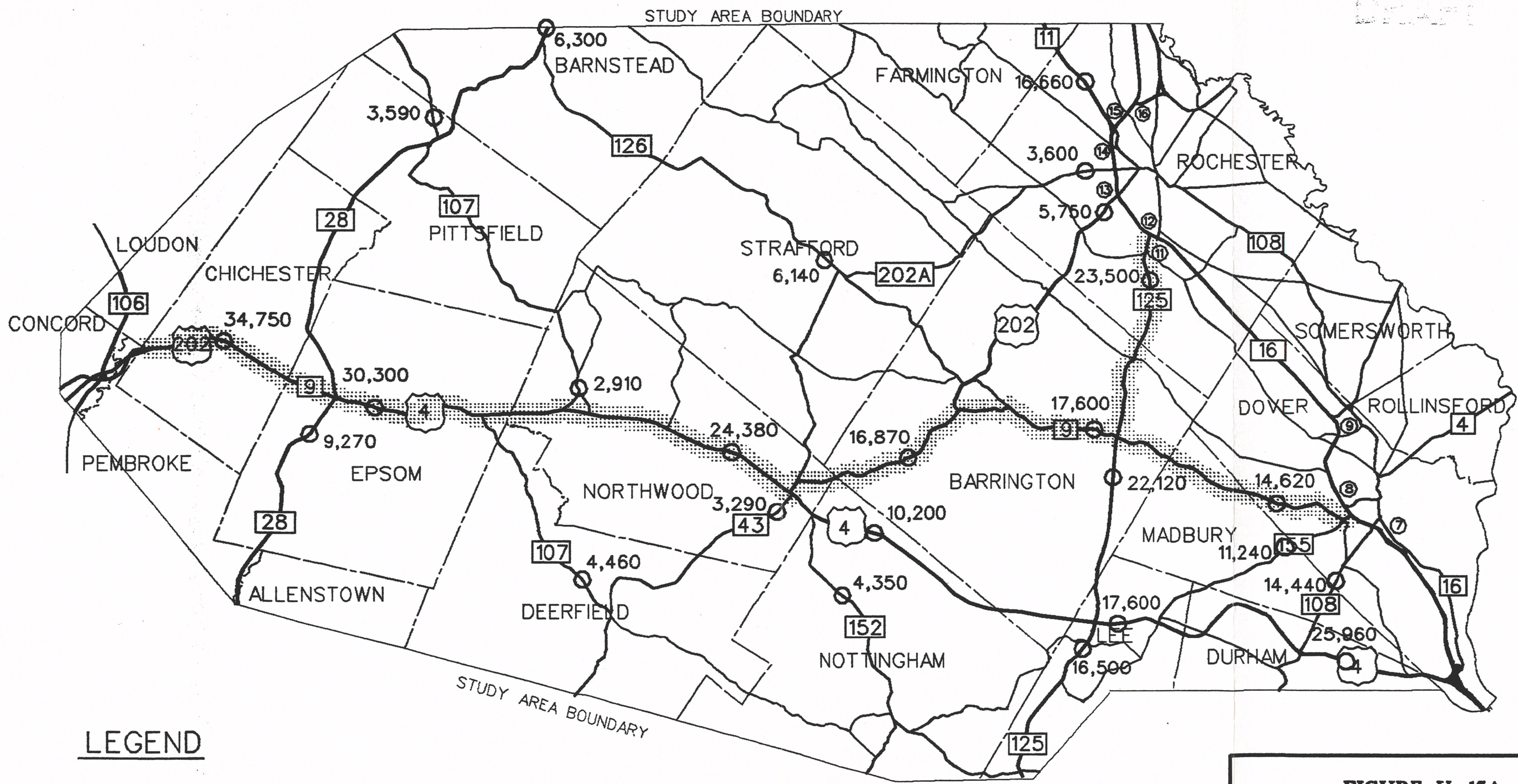
Design File: /usr2/prol/020219/rr933.plt
PRF Name: RR933.prf
Date of Plot: 03/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

UPGRADED ROUTES

9,270 2010 ADT TRAFFIC VOLUMES

FIGURE V- 13A
UPGRADE ALTERNATIVE 1B
YEAR 2010 ADT

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

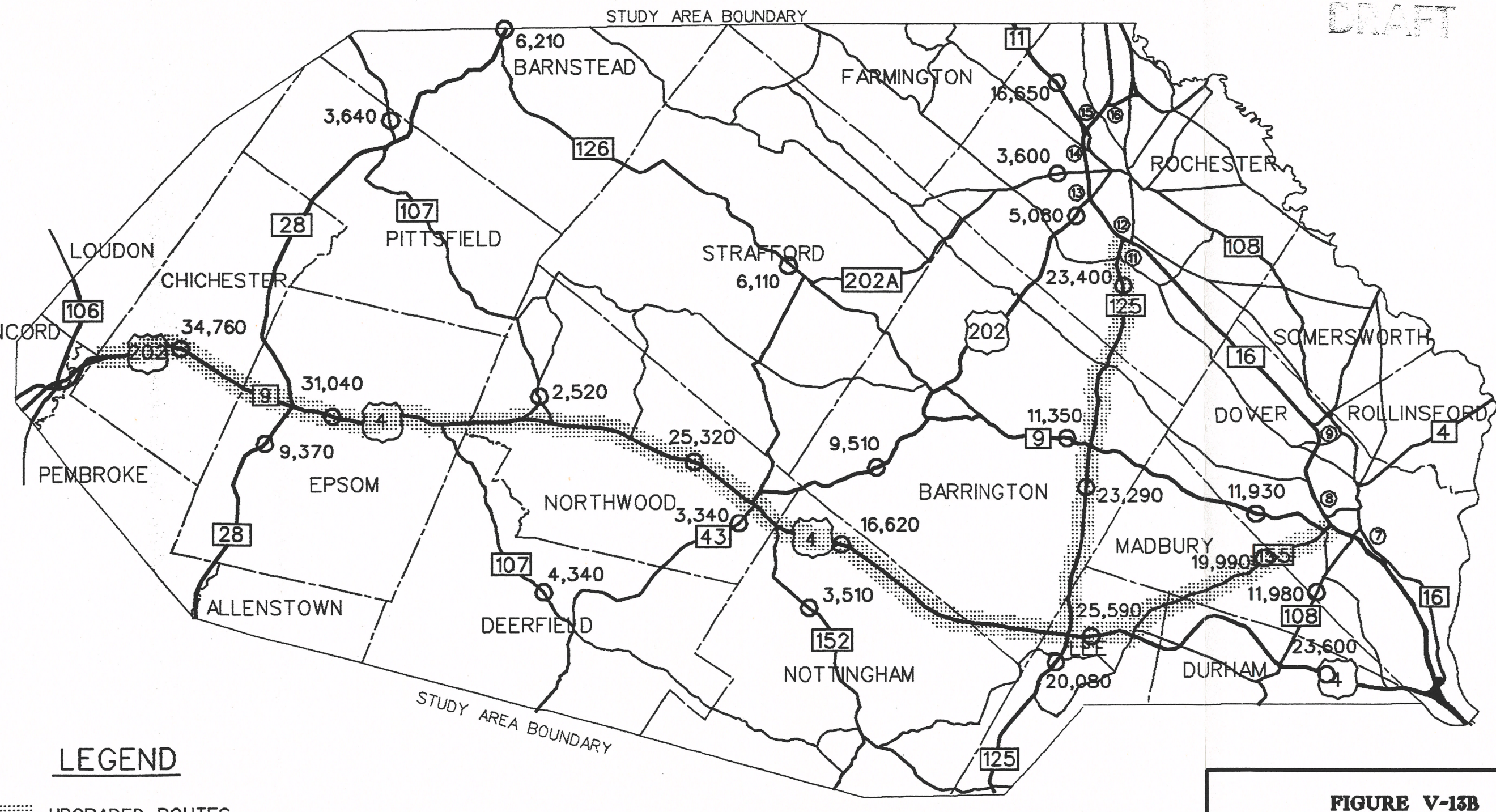
Design File N... /usr2/proj/020219/rr5434.plt
PRF N... rr5434-pr4
Date of Plot: 03/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT



LEGEND

UPGRADED ROUTES

9,270 2010 ADT TRAFFIC VOLUMES

FIGURE V-13B
UPGRADE ALTERNATIVE 1D
YEAR 2010 ADT

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N... /usr2/proj/020219/rr3535.plt
PRF N... /NHRT535.prf
Date of Plot: 03/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

DRAFT

STUDY AREA BOUNDARY

BARNSTEAD

FARMINGTON

ROCHESTER

LOUDON

CHICHESTER

PITTSFIELD

STRAFFORD

SOMERSWORTH

DOVER

ROLLINSFORD

PEMBROKE

EPSOM

ALLENSTOWN

DEERFIELD

NOTTINGHAM

LEE

SPAULDING TURNPIKE

CONCORD 106 — 202 — 9 — 4 — 28 — 107 — 126 — 202A — 11 — 125 — 16 — 155 — 108 — 43 — 152

34,750	34,760		
30,300	31,040		
9,270	9,370		
3,950	3,899	667	604
(2,097)	(2,177)	(1,811)	(1,624)
24,380	25,320	5,750	5,080
1,881	3,207	1,778	1,998
(822)	(1,412)	(11,043)	(11,047)
10,200	16,620	23,400	23,500
3,914	1,360	5,100	3,009
(2,615)	(1,807)	(1,548)	(1,022)
16,870	9,510	17,600	11,350
1,748	2,249	4,711	5,510
(3,216)	(3,916)	(119)	(102)
16,500	20,080	11,930	14,620
3,361	3,004	4,640	8,438
(5,661)	(6,450)	(11)	(0)
22,120	23,290	11,240	19,990
5,041	3,250	14,440	
(435)	(0)	11,980	
25,590	17,600		
6,301	7,866		
(448)	(467)		
23,600	25,960		

- Alternative 1 B
- 5000 - Dover-oriented ADT
- (5000) - Rochester-oriented ADT
- 5000 - Total ADT
- Traffic Survey Station

- Alternative 1 D
- 5000 - Dover-oriented ADT
- (5000) - Rochester-oriented ADT
- 5000 - Total ADT

FIGURE V-13C
UPGRADE ALTERNATIVES:
YEAR 2010 ADT

0 5000 10000 15000 20000
SCALE IN FEET

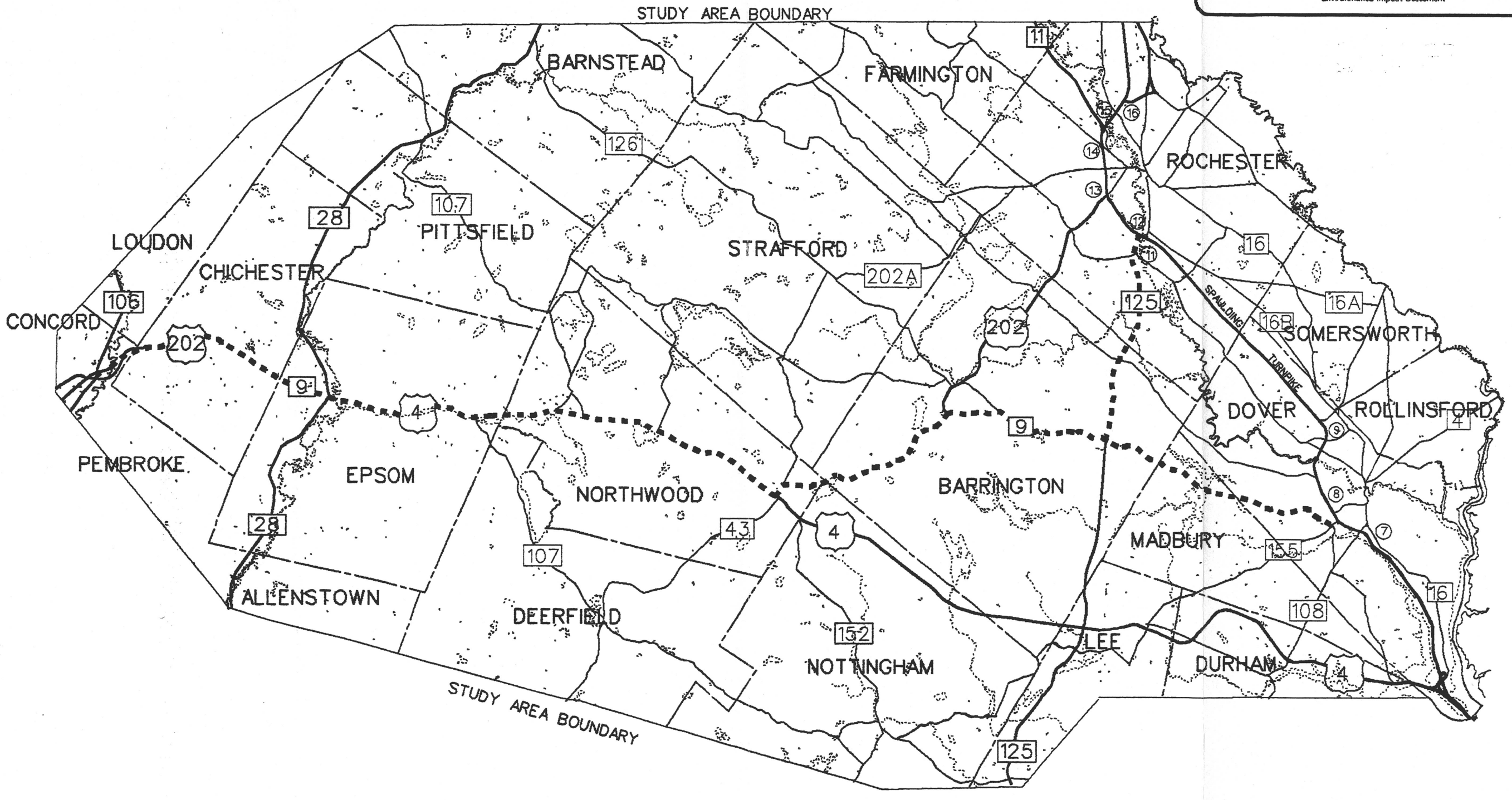
3/17/92

Design File Name: /usr2/proj/020218/rr4f13.plt
PRF Name: rrr4f13.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED UPGRADE CORRIDOR

FIGURE V - 14
ALTERNATIVE 1B
UPGRADE

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File: /usr2/proj/020218/rr5f14.plt
PRF Name: rr5f14.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

STUDY AREA BOUNDARY

BARNSTEAD

FARMINGTON

ROCHESTER

LOUDON

CHICHESTER

PITTSFIELD

STRAFFORD

CONCORD

PEMBROKE

EPSOM

NORTHWOOD

BARRINGTON

SOMERSWORTH

DOVER

ROLLINSFORD

MADBURY

ALLENSTOWN

DEERFIELD

NOTTINGHAM

LEE

DURHAM

SPAULDING TURNPIKE

STUDY AREA BOUNDARY

LEGEND

PROPOSED NEW LOCATION BYPASS

PROPOSED UPGRADE CORRIDOR

FIGURE V - 15
ALTERNATIVE 2A
BYPASS

0 5000 10000 15000 20000

SCALE IN FEET

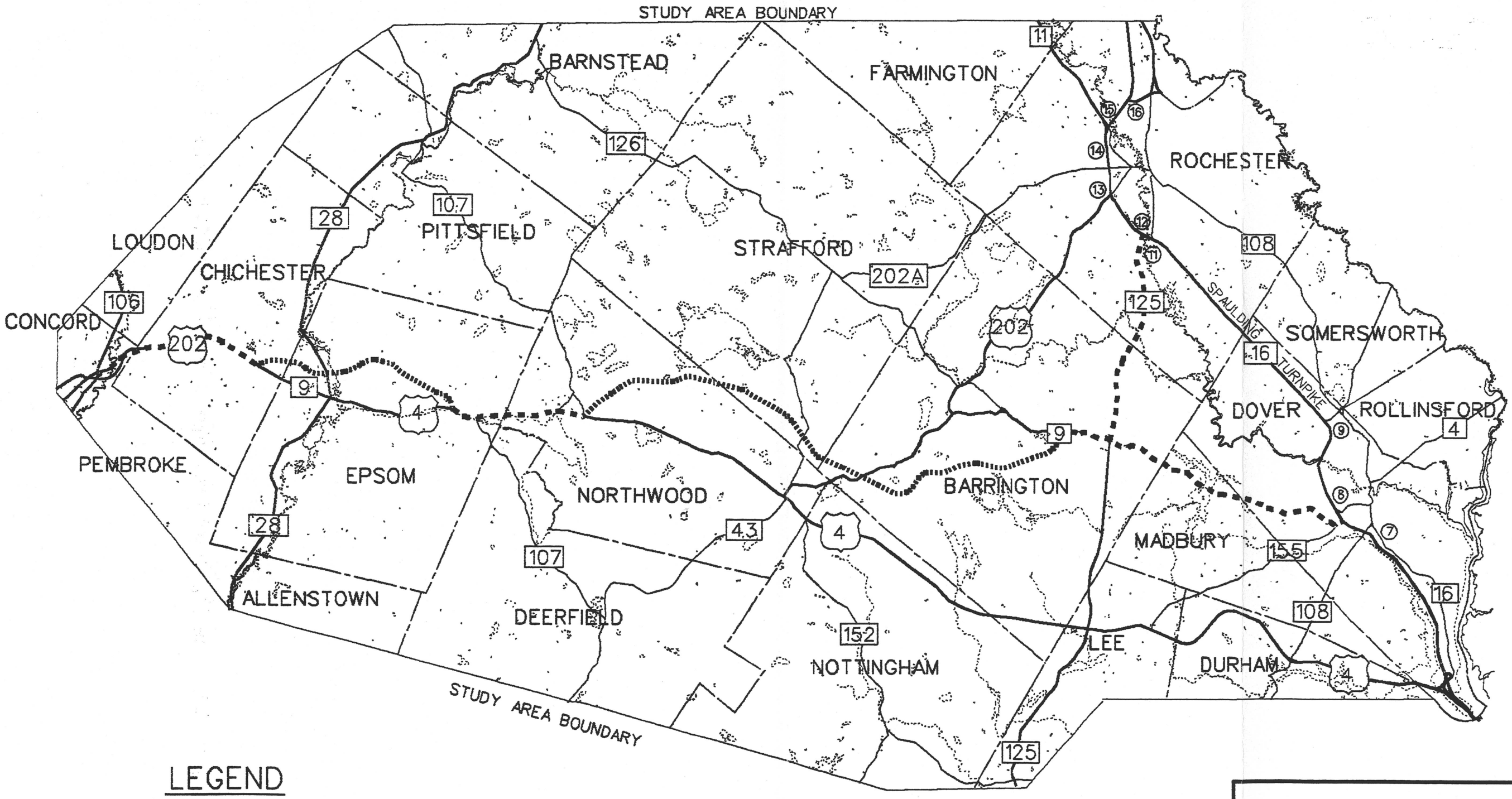
3/17/92

Design File /usr2/pro1/020218/rr5615.plt
PRF Name rrr5615.prf
Date of Plot 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION BYPASS

PROPOSED UPGRADE CORRIDOR

FIGURE V - 16
ALTERNATIVE 2B
BYPASS

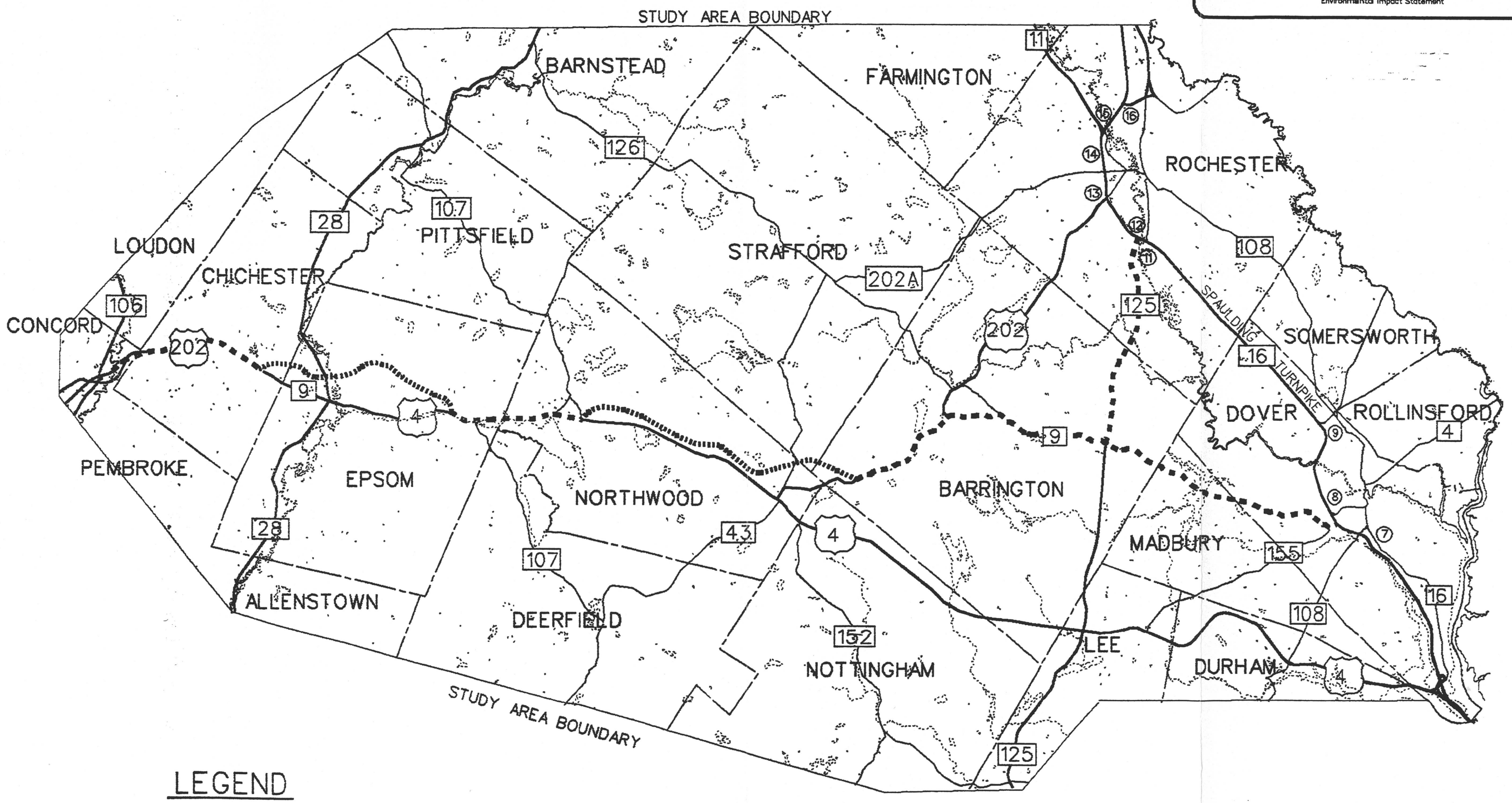
0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION BYPASS

PROPOSED UPGRADE CORRIDOR

FIGURE V - 17
ALTERNATIVE 2C
BYPASS

0 5000 10000 15000 20000
SCALE IN FEET

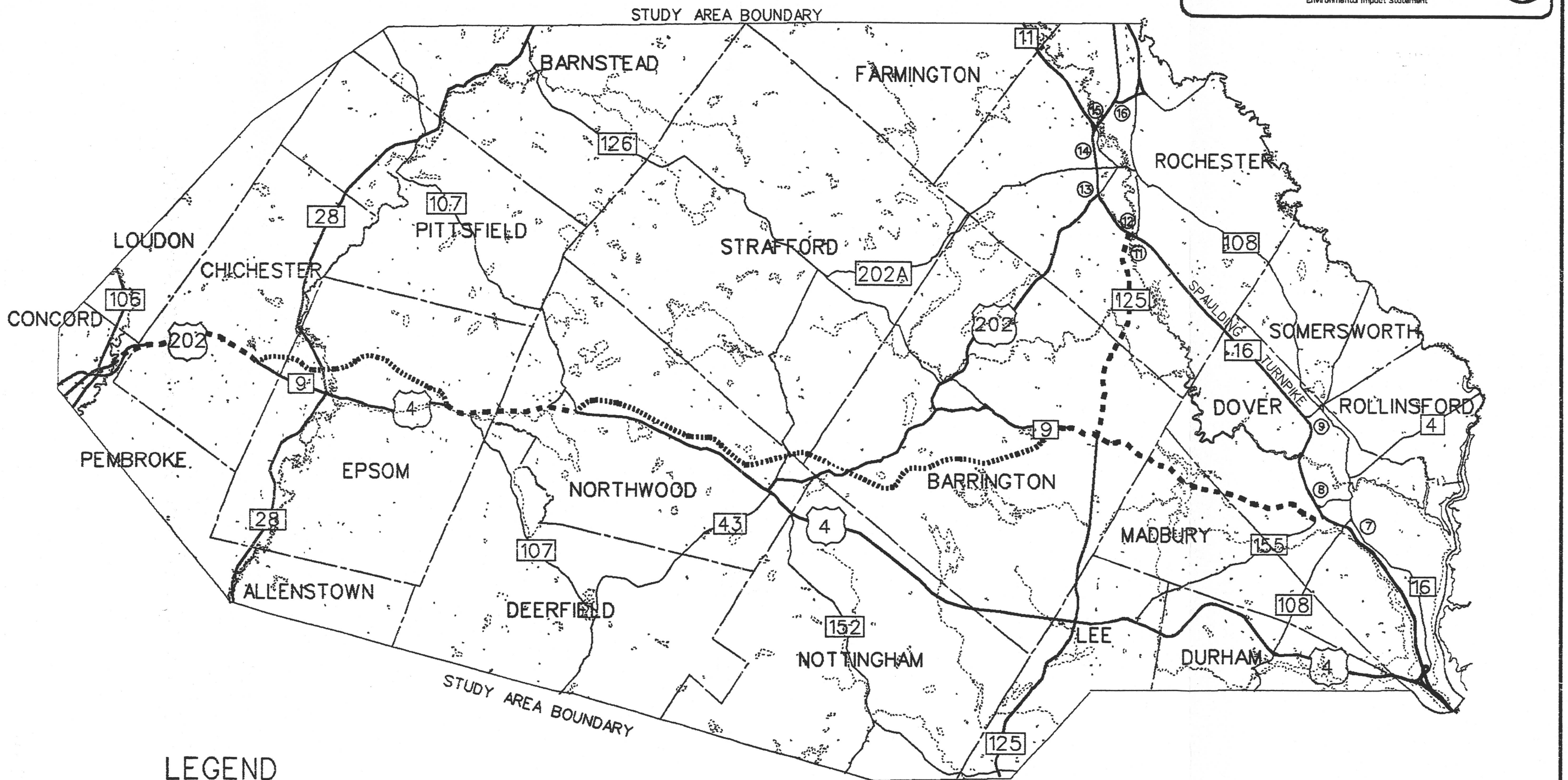
3/17/92

Design File: /proj/020219/rr5117.plt
PRF Name: rr5117.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

393 CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION BYPASS

PROPOSED UPGRADE CORRIDOR

FIGURE V - 18
ALTERNATIVE 2D
BYPASS

0 5000 10000 15000 20000
SCALE IN FEET

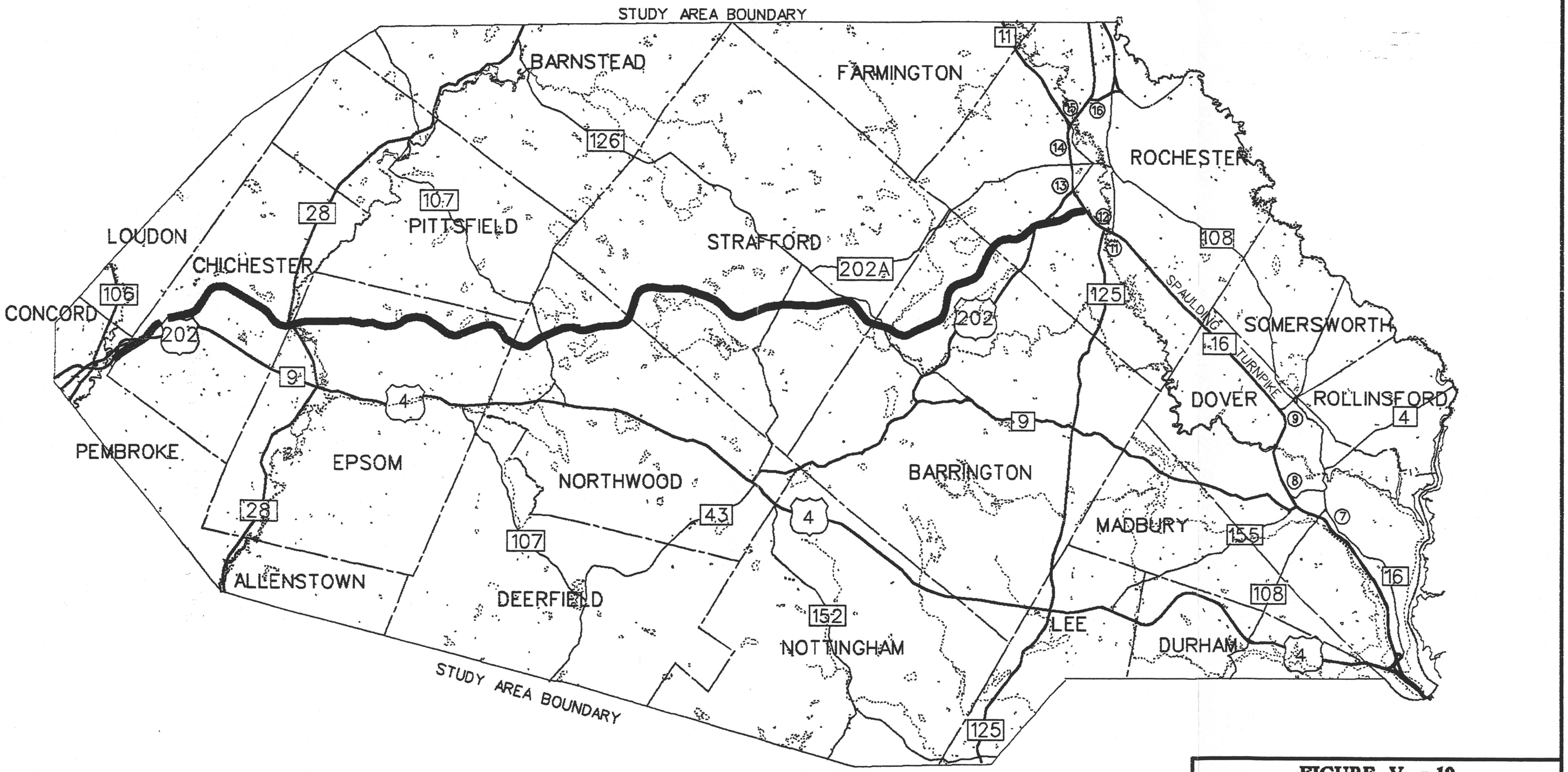
3/17/92

Design File Name: /usr2/prj/020219/rr5418.plt
PRF Name: rrr5418.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 19
ALTERNATIVE 3B
LOCKES HILL NORTH - STRAFFORD - CHESLEY HILL

0 5000 10000 15000 20000
SCALE IN FEET

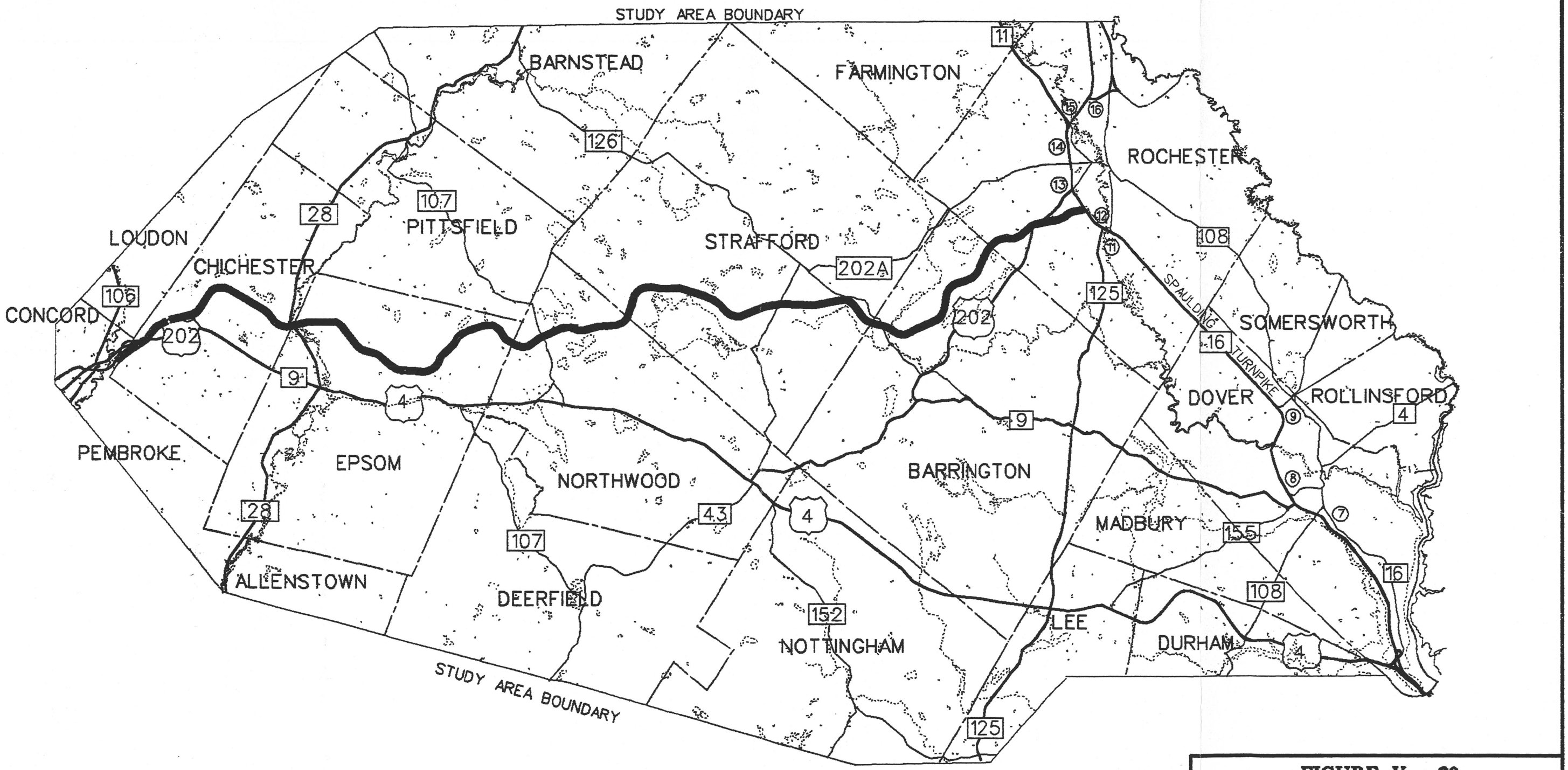
3/17/92

Design File: /usr2/proj/020219/rr5fig19.plt
PRF Name: rr5fig19.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 20
ALTERNATIVE 3D
LOCKES HILL SOUTH - STRAFFORD - CHESLEY HILL

0 5000 10000 15000 20000
SCALE IN FEET

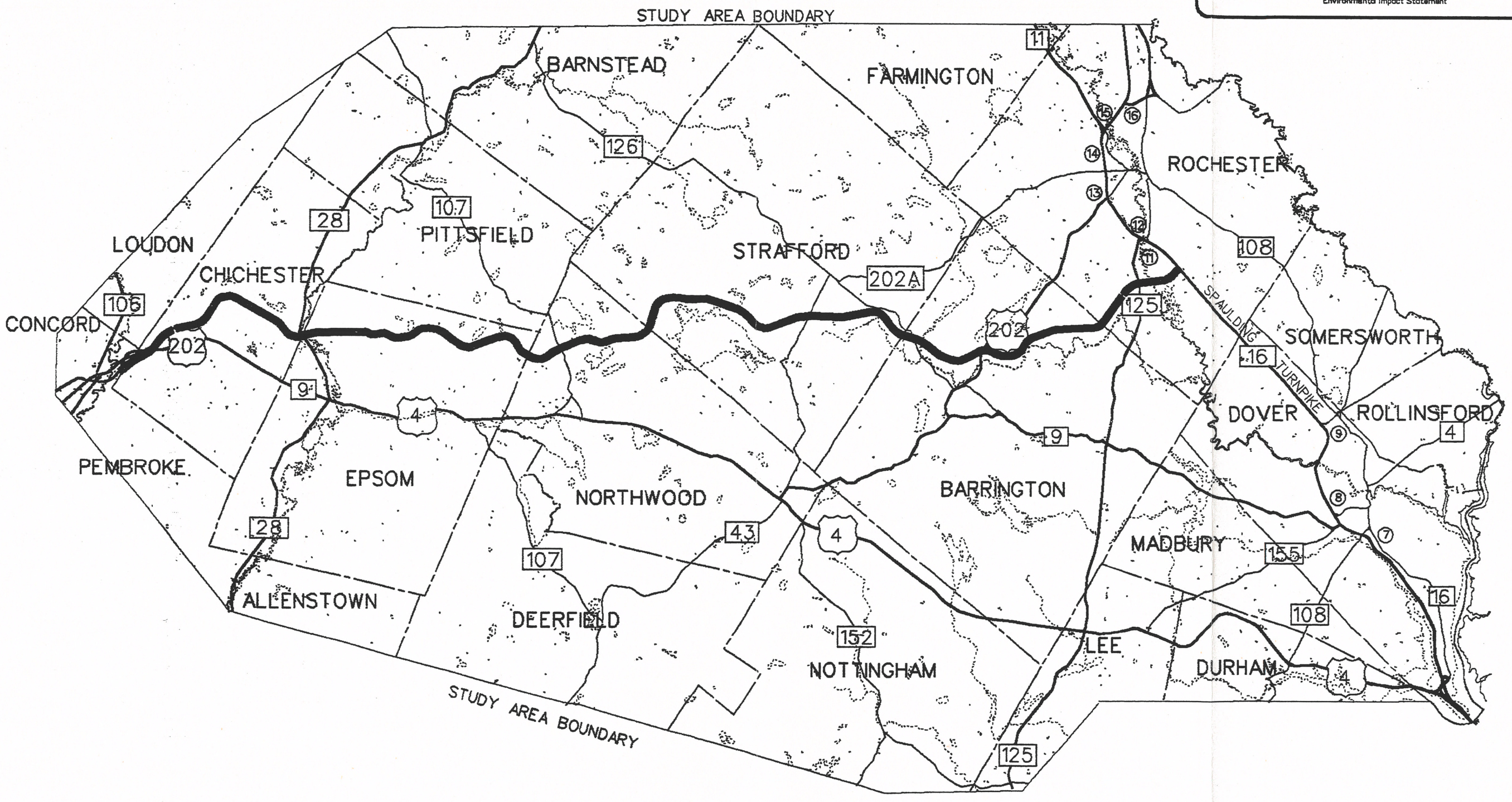
3/17/92

Design File N /usr2/proj/020218/rr5420.plt
PRF Name: RR5420.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 21
ALTERNATIVE 4B
LOCKES HILL NORTH - STRAFFORD - GONIC

0 5000 10000 15000 20000
SCALE IN FEET

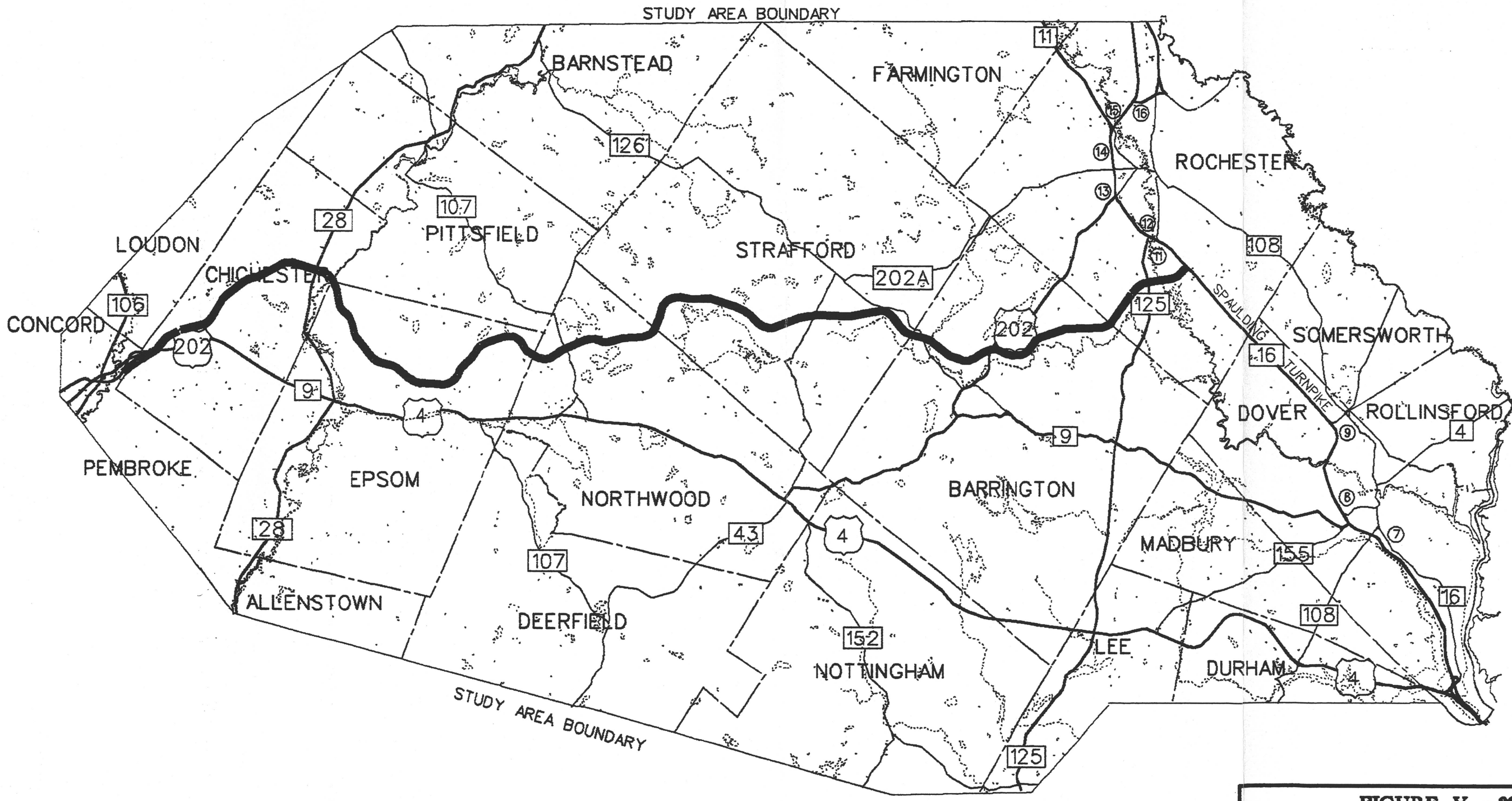
3/17/92

Design File: /usr2/pro1/020219/rt-sf21.plt
PRF: rtsf521.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 22
ALTERNATIVE 4C
LOCKES HILL SOUTH - STRAFFORD - GONIC

0 5000 10000 15000 20000
SCALE IN FEET

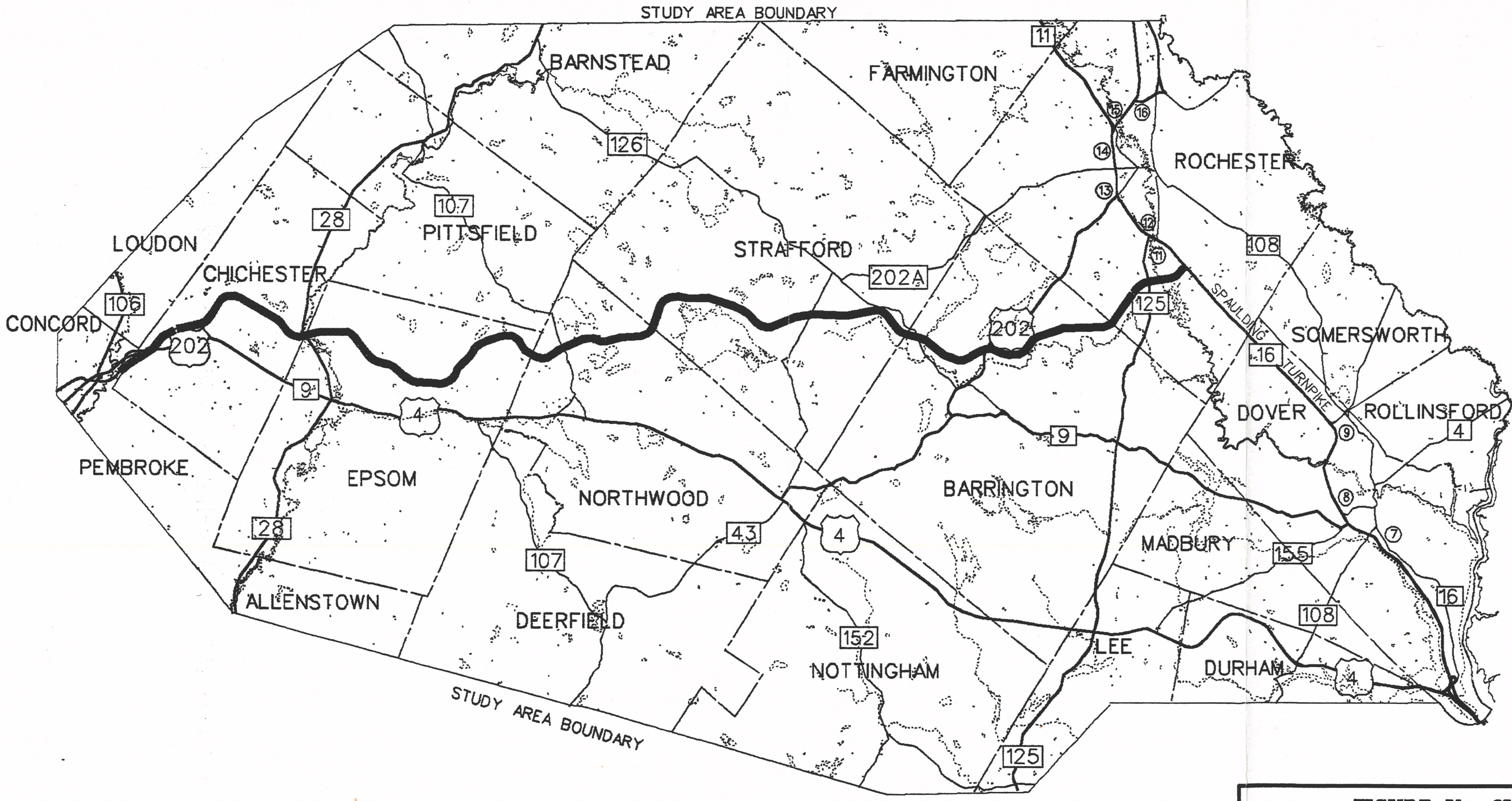
3/17/92

Design File /usr2/proj/020219/rr6f22.plt
PRF Name: nhrr6f22.prf
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 23
ALTERNATIVE 4D
PERRY BROOK - LOCKES HILL
SOUTH - STRAFFORD - GONIC

0 5000 10000 15000 20000
SCALE IN FEET

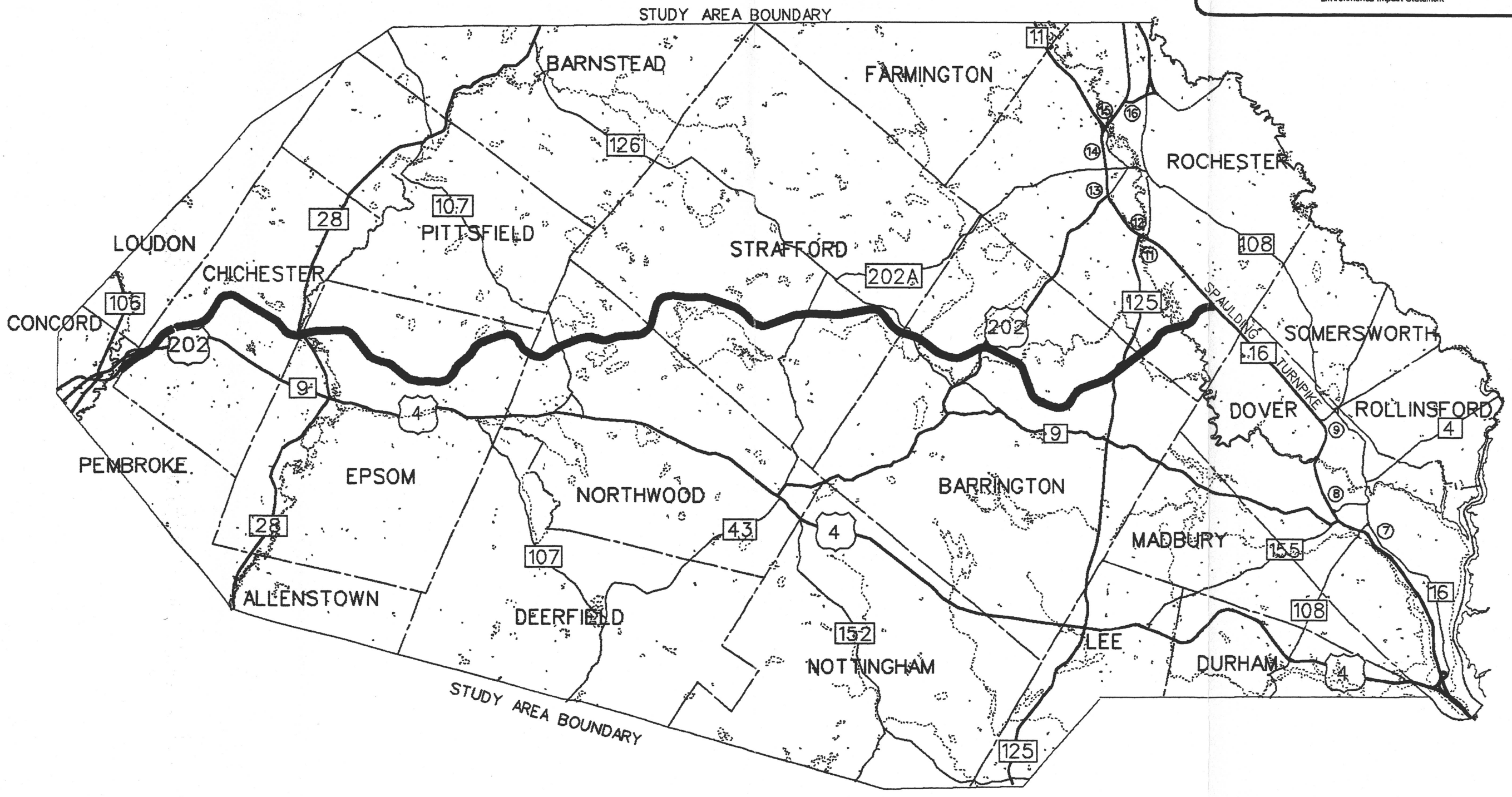
3/17/92

Design File: /usr2/pro1/020219/nr5f23.dit
PRF Name: NHT5F23.PRF
Date of Plot: 02/12/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 24
ALTERNATIVE 5D
STRAFFORD - BLACKWATER ROAD

0 5000 10000 15000 20000
SCALE IN FEET

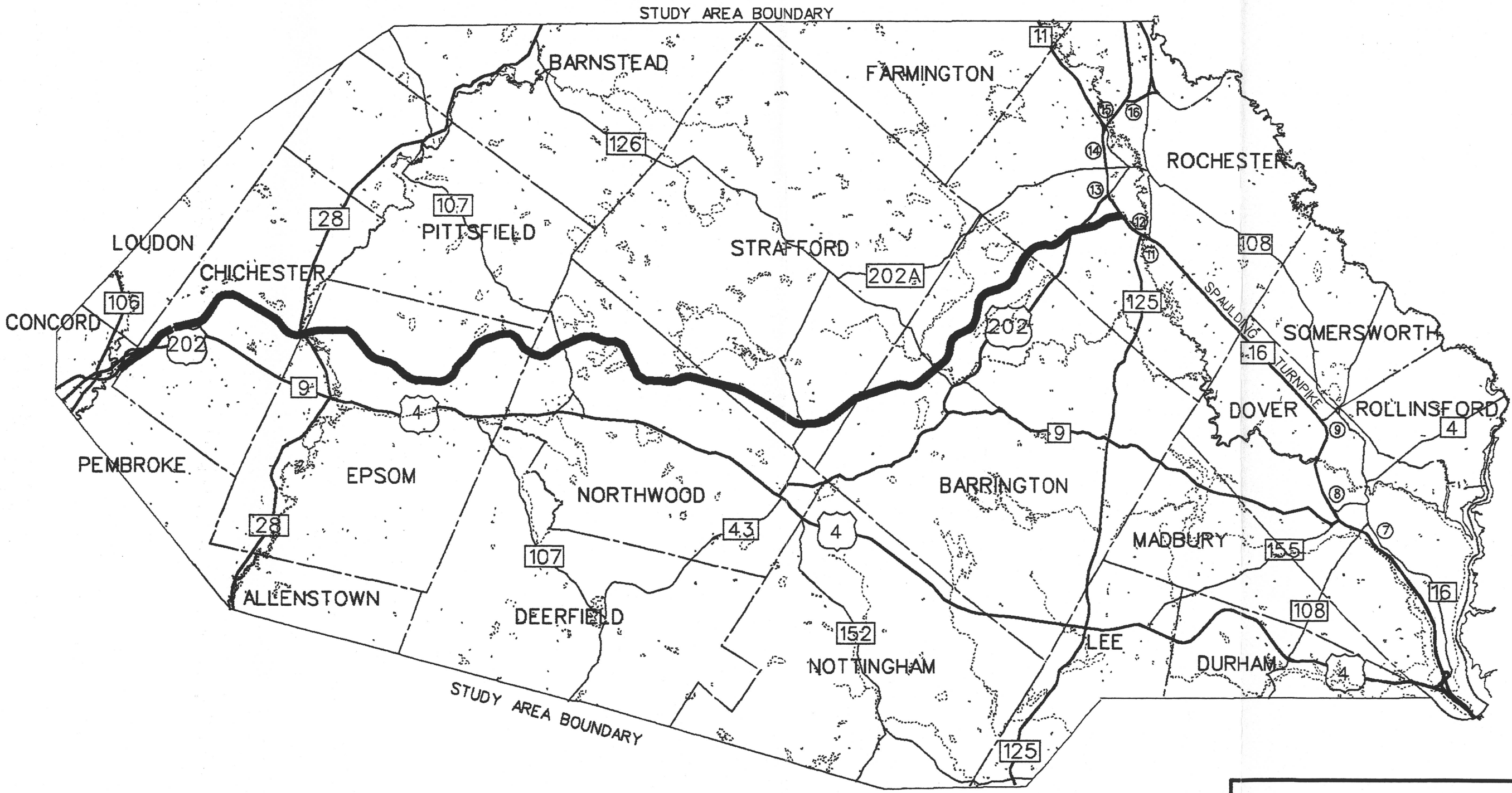
3/17/92

Design File /usr2/proj/020218/rr5424.plt
PRF h...ot rr5424.prf
Date of Plot 02/11/92 (usr/ng STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 25
ALTERNATIVE 6D
OAK HILL - CHESLEY HILL

0 5000 10000 15000 20000
SCALE IN FEET

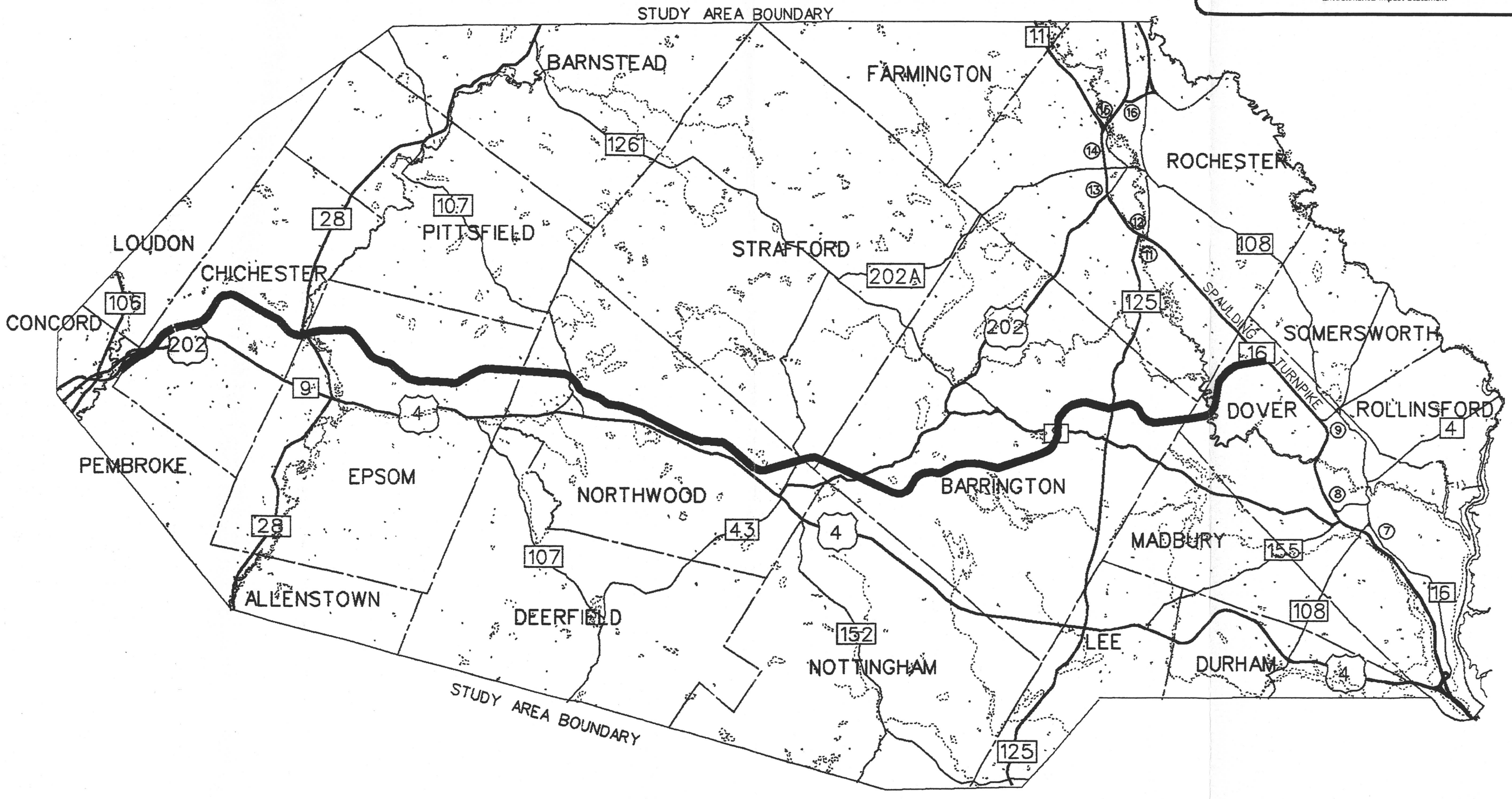
3/17/92

Design File: /proj/020218/rr3525.plt
PRF Name: rhrr3525.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 26
ALTERNATIVE 9H
BARRINGTON SOUTH - BLACKWATER HILL

0 5000 10000 15000 20000
SCALE IN FEET

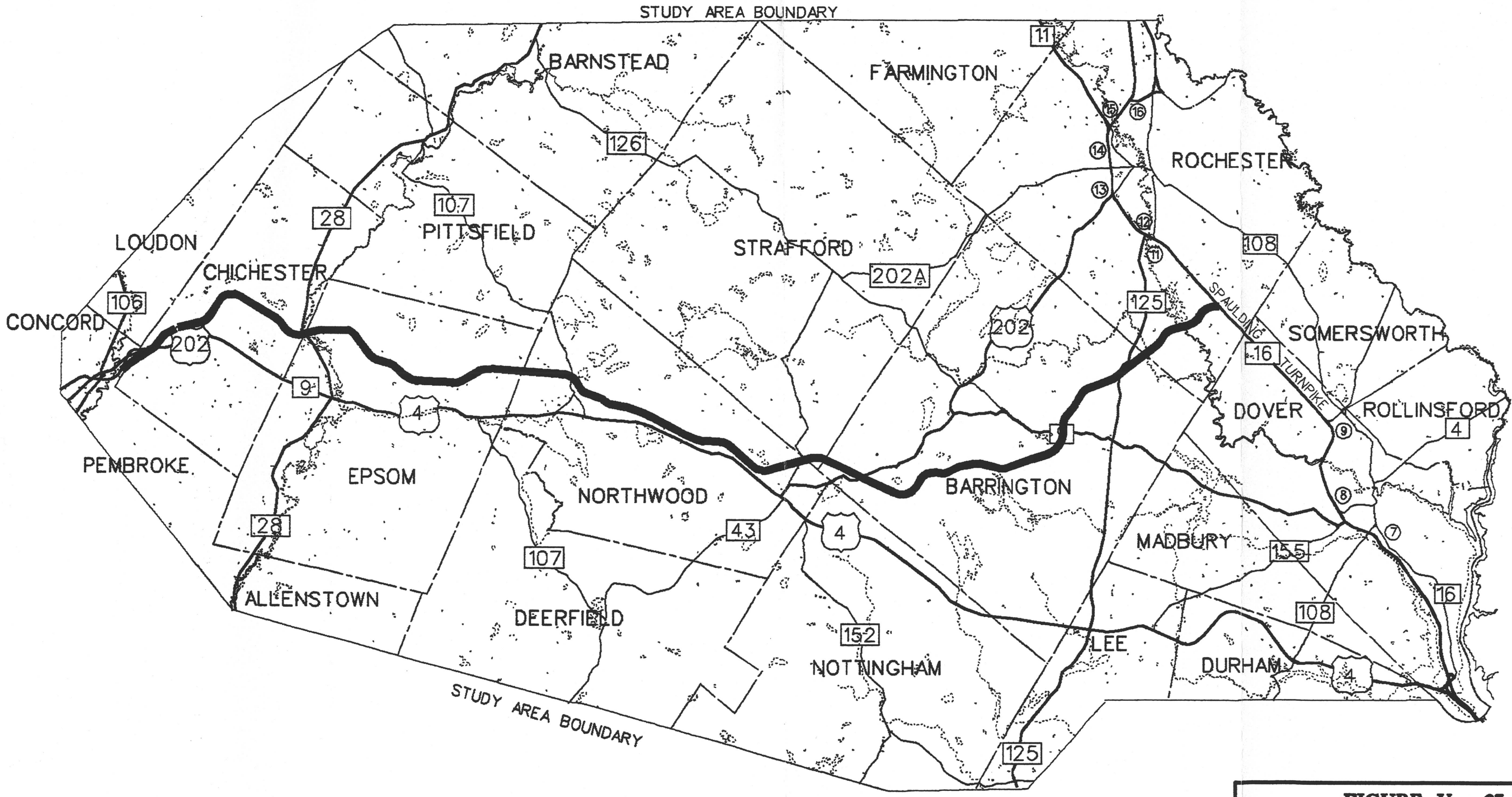
3/17/92

Design File N /usr2/proj/020219/rr-5f26.dit
PRF Name= rr-5f26.prf
Date of Plot= 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement



LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 27
ALTERNATIVE 10H
BARRINGTON SOUTH - BLACKWATER ROAD

0 5000 10000 15000 20000
SCALE IN FEET

3/17/92

Design File N... /usr2/proj/02019/rr5f27.plt
PRF Name: rrr5f27.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

STUDY AREA BOUNDARY

BARNSTEAD

FARMINGTON

ROCHESTER

LOUDON

CHICHESTER

PITTSFIELD

STRAFFORD

SPAULDING TURNPIKE

SOMERSWORTH

DOVER

ROLLINSFORD

PEMBROKE

EPSOM

NORTHWOOD

BARRINGTON

MADBURY

ALLENSTOWN

DEERFIELD

NOTTINGHAM

LEE

DURHAM

STUDY AREA BOUNDARY

LEGEND

PROPOSED NEW LOCATION CORRIDOR

FIGURE V - 28
ALTERNATIVE 11H
BARRINGTON SOUTH - REYNER'S BROOK

0 5000 10000 15000 20000

SCALE IN FEET

3/17/92

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

CONCORD TO SPAULDING TURNPIKE STUDY

Environmental Impact Statement

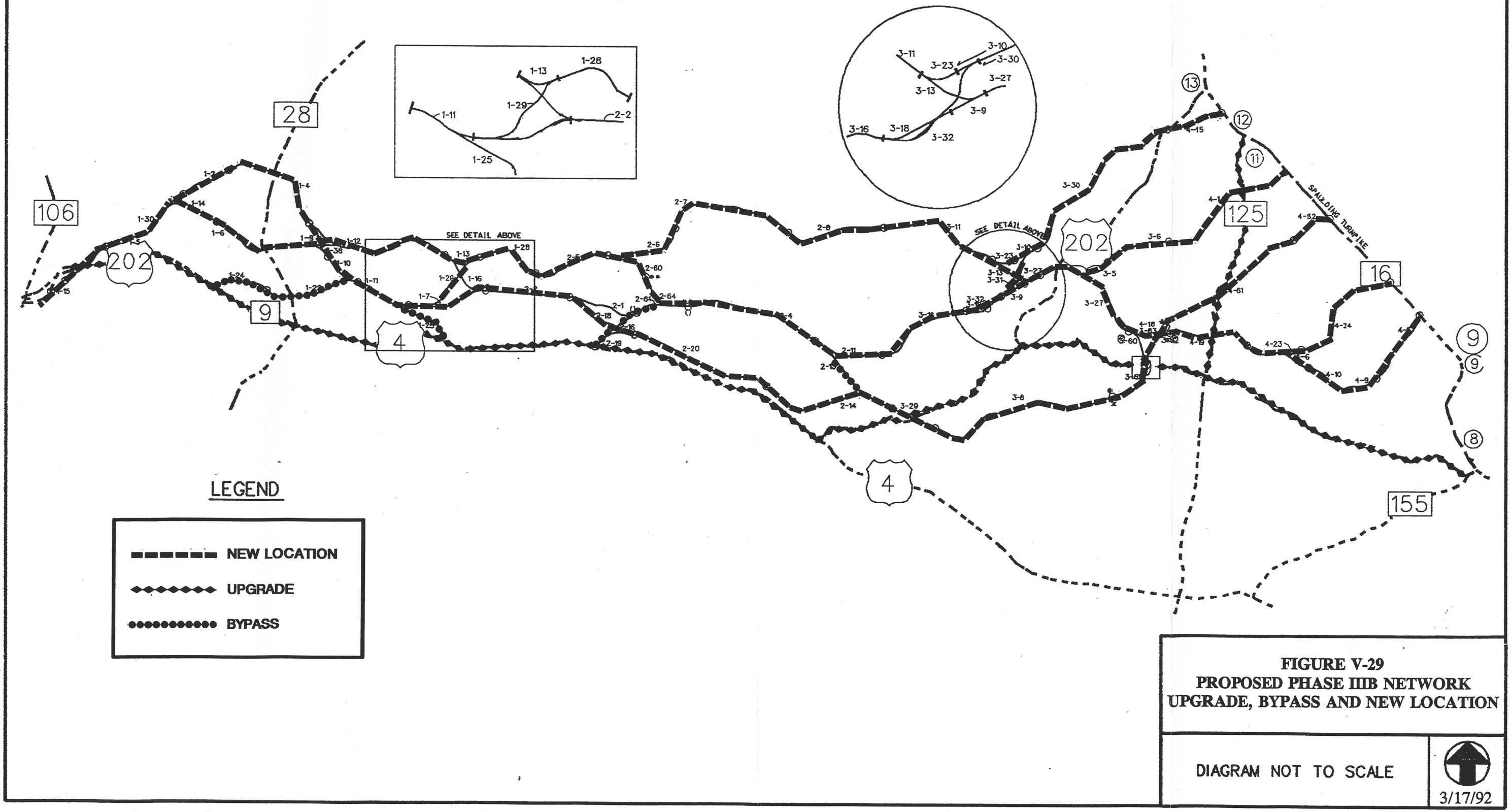


FIGURE V-29
PROPOSED PHASE IIIB NETWORK
UPGRADE, BYPASS AND NEW LOCATION

DIAGRAM NOT TO SCALE

3/17/92

Design File: /proj/020219/rr4f16.plt
PRF Name: nhrr4f16.prf
Date of Plot: 02/11/92 (using STANDARD.TBL)